

Bygningsbeslag – Hængelåse og beslag til hængelåse – Krav og prøvningsmetoder

Building hardware – Padlocks and padlock fittings –
Requirements and test methods



DANSK STANDARD

© DANSK STANDARD - Eftertryk uden tilladelse forbudt

DS/EN 12320

København
DS Projekt: 23014
ICS: 91.190

Deskriptorer:

isenkram,prøvning,bygninger,indbrudssikring,låse,døre,vinduer,vinduesrammer,risikoforebyggelse i bygninger,brandsikkerhed

Første del af denne publikations betegnelse er:

DS/EN, hvilket betyder, at det er en europæisk standard, der har status som dansk standard.

Denne publikations overensstemmelse er:

IDT med: EN 12320:2001 på engelsk

DS-publikationstyper

DANSK STANDARD udgiver forskellige publikationstyper.

Typen på denne publikation fremgår af forsiden.

Der kan være tale om:

Dansk standard

- standard, der er udarbejdet på nationalt niveau, eller som er baseret på et andet lands nationale standard eller
- standard, der er udarbejdet på internationalt og/eller europæisk niveau, og som har fået status som dansk standard

DS-information

- publikation, der er udarbejdet på nationalt niveau, og som ikke har opnået status som standard, eller
- publikation, der er udarbejdet på internationalt og/eller europæisk niveau, og som ikke har fået status som standard, fx en teknisk rapport, eller
- europæisk præstandard

DS-håndbog

- samling af standarder, eventuelt suppleret med informativt materiale

DS-hæfte

- publikation med informativt materiale

Til disse publikationstyper kan endvidere udgives

- tillæg og rettelsesblade

DS-publikationsform

Publikationstyperne udgives i forskellig form som henholdsvis

- fuldtekstpublikation (publikationen er trykt i sin helhed)
- godkendelsesblad (publikationen leveres i kopi med et trykt DS-omslag)
- elektronisk (publikationen leveres på et elektronisk medie)

DS-betegnelse

Alle DS-publikationers betegnelse begynder med DS efterfulgt af et eller flere præfikser og et nr. fx **DS 383**, **DS/EN 5414** osv. Hvis der efter nr. er angivet at **A** eller **Cor**, betyder det, enten at det er et **tillæg** eller et **rettelsesblad** til hovedstandard, eller at det er indført i hovedstandard.

DS-betegnelse angives på forsiden.

Overensstemmelse med anden publikation:

Overensstemmelse kan enten være IDT, EQV, NEQ eller MOD

- **IDT:** Når publikationen er identisk med en given publikation.
- **EQV:** Når publikationen teknisk er i overensstemmelse med en given publikation, men præsentationen er ændret.
- **NEQ:** Når publikationen teknisk eller præsentationsmæssigt ikke er i overensstemmelse med en given standard, men udarbejdet på baggrund af denne.
- **MOD:** Når publikationen er modificeret i forhold til en given publikation.

ICS 91.190

English version

Building hardware - Padlocks and padlock fittings - Requirements and test methods

Quincaillerie pour le bâtiment - Cadenas et porte-cadenas -
Prescriptions et méthodes d'essai

Baubeschläge - Hangschlösser und Hangschlossbeschläge
- Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 6 December 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

	Page
Foreword.....	3
1 Scope	3
2 Normative references	3
3 Definitions and symbols	3
4 Requirements	5
5 Test methods	7
6 Classification	12
7 Marking	13
Annex A (normative) Sampling and sequencing - Tests on alternative design padlocks	14
Annex B (normative) Test rig illustrations	15
Bibliography	21

Foreword

This European Standard 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 July 2001, and conflicting national standards shall be withdrawn at the latest by July 2001.

This European Standard is one of a series of European Standards dedicated to building hardware products.

Test methods are specified in detail to ensure reproducibility at any testing establishment within Europe, and acceptance criteria are defined objectively to ensure consistency of assessment.

Annexes A and B are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies performance requirements and describes test methods for strength, security, function and corrosion of padlocks and padlock fittings used in building applications, but excluding cables and chains.

Requirements which relate to security are classified in six grades, based on performance tests that simulate attack.

Human intervention test, durability test, manipulation and picking tests are not included in this standard.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1670:1998, Building hardware - Corrosion resistance — Requirements and test methods.

EN 10025, *Hot rolled products of non-alloy structural steels — Technical delivery conditions.*

3 Definitions and symbols

3.1 Definitions

For the purposes of this European Standard, the following definitions apply.

3.1.1

cam

part of the key mechanism which operates the locking mechanism.

3.1.2

effective differ

difference between key mechanism of similar design, achieved only by the movable detainer, which allows each key mechanism to be operated only by its own key. The number of effective differs is equal to the number of theoretical differs after deduction of the differs suppressed by the manufacturer due to technical constraints.

3.1.3

hasp

part of the padlock fitting which goes over the staple.

3.1.4

key mechanism

part of the mechanism which recognises a correct key

3.1.5

locking mechanism

part of the mechanism which is operated by the key mechanism to lock/unlock the padlock.

3.1.6

padlock

independent locking device comprising a body, a key mechanism, a locking mechanism, and a shackle.

3.1.7

padlock fitting

device fitted to the object which is to be locked with a padlock.

3.1.8

shackle

part of the padlock which passes through and secures the padlock fitting.

3.1.9

staple

part of the padlock fitting through which the padlock shackle is passed.

3.2 Symbols

For the purposes of this European Standard, the symbols described in table 1 apply.

