
**Cross-country skis — Determination
of elastic properties**

Skis de fond — Détermination des caractéristiques élastiques

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 83, *Sports and other recreational facilities and equipment*, Subcommittee SC 4, *Snowsports equipment*.

This second edition cancels and replaces the first edition (ISO 7139:1984), which has been technically revised.

Cross-country skis — Determination of elastic properties

1 Scope

This document specifies laboratory measurement methods to determine the elastic properties of cross-country skis. Its purpose is to calculate the resistance of defined parts of the ski to bending.

This document applies to cross-country skis with a nominal length greater than or equal to 150 cm.

The standard measurement procedures can be used to ensure comparability between laboratory measurement data, determined and published by ski manufacturers, institutions or others.

In this document, no attempt is made to relate the measurement data to the quality of the ski.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5902:2013, *Alpine skis — Determination of elastic properties*

ISO 6289, *Skis — Vocabulary*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 6289 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Apparatus

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

- a) two supports, which are placed at a distance that is adjustable between 750 mm and 1 050 mm, 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 ± 5 N for application of the test force, F_M , mid-way between the supports 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 $\pm 0,5$ mm.

4.2 The apparatus for measuring the shovel and rear 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 in accordance with ISO 5902:2013, Figure 2;

- b) a load application device with an accuracy of ± 2 N for application of the test forces, F_S , and F_R , at an adjustable distance 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).

5 Sampling and conditioning

In order to ensure comparability, it is recommended to use for publication only data of the following ski sizes:

- 150 cm, 180 cm or 200 cm.

From these three sizes, the one which is most representative for the intended application shall be selected for the ski model concerned.

All measurements shall be taken from a finished ski without any ancillary equipment.

Before testing, the test ski shall be conditioned for at least 2 h at a temperature of (20 ± 2) °C and a relative humidity of (65 ± 1) %.

6 Procedure

6.1 Determination of spring constant of the central section, c_M

Place the ski on two supports set at a distance of $0,5 l_N$, with the binding mounting point MP mid-way between the supports using the apparatus specified in 4.1 and shown in Figure 1.

Apply a pre-load of 10 N. Load the ski quasi-statically with a test load of $F_M = 250$ N. Read the deflection, f_M , in millimetres, caused by the test load, F_M , within 2 s to 5 s after the test load has been applied.

NOTE “quasi-statically” 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 $x_{MP} + 0,25 l_N$ from the tail as shown in Figure 2.

Apply a pre-load of 10 N. Load the ski quasi-statically with a test load of $F_S = 40$ N. Read the deflection, f_S , in millimetres, caused by the test load, F_S , within 2 s to 5 s after the test load has been applied.

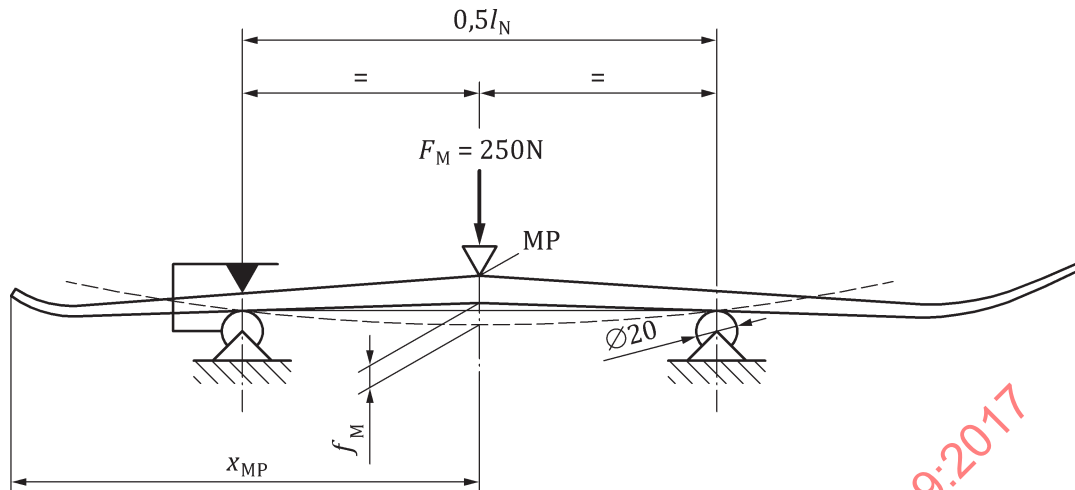
NOTE “quasi-statically” means that the rate of deflection is less than 20 mm/min.

