International Standard 5902

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Alpine skis — Determination of the elastic properties

Skis alpins — Détermination des caractéristiques élastiques

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

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It has been approved by the member bodies of the following countries :

Egypt, Arab Rep. of	Mexico	Turkey
France	New Zealand	USA
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India	Romania	Yugoslavia
Italy	South Africa, Rep. of	

The member body of the following country expressed disapproval of the document on technical grounds :

Austria

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Alpine skis — Determination of the elastic properties

1 Scope and field of application

This International Standard specifies laboratory measurement methods to determine the elastic properties of alpine skis. Its purpose is to calculate the resistance of defined parts of the ski to bending and torsion.

The standard measurement procedures are recommended in order to ensure comparability between laboratory measurement data, determined and published by ski manufacturers, institutions and others. In this International Standard no attempt is made to relate the measurement data to the quality of the ski.

Depending on the individual parts of the ski on which the force F is applied, one can define :

- the centre spring constant, c_M;
- the shovel spring constant, c_S;
- the rear spring constant, c_R;
- the afterbody spring constant, c_A;
- the forebody spring constant, c_B.

2 Reference

ISO 5901, *Alpine skis — Geometry — Terms, definitions and measuring conditions.*

3 Definitions

For the purpose of this International Standard the following definitions apply.

3.1 spring constant, c : The ratio of the force F applied to the ski, to the corresponding deflection f :

$$c = \frac{F}{f}$$

3.2 spring constant balance, B : The ratio of the afterbody spring constant, c_A, to the forebody spring constant, c_B :

$$B = \frac{c_A}{c_B}$$

3.3 torsional spring constant, c_T : The ratio of the torque applied to the ski to the corresponding torsion angle α.

$$c_T = \frac{M}{\alpha}$$

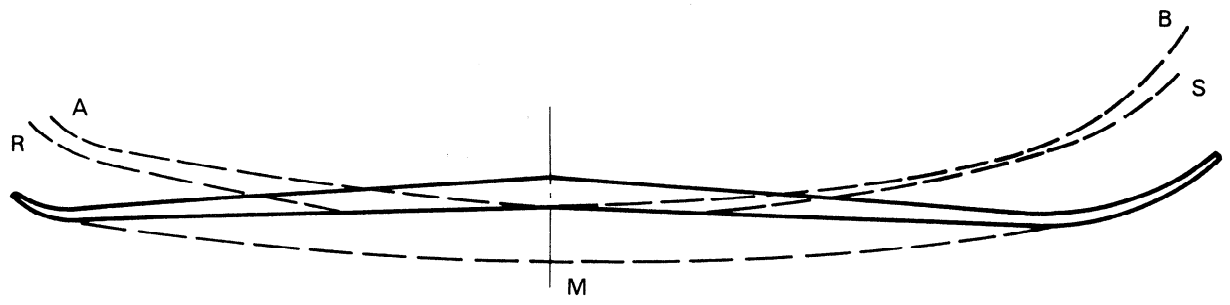


Figure 1 — Indices for spring constants

4 Apparatus

4.1 The apparatus for measuring the centre spring constant shall consist of :

a) two adjustable supports with low-friction rollers of 20 mm diameter and wide enough to ensure that the test ski can be supported on its whole width. One of the supports with low-friction rollers has a device for clamping the end of the ski;

b) a load application device with an accuracy of ± 2 N for application of the test force F_M mid-way between the supports, which are placed at a distance that is adjustable between 1 200 and 1 720 mm, by means of a contact ram with a radius of 10 mm and a width touching the whole width of the test ski;

c) a linear measuring device for measuring the deflection f with an accuracy of ± 0,5 mm.

4.2 The apparatus for measuring the shovel, rear, afterbody and forebody spring constants shall consist of :

a) a clamping device, consisting of a flat jaw and three clamps, ensuring that the whole width of the ski can be clamped (see figure 2);

b) a load application device with an accuracy of ± 2 N for application of the test forces F_S, F_R, F_A or F_B at a distance that is adjustable between 330 mm and 860 mm from the edge of the flat jaw of the clamping device by means of a low-friction roller of 20 mm diameter and wide enough to touch the whole width of the test ski;

c) a linear measuring device as specified in 4.1 c).

