International Standard 7140

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Cross-country skis — Determination of dynamic performance — Laboratory measurement method

Skis de fond — Détermination des performances dynamiques — Méthode de mesurage en laboratoire

First edition — 1985-10-15

UDC 685.363.2 : 620.174.2 **Ref. No. ISO 7140-1985 (E)**

Descriptors : sports equipment, skis, cross country skis, dynamic properties, tests, flattening tests.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7140 was prepared by Technical Committee ISO/TC 83, *Sports and recreational equipment.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Cross-country skis — Determination of dynamic performance — Laboratory measurement method

1 Scope and field of application

This International Standard specifies a laboratory measurement method for determination of the dynamic performance of cross-country skis. The purpose of the test is to determine the residual camber height and length as a function of the load. Another name for this measuring method is "flattening test".

The graphs (for examples see figures 2 and 3) which are obtained according to this test are mainly intended to be used by specialists but may also be of some use for the consumer in selecting a ski with appropriate stiffness. For the latter purpose, two parameters which in a simplified and less stringent way give some of the information obtained by this test, can be extracted from the graphs. These parameters are

— the "contact load", which is a measure of the minimum load necessary to bring the centre part of the ski in first contact with the snow. If the ski is loaded with a higher load than the contact load, the frictional properties (during gliding and kicking) of the centre part of the ski will influence the ski behaviour significantly. For lower loads, the central part of the ski base will have a minor influence on the friction;

— the "standard camber length", which is a measure of the length of the ski base which is not in firm contact with the snow during gliding when the body weight is equally supported on both skis. Note that in extracting this parameter, a normal average weight is assumed for the skier. This parameter has special relevance for skis designed for use of wax as a kicking aid (especially on wet snow or ice).

Note that the best values of these parameters depend on several factors, such as the skier's weight and skill, snow conditions, ski construction, base structure and preparation. It is therefore recommended that the ski manufacturer for each type of ski supplies information on how to use these parameters.

As a consequence, the values of the parameters measured in this test cannot be directly related to the quality of the ski.

This International Standard is applicable to cross-country skis of size 130 cm and longer.

2 References

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications.*

ISO 6289, *Skis — Terms and definitions.*

3 Terms, symbols and definitions

For the purpose of this International Standard, the definitions of ISO 6289, and the following, apply.

3.1 residual camber height, h_{RF}: Distance measured at the load application point P, 8 cm behind the binding mounting point between the running surface of the ski and a flat horizontal surface when the ski is subjected to a load, F (see figure 1).

Examples: The magnitude of load F can be from zero up to contact load:

— h_{R294} is the residual camber height when the ski is loaded with 294 N;

— h_{R0} is the camber height when the ski is loaded only with its own mass.

3.2 residual camber length, l_{RF}: Length of separation between the running surface of the ski and a flat horizontal surface which the ski is pressed against by a load, F (see figure 1).

Examples: The magnitude of load F can be from zero up to the contact load:

— l_{R294} is the camber pocket length when the ski is loaded with 294 N;

— l_{R0} is the camber pocket length when the ski is loaded with its own weight.

3.3 test load, F: Force normal to the flat surface and applied at the load application point P (see figure 1).

3.4 contact load, F_C: Force normal to the flat surface and applied at the load application point P which reduces the residual camber height to 0,3 mm.

3.5 standard load, F_S: Load for the determination of the standard residual camber length.

3.6 standard residual camber length, l_{RS}: The residual camber length remaining after a standard load, F_S, has been applied according to the table.

4 Apparatus

4.1 Flat surface

A beam, at least 220 cm long and 10 cm wide with a flatness tolerance of 0,1 mm (over the whole area) shall be used as the flat and horizontal surface. The beam shall be adequately supported to prevent beam deflections.

4.2 Load application device

The load shall be applied through a cylindrical ram of 20 mm diameter which extends over the width of the ski. Direction of loading shall be perpendicular to the flat surface. Load application axis shall be located at the ski's centreline.

4.3 Equipment for measuring the camber height

For measuring the camber height a dial indicator or similar equipment with a minimum accuracy of 0,05 mm shall be used.

4.4 Equipment for measuring the camber length

For measuring the camber length a feeler gauge 0,1 mm thick and a tape measure shall be used.

5 Sampling and conditioning

5.1 In order to ensure comparability of published data it is recommended that one of the following sizes be used:

for adult skis group I	(180 cm . . . 220 cm)	210 cm
for junior skis group II	(130 cm . . . 175 cm)	150 cm

5.2 All measurements according to this International Standard shall be taken from a finished ski without any ancillary equipment.

5.3 Before testing, the test ski shall be conditioned for at least 2 h at a standard atmosphere of 23/50 in accordance with ISO 554 with ordinary tolerances and at (−10 ± 2) °C.

6 Location of load application point P

The load application point P shall be 8 cm behind the binding mounting point. On skis without a binding mounting point marked, use position of balance point.

This defines the average load application point in diagonal strides with proper correlation of nominal ski length and average foot size of the skier.

