

English Version

Plastics - Poly(vinyl chloride) (PVC) based profiles -
Determination of the strength of welded corners and T-
joints

Plastiques - Profilés à base de poly(chlorure de vinyle)
(PVC) - Détermination de la résistance des
assemblages soudés en angle et en T

Kunststoffe - Profile auf Basis von Polyvinylchlorid
(PVC) - Bestimmung der Festigkeit verschweißter
Ecken und T-Verbindungen

This European Standard was approved by CEN on 7 April 2025.

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

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Contents	Page
European foreword.....	3
1 Scope.....	4
2 Normative references.....	4
3 Terms and definitions.....	4
4 Principle.....	4
5 Apparatus.....	4
5.1 Tensile or compression testing machine.....	4
5.2 Test setup.....	4
6 Test specimen.....	8
6.1 Welding of the corner test specimen	8
6.2 Welding of the T-joint test specimen.....	8
6.3 Tensile bending test specimen.....	9
6.4 Compression bending test specimen.....	9
6.5 Number of test specimens.....	9
7 Conditioning.....	9
8 Procedure.....	10
8.1 Test temperature	10
8.2 Tensile bending test.....	10
8.3 Compression bending test	10
9 Test report.....	10
Annex A (normative) Method for the calculation of the failure stress	12
A.1 Tensile bending test.....	12
A.2 Compression bending test	12

European foreword

This document (EN 514:2025) has been prepared by Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by SIS.

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of an identical text or by endorsement, at the latest by November 2025, and conflicting national standards shall be withdrawn at the latest by November 2025.

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

This document supersedes EN 514:2018.

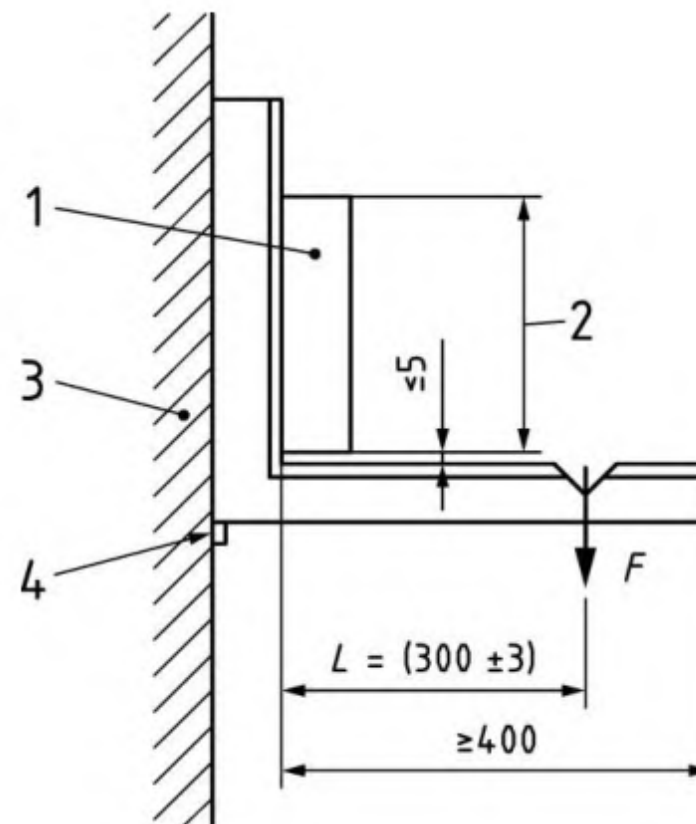
EN 514:2025 includes the following significant technical changes with respect to EN 514:2018:

- term 3.1 "failure load" has been revised;
- in 5.1 the measuring range of load for the tensile or compression testing machine has been expanded.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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Dimensions in millimetres