4.3 The apparatus for measuring the torsional spring constant shall consist of :

a) a clamping device as specified in 4.2 a) and shown in figure 2;

b) a torsion head of low friction with an accuracy of ± 2 N·m for application of the torque M at a distance, adjustable between 610 mm and 860 mm from the edge of the flat jaw of the clamping device. The clamping device of the torsion head holds the running surface at the same level as the clamping device of the centre of the ski (see figure 3);

c) a scale to read the torsion angle with an accuracy of ± 0,5°.

5 Sampling and conditioning

All measurements according to this International Standard shall be taken from a finished ski without any mounted parts.

It is recommended that one of the following sizes of ski be used :

150, 180 or 200 cm.

From these three sizes shall be selected the size that is nearest in length to the model that is submitted for testing.

Before testing, the test ski shall be conditioned for at least 2 h at a temperature of 23 ± 5 °C.

Dimensions in millimetres

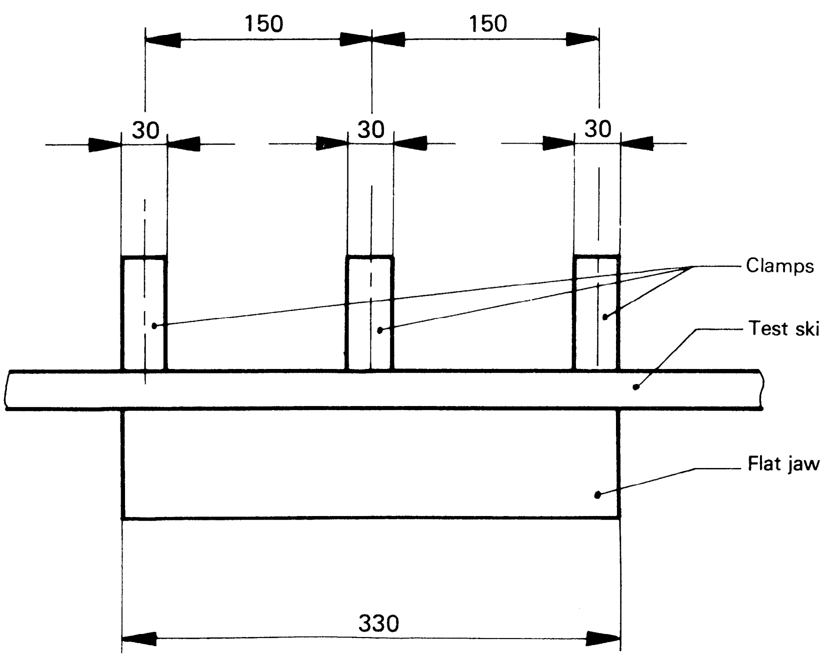


Figure 2 — Clamping device for bending and torque-tests of alpine-ski — Minimal dimensions

6 Procedure

6.1 Determination of centre spring constant, c_M

Place the ski on two supports set at a distance of $L_N - 280$ mm using the apparatus specified in 4.1 and clamp at a distance of 50 mm from the end of the ski (see figure 4).

Apply a pre-load of 20 N. Load the ski quasi-statically[1] with a test load of $F_M = 300$ N. Read the deflection, f_M, in millimeters, caused by the test load, F_M, within 2 to 5 s after the test load has been applied.