Table 1

Symbol	Unit	Definition
d	mm	Diameter of shackle
F1	kN	Push/pull force on cylinder plug/locking mechanism
F2	kN	Pull force on shackle and staple
F3	kN	Cutting force on shackle and staple
F4	kN	Maximum possible push/pull force on cylinder plug/locking mechanism
h	mm	Height through which weight is dropped (impact test)
M1	Nm	Torque on key to test for interpassing
M2	Nm	Torque on cylinder plug/locking mechanism
M3	Nm	Twisting torque on shackle and staple
n		Minimum number of effective key differs
t	s	Drilling/sawing resistance time
T	°C	Temperature of product for impact testing
m	g	Drop mass for impact test

4 Requirements

The structure of this clause reflects the classification as given in clause 6. The first five digits of the classification (table 5) are not in use and therefore only corrosion resistance (sixth digit) and the security (seventh digit) are included.

4.1 General

4.1.1 Operational unlocking test

When tested in accordance with 5.1.1 the shackle shall be released.

4.2 Corrosion resistance

Products shall be classified in accordance with EN 1670:1998.

Products intended for internal use shall conform to the minimum requirements for grade 1 (mild resistance).

Products intended for external use shall conform to the minimum requirements for grade 3 (high resistance).

After the corrosion test, the padlock shall operate, using a maximum torque on the key of 2,5 Nm.

4.3 Security

In grades 4, 5 and 6 it shall not be possible to remove the key until the shackle is deadlocked in the closed position.

4.3.1 Minimum number of effective key differs

Padlocks shall have a minimum of n effective differs (table 2).

Maximum number of steps on the same level 60%, maximum two adjacent and a minimum of three levels.

4.3.2 Non-interpassing of keys with just one interval effective differ

When tested in accordance with 5.4.2 it shall not be possible to operate the padlock with keys differing from the correct key by one interval, i.e. the next closest key. The next closest key shall be defined by the manufacturer according to its key coding system.

4.3.3 Resistance to force on cylinder plug or locking mechanism

When tested in accordance with 5.4.3, the cylinder plug or the locking mechanism shall resist a force F_1 (table 2).

4.3.4 Resistance to torque on cylinder plug or locking mechanism

When tested in accordance with 5.4.4, the cylinder plug or the locking mechanism shall resist a torque M_2 (table 2).

4.3.5 Resistance to pulling of shackle and staple

When tested in accordance with 5.4.5, the shackle and the staple shall each resist a force F_2 (table 2).

4.3.6 Resistance to twisting of shackle and staple

When tested in accordance with 5.4.6, the shackle and the staple shall each resist a torque M_3 (table 2).

4.3.7 Resistance to cutting of shackle and staple

When tested in accordance with 5.4.7, the shackle and the staple shall each resist a force F_3 (table 2).

4.3.8 Resistance to impact on padlock body, shackle and staple at low temperature

When tested in accordance with 5.4.8, the padlock body, the shackle and the staple cooled to temperature T , shall each resist the blows from the steel pole with the mass m and from the height h (table 2).

4.3.9 Resistance to drilling of padlock body, shackle and staple

When tested in accordance with 5.4.9, the padlock body, the shackle and the staple shall each resist drilling for a time t (table 2).

4.3.10 Resistance to sawing of padlock body, shackle and staple

When tested in accordance with 5.4.10, the padlock body, the shackle and the staple shall each resist sawing for a time t (table 2).

Table 2 — Security requirements

Requirement clause number	Requirement	Test method clause number	Test parameter	Grade						Unit
				1	2	3	4	5	6	
4.3.1	Minimum number of effective key differs	5.4.1	n	300	1 000	2 500	5 000	10 000	20 000	-
4.3.2	Non-interpassing of keys with just one interval differ - Torque on key	5.4.2	M1	1	1	1,5	1,5	1,5	1,5	Nm
4.3.3	Resistance to force on cylinder plug or locking mechanism	5.4.3	F1	-	-	4	5	10	15	kN
4.3.4	Resistance to torque on cylinder plug or locking mechanism	5.4.4	M2	-	2,5	5	15	20	30	Nm
4.3.5	Resistance to pulling of shackle and staple	5.4.5	F2	3	5	15	30	70	100	kN
4.3.6	Resistance to twisting of shackle and staple	5.4.6	M3	40	100	200	450	1 200	2 500	Nm
4.3.7	Resistance to cutting of shackle and staple	5.4.7	F3	6	15	25	35	70	100	kN
4.3.8	Resistance to impact on padlock body, shackle and staple at low temperature	5.4.8	T m h	- - -	- - -	- 20 1 250 800	- 20 3 050 1 000	- 40 6 550 1 400	- 40 7 150 1 500	°C g mm
4.3.9	Resistance to drilling of padlock body, shackle and staple	5.4.9	t	-	-	-	2	4	8	min
4.3.10	Resistance to sawing of padlock body, shackle and staple	5.4.10	t	-	-	-	2	4	8	min
NOTE Classification is in six grades where grade 1 has the lowest requirement.										

5 Test methods

5.1 General

5.1.1 General requirements

The padlock shall be tested in the locked position with the key removed.

Two padlocks/ padlock fittings and their original keys shall be taken at random and submitted for each test.

In the event of one of the original two samples failing the test, the padlocks/ padlock fittings shall be deemed to have failed and a further two shall be tested, both of which shall pass the test.

If the parts to be tested are inaccessible when the product is correctly mounted in accordance with the manufacturer's instructions, the product shall be considered to have passed that test.