**Key**

1 clamping device

2 rigid support over a minimum clamping length of 400 mm

3 frame

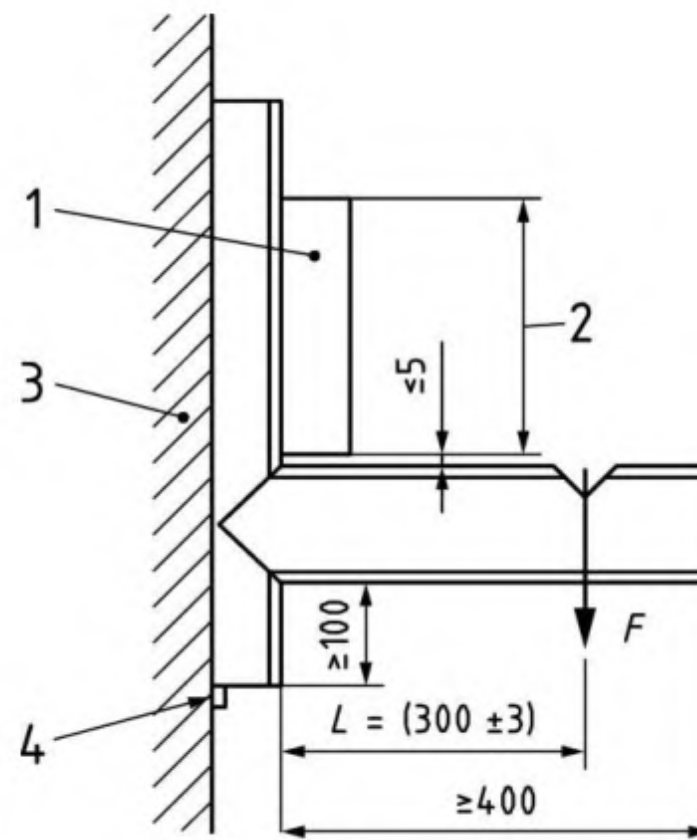
4 optional support block ($5 \pm 0,5$) mm L distance between the corner in the highest flange and the point of application of the load F load applied on the profile

NOTE The force can be applied with or without a notch.

Figure 1 — Example of a test setup for a tensile bending test of corners

5.2.2 Tensile bending test with a welded T-joint as test specimen (see Figure 2).

Dimensions in millimetres



Key

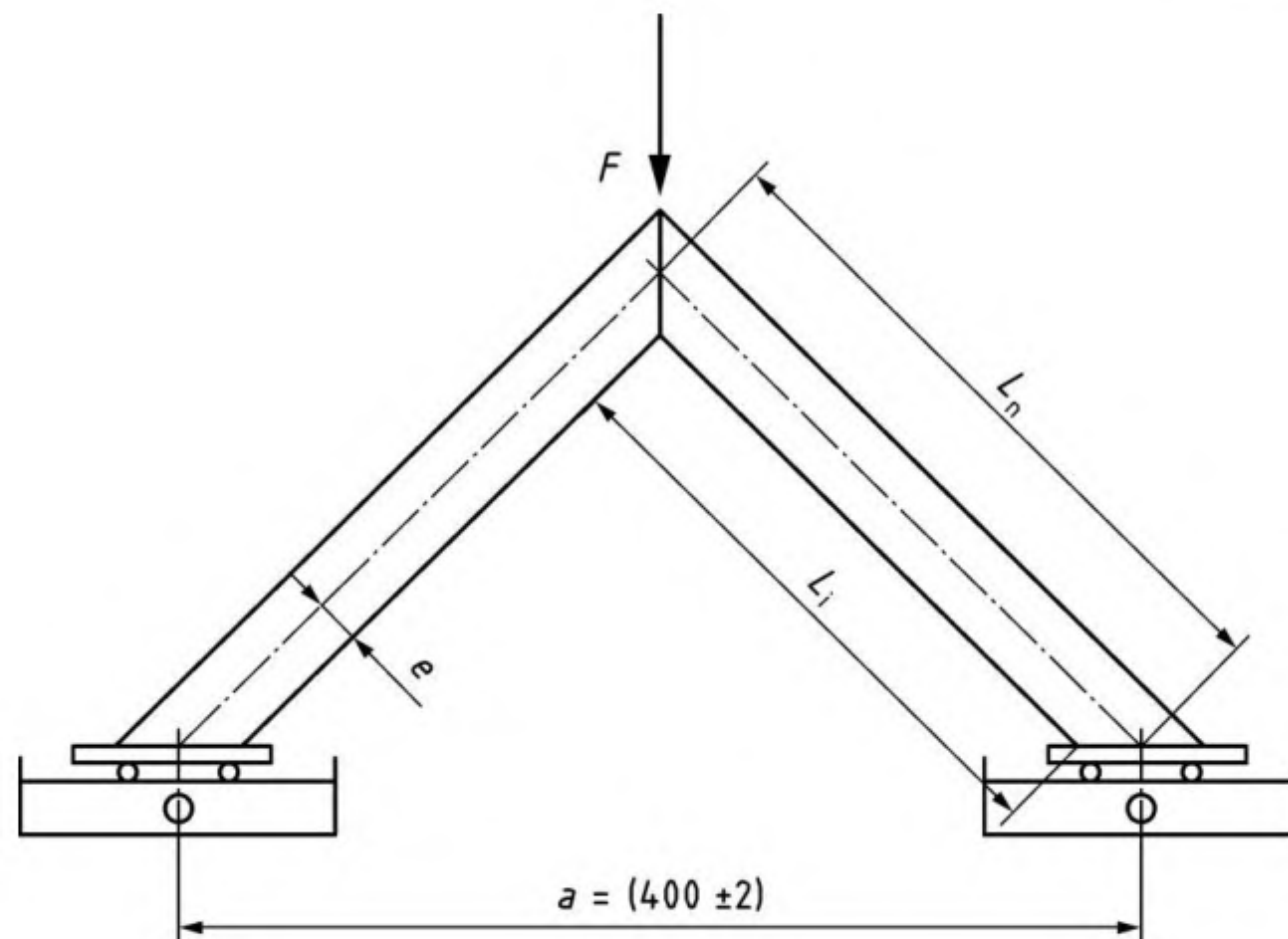
- 1 clamping device
 - 2 rigid support over a minimum clamping length of 400 mm
 - 3 frame
 - 4 optional support block ($5 \pm 0,5$) mm
- L distance between the corner in the highest flange and the point of application of the load
- F load applied on the profile