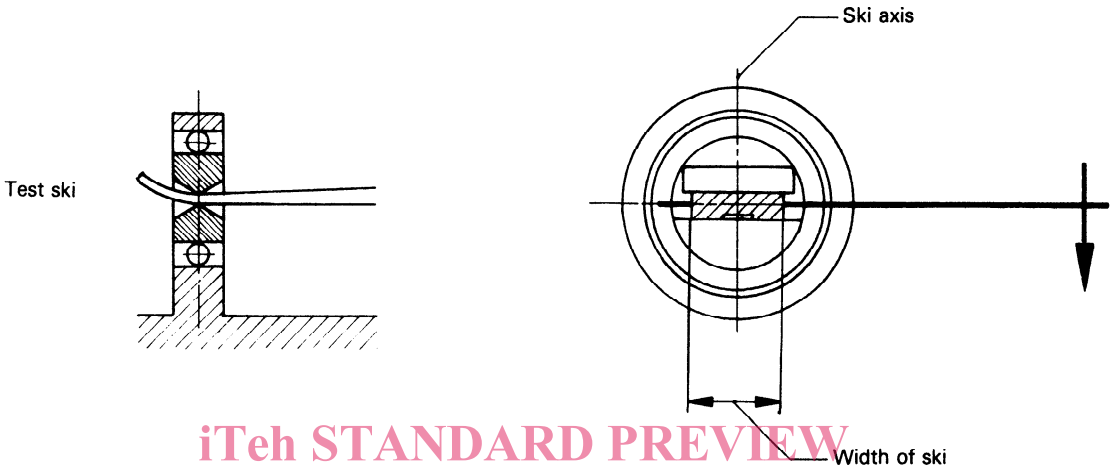
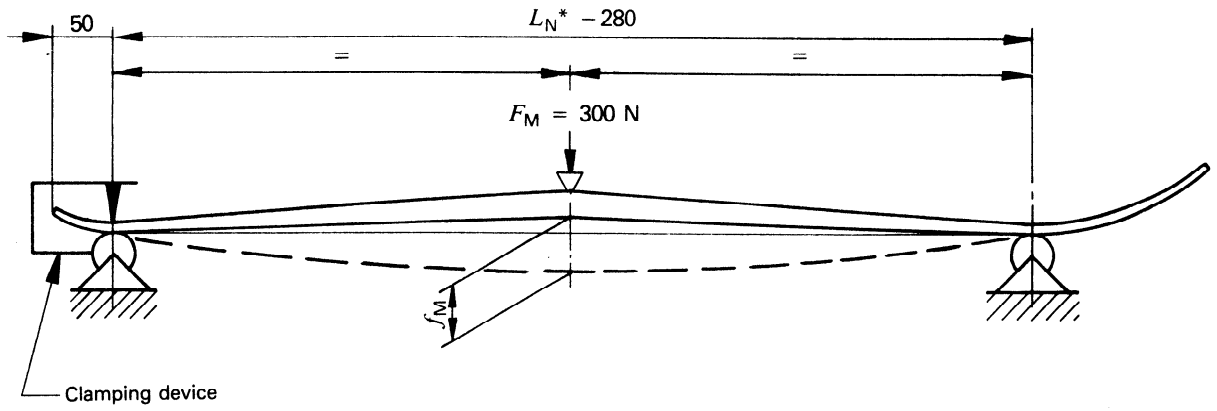


Figure 3 — Torsion head for the torque test of alpine ski

Dimensions in millimetres



* L_N = nominal length according to ISO 5901.

Figure 4 — Determination of centre spring constant, c_M

1) This means that the rate of deflection is less than 20 mm/min.

6.2 Determination of shovel spring constant, c_S

Clamp the ski in the apparatus specified in 4.2 at a projected distance of 120 mm between ski tip and load application roller, after having set a distance of 0,3 L_N − 120 mm between the clamping device and the load application roller, as shown in figure 5.

Apply a pre-load of 20 N. Load the ski quasi-statically[1] with a test load of F_S = 150 N[2]. Read the deflection, f_S, in millimetres, caused by the test load F_S, within 2 to 5 s after the test load has been applied.

6.3 Determination of rear spring constant, c_R

Clamp the ski in the apparatus specified in 4.2 at a projected distance of 10 mm[3] between the ski tail and the load application roller, after having set a distance of 0,3 L_N − 120 mm between the clamping device and the load application roller, as shown in figure 6.

Apply a pre-load of 20 N. Load the ski quasi-statically[1] with a test load of F_R = 150 N[2]. Read the deflection f_R, in millimetres, caused by the test load F_R within 2 to 5 s after the test load has been applied.