A padlock shall be deemed to have been opened when a round bar, of equal cross-section to that of its shackle, can be released. Ability to open can be checked at any time during the test by manipulation with a screwdriver or similar implement (maximum length 200 mm) for a period of 5 s max.

5.1.2 Tolerances

Unless otherwise stated, the following tolerances shall apply :

- force $\pm 2\%$;
- torque $\pm 2\%$;
- mass/weight $\pm 2\%$;
- distance $\pm 2\%$;
- time $\pm 5\text{ s}$;
- temperature $\pm 2\text{ }^\circ\text{C}$.

Unless otherwise stated, the forces shall be applied progressively and without shock to the required load within 1 min.

5.1.3 Test environment

The ambient temperature of the test environment shall be controlled throughout the test to $20^\circ\text{C} \pm 5^\circ\text{C}$ unless otherwise stated.

5.1.4 Test tools

Specification of steel for cutting and impact tests shall be as required in 5.4.7.1 and 5.4.8. All steel used for these tests shall be structural steel E335 defined in EN 10025, heat treated to have a hardness of 60 HRC to 62 HRC.

Specification of steel for torque test shall be as required in 5.4.4. All steel used for this test shall be a structural steel which is strong enough to hold the torque resistance values given in table 2. The tool shall be heat treated to have a hardness of 46 HRC to 48 HRC.

5.1.5 Sampling

Test sampling and sequencing shall be in accordance with annex A.

5.2 Operational unlocking test

Mount the padlock in a suitable holding fixture, and apply a torque to a fully inserted correct key using a torque-meter, as shown in figure B.1. At no point between locked and unlocked shall the torque exceed 1 Nm.

5.3 Corrosion resistance

Padlocks and padlock fittings shall be classified in two grades as follows.

- Products intended for internal use : EN 1670:1998, grade 1 (mild resistance).
- Products intended for external use : EN 1670:1998, grade 3 (high resistance).

Padlocks shall be tested according to EN 1670:1998, subclause 5.6. Tests 5.2, 5.3, 5.4, 5.5 are not necessary for verifying product performance.

After the test it shall be possible to operate the padlock with its own key using a torque not exceeding 2,5 Nm.

After the test it shall not be possible to open the padlock with its next closest key, see 5.4.2.

The padlock may be lubricated according to the manufacturers instructions before attempting to unlock.

5.4 Security

5.4.1 Number of effective key differs

Check in accordance with 4.3.1 based on manufacturer's information.

The manufacturer shall provide information stating how the required number of differs can be achieved in each padlock.

5.4.2 Non-interpassing of keys

A torque of M1 (table 2) shall be applied to the bow of a correctly inserted next closest key taken from the manufacturer's charts which shall differ from the correct key by one step-up or one step-down at one position only.

5.4.3 Resistance to pulling or pushing of cylinder plug or locking mechanism

The test shall be carried out as a simulated pull test (5.4.3.1), but if the construction of the retaining devices of the key mechanism is weakened by a hole through the padlock, then an actual pull test (5.4.3.2) should be conducted instead.

5.4.3.1 Simulated pull test

Make a hole in the padlock to provide access to the back of the cylinder plug or locking mechanism (without damaging the anchoring arrangements). With padlock mounted in a suitable test-rig, apply the force F4 (table 3) through the hole as shown in figure B.2, to simulate pulling.

The "pulling" force F4 (table 3) for grades 4, 5 and 6 can be reduced if the plug/locking mechanism has sufficient drill resistance. This is determined by the following drill test :

- a) when testing in accordance with 5.4.9, drill the largest possible hole on the face of the cylinder plug/locking mechanism, in the time allowed ;
- b) with reference to table 3, determine the maximum possible pulling force, F4 ;
- c) compare F4 (table 3) maximum with F1 (table 2) and if F4 is less than F1, then use F4, otherwise use F1 in table 2.

Table 3 — Determination of maximum pull force

Diameter of drill, mm	Depth of drilled hole mm	Maximum possible pulling force F4 kN
2,5	3,0	2,5
	5,0	5,0
3,0	3,0	3,5
	6,0	7,0
4,0	4,0	6,3
	8,0	12,6
5,0	5,0	9,8
	10,0	19,6
6,0	6,0	14,2
	12,0	28,3

NOTE 1 Forces for other depths can be determined by linear interpolation or extrapolation.

NOTE 2 If the hole is drilled in the keyway, or if there are other surfaces in the drilled hole which would not provide anchorage for the threads of a pulling screw, the pulling force should be reduced accordingly.

5.4.3.2 Actual pull test

Mount the padlock in a suitable test-rig as shown in figure B.3 and apply a force F_1 (table 2) to the cylinder plug or the locking mechanism. Use a pulling screw in accordance with manufacturer's instructions.

5.4.4 Torque resistance of cylinder plug

Mount the padlock in a suitable holding fixture and apply a torque M_2 (table 2) in both directions by means of a suitable key shaped tool inserted into the keyway as shown in figure B.1.

5.4.5 Resistance to pulling of shackle and staple

Mount the padlock and the staple in suitable test-rigs as shown in figure B.4, and apply a pull force F_2 (table 2) to the shackle/staple by means of a circular drawing bar with a diameter equal to 80 % of the horizontal shackle clearance, or 80 % of the internal diameter, or horizontal clearance of the staple.