NOTE The force can be applied with or without a notch.

Figure 2 — Example of a test setup for a tensile bending test of T-joints

5.2.3 Compression bending test with a welded corner as test specimen (see Figure 3).

Dimensions in millimetres



Key

L_i inside length of the legs

L_n length of the neutral axis of the profile

e distance between the inside of the section and the neutral axis

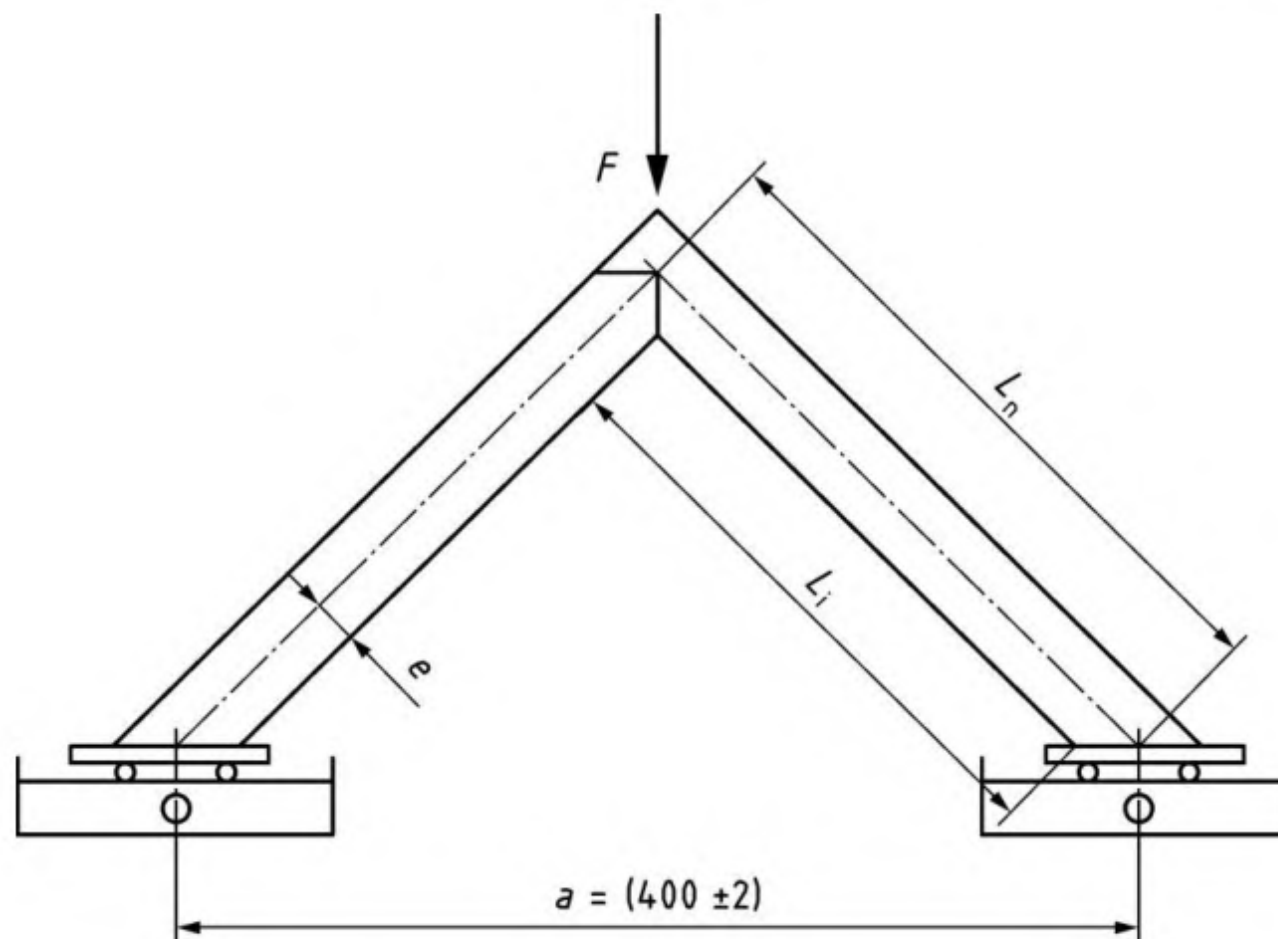
a distance between the axes of rotation of the carriages