Dimensions in millimetres

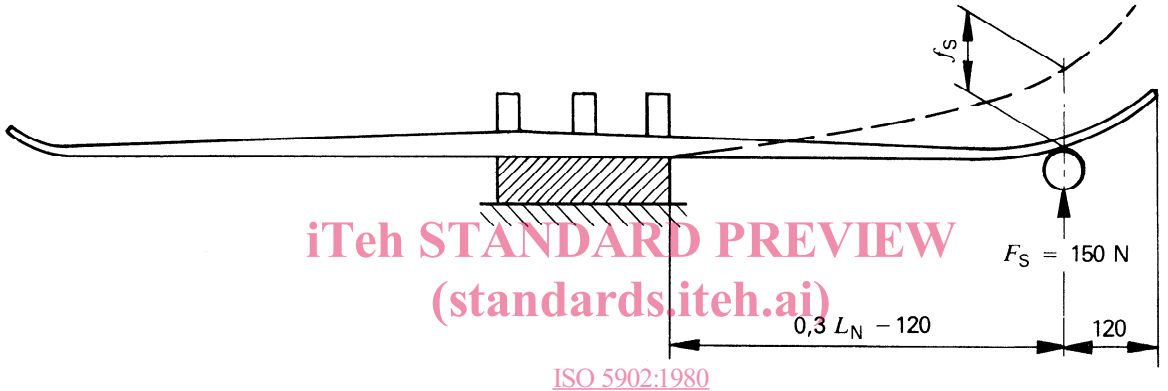


Figure 5 — Determination of shovel spring constant, c_S

Dimensions in millimetres

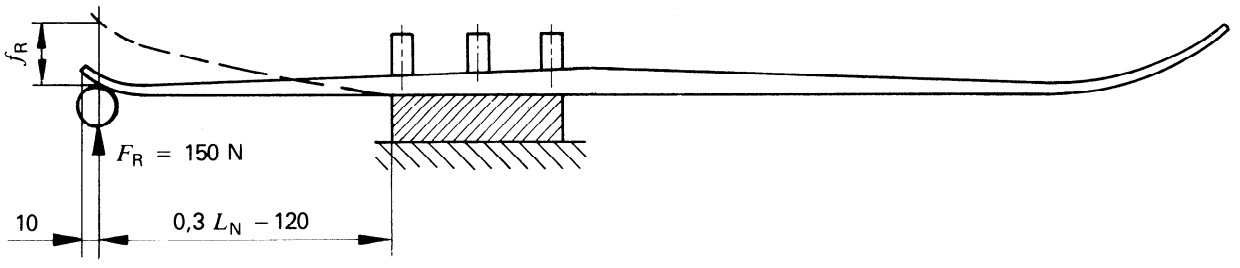


Figure 6 — Determination or rear spring constant, c_R

1) This means that the rate of deflection is less than 20 mm/min.

2) If the deflection is more than 50 mm, the load should be reduced to 100 N.

3) For a ski with high tail turn up, the load application point is found by determining the point of the running surface which is 5 mm above a flat standing surface and 10 mm forward from that point.

6.4 Determination of spring constant balance, B (forebody and afterbody spring constants)

Make two bending tests, loading first the afterbody and then the forebody of the ski. Use the apparatus specified in 4.2, setting the clamping device and the load application roller at a distance of $0{,}5\ L_N - 140$ mm. The clamping point for the afterbody spring constant as well as for the forebody spring constant shall be $0{,}5\ L_N - 140 + 50$ mm from the ski tail (see figure 7). Mount the ski on the clamping device in such a way that the ski afterbody or ski forebody can be bent freely from the clamping point.

Apply a pre-load of 20 N. Load the ski quasi-statically[1] with a test load of F_A or $F_B = 50$ N. Read the deflection f_A or f_B caused by the test load F_A or F_B within 2 to 5 s after the test load has been applied.