5.4.6 Resistance to twisting of shackle and staple

Mount the padlock and the staple in suitable test-rigs as shown in figure B.5, and apply a torque M_3 (table 2) to the shackle/staple by means of a loading device which makes contact at points corresponding to half the internal height of the shackle/staple or 25 mm maximum.

Support the padlock body similarly at half its height.

5.4.7 Resistance to cutting of shackle and staple

5.4.7.1 General

Where there is sufficient access, as indicated by the accessibility checks below, subject both the shackle and the staple to a cutting force of F_3 (table 2) applied by means of special jaws as shown in figure B.6. Where restricted access is indicated, the same test shall be carried out, with the force F_3 , reduced to that of a lower grade, as determined by the accessibility check. If there is less than a 7 mm of shackle/staple exposed during the accessibility check, the component is considered to have passed the cutting test, and no further assessment is necessary.

5.4.7.2 Shackle accessibility check

- a) Mount the padlock on the standard staple shown in figure B.7 unless it is designed for use only with its own special fitting, in which case, use that instead.
- b) Determine by trial and error the largest of the six gauges shown in figure B.9 that will enclose the shackle. The shackle is considered to be enclosed if it is between the edges of the gauge, and in contact with the inside back face Z (Figure B.9 dimension D).
- c) Determine the maximum cutting force F_3 in accordance with table 4.
- d) Compare F_3 maximum (table 4) with F_3 (table 2) and if F_3 (table 4) is less, use the force stated in table 4.

Table 4 — Determination of maximum cutting force

Largest gauge that will enclose shackle/staple	Maximum possible cutting force F3 kN
A	6
B	15
C	25
D	35
E	70
F	100

5.4.7.3 Staple accessibility check

- a) Mount the standard padlock shown in figure B.8 on the staple.
- b) Determine by trial and error the largest of the six gauges shown in figure B.9 that will enclose the staple. The staple is considered to be enclosed if it is between the edges of the gauge, and in contact with the inside back face.
- c) Determine the maximum cutting force F3 in accordance with table 4.
- d) Compare F3 maximum (table 4) with F3 (table 2) and if F3 (table 4) is less, use the force stated in table 4.

5.4.8 Resistance to impact at low temperature

Before commencing impact testing, condition the padlocks and staples at low temperature T for $3\text{ h} \pm 1\text{ h}$ (table 2). Mount them on suitable test-rigs as shown in figures B.10, B.11 and B.12. Subject the padlock body, the padlock shackle, and the staple (in two positions) each to five blows with a mass m dropped through a height h (table 2).

The testing shall start within 15 s of the product being removed from the conditioning chamber, and shall be completed within 60 s.

5.4.9 Drill resistance

The requirements of 4.3.9 shall be satisfied.

This test shall not be applicable to padlocks for security grades 1, 2 or 3. For security grades 4, 5 and 6, three padlocks shall be tested in an apparatus as illustrated in figure B.13.

Mount the padlock or the staple on to a suitable test-rig for use with a drilling machine as shown in figure B.13. A 700 W (input power) drilling machine with a speed of 500 r.min^{-1} to 800 r.min^{-1} shall be mounted on a sliding block. A force not exceeding 300 N shall be applied axially to the drill without shock.

High speed steel drills (see bibliography) or equivalent shall be used with a maximum diameter of 12 mm. A maximum of three drills per padlock may be used.

By referring to assembly/component drawings (including material/heat treatment information), determine the most suitable drilling location(s). Using this information, carry out drilling on vulnerable areas for a time t, (table 2), which shall include 15 s for each drill change (number of changes at discretion of tester up to a maximum of three drills), and time taken testing to see if security has been overcome. Conduct this final part of the test using simple implements only, e.g. paper clip, pliers, screwdriver under 150 mm long.

Drilling shall continue for the appropriate maximum net drilling time within the total time allowed for each test, including time taken to attempt to open the padlock.

5.4.10 Sawing resistance

Mount both the padlock and the staple on to a suitable test-rig for use with a sawing machine as shown in figure B.14. Saw blades used should conform to the French standard NF E 73-072 (see bibliography), tensioned to 1 kN. The sawing machine shall make 60 complete 165 mm stroke cycles per minute, with an applied load of 90 N. Do not use any coolant or lubricant during the test.

By referring to assembly/component drawings (including material/heat treatment information), determine the most suitable sawing location(s). Using this information, sawing shall be carried out on vulnerable areas for a time t (table 2), which shall include 60 s for each blade change (number of changes at discretion of tester), and time taken testing to see if security has been overcome. Conduct this final part of the test using simple implements only, e.g. paper clip, pliers, screwdriver under 150 mm long.

6 Classification

Classification shall be in form of a seven digit code as shown below:

Table 5 — Classification

1	2	3	4	5	6	7
Category of use	Test cycles/durability	Door mass	Fire resistance	Safety	Corrosion resistance	Security

6.1 Category of use (first digit)

No classification.

6.2 Test cycles / durability (second digit)

No classification.

6.3 Door mass (third digit)

No classification.

6.3 Fire resistance (forth digit)

No classification.

6.4 Safety (fifth digit)

No classification.

6.5 Corrosion resistance (sixth digit)

Padlocks and padlock fittings shall be classified in two grades.

- Grade 1 Internal applications
- Grade 2 External applications

6.7. Security (seventh digit)

Padlocks and padlock fittings shall be classified in security grades 1 to 6, where 6 is the highest.