F load applied on the corner

Figure 3 — Example of a test setup for compression bending test of corners joints

5.2.4 Compression bending test with a welded T-joint as test specimen (see Figure 4).

Dimensions in millimetres



Key

L_i inside length of the legs

L_n length of the neutral axis of the profile

e distance between the inside of the section and the neutral axis

a distance between the axes of rotation of the carriages

F load applied on the corner

Figure 4 — Example of a test setup for compression bending testing of T-joints

6 Test specimen

6.1 Welding of the corner test specimen

The test specimen is a welded corner with an angle of $(90 \pm 1)^\circ$.

Two lengths of profile cut at 45° are heat welded.

6.2 Welding of the T-joint test specimen

The test specimen is a welded T-joint with an angle of $(90 \pm 1)^\circ$. The T-joint is fabricated by heat welding one piece of, for instance, sash or frame profile at least 500 mm long and one piece of, for instance, transom profile at least 400 mm long.

Before welding the sash or frame profile is notched at $2 \times 45^\circ$ to a depth in accordance with Formula (1):

$$0,5 \cdot (w - s) \quad (1)$$

where

w is width of transom profile;

s is welder head stroke.

The transom profile end is sawn into a symmetrical 90° point.

The position of the 90° notch in the sash or frame profile is such as to leave a minimum 400 mm leg measured from the top of the transom profile (see Figure 2).

6.3 Tensile bending test specimen

6.3.1 The inside leg length of the test specimen for corner testing shall be at least 400 mm (see Figure 1).

6.3.2 The T-joint test specimen is fabricated with the sash or frame arms of inside length at least 400 mm and 100 mm, and the transom or mullion stem length at least 400 mm (see Figure 2).

6.4 Compression bending test specimen

6.4.1 The legs of the corner test specimen are cut at an angle of $(45 \pm 1)^\circ$ in such a way that the neutral axes of the end sections are located vertically over the axes of rotation of the carriage (approximately the middle of the main chamber of the profile) (see Figure 3). The inside length of the legs L_i in millimetres is obtained from the following formulae:

$$L_i = L_n - 2e \quad (2)$$

$$L_n = \frac{400}{\sqrt{2}} = 283 \quad (3)$$

$$L_i = 283 - 2e \quad (4)$$

where

L_n is the length of the neutral axis of the profile in millimetres;

e is the distance between the inside of the section and the neutral axis in millimetres.

