

English Version

Slide fasteners (zips) - Specification

Fermetures à glissière - Spécifications

Reißverschlüsse - Spezifikation

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Contents

Page

European foreword	4
Introduction.....	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions.....	7
4 Requirements.....	10
5 Conditioning and testing.....	11
5.1 Conditioning of test samples.....	11
5.2 Slide fasteners measurements.....	12
5.2.1 Length.....	12
5.2.2 Openings	12
5.3 Strength of puller attachment.....	12
5.4 Strength of closed-end slide fastener bottom stop.....	12
5.5 Strength of top stops.....	12
5.6 Strength of open-end slide fastener box.....	13
5.7 Resistance to reciprocation.....	13
5.8 Lateral strength of slide fastener.....	13
5.9 Lateral strength of open-end attachment.....	13
5.10 Strength of slider locking device.....	13
5.11 Open-end slide fastener single stringer slider retention.....	13
5.12 Torque strength.....	13
6 Washing and dry cleaning test.....	13
7 Test report.....	14
8 Marking	14
Annex A (informative) Guidance on factors to be taken into consideration when specifying slide fasteners.....	19
Annex B (normative) Test for strength of puller attachment.....	20
Annex C (normative) Test for strength of closed-end slide fastener bottom stop	21
Annex D (normative) Test for strength of top stops.....	23
Annex E (normative) Test for strength of open-end slide fastener box.....	25
Annex F (normative) Test for resistance to reciprocation.....	27
Annex G (normative) Test for lateral strength of slide fastener.....	30
Annex H (normative) Test for lateral strength of open-end attachment.....	31
Annex I (normative) Test for strength of slider locking device.....	32
Annex J (normative) Test for open-end slide fastener single stringer slider retention.....	33
Annex K (normative) Torque test.....	34
Annex L (informative) Sampling procedures for bulk quantities of slide fasteners.....	37

Annex M (informative) End-uses and performance codes for labelling purposes.....	38
Annex N (informative) Test for resistance to reciprocation for slide fasteners with length from 75 mm to 200 mm.....	39
Bibliography.....	43

Introduction

The different types of slide fasteners are defined by the material of the elements (teeth), which form their slide fastener chains. They can be of metallic, moulded plastic or monofilament plastic construction.

Metallic elements can be produced from flat or profiled wire and are usually clamped around the edge of a beaded tape. An alternative approach is to cast metallic elements directly onto such a tape. Similarly, plastic elements can be moulded onto a beaded tape. Such cast or moulded elements might have projections on which the slider operates to reduce abrasion of the tape.

Plastic coil slide fasteners have polyamide or polyester monofilaments that are wound into coils to form engaging elements. The coils can be attached to the face of flat tapes by sewing. Alternatively, the coils can be woven or knitted into the tapes as they are constructed. Monofilament plastic elements can also be of the meander type, which straddle the tape edge.

Typical slide fastener chain types are shown in Figure 3.

1 Scope

This document specifies performance levels and test methods for the following characteristics of slide fasteners made from interlocking components mounted on tapes: strengths of puller attachment, closed-end slide fastener bottom stop, top stop, open-end slide fastener box, reciprocating mechanism, closed slide fastener when extended laterally, open-end attachment when extended laterally, slider locking device, and open-end slide fastener single stringer slider retention and slider resistance to torque.

NOTE The tests specified in Annexes B to K have been specifically devised to permit their direct application to finished slide fasteners with a view to giving the user reasonable assurance that a slide fastener conforming to the requirements of this document can satisfactorily fulfil its intended purpose. Annex L gives information about sampling procedures for bulk quantities of slide fasteners.

In addition, performance levels are also specified for colour fastness to washing, dry cleaning and water, and for dimensional stability to washing and dry cleaning.

This document is applicable to all different types of slide fasteners for general use and is not applicable to slide fasteners for specialist purposes (for example: pressure sealed slide fasteners for diving suits).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 20105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour (ISO 105-A02)*

EN ISO 105-A03, *Textiles — Tests for colour fastness — Part A03: Greyscale for assessing staining (ISO 105-A03)*

EN ISO 105-C06, *Textiles — Tests for colour fastness — Part C06: Colour fastness to domestic and commercial laundering (ISO 105-C06)*

EN ISO 105-D01, *Textiles — Tests for colour fastness — Part D01: Colour fastness to dry cleaning using perchloroethylene solvent (ISO 105-D01)*

EN ISO 105-E01, *Textiles — Tests for colour fastness — Part E01: Colour fastness to water (ISO 105-E01)*

EN ISO 139, *Textiles — Standard atmospheres for conditioning and testing (ISO 139)*

EN ISO 3175-2, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 2: Procedure for testing performance when cleaning and finishing using tetrachloroethene (ISO 3175-2)*

EN ISO 5077, *Textiles — Determination of dimensional change in washing and drying (ISO 5077)*

EN ISO 6330, *Textiles — Domestic washing and drying procedures for textile testing (ISO 6330)*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

slide fastener

zip

fastening device consisting of two flexible, interlocking stringers, with or without end stops, and one or more sliders so arranged that by moving the slider along the stringers in one direction an opening is formed, and by moving it in the other direction the opening is closed

3.2

stringer

tape with an attached row of elements designed to interlock with a row similarly attached to another tape

3.3

tape

narrow fabric to which elements are fitted

3.4

element

tooth

engaging component fixed to the edge of the tape

Note 1 to entry: See Figure 4.

3.5

slider

moving component consisting essentially of a slider body and, normally, a puller which opens or closes the slide fastener by separating or engaging the single elements of the stringer

Note 1 to entry: The slider might incorporate a locking device. Alternative slider types are available with a flip-over puller or double pullers, to facilitate operation from both front and back sides.

3.6

slider body

component that joins or separates the elements when sliding along the two stringers of slide fastener

3.7

puller

fitting attached to the slider body to facilitate manipulation

3.8

locking device

device incorporated in the slider unit restricting its free movement along the slide fastener length in an opening direction

Note 1 to entry: The locking device might operate either automatically on release of the puller or by manual pressure on the puller.

3.9

slide fastener length

distance from the top of the slider to the bottom of the bottom stop, or box in the case of an open-end slide fastener, measured with the slider in the top position and with the puller in the downward position

Note 1 to entry: See Figure 4.

Note 2 to entry: Some suppliers measure the effective length of slide fasteners from the top of the slider to the bottom edge of the tape, especially in the case of two-way open-end slide fasteners.

3.10 bottom

stop

stop at the *bottom end* (3.14) of the chain that checks the opening movement of the slider

Note 1 to entry: See Figure 4a), Key n. 5.

3.11 top

stop

stop(s) at the *top end* (3.15) of the chain that check(s) the closing movement of the slider

3.12

chain

continuous closure formed by two interlocking compatible stringers

Note 1 to entry: See Figure 4a), Key n.8.

3.13

chain width

width across the interlocked elements or shoulder on which the slider runs, whichever is the greater

Note 1 to entry: See Figure 4b), Key n.6.

3.14

bottom end

end which is adjacent to the slider when the device is fully open

3.15

top end

end which is adjacent to the slider when the device is fully closed

3.16

open-end slide fastener

slide fastener having a special fitment at the *bottom end* (3.14) of each stringer in place of the bottom stop, so as to permit the two stringers to be completely separated and re-assembled at will when the slider is in the fully open position

Note 1 to entry: The special fitment normally consists of a pin permanently fixed to the *bottom end* (3.14) of one stringer, which fits into a box permanently fixed to the *bottom end* (3.14) of the other stringer (see Figure 7 a) and 7 b)).

Note 2 to entry: See Figure 5c) and 6a).

3.17**closed-end slide fastener**

slide fastener which does not permit the complete separation of the two stringers

Note 1 to entry: Normally the *top end* (3.15) of the slide fastener separates as the slider is lowered, although there is one type whose *top ends* (3.15) are permanently joined together by means of a bridge stop [see Figure 5a) and Figure 5b), 6b), 6d)].

3.18**concealed slide fastener**

slide fastener with the tapes folded so that on closure neither the slider body nor the slide fastener are visible from the outside of the article

Note 1 to entry: See Figure 3g).

3.19**two-way slide fastener**

slide fastener fitted with two sliders that operate with equal facility in either direction

Note 1 to entry: This type is available in a variety of forms, as illustrated in Figure 6.

3.20**batch**

quantity of slide fasteners having a specific design, performance code and chain size

3.21**baby**

child from birth up to age 12 months, that is all children of height up to and including 80 cm

[SOURCE: CEN/TR 16792:2014, 3.1]

3.22**infant**

child from age 12 months to and including 36 months, that is all children over 80 cm and up to and including 98 cm in height

[SOURCE: CEN/TR 16792:2014, 3.2]

3.23**child****young person**

person aged over 36 months and up to 14 years (that is up to and including 13 years and 11 months), that is all children over 98 cm in height and for girls up to 176 cm and for boys 182 cm in height

[SOURCE: CEN/TR 16792:2014, 3.3]

3.24**tape width**

width of a single tape

Note 1 to entry: See Figure 4b), Key N.2

4 Requirements

When subjected to the tests specified in Clause 5 (as applicable to the features of the slide fastener design to be tested), other than the slide fastener length measurements (see 5.2), samples of new slide fasteners shall conform to Table 1 and to Table 2 if applicable (children's items, 3.21, 3.22 and 3.23).

For children's items (3.21, 3.22 and 3.23), no sharp point and no sharp edges shall be noted on the original state and no sharp point or sharp edges shall be noted after testing according to Annex F, Annex K, and Annex N. Sharp point and sharp edges shall be verified by visual and tactile inspection [5].

The overall performance for the slide fastener, as determined by the minimum test results, shall be that of the lowest performance grade achieved by any test specimen for any applicable test.

Attention shall be given to the use of the sampling procedures given in Annex L with regard to the interpretation of potential outlier results.

It is permissible to perform more than one test on the same slide fastener, but care should be taken to ensure that damage sustained in testing does not compromise subsequent test results.

A minimum of 3 specimens shall be tested in respect of each applicable test. Failure of any part of a slide fastener before the specified force or number of cycles is reached in any of these tests shall be deemed a failure of the sample. For the acceptance criteria for larger batches the sampling scheme in Annex L shall be used and the number of specimens for each test increased accordingly.

Annex L gives information about an appropriate sampling procedure for bulk quantities of slide fasteners.

Annex M gives information about end-use and performance codes for labelling purposes.

Table 1 — Performance requirements of slide fasteners according to end use

Annex	Test description	Unit	Performance code ^a				
			A	B	C	D	E
B	Strength of puller attachment (min.)	N	70	80	200	250	300
C	Strength of closed-end slide fastener bottom stop (min.)	N	35	70	90	100	140
D	Strength of top stops (min.)	N	50	70	90	110	130
E	Strength of open-end slide fastener box (min.)	N	40	70	90	120	150
	Resistance to reciprocation:						
F ^b	Minimum cycles without failure	Cycles	500	500	500	500	500
G	Lateral strength of slide fastener (min.)	N	150	200	250	370	470
H	Lateral strength of open-end attachment (min.)	N	40	70	90	120	160
I	Strength of slider locking device (min.)	N	10	15	25	40	60
^a These performance codes correspond to the description of slide fastener type as follows: A (ultra-light), B (light), C (medium), D (medium-heavy) and E (heavy).							
^b For slide fasteners with length from 75 mm to 200 mm Annex N can be alternatively applied.							

Table 2 — Additional performance requirements of slide fasteners for baby's and infant's (3.21, and 3.22) items

Annex	Test description	Unit	Minimum requirement
J	Open-end slide fastener single stringer slider retention	N	70
K	Torque strength	Nm	0,34

In addition to the requirements of Table 1 and Table 2, slide fasteners shall conform to the colour fastness and dimensional stability requirements of Table 3.

Table 3 — Colour fastness and dimensional stability requirements of slide fasteners

Property	Method of test	Performance level ^d
Colour fastness ^a minimum rating to:		
dry cleaning	EN ISO 105-D01	Change in colour and staining 3–4
washing	EN ISO 105-C06, Method A2S	Change in colour and staining 3–4
water	EN ISO 105-E01	Change in colour and staining 3–4
Maximum dimensional change on:		
washing	EN ISO 5077 ^{b, c}	–4 % of original length
dry cleaning	EN ISO 3175-2 ^c	–3 % of original length
^a Colour change and staining assessed using the Grey scale according to EN 20105-A02 and EN ISO 105-A03. ^b Using washing procedure 4N and tumble-drying procedure F at a temperature not exceeding 80 °C according to EN ISO 6330. ^c Except that the change in slide fastener length only, as defined in 3.9, shall be determined. ^d In some cases performance levels can be lower due to technical reasons (e.g.: denim, pigment prints, fluorescent colours). In other cases, they can be higher (e.g.: contrast colour). Variation of the performance levels shall be agreed between the parties.		