EXAMPLE

x	x	x	x	x	3	3
----------	----------	----------	----------	----------	----------	----------

Box 1, 2, 3, 4 and 5: No classification

Box 6: Corrosion grade (3)

Box 7: Security grade (3)

7 Marking

Each padlock in conformity with this standard and/or its literature/packaging, shall be marked with the following :

- manufacturer's name or trademark or other means of identification;
- product model identification;
- classification according to clause 6;
- the reference to this European Standard, i.e. EN 12320;
- the year and week of manufacture.

NOTE This information can be in coded form.

Annex A (normative)

Sampling and sequencing - Tests on alternative design padlocks

A minimum of twelve padlocks and/ or six padlock fittings shall be subjected to a sequence of tests as shown in the following tables A.1 and A.2 .

Each test shall be carried out on two items.

NOTE Additional samples will be necessary as some tests prevent further testing on a particular sample.

Table A.1 — Tests on padlocks

Test	Samples A and G	Samples G and H	Samples C and J	Samples D and K	Samples E and L	Samples F and M
1	Shackle accessibility check 5.4.7.2	Number of effective key differs/interpassing of key checks 5.4.1/5.4.2	Torque resistance of cylinder plug 5.4.4		Operational unlocking test 5.2	
2	Resistance to pulling of shackle 5.4.5	Pulling or pushing of cylinder plug or locking mechanism 5.4.3.1/5.4.3.2	Resistance to twisting of shackle 5.4.6	Impact at low temperature on body 5.4.8	Impact at low temperature on shackle 5.4.8	Corrosion resistance 5.3
3	Resistance to cutting of shackle 5.4.7				Sawing resistance 5.4.10	Drilling resistance 5.4.9

Tableau A.2 — Tests on padlock fittings

Essai	Samples O and R	Samples P and S	Samples Q and T
1	Corrosion resistance 5.3	Staple accessibility check 5.4.7	Resistance to pulling of staple 5.4.5
2	Impact at low temperature on staple 5.4.8	Resistance to twisting of staple 5.4.6	Sawing resistance 5.4.10
3	Drilling resistance 5.4.9	Resistance to cutting of staple 5.4.7	

Annex B (normative)

Test rig illustrations

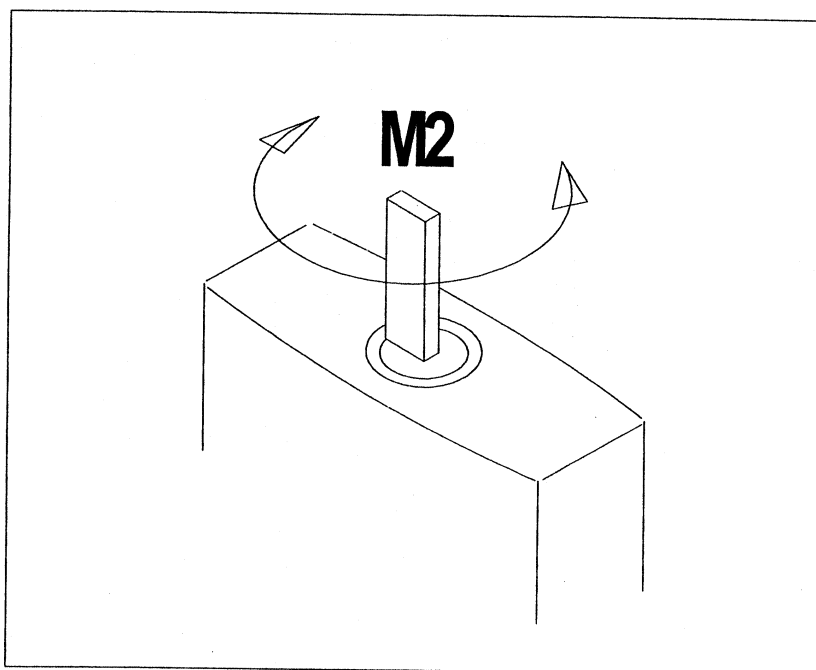
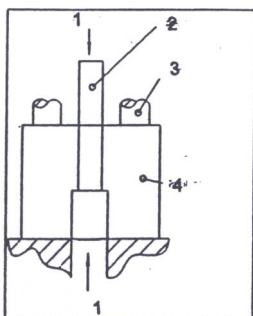