6.4.2 The short arm of the T-joint test specimen is cut off level with the outer face of the stem to produce a 90° corner. Further preparation of the corner is in accordance with 6.4.1 (see Figure 4).

6.5 Number of test specimens

A minimum of three test specimens per profile type, all made on the same welder head, shall be tested to obtain a mean value.

7 Conditioning

The test specimens shall be conditioned at $(23 \pm 5)^\circ\text{C}$ for at least two hours immediately prior to testing.

8 Procedure

8.1 Test temperature

Carry the test out at a temperature of $(23 \pm 5) ^\circ\text{C}$.

8.2 Tensile bending test

8.2.1 Clamp the test specimen in the apparatus as shown in Figures 1 or 2. Contoured support blocks may be used, if necessary, to limit twisting.

8.2.2 Apply the load to the test specimen in such a way that the speed of application is 50 mm/min.

8.2.3 Continue until the test specimen fails.

8.2.4 Note the failure load F_t and calculate the failure stress in accordance with Annex A.

8.3 Compression bending test

8.3.1 Place the test specimen on the trolley as shown in Figures 3 or 4. In order to avoid excessive deflection, the open frame end of the T-joint can be supported in the corner area by inserting a cavity filling block (e.g. a piece of metal reinforcement or a wooden block).

8.3.2 Apply the load to the test specimen in such a way that the speed of application is 50 mm/min. The force application shall be uniform. If necessary, a block adapted to the shape of the profile space may be used to limit the torsion during the test.

8.3.3 Continue until the test specimen fails.

8.3.4 Note the failure load F_c and calculate the failure stress in accordance with Annex A.

9 Test report

The test report shall include at least the following information:

- a) dated reference to this document (i.e. EN 514:2025);
- b) the name of the test laboratory;
- c) full identification of the profile(s);
- d) identification of the joint:
 - 1) the type of the joint (corner or T-joint);
 - 2) the presence or absence of welding sprue (bead);
 - 3) if more than one welding head is in use, the nominated head;
- e) the date of testing;
- f) the welding conditions;
- g) the test method (tensile bending or compression bending);

- h) for compression bending testing the inside length of the leg of the test specimen;
- i) the test temperature;
- j) the failure load for every test specimen;
- k) the calculated failure stress for every test specimen and the average failure stress;
- l) all operating details not specified in this document, as well as any incidents likely to have influenced the results.

Annex A (normative)

Method for the calculation of the failure stress

A.1 Tensile bending test

The failure stress of a welded corner or T-joint depends on the failure load, the profile geometry and the test arrangement (see Figures 1 or 2). It is calculated by Formula (A.1):

$$\sigma_t = \frac{LF_t}{W} \quad (\text{A.1})$$

where

- F_t is the failure load determined by tensile bending testing, expressed in N;
- L is the distance between the corner in the highest flange and the point of application of the load, expressed in mm;
- W is the moment of resistance in the loading direction = I/e , expressed in mm³;
- I is the moment of inertia about the neutral axis ZZ' (see Figure A.1) of the cross section of the profile given by the manufacturer, expressed in mm⁴; for T-joints with different profiles, the lower moment of inertia shall be used;
- e is the distance between the critical point A and the neutral axis ZZ' (see Figure A.1), expressed in mm;
- σ_t is the failure stress by tensile bending, expressed in N/mm².