NOTE Guidance on the factors to be considered when specifying slide fasteners is given in Annex A.

5 Conditioning and testing

5.1 Conditioning of test samples

Prior to being subjected to the tests specified in 5.2 to 5.11, sample slide fasteners shall first be conditioned for minimum of 16 h and then tested in the reference standard atmosphere for testing textiles as defined in EN ISO 139 [i.e. a temperature of (20 ± 2) °C and a relative humidity of (65 ± 4) %].

An alternative atmosphere having a temperature of (23 ± 2) °C and a relative humidity of (50 ± 4) % may be used and the alternative atmosphere used shall be reported on the test report.

5.2 Slide fasteners measurements

5.2.1 Length

The length tolerance for slide fasteners compared with the nominal length shall be $\pm 1,5\%$ or ± 5 mm (whichever is the greater), unless otherwise specified between parties. The slide-fastener length shall be measured on a smooth flat surface using a one-millimetre graduated ruler (see Figure 4).

5.2.2 Openings

On slide fasteners used in baby and/or infant (from birth to 36 months, up to 98 cm in height) items, there shall be no completely bounded openings between 5 mm and 12 mm, unless the depth of penetration is less than 10 mm.

The test probes shall be made from plastic or other smooth, hard material, which can be mounted on a force-measuring device.

Determine whether the 5 mm test probe (Figure 1) with an applied force of up to 30 N, enters 10 mm or more into any completely bounded circular openings in rigid materials, in any possible orientation.

Dimensions in millimetres

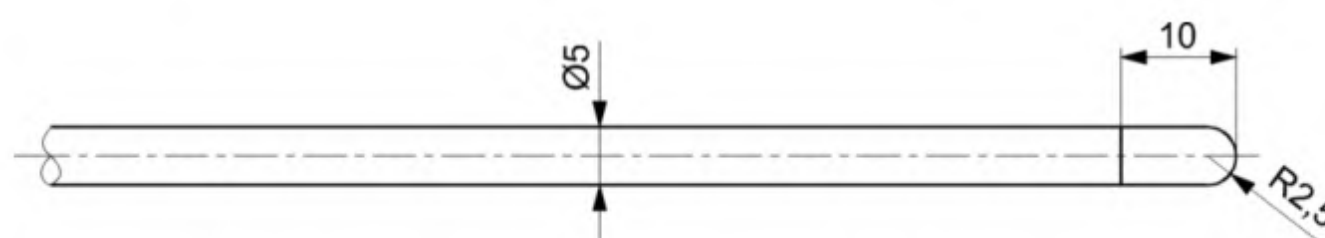


Figure 1 — 5 mm test probe for openings in rigid materials

If the 5 mm test probe enters 10 mm or more, then the 12 mm test probe (Figure 2) shall also enter 10 mm or more with an applied force of up to 5 N.

Dimensions in millimetres

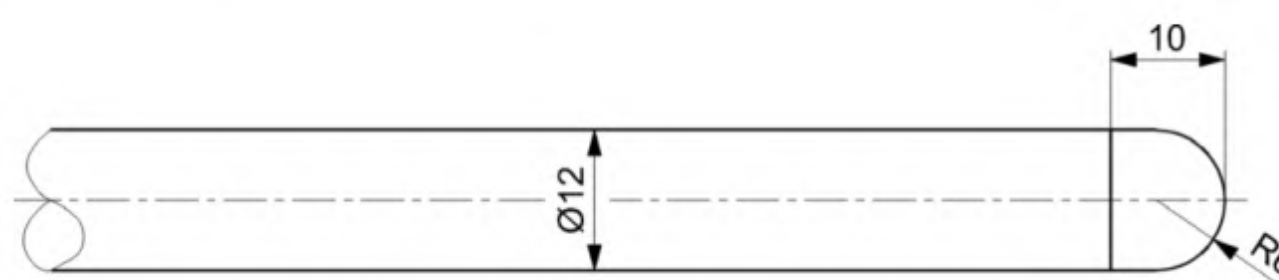


Figure 2 — 12 mm test probe for openings in rigid materials

5.3 Strength of puller attachment

Strength of puller attachment shall be in accordance with Annex B. When tested in accordance with Annex B, slide fasteners shall conform to the performance code specified in Table 1.

5.4 Strength of closed-end slide fastener bottom stop

Strength of closed-end slide fastener bottom stop shall be in accordance with Annex C. When tested in accordance with Annex C, closed-end slide fasteners bottom stop shall conform to the performance code specified in Table 1.

5.5 Strength of top stops

Strength of top stops shall be in accordance with Annex D. When tested in accordance with Annex D, slide fasteners shall conform to the performance code specified in Table 1.

5.6 Strength of open-end slide fastener box

Strength of open-end slide fastener box shall be in accordance with Annex E. When tested in accordance with Annex E, slide fasteners shall conform to the performance code as specified in Table 1. This method may also be applied to test the retention of the lower slider on two-way slide fasteners.

5.7 Resistance to reciprocation

Resistance to reciprocations shall be in accordance with Annex F. When tested in accordance with Annex F, a slide fastener 200 mm or longer shall complete 500 cycles without failure.

If a slide fastener is less than 200 mm long then it is permissible to attach extension stringers by suitable means to the top and/or bottom of the existing stringers such that the slide fastener can be mounted on the apparatus described in Annex F and tested.

The means of attachment of the extension stringers is not critical but shall be of sufficient strength as to withstand the forces applied during the test. Where the length of the interlocking elements of the slide fastener is insufficient to permit reciprocation to be performed, then it is permissible to test a nominally identical slide fastener with a longer length of interlocking elements.

Zipper with a length less than 200 mm can be alternatively tested in accordance with Annex N.

5.8 Lateral strength of slide fastener

Lateral strength of slide fastener shall be in accordance with Annex G. When tested in accordance with Annex G, slide fasteners shall conform to the performance code specified in Table 1.

5.9 Lateral strength of open-end attachment

Lateral strength of open-end attachment shall be in accordance with Annex H. When tested in accordance with Annex H, slide fasteners shall conform to the performance code specified in Table 1.

5.10 Strength of slider locking device

Strength of slider locking device shall be in accordance with Annex I. When tested in accordance with Annex I, a slider fitted with a locking device shall withstand the lateral force specified in Table 1 when the lock is engaged, and the stringers are pulled at right angles to the length of the slide fastener.

5.11 Open-end slide fastener single stringer slider retention

Open-end slide fastener single stringer slider retention shall be in accordance with Annex J. When testing in accordance with Annex J, slide fasteners shall conform to the performance requirement specified in Table 2.

5.12 Torque strength

Torque strength shall be in accordance with Annex K. When testing in accordance with Annex K, slide fasteners shall conform to the minimum requirement as specified in Table 2.

6 Washing and dry cleaning test

If particular post-washing/dry cleaning performance levels are specified in the care information for the slide fasteners or for the article in which the slide fastener is intended to be used, the samples shall be tested in accordance with Clause 5 after subjecting samples to the specified cleansing procedures. If no cleansing procedures are specified but it is desired to determine the performance of the fastener after laundering then the samples shall be subjected to one or both of the default cleansing regimes detailed below. For fasteners which can be both washed and dry cleaned, separate sets of samples shall be tested after washing and after dry cleaning.

- a) One wash and dry in accordance with, respectively, procedure 4 N and tumble drying procedure F specified in EN ISO 6330.
- b) One dry cleaning cycle in accordance with EN ISO 3175-2.

After dry cleaning the application of a suitable lubricant prior to reciprocation is acceptable.

7 Test report

The test report shall include the following information:

- a) a reference to this document (i.e. EN 16732);
- b) identification of slide fasteners tested and declared performance code, if known;
- c) where known, information on the intended end-use;
- d) date of the tests;
- e) slide fasteners measurements results and rigid opening assessment when applicable;
- f) final performance code based on test results;
- g) any deviations from the procedure;
- h) the numerical result obtained for each test and sharp points and sharp edges assessment when applicable;
- i) a description of the mode of failure by component parts;
- j) the Annex used for testing the reciprocation (if any additional tab on tape is added to the item it shall be specified including the type of tab);
- k) a description of any washing or dry cleaning procedures performed and of any observed effects of these procedures;
- l) where applicable, the alternative atmosphere used when conditioning the test samples; and
- m) any unusual features observed.

8 Marking

The following information shall be indicated on the package, the swing ticket or any associated commercial documents:

- a) the name of the manufacturer;
- b) number and date of this document and the performance code of the slide fastener, as given in Table 1;
- c) details of slide fastener type, length, colour, chain and tape width, element material and,
- d) any special characteristics or manufacturer's identification which defines these details.