Figure B.1 — Cylinder plug or locking mechanism, torque test



Key

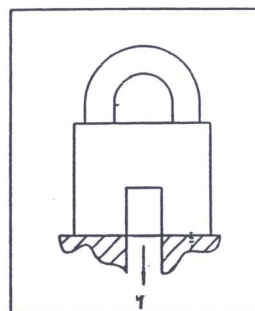
1 F1 = push

2 Loading device

3 Shackle removed if necessary

4 Padlock body

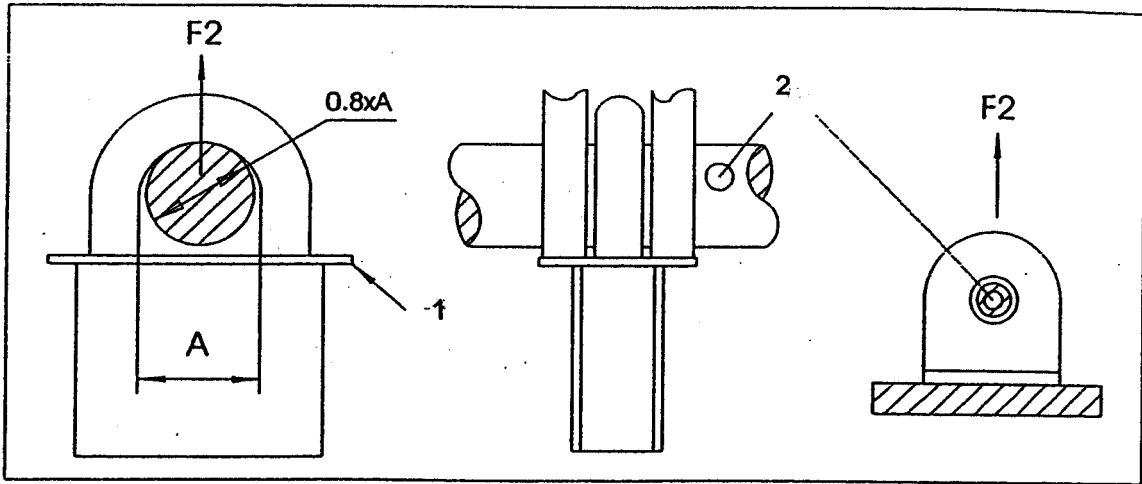
Figure B.2 — Cylinder plug or locking mechanism
simulated pull test



Key

1 F1 = pull

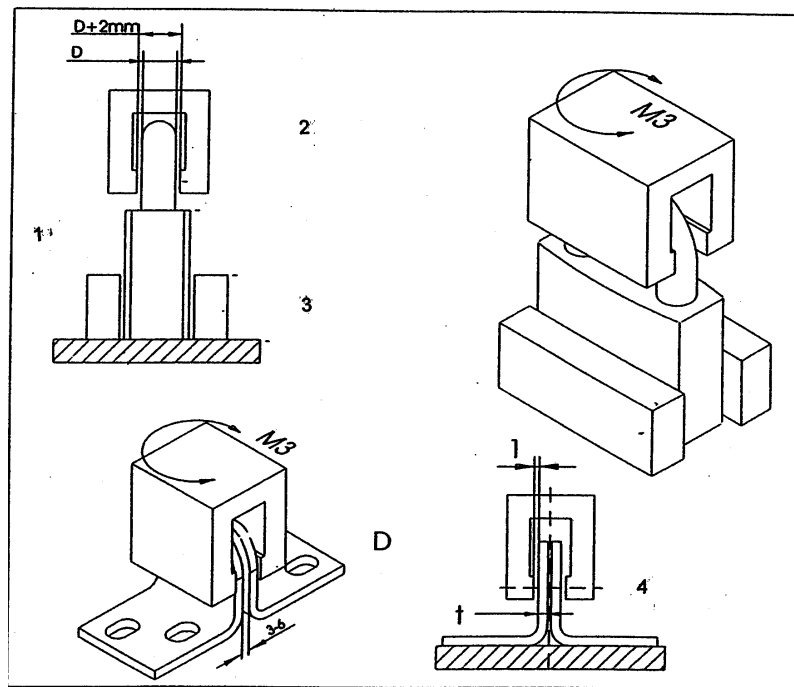
Figure B.3 — Cylinder locking mechanism actual
pull test



Key

- 1 Clamping plate
- 2 Drawing punch

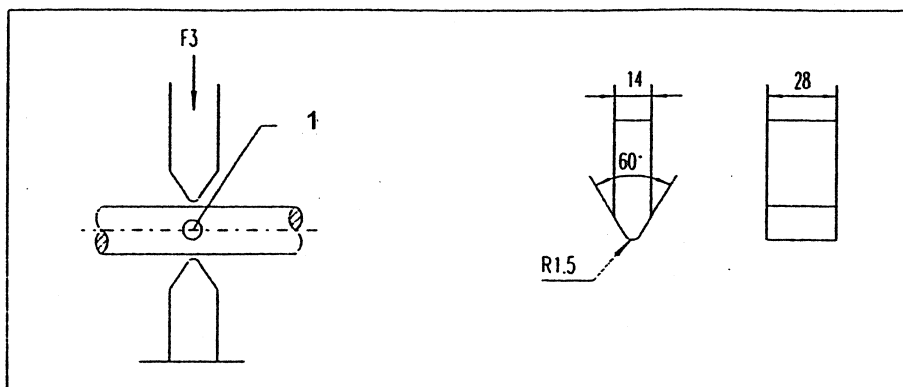
Figure B.4 — Shackle/staple pulling tests



Key

- 1 Shackle diameter, D
- 2 $\frac{1}{2}$ internal shackle height up to a maximum of 25 mm
- 3 $\frac{1}{2}$ padlock body height
- 4 Shackle hole D in staple

