EN 514 – Unplasticized Polyvinylchloride (PVC-U) Profiles for the Fabrication of Windows and Doors – Determination of the Strength of Welded Corners and T-joints – Testing Equipment

Description

3 Principle

Welded corners and T-joints made from unplasticized polyvinylchloride (PVC-U) profiles are subjected to a tensile bending or compression bending test at specified temperature and test speed.

The failure load is recorded and the failure stress is calculated.

4 Apparatus

4.1 Tensile or compression testing machine with the following specifications:

a)measuring range of load : 2 KN to 20 kN ;

b)load indication with zero point setting and peak recording ;

C)measurement accuracy : ± 3 % ;

d) test speed : (50 ± 5) mm/min.

4.2 Test arrangements

4.2.1 Corner weld samples for tensile bending test (see figure 1)
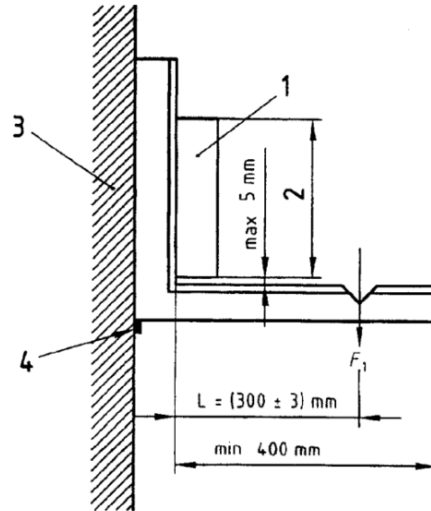
1 clamping device
2 rigid support over a minimum clamping length of 400 mm

3 frame
4 optional support block (5 ± 0,5) mm

Figure 1: Example of a test rig for a tensile bending test of corners

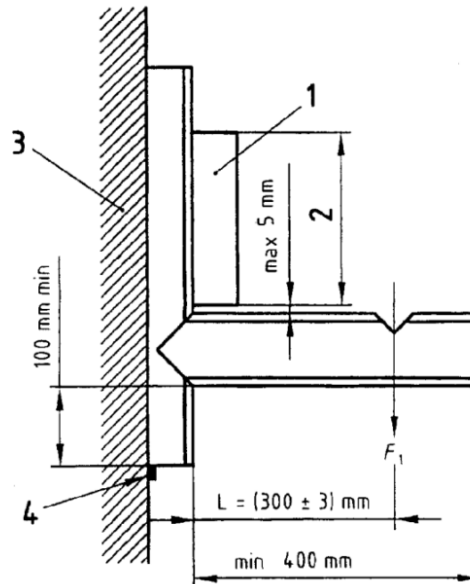## 4.2.2 T-joint weld samples for tensile bending test (see figure 2)

1 clamping device
2 rigid support over a minimum clamping length of 400 mm

3 frame
4 optional support block (5 ± 0,5) mm

Figure 2: Example of a test rig for a tensile bending test of T-joints

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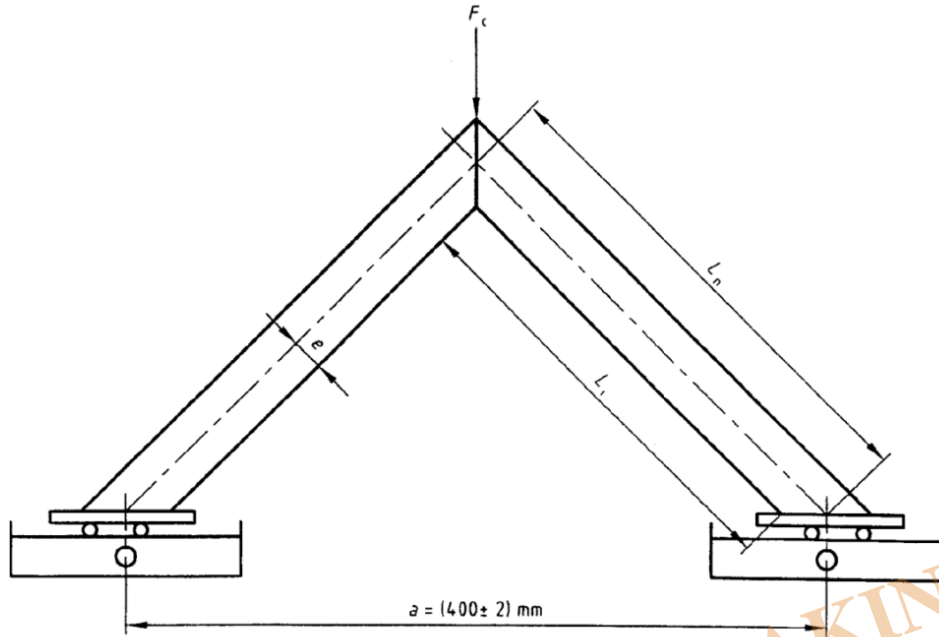## 4.2.3 Corner weld samples for compression bending test {see figure 3)