Dimensions in millimetres

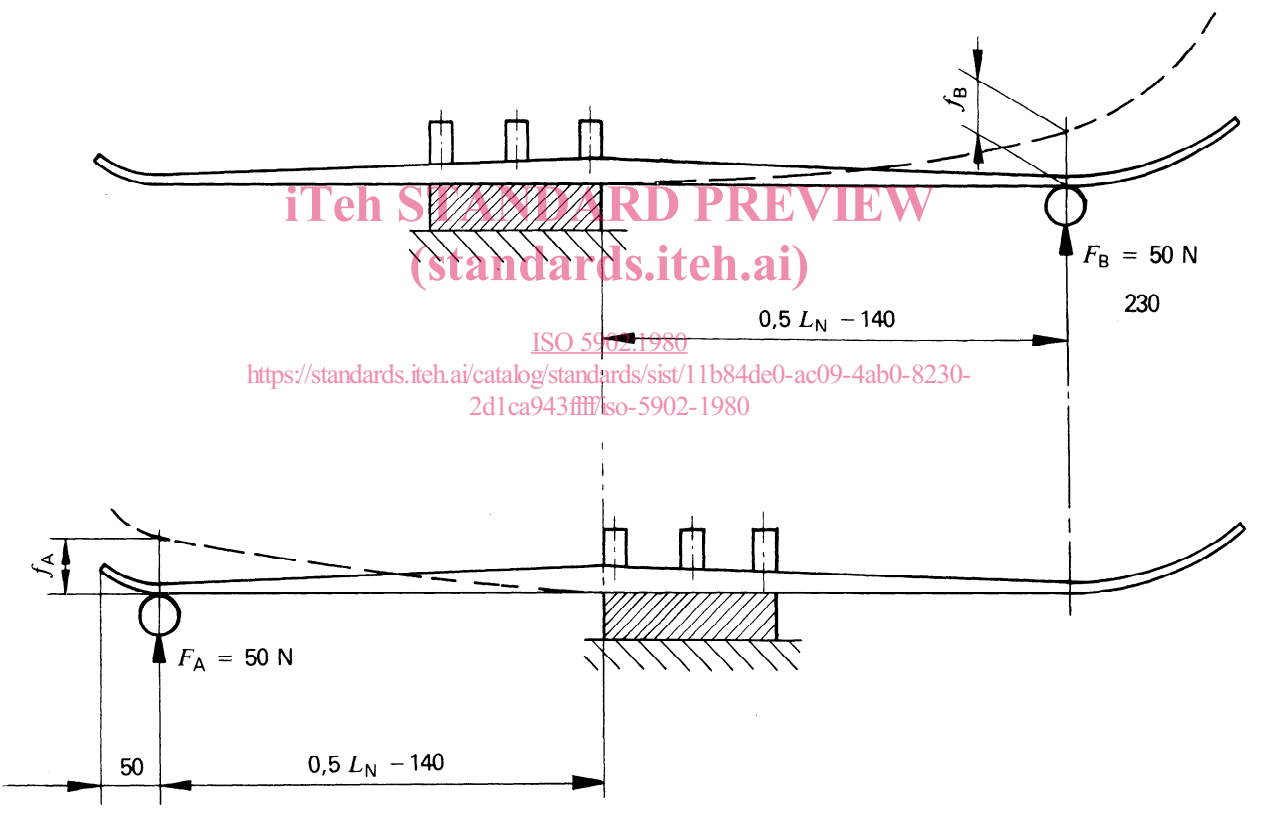


Figure 7 — Determination of spring constant balance, B (forebody and afterbody spring constants)

1) This means that the rate of deflection is less than 20 mm/min.

6.5 Determination of forebody torsional spring constant, c_{TB}, and afterbody torsional spring constant c_{TA}

Use the apparatus specified in 4.3, setting a distance of 0,5 L_N — 140 mm between the clamping device and the torsion head. Clamp the ski in the measurement device as shown in figure 8. The axis of the ski shall be in the centre of the torsion head.

Apply a torque quasi-statically[1] (in the case of very stiff skis a torque of 20 N·m is recommended if the torsion angle is less than 5°). Read the torsion angle within 2 to 5 s after the torque has been applied.

7 Expression of results

For each property, calculate the single results of three tests, in accordance with clause 3, recording their mean.