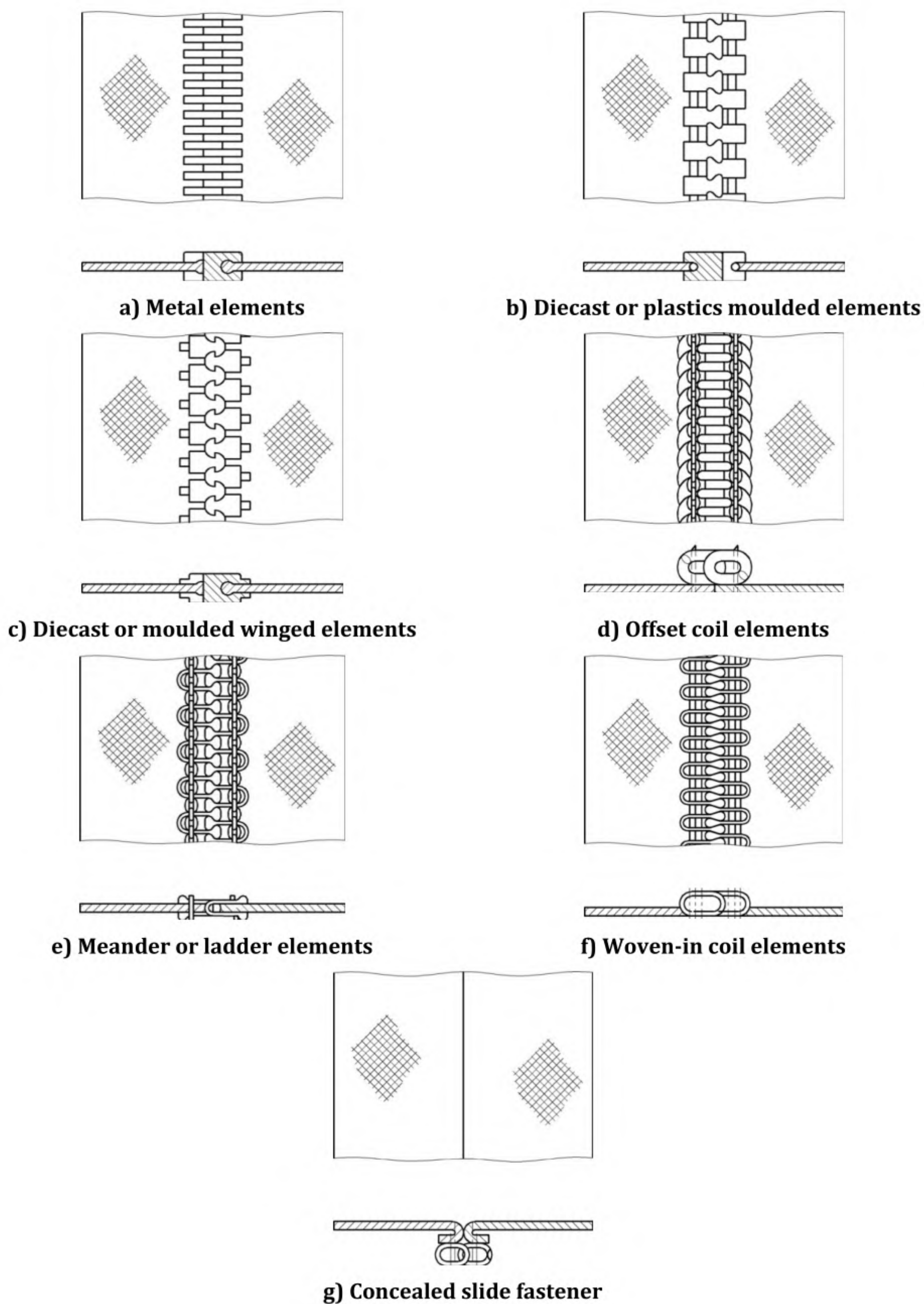
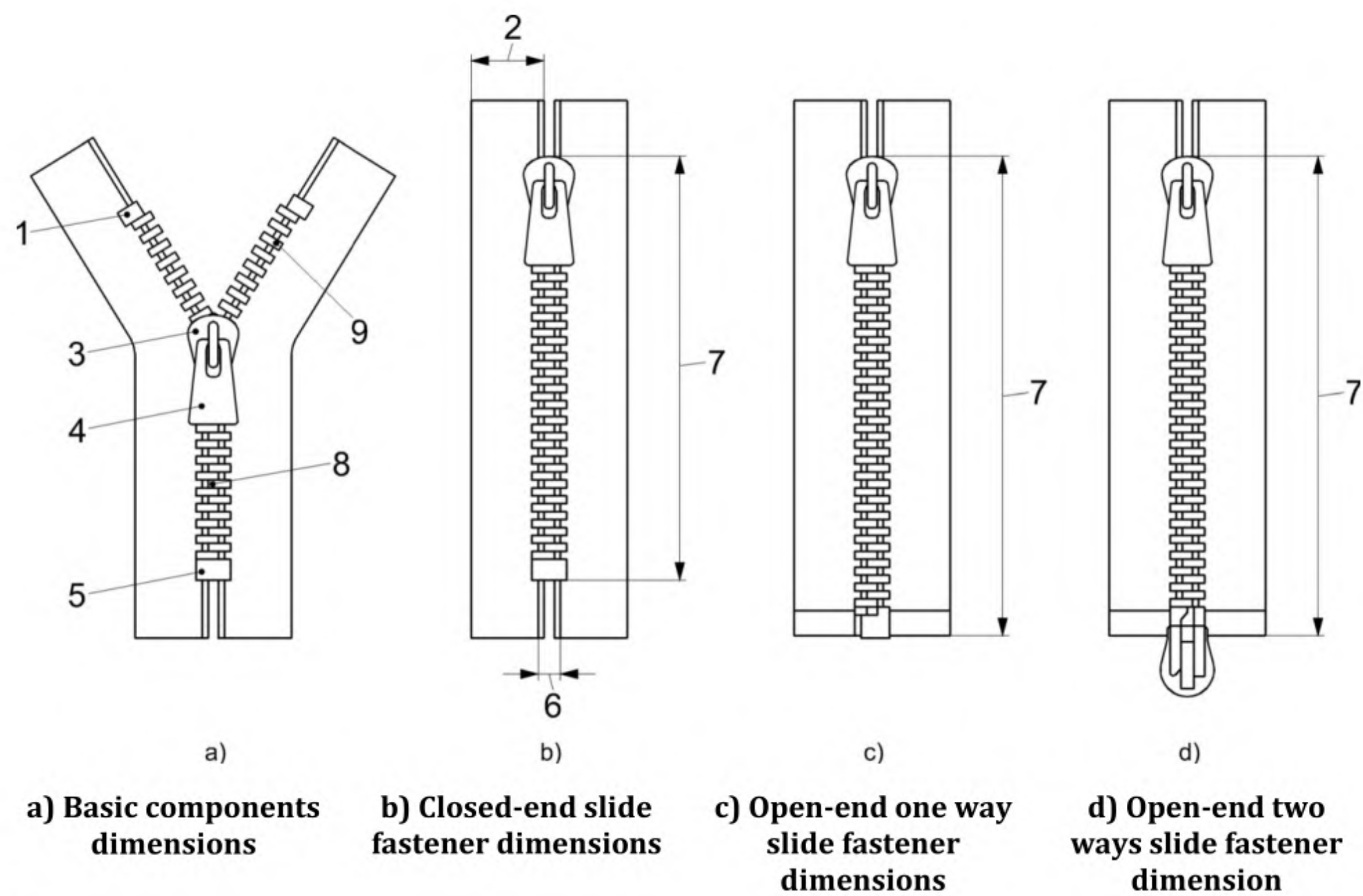


Figure 3 — Slide fastener chain types



Key

- | | | | |
|---|-------------|---|--------------------------|
| 1 | top stop | 6 | chain width |
| 2 | tape width | 7 | length of slide fastener |
| 3 | slider body | 8 | chain |
| 4 | puller | 9 | elements (teeth) |
| 5 | bottom stop | | |

Figure 4 — Slide fasteners: basic components dimensions

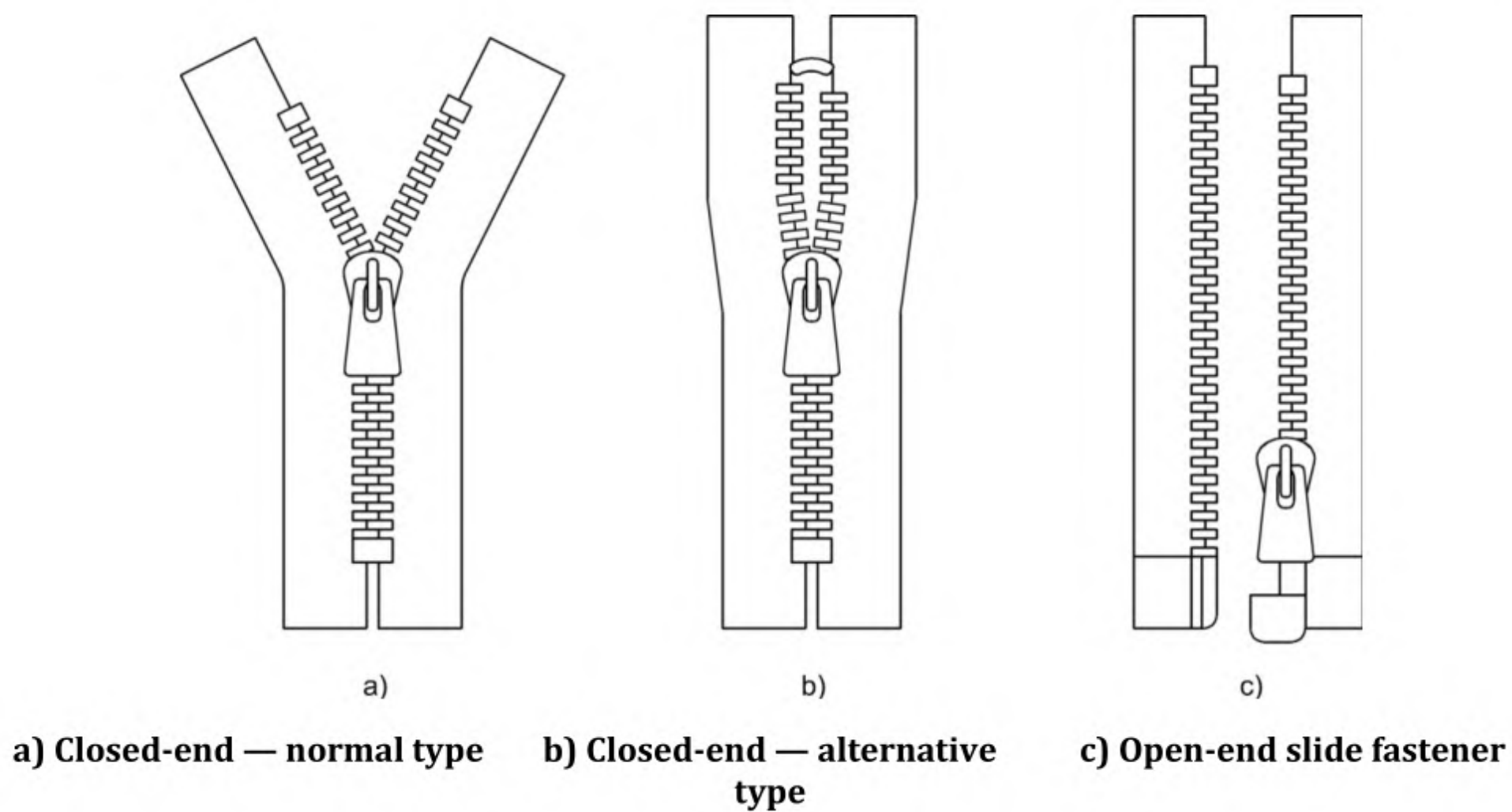


Figure 5 — One-way slide fasteners

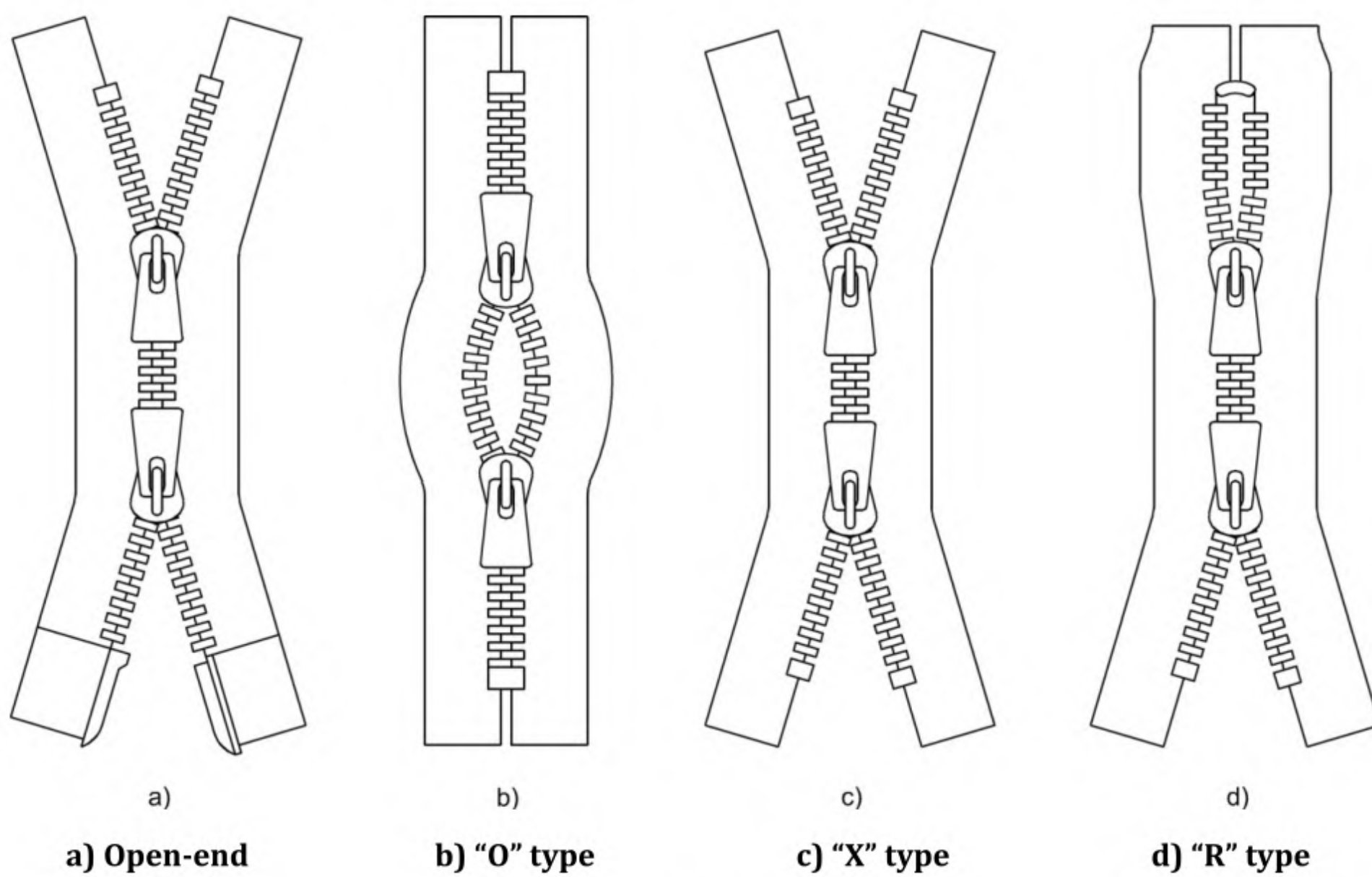
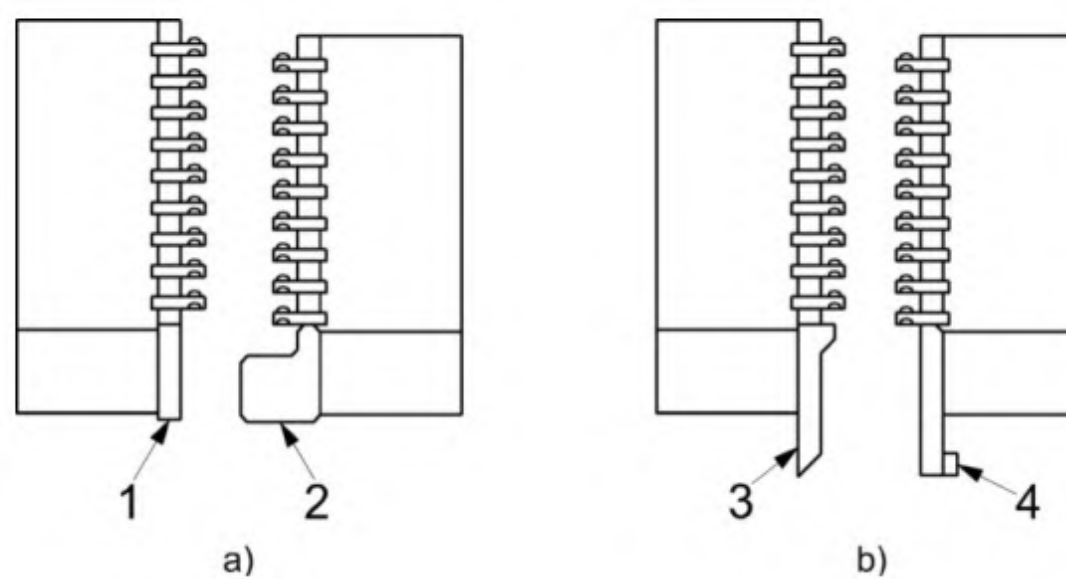