Figure 3: Example of a test rig for compression bending test of corners joints

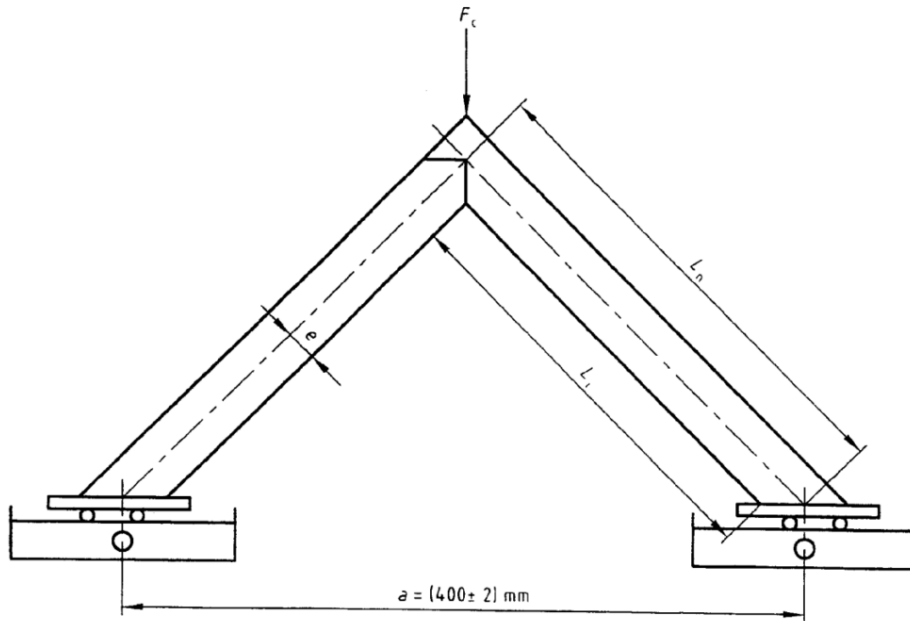## 4.2.4 T-joint weld samples for compression bending test (see figure 4)

Figure 4: Example of a test rig for compression bending testing of corners

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5 Test piece

5.1 Welding of the corner test piece

The test piece is a welded corner with an angle of (90 ± 1) °

Two lengths of profile cut at 45 ° are heat welded

5.2 Welding of the T-joint test piece

The test piece is a welded T-joint with an angle of (90 ± 1) ° The T-joint is fabricated by heat welding one piece of, for instance, sash or outer 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 outer frame profile is notched at 2 x 45 ° to a depth in accordance with the formula:

0.5*(W-S)

Where

w = width of transom profile
s = 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).

NOTE : The document DVS 2207 Part 25 clauses 2 to 8 contain information about welding procedures which may be of relevance.

5.3 Tensile bending test piece

5.3.1 The inside leg length of the test piece for corner testing shall be at least 400 mm (see figure 1).

5.3.2 The T-joint test piece 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).

5.4 Compression bending test piece

5.4.1 The legs of the corner test piece are cut at an angle of (45 ± 1) ° 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 Lj in millimetres is obtained from the following formulae:

$$L_i = L_n - 2e$$

$$L_n = \frac{400}{\sqrt{2}} = 283$$

$$L_i = 283 - 2e$$

Where:

Ln = the length of the neutral axis of the profile in millimetres
e = the distance between the inside of the section and the neutral axis in millimetres

5.4.2 The short arm of the T-joint test piece 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 5.4.1 (see figure 4).

5.5 Number of test pieces

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

6 Conditioning
The test pieces shall be conditioned at (23 ± 5) °C for at least two hours immediately prior to testing.

7 Procedure

7.1 Test temperature
The test is carried out at a temperature of (23 ± 5) °C.

7.2 Tensile bending test

7.2.1 Clamp the test piece in the apparatus as shown in figures 1 or 2. Contoured support blocks may be used, if necessary, to limit twisting.