6.3 Determination of rear spring constant, c_R

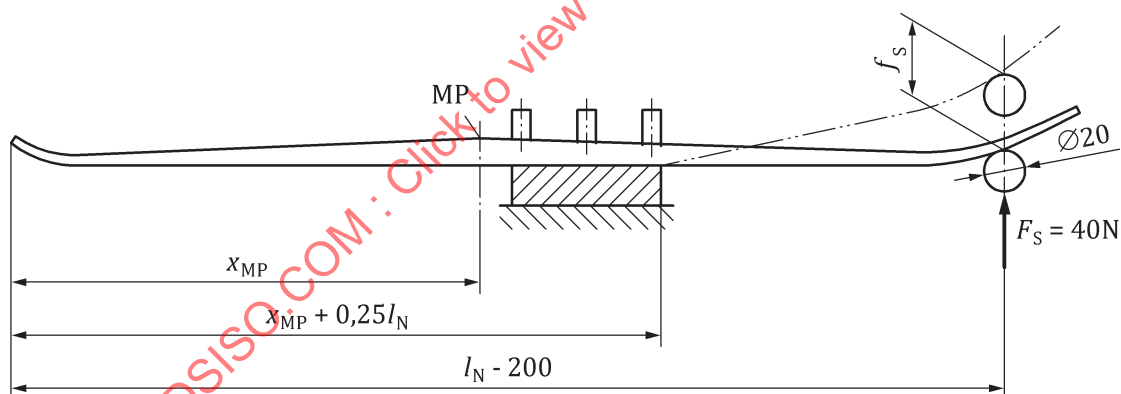
Clamp the ski in the apparatus specified in 4.2 at a projected distance $x_{MP} - 0,25 l_N$, from the tail as shown in Figure 3.

Apply a pre-load of 10 N. Load the ski quasi-statically with a test load of $F_R = 40$ N. Read the deflection, f_R , in millimetres, caused by the test load, F_R , within 2 s to 5 s after the test load has been applied.

NOTE “quasi-statically” means that the rate of deflection is less than 20 mm/min.

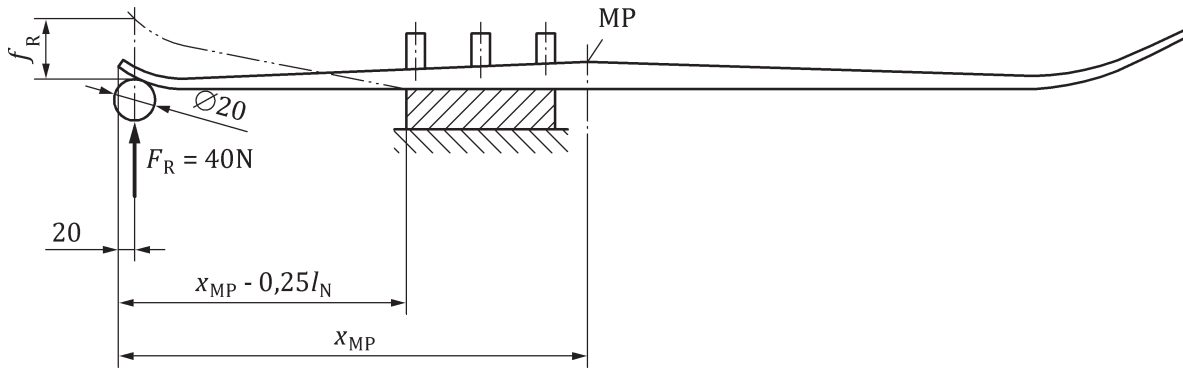
**Key** l_N nominal length f_M deflection mounting point X_{MP} projected distance mounting point

MP mounting point

 F_M test load mounting point**Figure 1 — Determination of spring constant of the central section, c_M** **Key** l_N nominal length f_S deflection shovel X_{MP} projected distance mounting point

MP mounting point

 F_S test load shovel**Figure 2 — Determination of shovel spring constant, c_S**



Key

- l_N nominal length
- f_R deflection rear
- X_{MP} projected distance mounting point
- MP mounting point
- F_R test load rear

Figure 3 — Determination of rear spring constant, c_R

7 Expression of results

For each property, calculate the single results of three tests, recording their mean.

The recommended unit for the spring constant, c , is newtons per millimetre (N/mm).

8 Tolerances

If data are published by the manufacturer with reference to this document, the following tolerance range shall be observed:

- all spring constants ± 20 %.

9 Test report

The test report shall include at least the following particulars:

- a) a reference to this document, i.e. ISO 7139:2017;
- b) name of distributor or manufacturer;
- c) trade mark and model designation;
- d) nominal length;
- e) imprinted serial number;
- f) test results (see [Clause 7](#));
- g) any deviation from this document with an explanation of the reason for the deviation.