Figure 6 — Two-way slide fasteners



Key

- 1 pin for open-end one way 2
- box for open-end one way
- 3 pin for open-end two ways
- 4 box for open-end two ways

Figure 7 — Box and pin of open-end slide-fasteners

Annex A

(informative)

Guidance on factors to be taken into consideration when specifying slide fasteners

The following information should be included in the slide fastener specifications: a) the type of slide fastener (e.g. closed-end, open end, left-handed, right-handed);

b) the fabric construction used in the tape;

c) the type and material of the elements;

d) the slide fastener length;

e) the chain width;

f) the tape width, as shown in Figure 4b) Key 2;

g) the slider type;

h) the performance code of the slide fastener;

i) any other special features of the slide fastener;

j) any end product related characteristics which might can affect the recommendation of minimum performance code.

Annex B (normative)

Test for strength of puller attachment

B.1 Principle

The puller is subjected to tension whilst the slider is rigidly supported.

B.2 Apparatus

B.2.1 Constant rate of extension tensile testing machine

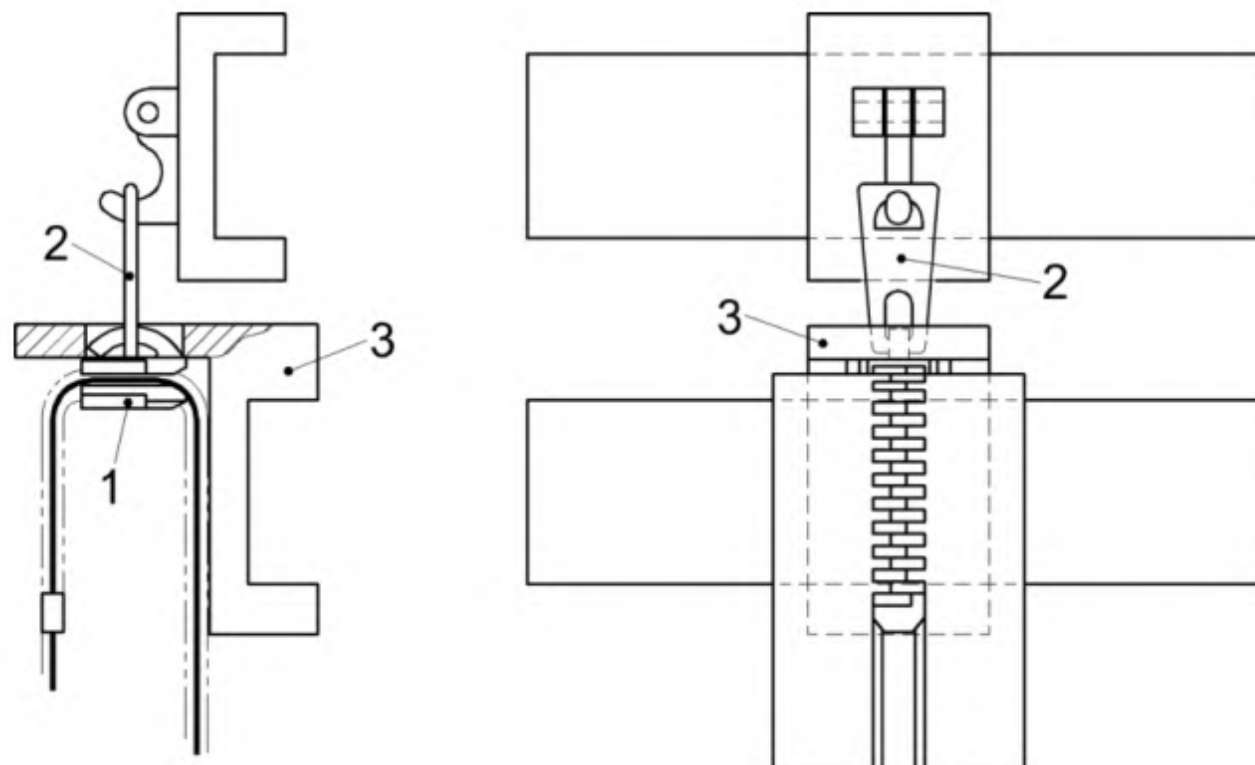
Constant rate of extension tensile testing machine conforms to EN ISO 7500-1 and produces a rate of jaw separation of (100 ± 10) mm/min. The force range is such that the breaking strength of the test specimen falls between 10 % and 90 % of the maximum on the scale.

B.2.2 Fixture to retain the slider body rigidly

Fixture to retain the slider body rigidly, such as a face-plate or a blanking-off plate, to allow the tension to be applied to the puller and its attachment to the slider body (see example in Figure B.1).

B.3 Procedure

Mount the test specimen in one jaw of the tensile testing machine, with the puller passed through a hole in the fixture. Arrange the fixture so that the slider and the chain are rigidly clamped in place, with only the puller and its attachment to the slider being free. Secure the end of the puller to the other jaw so that tension is applied perpendicular to the face of the slider. Set the testing machine in operation until either the specified force is reached or the specimen fails.



Key

- 1 slider body
- 2 puller
- 3 fixture

Figure B.1 — Example of puller attachment test

Annex C

(normative)

Test for strength of closed-end slide fastener bottom stop

C.1 Principle

The bottom stop is subjected to a force via the slider by tension applied to the stringers.

C.2 Apparatus

C.2.1 Constant rate of extension tensile testing machine

See Annex B.

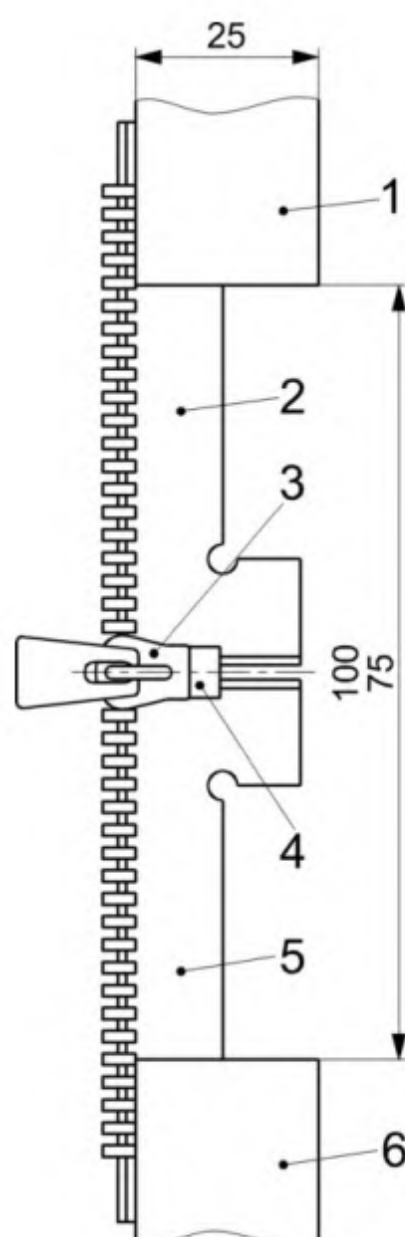
C.2.2 Clamping device

The clamping devices of the machine shall be positioned with the central point of the two jaws in the line of applied force, the front edges shall be at right angles to the line of applied force and their clamping faces shall be in the same plane.

The jaws shall be capable of holding the test specimen without allowing it to slip and designed so that they do not cut or otherwise weaken the test specimen.

The faces of the jaws shall be smooth and flat, except that when, even with packing, the test specimen cannot be held satisfactorily with flat-faced jaws, engraved or corrugated jaws can be used to prevent slippage.

The width of the jaws shall be (25 ± 1) mm (see Figure C.1).

**Key**

- 1 upper clamp
- 2 stringer
- 3 slider body
- 4 bottom stop
- 5 stringer
- 6 lower clamp (jaw)

Figure C.1 — Closed-end slide fastener bottom stop test

C.3 Procedure

With the test specimen in its open position and the slider adjacent to the bottom stop, clamp one stringer in each of the two jaws approximately between 75 mm and 100 mm between the jaws. (This might be better achieved by cutting away the surplus stringer). Ensure that the locking mechanism is inoperative. Apply a longitudinal force to the stringers thus forcing the slider against the bottom stop. Set the machine in operation until either the specified force is reached, or the specimen fails.

Instances of failure include slipping of the bottom stop and removal of adjacent elements.

Annex D (normative)

Test for strength of top stops

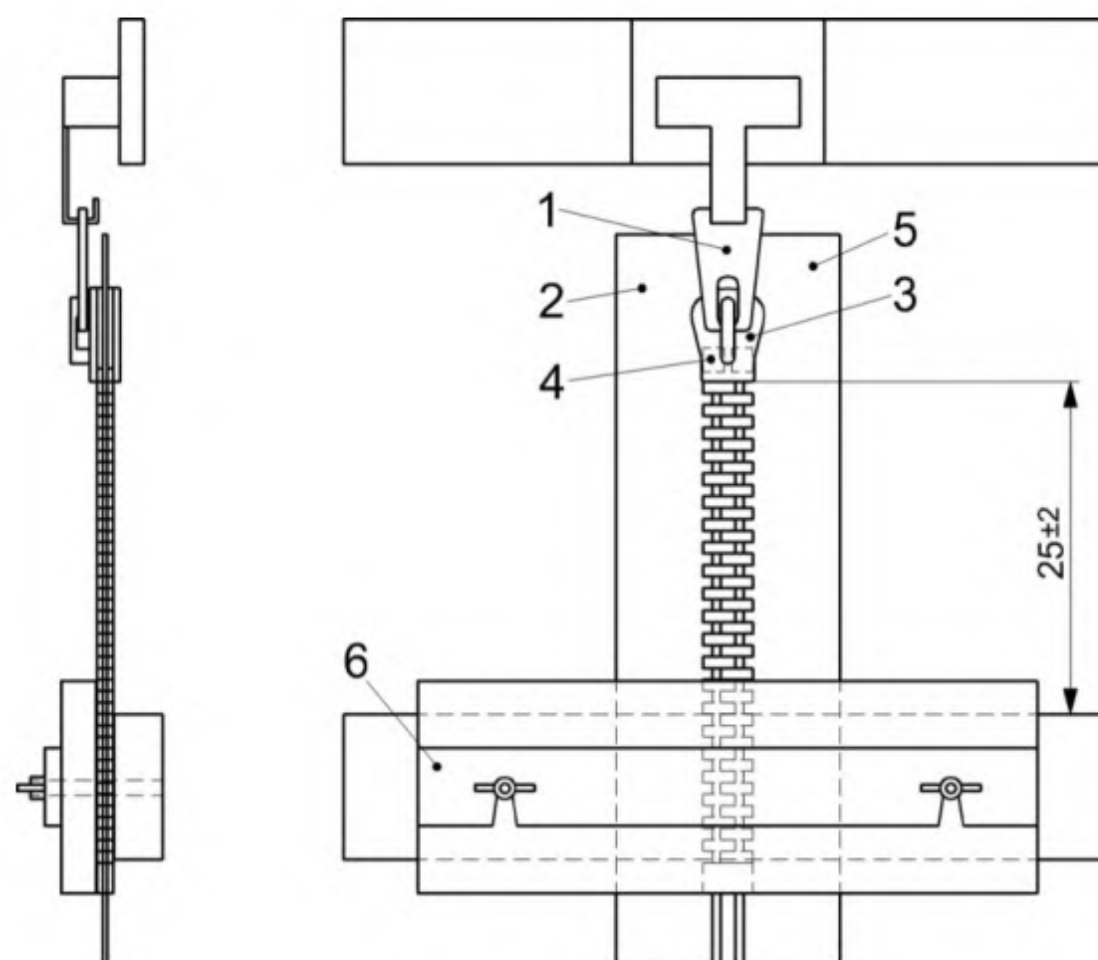
D.1 Principle

The top stops are subjected to a force via the slider applied through the puller.