Table — Recommended units

Characteristic	Unit
Spring constant, c	N/mm
Torsional spring constant, c_T	N·m/°

8 Tolerances

If data are published by the manufacturer with reference to this International Standard, the following tolerances shall be observed :

spring constant ± 10 %

torsional spring constant ± 10 %

9 Test report

The test report shall include the following particulars :

a) reference to this International Standard;

b) name or trademark of the manufacturer;

c) model designation;

d) nominal length;

e) manufacturer's registration number;

f) test results;

g) any deviation from this International Standard with an explanation of the reason for the deviation.

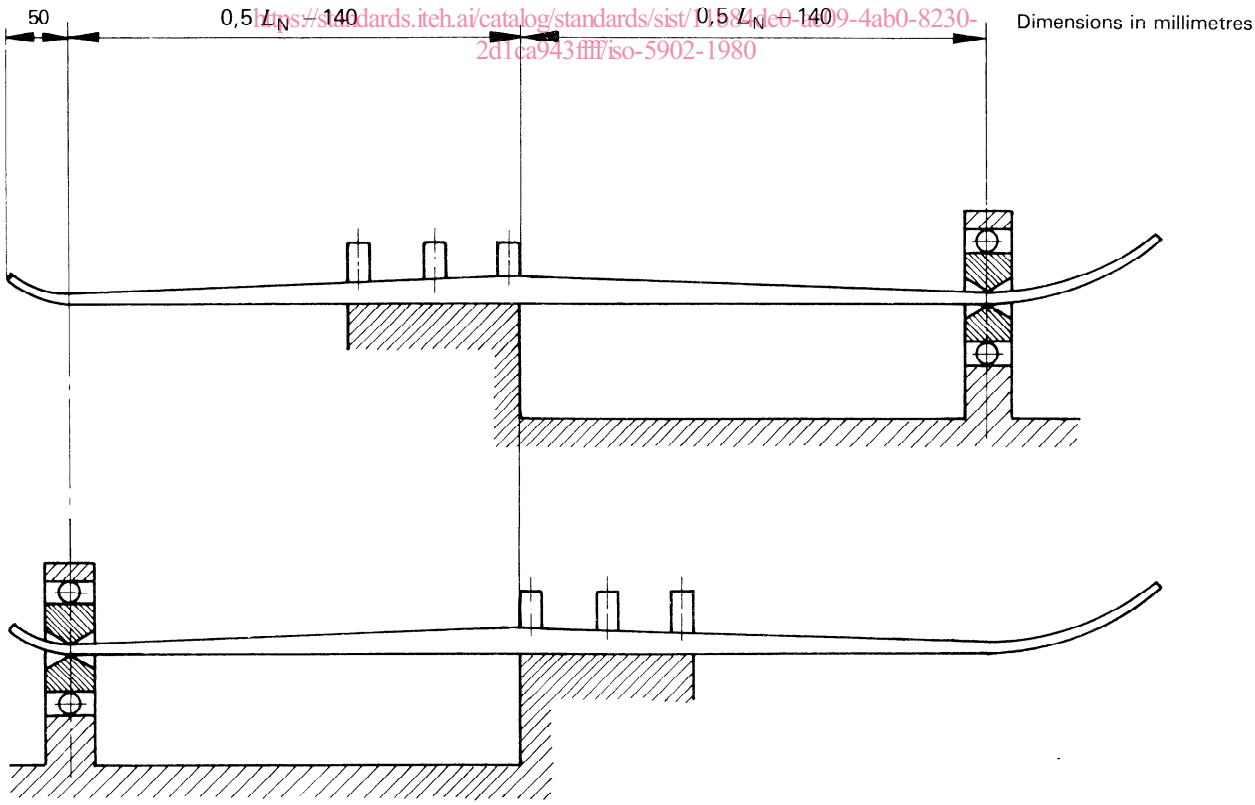


Figure 8 — Determination of forebody torsional spring constant c_{TB} and afterbody torsional spring constant c_{TA}

1) This means that the rate of deflection is less than 20 mm/min.