A.2 Compression bending test

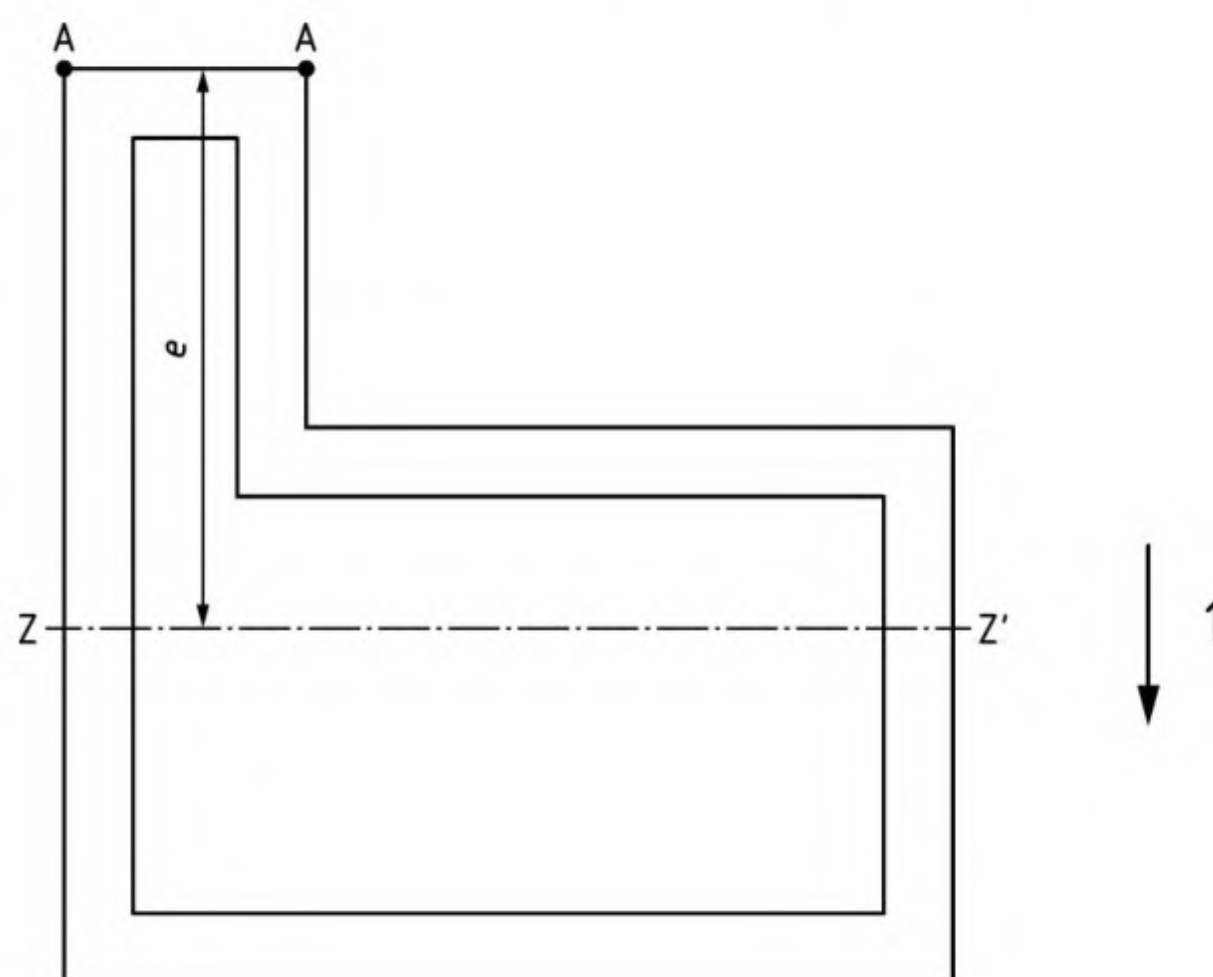
The failure stress of a welded corner or T-joint depends on the failure load, the profile geometry and the test arrangement (see Figure 3 or 4). It is calculated by Formula (A.2):

$$\sigma_c = F_c \left[\left(a/2 \pm e/\sqrt{2} \right) / 2W \right] \quad (\text{A.2})$$

where

- F_c is the compression bending failure load, expressed in N;
- W is the moment of resistance in the loading direction = I/e , expressed in mm³;
- I is the moment of inertia about the neutral axis ZZ' (see Figure A.1) of the cross section of the profile given by the manufacturer, expressed in mm⁴; for T-joints with different profiles, the lower moment of inertia shall be used;
- e is the distance between the critical point A and the neutral axis ZZ' (see Figure A.1), expressed in mm;
- a is the distance between the axes of rotation of the carriages = (400 ± 2) mm;

σ_c is the failure stress by compression bending, expressed in N/mm².



Key

- 1 direction of loading
- A points of maximum stress
- e* distance between the critical point A and the neutral axis ZZ'
- ZZ' neutral axis

Figure A.1 — Position of point of maximum bending stress