D.2 Apparatus

Constant rate of extension tensile testing machine, as described in Annex B.

Dimensions in millimetres



Key

- 1 puller
- 2 stringer
- 3 slider body
- 4 top stop
- 5 stringer
- 6 lower clamp (jaw)

Figure D.1 — Example of top stop test

D.3 Procedure

With the slide fastener in the closed position and the slider adjacent to the top stops, secure the puller in the moving jaw of the machine and secure the closed slide fastener stringers in the fixed clamp of the machine such that the length of closed slide fastener between the top of the fixed jaw and the bottom of

the slider is set to (25 ± 2) mm (see Figure D.1). Set the machine in operation until the specified force is reached or until the specimen fails.

Instances of failure include slipping of the top stops, the slider riding over the top stops and the slider coming apart.

Annex E (normative)

Test for strength of open-end slide fastener box

E.1 Principle

The box (see 3.16, note 1 to entry) is subjected to longitudinal force whilst the slide fastener chain is in the closed position.

E.2 Apparatus

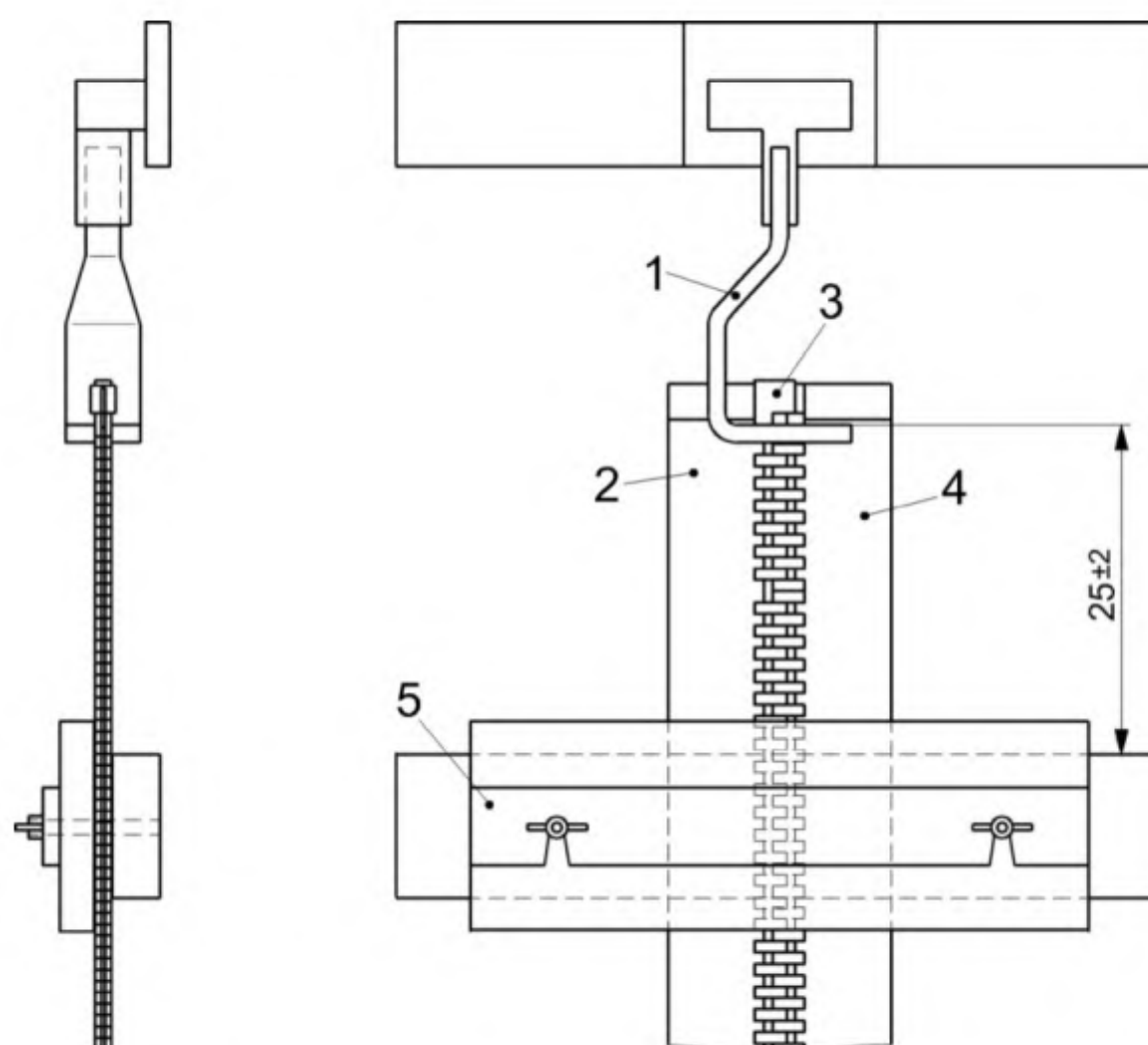
E.2.1 Constant rate of extension tensile testing machine

See Annex B.

E.2.2 Slotted plate

Slotted plate, shaped to clear the tape, chain and pin and to bear against the whole of the top edges of the box. In the case of a non-grippable box the use of an alternative slotted plate shall be reported (see Figure E.1).

Dimensions in millimetres



Key

- | | | | |
|---|--------------------------------|---|-------------|
| 1 | upper clamp with slotted plate | 4 | stringer |
| 2 | stringer | 5 | lower clamp |
| 3 | open end box | | |

Figure E.1 — Open-end one-way slide fastener box test

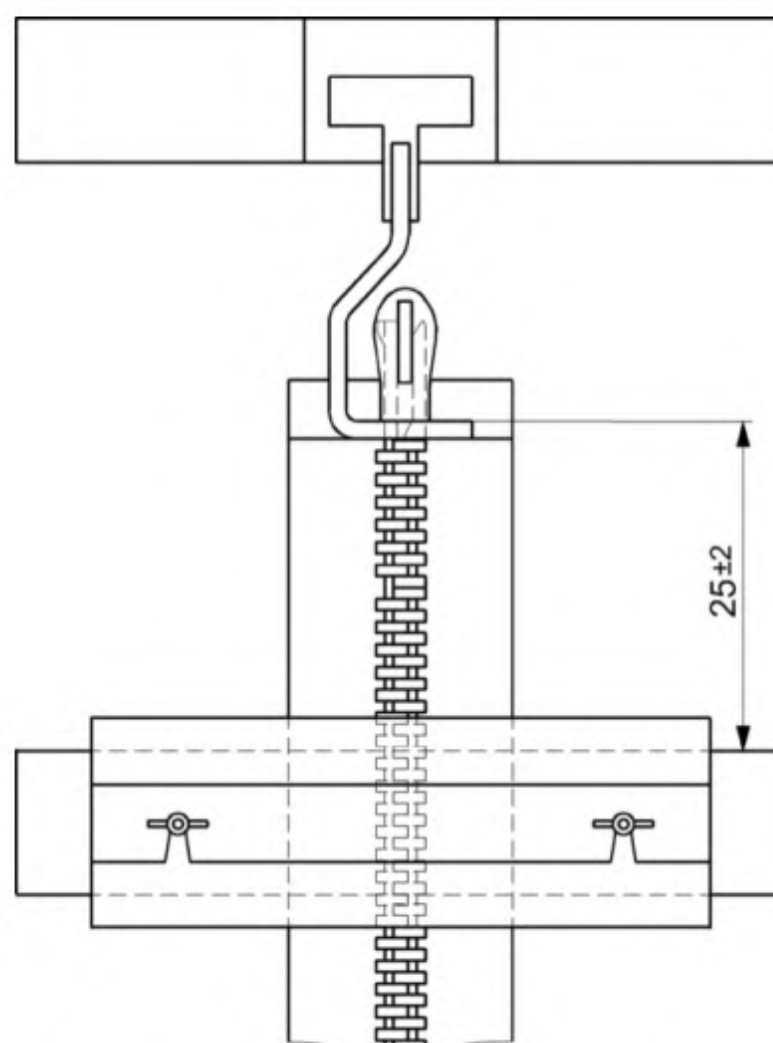


Figure E.2 — Open-end two-ways slide fastener box test

E.3 Procedure

With the test specimen in the closed position, clamp the whole slotted plate into the moveable jaw of the apparatus and insert the slide fastener such that the open-end slide fastener box is gripped in the slotted plate. For two-ways slide fasteners, clamp the puller of the lower slider into the upper jaw (see Figure E.2). Clamp the interlocked chain into the other jaw of the apparatus such that the distance between the top of the slotted plate and the top of the lower jaw is (25 ± 2) mm (see Figure E.1 or Figure E.2). Set the machine in operation until the specified force is reached or the test specimen fails.

Annex F (normative)

Test for resistance to reciprocation

F.1 Principle

The test specimen is subjected to a specified number of cyclic operations whilst under simultaneous lateral and longitudinal tension.

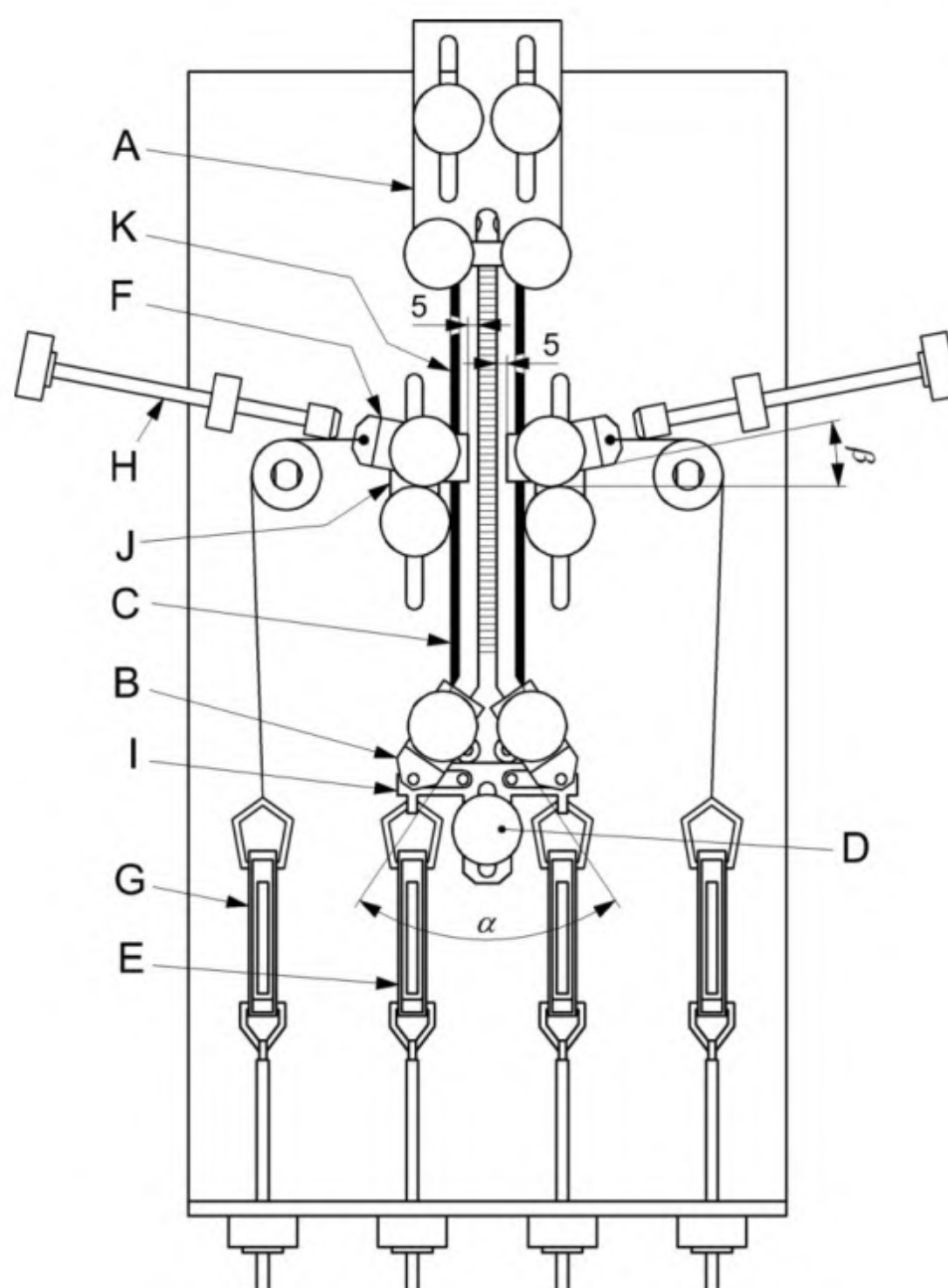
F.2 Apparatus

Vertically operated testing machine of the type shown in Figure F.1 and providing the following facilities.