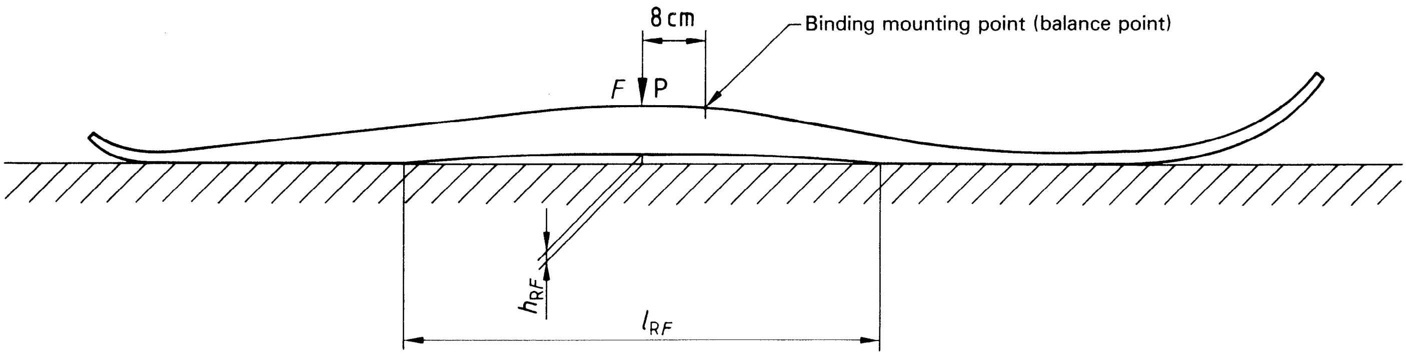

Figure 1

7 Standard test loads used for determination of standard residual camber length l_{RS}

For different ski sizes, the standard test load F_S shall be selected from the table for the determination of the standard residual camber length l_{RS}.

Table

Nominal length, l_N	Standard test load, F_S
cm	N
220	392
215	368
210	343
205	319
200	294
195	270
190	245
185	221
180	196
175	172
170	148
165	124
160	100
155	76
150	52
130	28

8 Procedure

The tests are to be carried out at a standard atmosphere of 23/50 in accordance with ISO 554 with ordinary tolerances and at -10 °C.

8.1 Residual camber measurements h_{RF} and l_{RF}

Mark the load application point in accordance with figure 1 on the top surface of the ski. Load the ski at this location in appropriate increments up to the contact load. For each load measure the residual camber height with an accuracy of 0,2 mm and the residual camber length between both contact lines which are marked by sliding a 0,1 mm feeler gauge into the camber between the ski bottom and the flat surface. Measure the camber pocket length with an accuracy of $\pm$ 10 mm.

8.2 Determination of the standard residual camber length l_{RS}

Load the ski with the standard test load F_S as indicated in the table. Measure the standard residual camber length l_{RS} as indicated in 8.1.

8.3 Contact load F_C

Increase the load until a dial indicator indicates a residual camber height of 0,3 mm. For skis with profiled running surfaces the feeler gauge used should be at least 20 mm wide. Read the load which causes a residual camber height of 0,3 mm with an accuracy of $\pm$ 5 N.

NOTE — For certain ski categories this measurement is not possible because the ski is flattened by the force in accordance with the table.

9 Evaluation

It is recommended that on a 3-cycle semi-logarithmic graph paper, the residual camber height h_{RF} on the logarithmic scale be plotted against the test load F on the linear scale, and that, on linear graph paper, the residual camber length l_{RF} be plotted against the test load F (see figures 2 and 3). From the latter plot determine the standard residual camber length l_{RS} caused by the standard test load F_S. In addition, determine from the former plot the contact load F_C by measuring the load which causes a residual camber height of 0,3 mm.

The values for contact load F_C and standard residual camber length l_{RS} shall be the average values of 6 skis (3 pairs) with the standard deviation.

10 Test report

The test report shall include the following information:

a) reference to this International Standard;

b) manufacturer and model designation of the ski;

c) registration number and nominal length;

d) test temperature;

e) test results;

f) deviations from this International Standard with reasons.

