PARTICLE BOARDS:
MODULUS OF ELASTICITY IN TENSION
AND TENSILE STRENGTH

1. SCOPE AND FIELD OF APPLICATION

This standard specifies a method of determining the modulus of elasticity in tension and the tensile strength.

2. PRINCIPLE

2.1 Measuring the width and the thickness of the specimen.

2.2 Placing the specimen in the testing equipment and loading it with a constant rate until rupture occurs. Recording the load and deformation.

2.3 Calculating the modulus of elasticity on basis of the dimensions of the specimen and the increment of load and deformation within the linear part of the load-deformation curve.

2.4 Calculating the tensile strength based on the dimensions of the specimen and the maximum load.
3. TEST EQUIPMENT

3.1 Equipment for conditioning of test specimens, see Clause 5.

3.2 Equipment for measuring the length, the width and the thickness of the specimens according to ISO 821.

3.3 Testing machine capable of recording the load to a relative accuracy better than 1%.

The testing machine shall have jaws with adjustable grips with a surface of at least 50 x 50 mm.

3.4 Extensometer for measuring the deformation within the gauge length (max. 100 mm) with an accuracy better than 1 µm.

4. TEST SPECIMENS

4.1 The dimensions and the shape of the specimens are given in Fig. 1.

![Fig. 1. Tensile test specimen.](image)

4.2 For determining the modulus of elasticity only, rectangular specimens with 20 mm width and 200 mm length can be used.

4.3 The specimens shall be cut at right angles and have straight plane edges. Two groups of specimens shall be cut with the length axis parallel and perpendicular to the production direction, which shall be marked on the specimens.
5. CONDITIONING

The specimens shall be conditioned to a constant mass at a temperature of 20 ± 2 °C and a relative humidity of 65% ± 5%.

Constant mass is considered to be reached when the results of two successive weighings carried out at a 24 hour interval do not differ more than 0.1% of the mass of the specimen.

6. TEST PROCEDURE

6.1 Measure the thickness and the width of the specimen at B-B, on Fig. 1, see also Clause 3.

6.2 Place the specimen with the axis A-A, see Fig. 1, centered between the jaws of the testing machine.

6.3 For determining the modulus of elasticity, fix the extensometer symmetrically to the axis B-B on both sides of the specimen. The gauge shall have a maximum length of 100 mm.

Apply the load to the specimen with a constant rate which shall be so adjusted that 30% of the maximum load is reached after approx. 30 seconds.

Record the increment of length and load as a curve or by point, at least 10 points in the range between 0 and 30% of the maximum load range.

6.4 For determining the tensile strength, apply the load to the specimen at a constant rate which shall be so adjusted that the maximum load is reached within 90 ± 30 seconds.

6.5 Determine the moisture content of the specimens according to ISO 823, immediately after testing.

7. EXPRESSION OF RESULTS

7.1 Calculate the modulus of elasticity $E_t$ in tension using the following formula:

$$E_t = \frac{\Delta F \cdot 1}{\Delta l \cdot b \cdot h} \quad [\text{MPa}]$$
where

\[ \Delta F = \text{Increment of load [N] within the linear part of the load-deformation curve, rounded off to the nearest } \% \text{ of } F_{\text{max}}. \]

\[ \Delta l = \text{Increment of length [mm] corresponding to } \Delta F, \text{ rounded off to the nearest } \mu \text{m}. \]

\( l = \text{Initial gauge length of the specimen [mm].} \)

\( b = \text{The width of the specimen [mm] rounded off to the nearest } 0.1 \text{ mm at B-B.} \)

\( h = \text{The thickness [mm] rounded off to the nearest } 0.1 \text{ mm at B-B.} \)

The test value shall be calculated for each specimen and rounded off to the nearest 10 MPa.

7.2 Calculate the tensile strength \( f_t \) using the following formula:

\[ f_t = \frac{F_{\text{max}}}{b \cdot h} \text{ [MPa]} \]

where

\( F_{\text{max}} = \text{The maximum load [N] rounded off to the nearest } \% \text{ of } F_{\text{max}}'. \)

\( b = \text{The width of the specimen [mm] rounded off to the nearest } 0.1 \text{ mm at B-B.} \)

\( h = \text{The thickness of the specimen [mm] rounded off to the nearest } 0.1 \text{ mm at B-B.} \)

The test value shall be calculated for each specimen and rounded off to the nearest 0.1 MPa.

8. TEST REPORT

The test report shall contain at least the following particulars:

a) A reference to this standard

b) Details of the board type tested as well as information to identify the board

c) Test results according to Clause 7

d) The moisture content of the specimens

e) Testing laboratory and date of testing

f) Conditions of importance when interpreting the result.
REFERENCES


ISO 823 - 1975 Particle Boards Determination of moisture content, 1975-08-01.