- a) Means of holding the test specimen firmly at the bottom end, with the slide fastener in the closed position, without the chain being damaged.
- b) Means of separately gripping the two stringers at the other end so that the slide fastener beyond the slider is open. These gripping devices form the means of applying longitudinal spring balance forces to the slide fastener and are therefore connected together by a swivel-plate or other similar device, so that the slide fastener can be centred when the forces are applied. The gripping devices also swivel at the points of connection to the swivel-plate to facilitate the operation of the slider on the test specimen. The distance between the gripping devices is such that when the slider is at the lowest point in the cycle the two ends of the slide fastener subtend an angle of $60^\circ \pm 10^\circ$ (see α in Figure F.1).
- c) Means of gripping the tapes securely midway along the traversed length at opposite points of the testing zone so that the clamps can be subjected to force by means of spring balances. The clamps are mounted so that they are "floating", i.e. free to follow the natural direction of opening of the test specimen.

The clamps are attached at an angle of $10^\circ \pm 5^\circ$ (see β in Figure F.1) and are capable of moving 5 mm in the direction of the pulleys. Setting pads are provided to hold the clamps in position until they are secured to the tapes. The spring balances are of the tubular type and are 100 N balances for the lateral tension and 50 N balances for the longitudinal force. In each case the scale is 44 mm in length. The 100 N balances have a spring rating of 2,25 N/mm and the 50 N balances one of 1,10 N/mm. They are graduated in 1 N steps and accurate to within 1 N on each reading.

- d) Means of applying a regular reciprocating action, at (30 ± 1) cycles per minute through the medium of the puller, to the slider on the test specimen. The clamp or other gripping device may provide an indirect form of connection in which the clamp is in two parts, one of which is attached to the reciprocating device and the other to the puller on the specimen. This method of attachment can incorporate a spring mechanism or other feature to withdraw any automatic locking device fitted to the slider on the specimen.



Key

 $\alpha 60^\circ$ $\beta 10^\circ$

A top clamp

B longitudinal clamps

C test specimen

D stop pin

E longitudinal spring balances

F lateral clamps

G lateral spring balances

H adjusting screw

I swivel plate

J setting pads

K test specimen

Figure F.1 — Resistance to reciprocation test

F.3 Procedure

F.3.1 Preparation of the specimens

Mount the test specimen in the vertical plane so that the bottom end is away from the spring balance ends of the testing machine. Leave the stringers separate at the other end so that they can be individually mounted in the testing machine (see Figure F.1). The lateral and longitudinal forces applied are as given in Table F.1.

Table F.1 — Lateral and longitudinal applied forces for reciprocating test

Performance code	Lateral force on each stringer	Longitudinal force on each stringer
	N	N
A	7	5
B	10	7
C	16	14
D	24	18
E	30	23

F.3.2 Method

Arrange the machine so that the length of traverse of the slider is from 75 mm to 90 mm in each direction, a to-and-fro movement of 150 mm to 180 mm forming a cycle. The procedure then follows the steps indicated below.

- Operate the testing machine by hand until the puller is in the lowest position, and place in position the setting pads.
- Clamp the puller, ensuring that any locking device is withdrawn.
- Place the slide fastener loosely in position in the top clamp, A.
- Secure the slide fastener ends in the longitudinal clamps, B.
- Take hold of the slide fastener C at the upper end and draw upwards until pin D prevents any further upward movement, without stretching the tape. Tighten clamp A. If the slide fastener is completely closed, then the tape ends that are attached by the bottom tape clamps are too long. To overcome this, release clamps B, F and A and cut off a length of each bottom tape end. To reassemble start at Step 3.
- Apply the appropriate longitudinal forces given in Table F.1 by adjusting the spring balances E.
- Secure lateral clamps F to the slide fastener tapes, leaving gaps of 5 mm between the lateral clamps and the chain at their nearest points. Ensure that the centre-lines of the clamps coincide with the strings that pass over the pulleys. Ensure that the clamps, F, are held firmly against the setting pads, J, whilst securing the clamps to the slide fastener tape. Withdraw the setting pads after fixing the clamps.
- Apply the appropriate lateral forces given in Table F.1 by adjusting spring balances G.
- Set the counter to zero. Set machine in motion for one cycle only to equalize the position of test specimen.
- Check the forces of spring balances E and G and adjust if necessary. When the slider is in the lowest position set the adjusting screws, H, a minimum of 5 mm away from the lateral clamps, F.
- Set the machine in motion.
- Once the test has started, do not readjust the spring balances E and G.
- Allow the machine to operate until 500 cycles have been completed. After 500 cycles, examine the slide fastener and record if the slide fastener has failed. Mechanisms of failure include slider breakage or detachment from chain, detachment of puller from slider, tape breakage, etc.

Annex G (normative)

Test for lateral strength of slide fastener

G.1 Principle

The test specimen is subjected to lateral force under controlled conditions whilst the slide fastener chain is in the closed position.

G.2 Apparatus

G.2.1 Constant rate of extension tensile testing machine

As described in Annex B, with jaws or other securing devices having a gripping surface 25 mm wide and constructed and finished such as not to damage the tape or allow the test specimen to slip (see Figure G.1).

G.2.2 Jaws

See Annex C.

Dimensions in millimetres

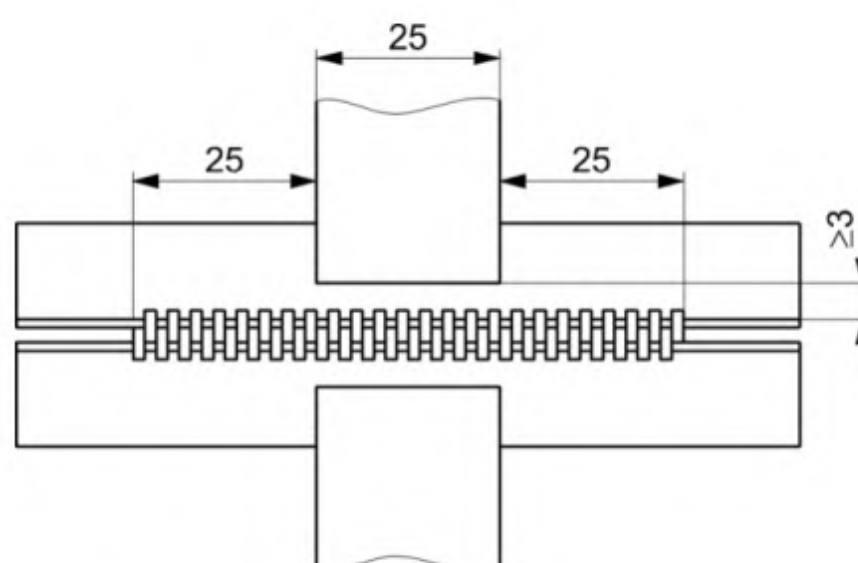


Figure G.1 — Lateral strength test

G.3 Procedure

Secure the test specimen in place with the jaws so arranged that at least half the width of each tape is gripped and there is at least 25 mm of closed chain on each side. Set the testing machine in operation until the specified force is reached or the test specimen fails.

Annex H (normative)

Test for lateral strength of open-end attachment

H.1 Principle

The test specimen is subjected to straight lateral force under controlled conditions whilst the slide fastener chain is in the closed position.

H.2 Apparatus

H.2.1 Constant rate of extension tensile testing machine

See Annex B.

H.2.2 Jaws

See Annex C.

Dimensions in millimetres

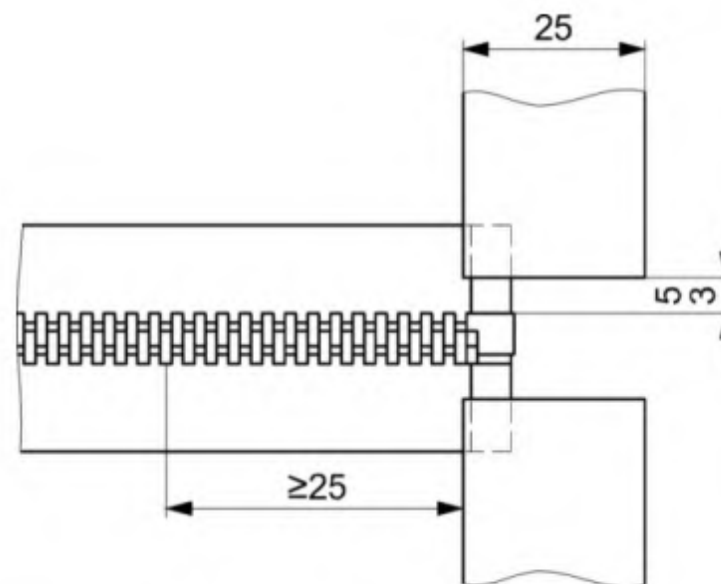


Figure H.1 — Lateral strength of open-end attachment test

H.3 Procedure

Secure the test specimen in place with the jaws set between 3 mm and 5 mm from the side edges of the box, and with one edge of each jaw aligned with the last element in the chain (as shown in Figure H.1) there is at least 25 mm of closed chain. Set the machine in operation until the specified force is reached or the test specimen fails.

Annex I (normative)

Test for strength of slider locking device

I.1 Principle

The slider is locked on the chain and the locking device subjected to tension via the chain stringers in such a way as to bring the locking device under pressure from the chain.

I.2 Apparatus

I.2.1 Constant rate of extension tensile testing machine

See Annex B.

I.2.2 Jaws

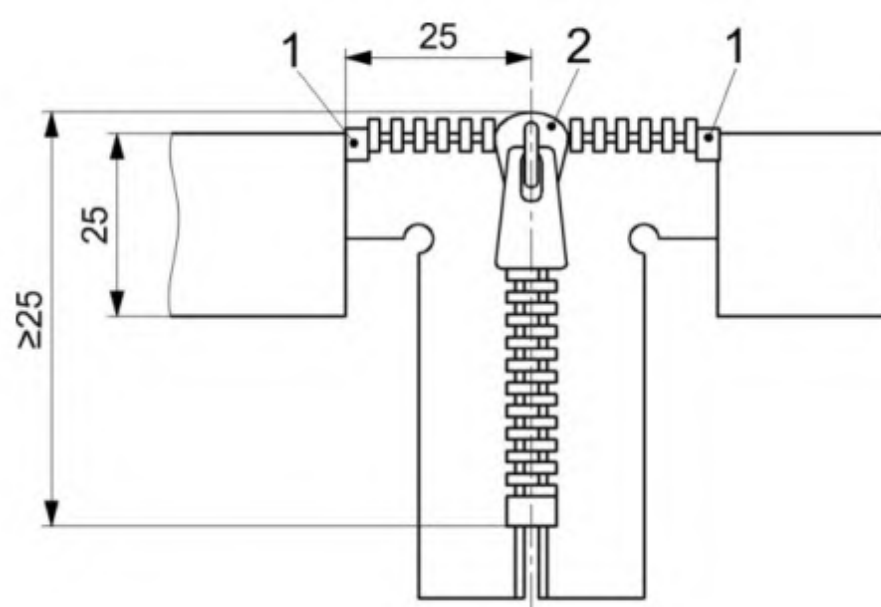
See Annex C.

