



Designation: F504 – 05 (Reapproved 2017)

Standard Test Method for Measuring the Quasi-Static Release Moments of Alpine Ski Bindings¹

This standard is issued under the fixed designation F504; 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 a procedure for the measurement of release moments of ski bindings under conditions where inertia loadings of the ski binding system are not significant.

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. Referenced Documents

2.1 ASTM Standards:²

F498 Test Method for Center Spring Constant and Spring Constant Balance of Alpine Skis
F779 Test Method for Torsion Characteristic of Alpine Skis
F944 Specification for Properties of Adult Alpine Ski Boots (Withdrawn 2004)³

2.2 ISO Standard:⁴

ISO 9838 Alpine Ski Bindings—Test Soles for Ski Binding Tests
ISO 9462 Alpine Ski Bindings—Safety Requirements and Test Methods
ISO 9465 Alpine Ski Bindings—Lateral Release under Impact Loading—Test Method

¹ This test method is under the jurisdiction of ASTM Committee F27 on Snow Skiing and is the direct responsibility of Subcommittee F27.10 on Binding Test Procedures.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

3. Terminology

3.1 The following terminology is introduced with reference to the sketch of the boot-ski system shown in Fig. 1.

3.1.1 Six points of load application to the standard test ski are required. With the adult boot sole (300 mm in length) the most forward point, located at a position 90 ± 0.5 cm from the centerline of the test shaft, shall be called the “forward point” and shall be designated as *F*. The second point, 45 ± 0.5 cm in front of the centerline of the test shaft, shall be designated the “near point,” *N*. The third point, located 45 ± 0.5 cm behind the centerline of the test shaft, shall be designated “rear point,” *R*. The fourth point, located 35 ± 0.5 cm in front of the center line of the test shaft, shall be designated the “near preload point,” *NP*. The fifth point, located 75 ± 0.5 cm behind the centerline of the test shaft shall be designated the “far rear point,” *FRP*. The sixth point, the “alternate near preload point,” *ANP*, is located 7.5 ± 0.25 cm, in the minus *y*-direction from the point *NP*. For sole lengths longer than 300 mm the *F* and *FR* points are not changed from the location used for the 300 mm boot sole. For sole lengths shorter than 300 mm the *N*, *R*, *ANP* and *NP* points are not changed from the location used for the 300 mm sole. For bindings which are to be used exclusively with skis shorter than the test ski, *F* and *FR* tests shall be performed at the *N* and *R* points. If the ski is too short for the specified *N* and *R* points, *N* and *R* shall be moved closer to the *z*-axis by 10 cm each, and all tests performed using the new *N* and *R* points. The forces that are applied to the standard ski at these six designated points may now be described by simple vector notation. A laboratory-fixed axis designation shall be used with the numeral *z* denoting the vertical axis normal to the top face of the ski (in the region of the test shaft) and positive in the direction outward from the ski; the numeral *x* denoting the longitudinal axis, positive in the forward direction of the ski; and the numeral *y* denoting the lateral axis, the positive direction of which is determined by the right-hand rule. The *z*-axis is coincident with the centerline of the test shaft. The origin of the XYZ coordinate system is a point 230 mm along the axis of the test shaft from the bearing surface of the test sole for 300 mm test soles. The location is changed proportionally for soles other than 300 mm. The direction of any force applied

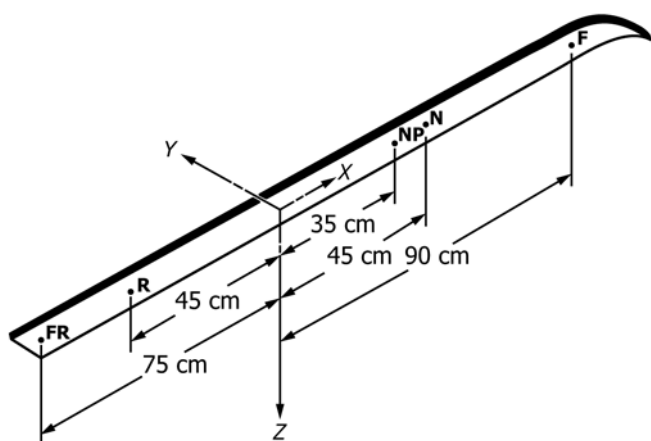


FIG. 1 Load Application

to the ski is defined by its unit vector. The magnitude of a preload force applied to the ski is defined by the M_z or M_y moment created by the force.