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

7.2.3 Continue until the test piece fails.

7.2.4 Note the failure load Fj and calculate the failure stress in accordance with annex A

7.3 Compression bending test

7.3.1 Place the test piece 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).

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

7.3.3 Continue until the test piece fails.

7.3.4 Note the failure load Fc and calculate the failure stress in accordance with annex A.

8 Test Report

The test report shall include the following information :

a) reference to this European Standard ;

b) the name of the test laboratory ;

C) full identification of the profile(s) ;

d) identification of the joint

I) 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 piece ;

i) the test temperature ;

i) the failure load for every test piece ;

k) the calculated failure stress for every test piece and the average failure stress ;

l) all operating details not specified in this European Standard, 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 the formula:

$$\sigma_t = \frac{(L \cdot F_t)}{W}$$

where :

F_t = the failure load determined by tensile bending testing [N] ;

L = the distance between the corner in the highest flange and the point of application of the load {mm} ;

W = the moment of resistance in the loading direction = I/e [mm^3] ;

I = the moment of inertia about the neutral axis zz' (see figure A.1) of the cross section of the profile given by the manufacturer [mm^4]; for T-joints with different profiles, the lower moment of inertia shall be used.

e = the distance between the critical point A and the neutral axis zz' (see figure A.1) [mm];

σ_t = the failure stress by tensile bending [N/mm^2]

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 the formula:

$$\sigma_c = F_c \cdot \left[\left(a/2 - e/\sqrt{2} \right)/2W \right]$$

where :

F_c = the compression bending failure load [N] ;

W = the moment of resistance in the loading direction = I/e [mm^3] ;

I = the moment of inertia about the neutral axis zz' (see figure A.1) of the cross section of the profile given by the manufacturer [mm^4]; for T-joints with different profiles, the lower moment of inertia shall be used.

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e = the distance between the critical point A and the neutral axis zz' (see figure A.1) [mm];

a = the distance between the axes of rotation of the carriages = (400 ± 2) mm;

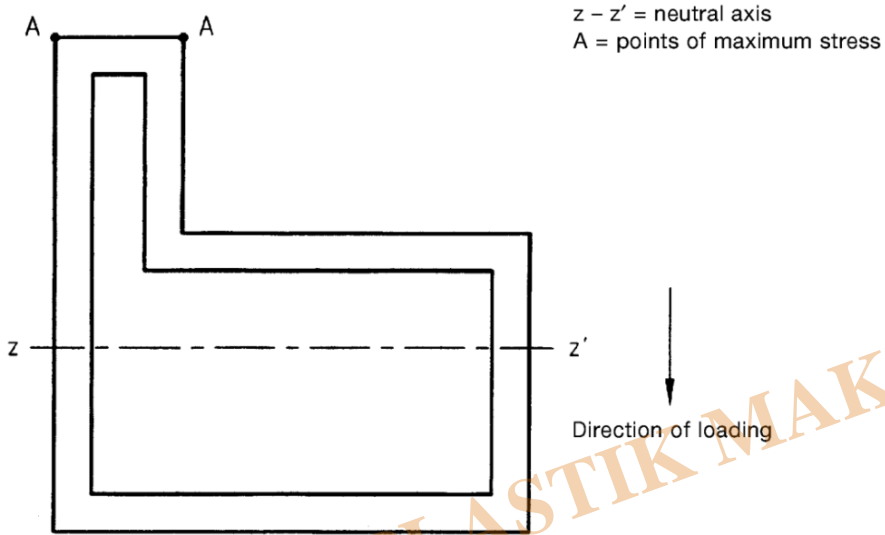σ_C = the failure stress by compression bending [N/mm^2].

z – z' = neutral axis
A = points of maximum stress

Direction of loading

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

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Welding Strength Tester for UPVC Profiles According to EN 514

It is used to detect the breaking strength of the corner welding part of PVC-U plastic materials for doors and windows, to test the mechanical properties of the unplasticized polyvinyl chloride (PVC-U) materials used for doors and windows, do the breaking strength test of the corners of doors and windows, and detect the failure load and bending stress of the test pieces.

This model includes required test fixtures that is mounted on the standard tensile tester. It gives you possibility of having tensile tester and welding tester of UPVC profiles at the same time.

- According to EN 514, DIN EN 12608
- Servomotor controlled
- USB data output to computer
- Windows-based software
- Ball screw double column
- Software is included (PC is up to the customer)
- Full fixtures to cover different types of welding strength for UPVC profiles
- Recording data and export the report to MS WORD
- Force capacity 20KN
- Maximum speed 200 mm/min
- Linear guide base supports for UPVC profile
- Power 750W single phase 230V
- 7/24 online support

Category

1. Equipment for Standards
2. Standards

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