I.3 Procedure

Mount the test specimen in the open position, with the locking device locked into the chain 25 mm from the top stops. Set the jaws 50 mm apart and secure the top of the stringer into the jaw adjacent to the top stop so that the top of the slider is 25 mm from the edge of each jaw, as shown in Figure I.1. Set the machine in motion and increase the force until the locking mechanism slips, the specified force is reached, or the test specimen fails.

Instances of failure of the test specimen include slipping of the locking mechanism or damage to an element.

Dimensions in millimetres



Key

- 1 top stops
- 2 slider body

Figure I.1 — Slider locking device test

Annex J (normative)

Test for open-end slide fastener single stringer slider retention

J.1 Principle

The single top stop is subjected to a force via the slider applied through the puller.

J.2 Apparatus

J.2.1 Constant rate of tension tensile testing machine

See Annex B.

J.2.2 Jaws

See Annex C.

J.3 Procedure

Open the test specimen to provide a single stringer with the slider adjacent to the top stop. Secure the puller in the upper jaw of the testing machine and the other end of the specimen in the lower jaw such as the minimum distance between the jaws is 25mm, as shown in Figure J.1, steps being taken to avoid damaging the stringer. Set the machine in operation until the specified force is reached or the test specimen fails.

Instances of failure include the slider becoming detached from the top stop of the slide fastener and the removal of the puller from the slider body.

Dimensions in millimetres

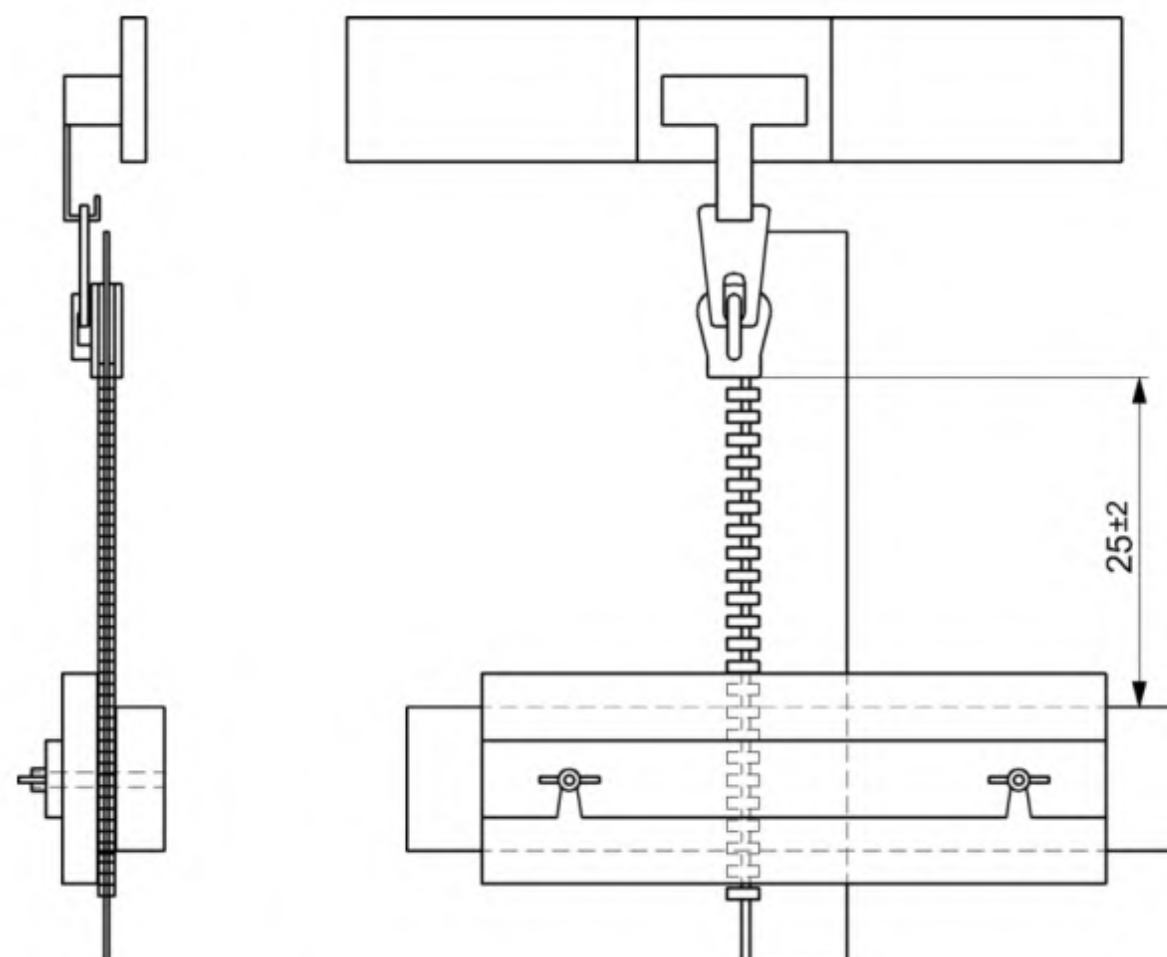


Figure J.1 — Open-end slide fastener single stringer slider retention test

Annex K (normative)

Torque test

K.1 Principle

This test method determines the resistance of a slider against a torque applied to the puller of a zipper in a plane perpendicular to its longitudinal axis.

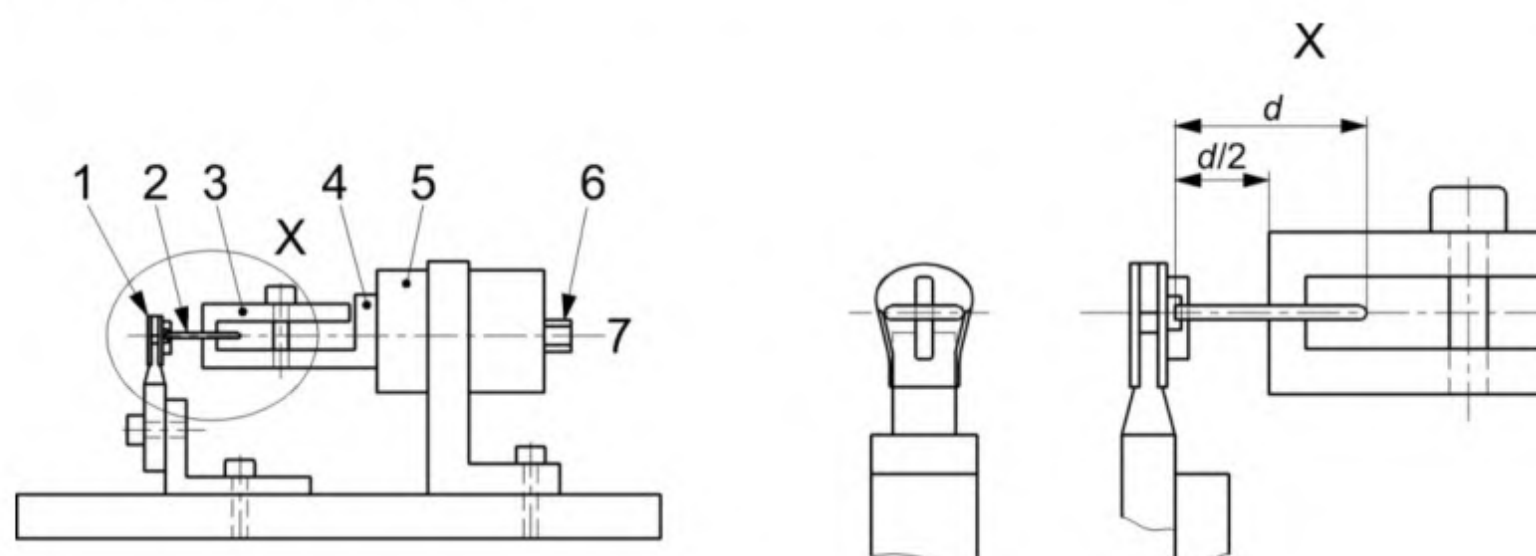
This test method can also be used to determine puller strength which measures the ability of a slider to resist deformation or rupture when a torque stress is applied on the puller during operation of the zipper in the end product.

K.2 Apparatus

Consisting of a puller twist fixture having a means for positioning the slider body, and for clamping the puller perpendicularly to the slider body as shown in Figure K.1. The puller clamp shall be rotatable around its longitudinal axis and shall be equipped with a dial for measuring the angle of rotation. The jaws shall be capable of holding the test specimen without allowing it to slip

Provision shall be made to apply torsional forces to the clamp by means of torque wrenches of the adjustable slip type at a constant rate.

The wrench selected for each test shall be such that the torque exerted falls between 20 % and 80 % of its scale capacity (of at least 0,70 Nm).



Key

- 1 slider body
- 2 puller
- 3 pull tab clamp
- 4 testing drum
- 5 angular dial
- 6 for attaching of torque wrench
- 7 axis of rotation
- X detail of puller clamp
- d length of puller

Figure K.1 — Pull tab twist test

K.3 Procedure

K.3.1 Preparation of the specimens

Remove the slider from the stringers of the fastener. Clamp the slider in one of the clamps and the puller in the other, so that the puller is perpendicular to the slider and the longitudinal centre line of the puller is aligned with the axis of rotation between the two clamps, and the puller is gripped in the middle of its total length as shown in Figure K.1, Key X.

Depending on the construction of the puller and its attachment it may be necessary to adjust the gripping position, in this case the gripping position should be reported.

The amount of permanent twist imparted to the puller or other permanent damage or deformation or detachment is noted.

K.3.2 Method

Operate the testing device so that the two jaws rotate relative to each other in a clockwise direction, when looking from the puller side of the slider, at a constant speed in order to achieve 180° rotation in 5 s until either:

- a) the specified torque is reached, or
- b) the puller breaks or twists off the slider, or
- c) the jaws have rotated through a total of 180°.

Maintain the maximum rotation or required torque for 10 s. Permit the test component to return to a relaxed condition. Repeat this procedure in an anticlockwise direction.

NOTE Applicable specification can be found in some standards dealing with safety requirements intended for children (3.21, 3.22 and 3.23) articles (e.g. clothing, sleep bags).

Repeat the same procedure for at least four additional specimens. Report the cases a), b), c) listed above. If a puller slippage occurs in the jaws, the test shall be reported as not suitable.

K.4 Test to failure method for quality control

IMPORTANT — This method is intended for quality control, and it is not to be used to comply with the requirement of Table 2.

Prepare the specimen as in K.3.1.

Operate the testing device (K.2) so that the two jaws rotate relative to each other in a clockwise direction, when looking from the puller side of the slider, at a constant speed of approximately 9°/s in order to achieve 180° rotation between 15 s and 25 s until either:

- the puller breaks or twists off the slider;
- the jaws have rotated through a total of 180°.

If a puller slippage occurs in the jaws, the test shall be reported as not suitable.

Record the maximum torque in Nm to the nearest 0,01 Nm and the type of failure such as:

- slider broke at the point of attachment to the puller;
- puller broke at the point of attachment to the slider;

- slider broke at a point away from the attachment to the puller;
- puller broke at a point away from the attachment to the slider;
- puller twisted but did not break.

If the puller is permanently twisted, estimate the amount of twist to the nearest 5°.

Repeat the procedure for two further test specimens.

Repeat the procedure for three further test specimens, this time rotating the jaws in an anticlockwise direction.

Calculate the arithmetic mean of the six maximum torques (clockwise and anticlockwise).

Annex L (informative)

Sampling procedures for bulk quantities of slide fasteners

L.1 General

Batch sizes and test rates are in accordance with Table L.1 based on ISO 2859-1 (with AQL Acceptance Quality Limit 4,0 and at special inspection level S3), which are consulted for information on sampling plans, including the switch from normal to tightened procedures.

L.2 Guidance on interpretation of results for acceptance purposes

Based on the sampling details given in Table L.1, the appropriate number of test samples can be tested for each test applicable to the design of slide fastener. Any test specimen within any test carried out which does not achieve the required performance level, can be considered to be a 'defect' for the purposes of determining acceptability or rejection of the batch. The Acceptance and Rejection levels given in Table L.1 are applicable to all defects detected for all tests applicable to the specific design of slide fastener being inspected. If the total number of defects does not exceed the number given in the Acceptance column of Table L.1 then the batch can be accepted. If the total number of defects is equal to or greater than the number given in the Rejection column of Table L.1 then the batch can be rejected.