4. Summary of Test Method

4.1 The ski binding is mounted on a standard ski and a standard boot sole is inserted into the binding. A relatively stiff test shaft instrumented for moments is affixed to the sole and attached rigidly to the test frame. The apparatus is shown in Fig. 2.

4.2 Loads sufficient to produce binding release are applied to the binding by forcing the ski to displace relative to the frame until release occurs. The components of the moments transmitted through the binding to the test shaft are recorded. These records are interpreted to provide the static release moments of the binding.

5. Significance and Use

5.1 This test method involves simulation in the laboratory of potential injury-producing loads that can occur in skiing, without implying the frequency or the magnitude of the danger. This test method does not include the simulation of all or part of a skier, and care must be taken not to confuse the values of

moments measured by the test shaft with the loads subjected to the tibia of a skier under the same conditions.

6. Apparatus

6.1 Ski:

6.1.1 *Ski*—Three test skis are defined in Table 1 of ISO 9462. The mounting platform shall be as specified in the relevant ASTM standard. The boot's ski location marker as shown on Specification F944 or ISO 9838 shall be aligned with the boot centerline marker on the ski. If there are no markers on the boot or ski the center of the boot sole shall be located 15 ± 0.5 cm behind the center of the ski's projected length unless the relevant ASTM standard applies.

6.2 *Boot*—Four test soles are defined in Table 2 of ISO 9462. The standard adult sole shall be 30 ± 0.5 cm in length and shall be adjustable, over a range of ± 4 cm. It shall be constructed to meet the requirements of ISO 9838. Details concerning boot characteristics shall conform to the relevant ASTM standard. However, it shall be permissible to modify the boot if the binding manufacturer specifies that modification is necessary for proper function of the binding.

6.3 *Stiffener*—When a ski stiffener is called for (see Annex A1 and Annex A2), a channel of dimensions 75 to 80 mm wide by 35 to 40 mm high by 4 to 5 mm thick shall be used to stiffen the ski between the rear and front points. The channel shall be made of 6061 T6 aluminum, or equivalent. The bar shall be attached to the ski by bolts, screws, or clamps at N and R points and at a point half way between N and R points. The stiffener described in Fig. A1.1 meets this requirement.

6.4 Test Frame:

6.4.1 The test frame consists of all mechanical components that connect the boot to a stationary reference, including the boot sole attachment, the test shaft, and the supporting structure for the test shaft. The test frame shall include a boot sole attachment constructed in accordance with ISO 9838 for the standard sole.

6.4.2 The angle between the bottom of the boot sole and the test shaft shall be $90 \pm 1^\circ$ in the z - x and z - y planes; the positions of centerline of the test shaft relative to the boot shall be at a longitudinal location 20 ± 1 cm from the front of the boot sole when the 300-mm boot sole is used. For other boot sole lengths the distance shall be two thirds the distance from the front of the sole.

6.4.3 The test shaft and associated instrumentation shall be capable of measuring moments about the x -, y -, and z -axes as required. Further specifications for the test shaft as part of the instrumentation system are discussed in 6.6.

6.4.4 The linear compliance of all combined mechanical components of the test frame shall be no more than 4×10^{-6} m/N in either of the x or y directions, and no more than 4×10^{-7} m/N in the z direction for loads applied at the intersection of the test shaft and the attachment plate. The angular compliance shall be no more than 5×10^{-5} rad/N · m for rotations around the x , y , or z -axes.

NOTE 1—When an associated high-speed test series is established, the angular compliance shall be no more than 2.5×10^{-5} rad/N · m for rotations around the x -, y -, or z -axes.

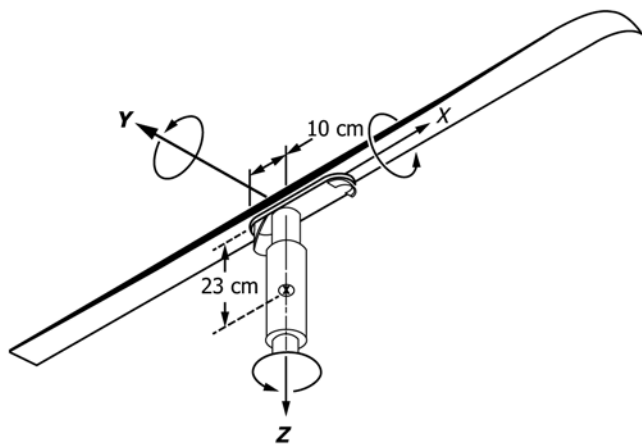


FIG. 2 Test Equipment