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Standard Test Method for Center Spring Constant and Spring Constant Balance of Alpine Skis¹

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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. Definitions

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

2.2 *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.

2.3 *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.

2.4 *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.

2.5 *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.

2.6 *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.

2.7 *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.

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

$$C_M = \frac{F_M}{f_m} \quad (1)$$

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

$$C_A = \frac{F_A}{f_m} \quad (2)$$

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

$$C_B = \frac{F_B}{f_B} \quad (3)$$

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

$$B = \frac{C_A}{C_B} \quad (4)$$

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. 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. Apply a load of 300 ± 2 N to the ski. Read

¹ This test method is under the jurisdiction of ASTM Committee F-27 on Snow Skiing and is the direct responsibility of Subcommittee F27.30 on Alpine and Nordic Skis.

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