L.3 Guide to changing from normal to tightened test procedures

If two of five or fewer successive batches have been rejected at the normal test rate, then the tightened test rate are introduced and remain in force until five successive batches have been accepted, after which the normal test rate can be restored.

Table L.1 — Batch sizes and test rates

Test rate	Batch size	No of samples	No of defects giving rise to	
			Acceptance	Rejection
Normal	2 to 150	3	0	1
	151 to 3 200	13	1	2
	201 to 35 000	20	2	3
	35 001 to 500 000	32	3	4
Tightened	2 to 150	5	0	1
	151 to 35 000	20	1	2
	35 001 to 500 000	32	2	3

Annex M (informative)

End-uses and performance codes for labelling purposes

Table M.1 — End-uses and possible performance codes for labelling purposes

End uses	Performance code				
	A	B	C	D	E
Dresses	X	X			
Knitwear	X	X	X		
Light leather goods		X	X		
Skirts, jeans or trousers		X	X		
Upholstery		X	X		
Foundation garments			X		
Coats and jackets			X	X	
Overalls			X		
Luggage			X	X	X
Sleeping bags			X	X	
Lightweight and inner tents			X		
Footwear			X	X	
Leather garments			X	X	
Ski clothes			X	X	
Wet suits					X
Awnings and frame tents					X
Mattresses			X	X	
Pillows		X	X		
Children's sleep bags		X	X		
Children clothes		X	X		
Workwear				X	X

NOTE Advice on the end use of slide fasteners can be indicated at the point of sale or earlier using the information given in Table M.1 and Annex A. For industrial users a technical advisory service is made available by most manufacturers. Some end-use categories given in Table M.1 overlap several performance codes; this is because certain items, e.g. knitwear, are manufactured in various weights and thus are designed for a variety of end uses. Users of this document can therefore preferably use their judgement in selecting a performance code following the guidance given in Table M.1 especially considering extreme conditions of use.

Annex N (informative)

Test for resistance to reciprocation for slide fasteners with length from 75 mm to 200 mm

N.1 Principle

The free tapes at the open end of a test fastener are clamped together so that they are parallel. The fastener is held under tension along its length and across its width while it is repeatedly opened and closed. The test is stopped when the fastener has either failed or been subjected to a set number of cycles (see Table 1).

The test specimen, from slide fasteners with a length (3.9) shorter than 200 mm, is subjected to a specified number of cyclic operations whilst under simultaneous lateral and longitudinal tension.

To have an appropriate test result, slide fasteners with a length (3.9) shorter than 75 mm cannot be tested and it is suggested to produce the same slide fasteners in a longer dimension to be able to correctly proceed with testing.

N.2 Apparatus

N.2.1 A test machine¹ with one or more stations each having the following:

N.2.1.1 A fixed clamp capable of firmly holding the close end of the test fastener without causing damage to teeth.

N.2.1.2 A free clamp capable of holding the open end of the fastener without causing damage to the teeth and with the two free tapes held so that they are together (see Figure N.1)

N.2.1.3 A lateral clamp system capable of holding a (25 ± 2) mm length of both edges of the test fastener tapes so that

- a) the centre of the clamped length is a point $(82,5 \pm 2)$ mm from the free clamp (N.2.1.2), and
- b) the lateral movement of each clamp is restricted, by stops, to (6 ± 1) mm.

N.2.1.4 A means of applying a longitudinal force F_1 as specified in Table F.1 to the free clamp (N.2.1.2) at an angle of 90° to and away from the clamping edge of the fixed clamp (N.2.1.1) (see Figure N.1)

N.2.1.5 A means of applying a lateral force F_2 as specified in Table F.1 to each of the clamps (N.2.1.3) in direction parallel to the clamping edge of the fixed clamp (N.2.1.1)

N.2.1.6 A device for holding the slider of the test fastener

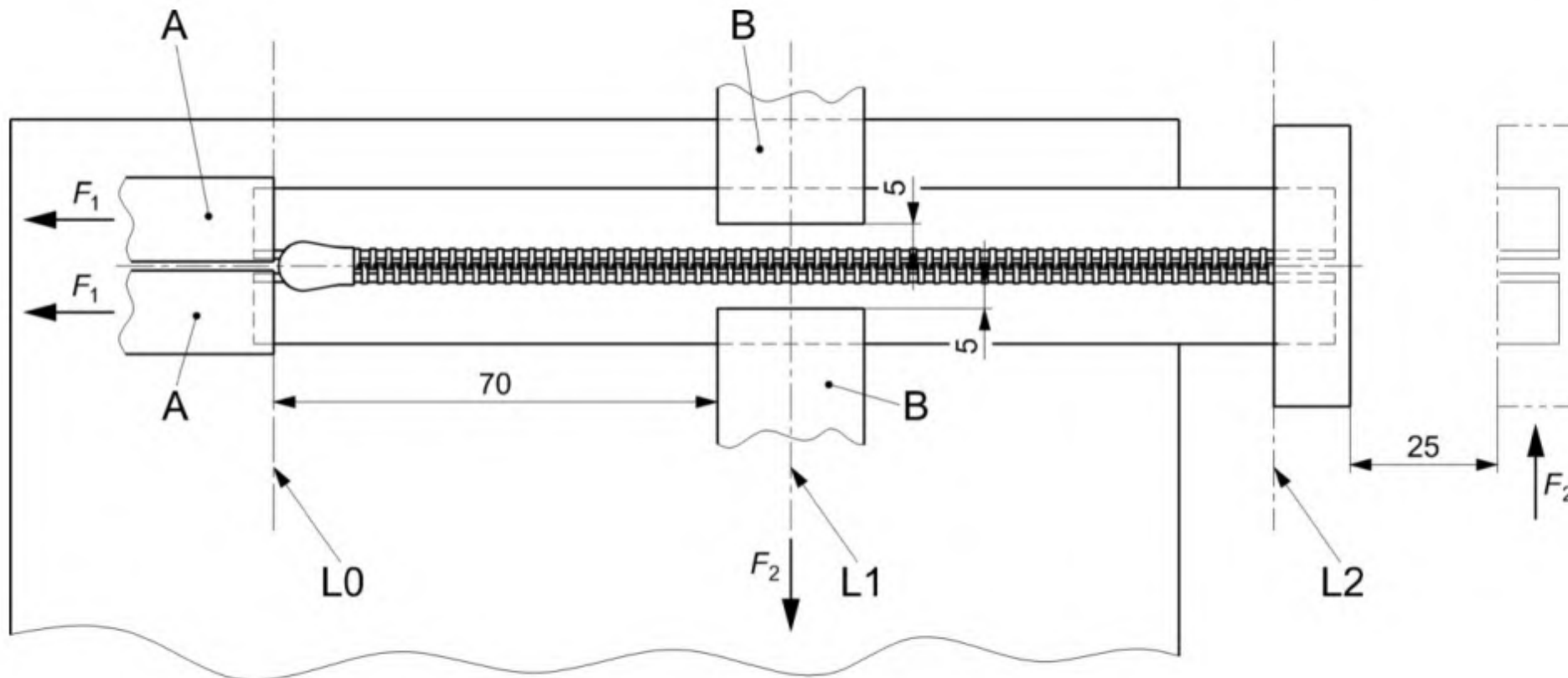
N.2.1.7 A method of applying a regular harmonic reciprocating motion to the device (N.2.1.6) with – stroke: $(63,50 \pm 1,5)$ mm, speed: (30 ± 1) cycles per minute (cycle/min)

¹ Suitable equipment can be obtained from PFI, <https://www.pfi-germany.de/>. This information is given for the convenience of users of this document and does not constitute an endorsement by CEN of this product.

N.2.1.8 A method of counting the number of cycles of the device¹ (N.2.1.6) up to failure of the test specimen

N.2.1.9 A device for measuring distances up to 300 mm to an accuracy of 1 mm. A steel rule is suitable.

Dimensions in millimetres



Key

- A free clamp (N.2.1.2)
- B lateral clamp (N.2.1.3)
- [C] fixed clamp (N.2.1.1)
- [D] distance between L₀ and L₂

Figure N.1 — Clamping arrangement for test specimens

N.3 Preparation of test specimens

N.3.1 The test can be conducted with any number of test specimens, but a minimum of three is suggested. Condition the test specimens for minimum of 16 h before testing and carry out the test in this environment.

N.3.2 Mark a line L₀ across the width of each tape of the test fastener which is (4 ± 2) mm on the outer side of the end stops at the open end for positioning the free clamp (N.2.1.2).

N.3.3 Mark a line L₁ on the edge of both tapes that is $(82,5 \pm 2)$ mm from the line L₀ (N.3.2) for positioning the lateral clamps (N.2.1.3).

N.3.4 Mark a line L₂ across the width of each tape parallel to the line L₀ (N.3.2) for positioning the fixed clamp (N.2.1.1) at (4 ± 2) mm on the outer side of the bottom stop, or if the line L₂ passes close to an end stop which is sufficiently thick to make clamping difficult, towards the centre of the fastener until it is over the teeth and clear of the end stop. Measure the distance D, between L₀ and L₂ at the nearest 1 mm and report it.

N.3.5 If the test fastener is narrower than the minimum distance between the two clamps (N.2.1.3), then for each test fastener:

- a) cut two tabs of materials (e.g. tape of slide fasteners under testing, or leather or woven fabric, not elasticized), minimum width 25 mm. The exact length of the strips depends on the clamping system of the machine being used, and
- b) sew a tab to the reverse edge of each tape so that the longitudinal centre line of the tab is at 90° to the edge of the teeth and is coincident with the line L_1 made in N.3.3. Use two rows of stitching which are parallel to the edge of the test fastener teeth with one row $(7,0 \pm 0,5)$ mm and the other $(9,0 \pm 0,5)$ mm from the teeth. Both rows of stitching continue for at least 25 mm beyond either end of the tab.

In case N.3.5 is applied, evaluate with caution the test result.

N.4 Procedure

N.4.1 Secure the closed-end of a test fastener; or any attached strip (N.3.2), in the fixed clamp (N.2.1.1) so that the line L_2 (N.3.4) is aligned with the edge of the clamp.

N.4.2 Grip the open end of the test fastener with the clamp (N.2.1.2) so that line L_0 (N.3.2) is aligned with the edge of the free clamp.

N.4.3 Apply the longitudinal force, F_1 , specified in Table F.1, to the clamp (N.2.1.2) so that the fastener is held under tension along its length.

N.4.4 If a tab is attached of the edge of each tape in N.3.5, then grip a tab with each clamp (N.2.1.3). Otherwise, grip the edge of the tape in the clamp (N.2.1.3) ensuring that the line L_1 (N.3.3) is at the centre of the clamp, and the edge of the clamp is parallel to, and at least 5 mm from the edge of the teeth.

N.4.5 Secure lateral clamps (N.2.1.3) to the slide fastener tapes, leaving gaps of 5 mm between the lateral clamps and the chain at their nearest points.

Tension the test fastener across its width by applying a force of F_2 , to each of the two lateral clamps (N.2.1.3) in a direction that is parallel to the clamping edge of clamp (N.2.1.1).

N.4.6 Clamp the test fastener slider in the device (N.2.1.6) and ensure that the stroke of the device is $(63,5 \pm 1,5)$ mm.

N.4.7 Repeat the procedure in N.4.1 to N.4.6 for any remaining test fastener up to the number of test stations.

N.4.8 Reset the counter (N.2.1.8) and run the test machine (N.2.1) at a speed of (30 ± 1) cycles per minute (cycles/min).

N.4.9 When the test fastener(s) have either failed or been subjected to a specified number of cycles, remove them from the machine and record any damage such as the following:

- detachment of slider from one track;
- breakage of puller;
- jamming or wear of the teeth;
- detachment or breakage of the teeth;

- stitch abrasion (sewn-on polyamide teeth);
- tearing of the tape.

Record the corresponding number(s) of cycles.

N.4.10 Repeat the procedure in N.4.1 to N.4.9 for any remaining test fastener.

Bibliography

- [1] ASTM D2061, *Standard test methods for strength tests for zippers*
- [2] EN ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system (ISO 7500-1)*
- [3] ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*
- [4] EN ISO 10751:2016, *Footwear — Test methods for slide fasteners — Resistance to repeated opening and closing (ISO 10751:2016)*
- [5] EN 16781:2018, *Textile child care articles — Safety requirements and test methods for children's sleep bags for use in a cot*
- [6] CEN/TR 16792:2014, *Safety of children's clothing — Recommendations for the design and manufacture of children's clothing — Mechanical safety*