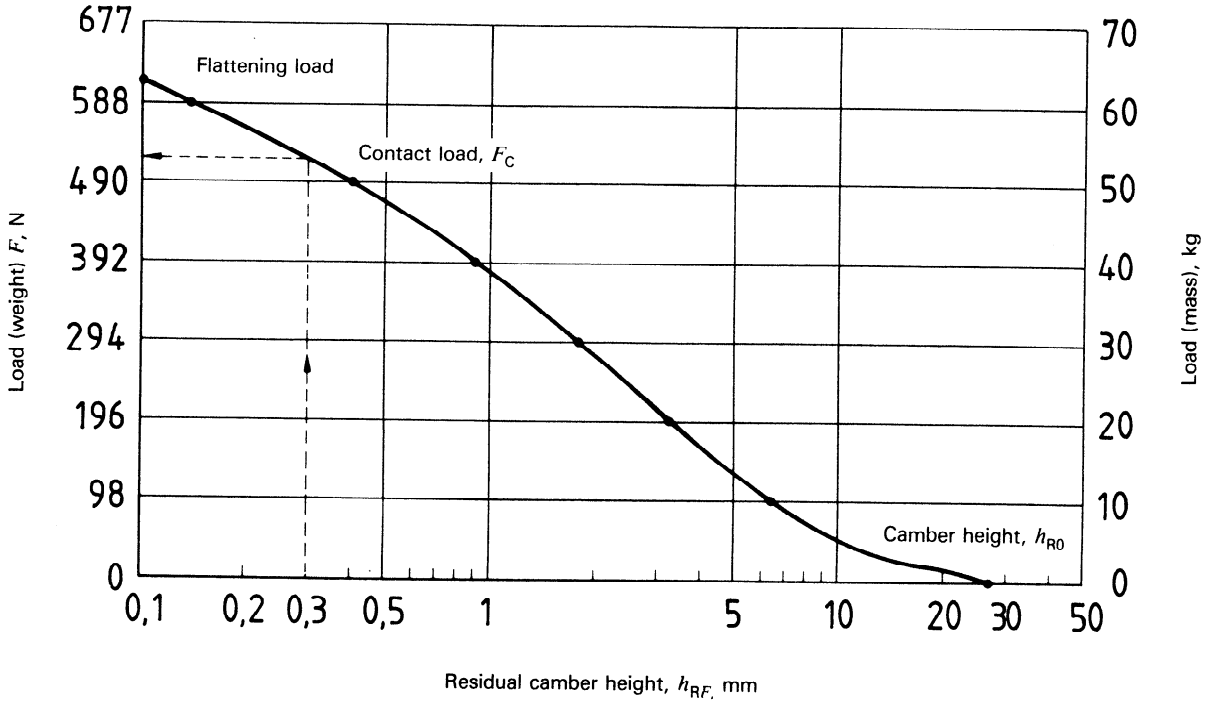

Figure 2

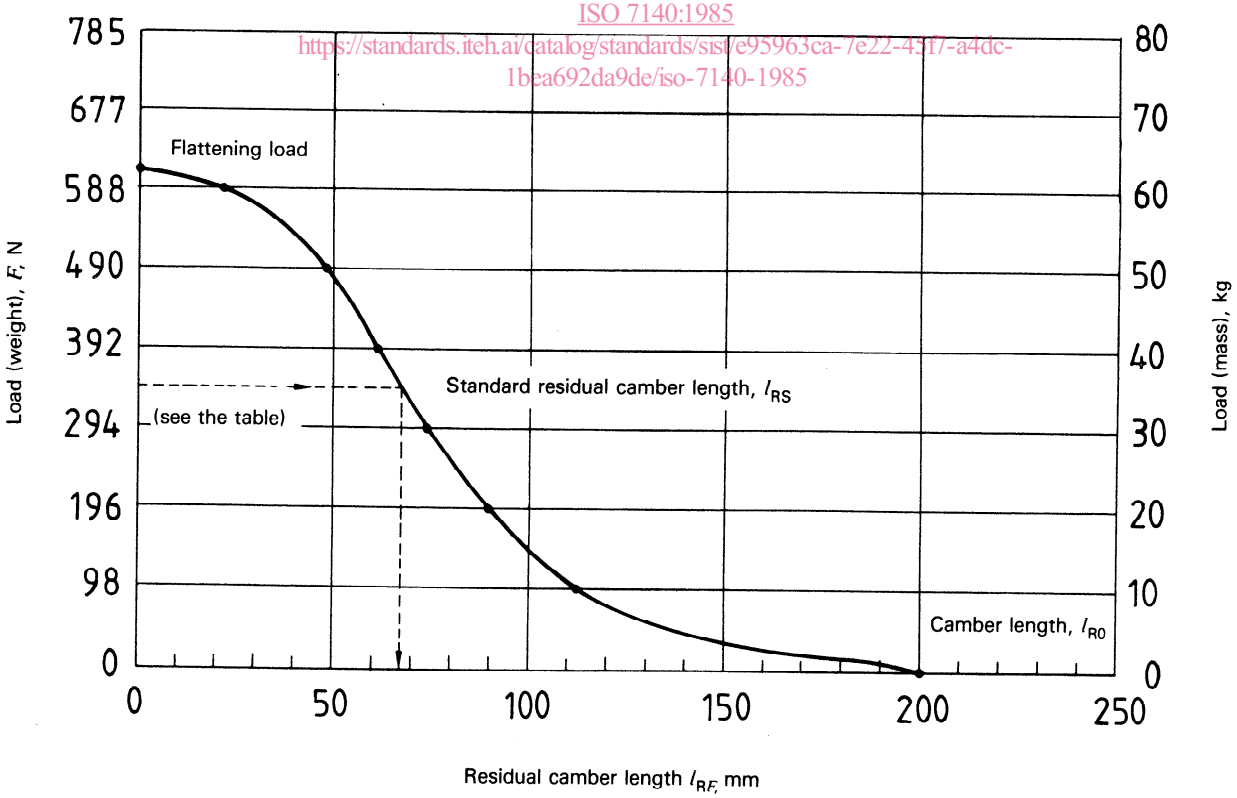

Figure 3

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