Figure B.5 — Shackle/staple twisting tests



Key

1 Exposed section of shackle/staple

Figure B.6 — Shackle/staple cutting test

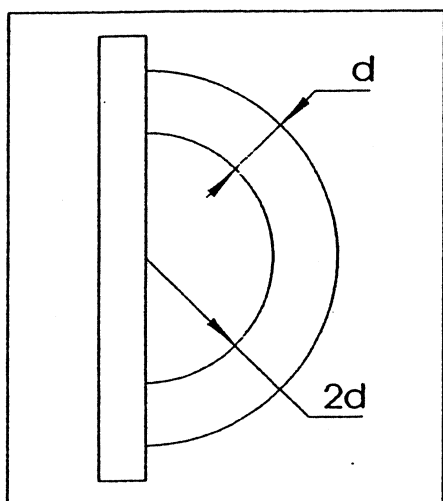


Figure B.7 — Test staple for shackle accessibility check

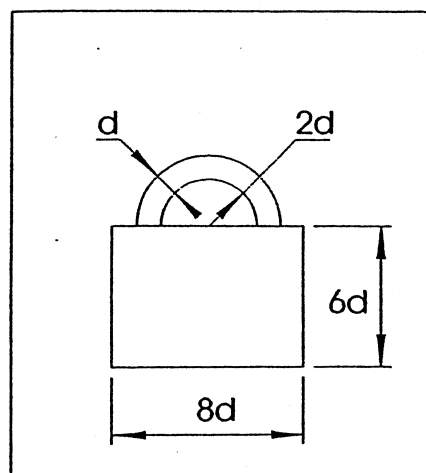


Figure B.8 — Test padlock for staple accessibility check

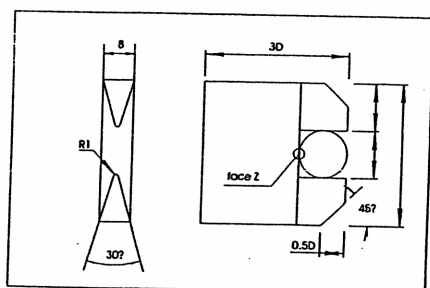
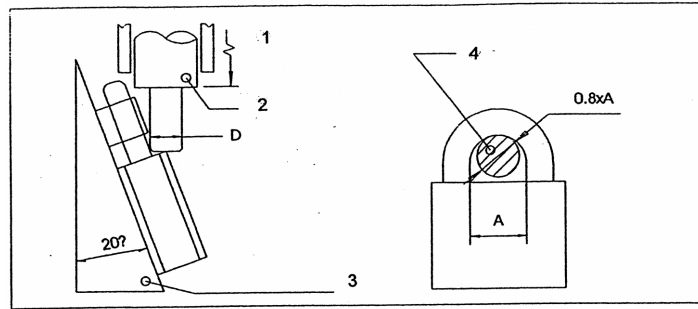


Figure B.9 — Gauges for accessibility

Tableau B.1 — Accessibility gauges

Gauge	B dimension	D dimension
A	7 mm	11 mm
B	9 mm	13 mm
C	10 mm	15 mm
D	12 mm	17 mm
E	14 mm	21 mm



Key

- 1 Drop height h
- 2 Steel mass m (dropped five times)
- 3 Rigid steel structure
- 4 Steel hanging device

Figure B.10 — Impact test on padlock body

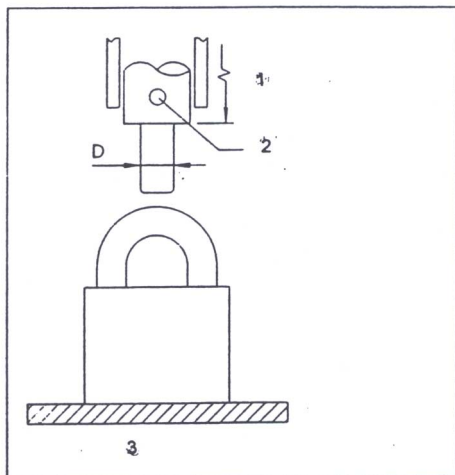


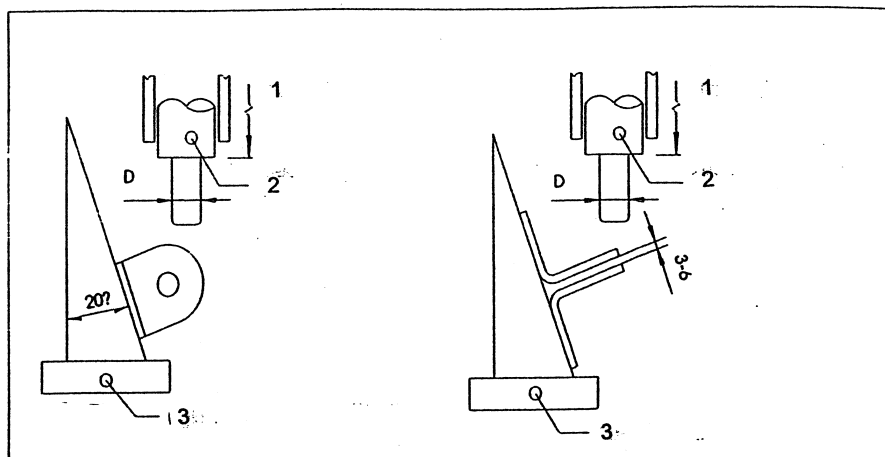
Tableau B.2 — Diameter of mass tip, figures 10, 11 et 12

Grade	D dimension mm
1	-
2	-
3	10
4	12
5	16
6	20

Key

- 1 Drop height h
- 2 Steel mass m (dropped five times)
- 3 Flat solid bed of steel

