Designation: F498 – 12

Standard Test Method for Center Spring Constant and Spring Constant Balance of Alpine Skis[1]

This standard is issued under the fixed designation F498; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of center spring constant, forebody spring constant, and afterbody spring constant of Alpine skis. In addition, it covers a method for determination of the spring constant balance.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 *Definitions:*

2.1.1 *afterbody spring constant*—the load, in newtons, required to deflect point *A* a distance of 1 cm.

$$C_A = \frac{F_A}{f_m} \tag{1}$$

2.1.2 *center spring constant*—the load, in newtons, required to deflect point *M* a distance of 1 cm.

$$C_M = \frac{F_M}{f_m} \tag{2}$$

2.1.3 *deflection f*—the displacement of the ski under load *F* measured at points *A, B,* or *M* normal to a line between support points or the clamping plane.

2.1.4 *forebody spring constant*—the load, in newtons, required to deflect point *B* a distance of 1 cm.

$$C_B = \frac{F_B}{f_B} \tag{3}$$

2.1.5 *load F*—the force applied normal to the support points or the clamping plane, at points *A, B,* or *M*. The only component of load *F* is shown in Fig. 1.

2.1.6 *point A*—the support point for the afterbody of the ski when the center spring constant is measured or the load application point when the afterbody spring constant is measured.

2.1.7 *point B*—the support point for the forebody of the ski when the center spring constant is measured or the load application point when the forebody spring constant is measured.

2.1.8 *point M*—the load application point when the center spring constant is measured and the clamping point when the forebody spring constant or the afterbody spring constant is measured. It is located at the midpoint between points *A* and *B*.

2.1.9 *ski size, x_{pl}*—the projected length with the ski body pressed flat against a plane surface, measured between the ski tail and the ski tip, commonly referred to as chord length. The developed or material length is the length from tip to tail along the bottom contour of the ski.

2.1.10 *spring constant*—a measurement of the stiffness of a ski in bending, expressed as a ratio of force to deflection.

2.1.11 *spring constant balance*—the ratio of afterbody spring constant divided by forebody spring constant.

$$B = \frac{C_A}{C_B} \tag{4}$$

3. Preparation of Apparatus

3.1 *Center Spring Constant Equipment*—Equip supports *A* and *B* with low-friction rolls of 2.0 ± 0.1 cm diameter. Apply the load with a dynamometer or calibrate the measurement of load with an accuracy of ±0.5 N. Measure the deflection with a suitable instrument with an accuracy of ±0.005 cm. Apply the load with a cylindrical contact ram having a radius of 1.0 ± 0.1 cm and extending over the width of the ski.

3.2 *Forebody and Afterbody Spring Constant Equipment*—Provide a clamping fixture to grip the ski as a vise with a flat rigid jaw and three clamps with at least 15-cm spacing between them. Locate one clamp at each end and one in the center. Clamps should be at least 3 cm wide covering the width of the ski. Apply the load with a cylindrical contact ram having a radius of 1.0 ± 0.1 cm and covering the width of the ski.

4. Procedure (See Fig. 2)

4.1 *Center Spring Constant*—Place the supports at points *A* and *B*. The location of point *A* is 5 ± 1 cm from the tail of the ski. If the ski geometry does not permit this point to act as a support, move the location of point *A* toward the center of the

[1] This test method is under the jurisdiction of ASTM Committee F27 on Snow Skiing and is the direct responsibility of Subcommittee F27.30 on Skis and Boots.

Current edition approved March 1, 2012. Published March 2012. Originally approved in 1977. Last previous edition approved in 2006 as F498 – 77 (2006). DOI: 10.1520/F0498-12.

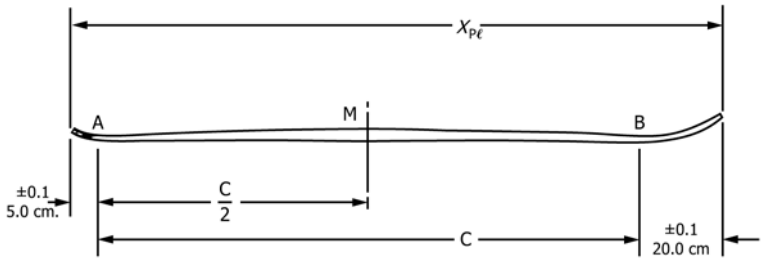
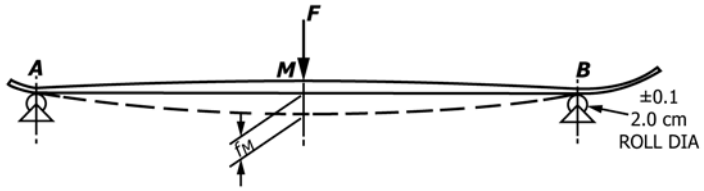
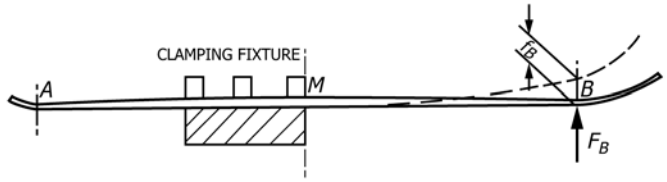


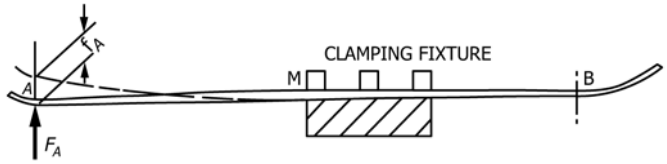
FIG. 1 Physical Dimensions of Alpine Ski



(*a*) Center Spring Constant.



(*b*) Forebody Spring Constant.



(*c*) Afterbody Spring Constant.

FIG. 2 Loading Methods

ski until it can act as a support. The location of point *B* is a distance of *C* ($C = x_{pl} - 25$ cm (± 1 cm)) from point *A* or equivalent to 20 ± 1 cm from the tip of the ski. If the ski geometry does not permit this point to act as a support, move the location of point *B* toward the center of the ski until it can act as a support. Apply a load of 300 ± 2 N to the ski. Read deflection within 2 to 5 s after load application with an accuracy of ±0.05 cm.

4.2 *Afterbody Spring Constant and Forebody Spring Constant*—Mount the ski to the clamping plate in a way that the ski forebody or ski afterbody can be bent freely from point *M*. Apply a load of 50 ± 0.5 N at point *A* or *B* normal to the line extended from the clamping plates. Read deflection within 2 to 5 s after load application and measure it normal to the clamping plates with an accuracy of 0.05 cm.

5. Report

5.1 The report shall include the following:

5.1.1 ASTM F498,

5.1.2 Brand, designation of model, manufacturer's registration number, size of ski, and the locations of points *A* and *B* from the tail of the ski, and

5.1.3 Results of center spring constant, forebody spring constant, afterbody spring constant, and spring constant balance.

6. Precision and Bias

6.1 The precision and bias of this test method is currently being determined.[2]

7. Keywords

7.1 Alpine skis; spring constants

[2] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:F08-1001.