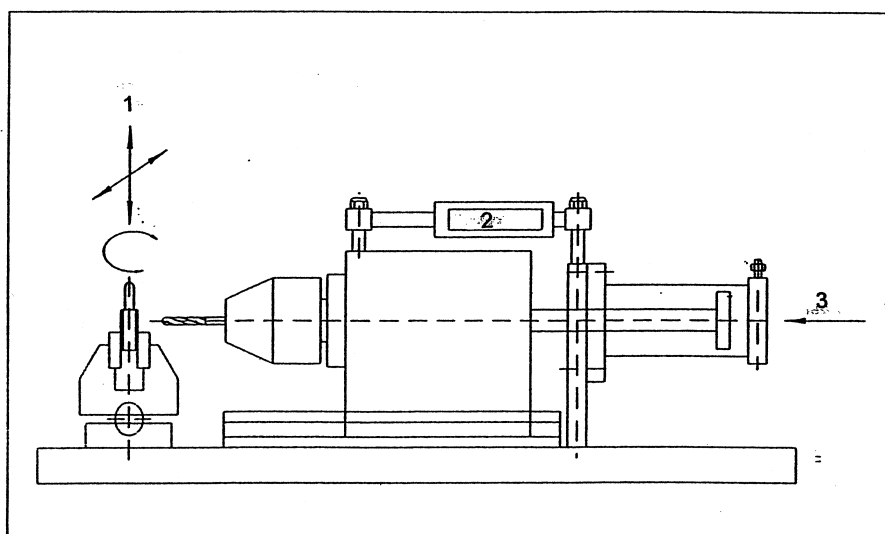
Figure B.11 — Impact test on padlock shackle



Key

- 1 Drop height, h
- 2 Steel mass m (dropped five times)
- 3 Rigid steel structure

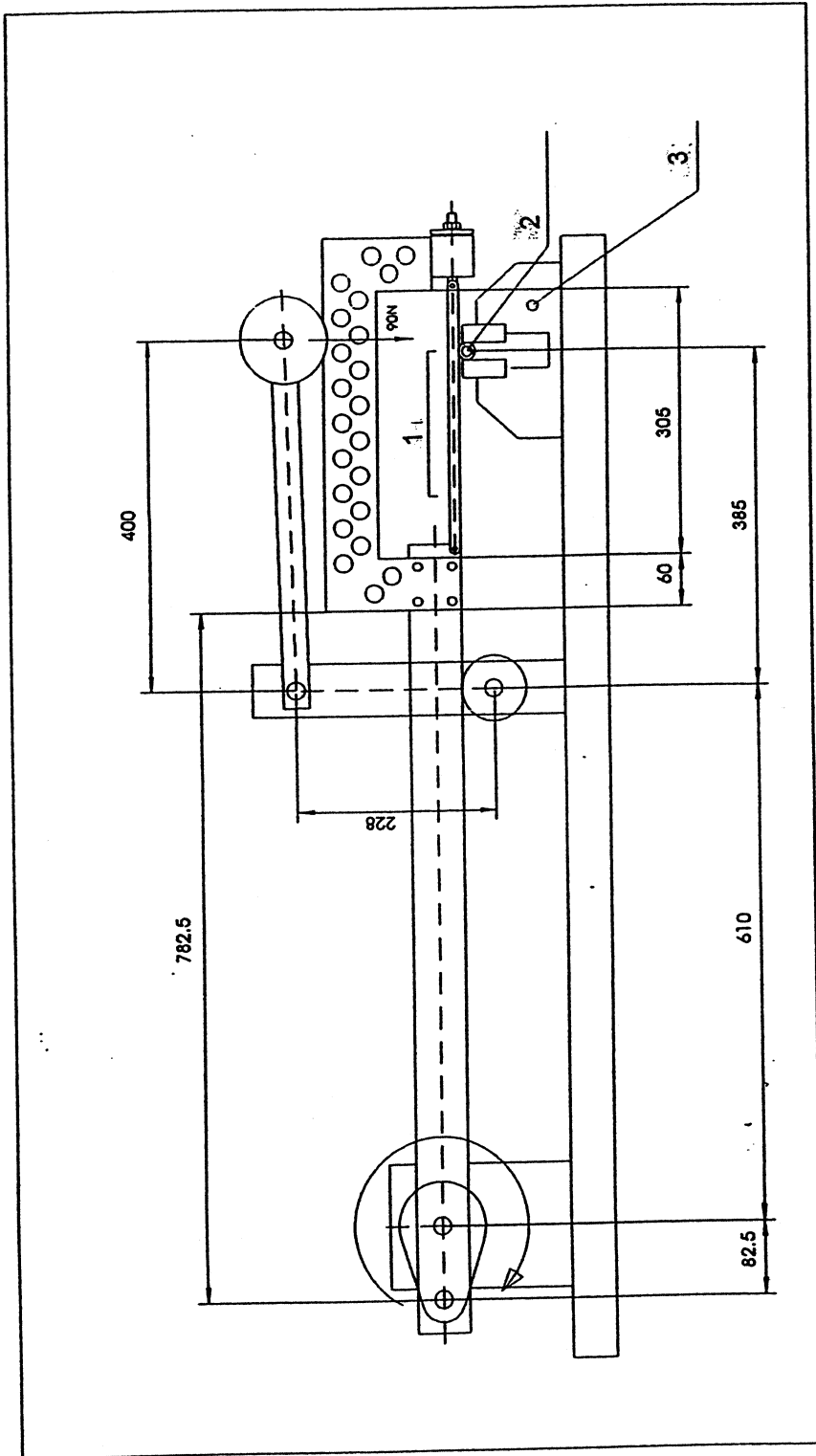
Figure B.12 — Impact tests on staple



Key

- 1 Adjustable in X, Y, Z axis
- 2 Shockabsorber
- 3 Pressure

Figure B.13 — Drilling tests



Key

- 1 165 mm stroke
- 2 Product under test
- 3 Holding fixture

Figure B.14 — Sawing tests

Bibliography

NF E 73-072:1982, *Lames de scies droites à métaux à main - Caractéristiques.*

ISO 10899:1996, *High-speed steel two-flute twist drills – Technical specifications.*