



Designation: F939 – 12

Standard Practice for Selection of Release Torque Values for Alpine Ski Bindings¹

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INTRODUCTION

Adhering to these guidelines may help to reduce the risk of injuries resulting from improper release torque selection. However, skiing involves inherent risks. Injury can result from simply falling down, impact with another object, or from many other actions. Many injuries are unrelated to binding release/retention characteristics. Furthermore, even a properly adjusted binding cannot release under all injury-producing loads or retain at all times when retention is desired. Therefore, it is to be clearly understood that compliance with these guidelines in no way guarantees that injury can be prevented.

1. Scope

1.1 This practice provides procedures for the selection of release torque values for Alpine ski/boot/bindings systems. These procedures may be used by ski binding manufacturers in their instructions for installation and use and by ski shops for the adjustment of already mounted ski bindings.

1.2 This practice is applicable to releasable Alpine ski/boot/binding systems.

1.3 Release torque values selected using this practice may not be appropriate for circumstances in which:

1.3.1 The skier carries an object that significantly increases the skier's effective body weight,

1.3.2 The skier grasps or in some manner controls an object such as a sled, or

1.3.3 The skier encounters exceptional snow or terrain conditions not commonly found on developed ski slopes.

1.4 This practice may be inappropriate for non-mechanical bindings or bindings used with boots that reach more than half way up the lower leg.

1.5 Release torque values outside the recommendations of this practice may increase the risk of injury to the skier. However, skiers who are informed of this potential risk may request such settings and have them provided, subject to any guidelines and limitations specified by the binding manufacturer.

1.6 These values refer to recommended release torque for initial adjustment of a ski binding and subsequent readjustment

of the binding during routine maintenance or following a suspected malfunction. However, these values are not intended to apply to the condition of the equipment at any time after it is put into use.

1.6.1 For information concerning applicable tolerances to be used for the adjustment and inspection of releasable Alpine ski bindings in retail operations consult Practice **F1063**; for rental applications consult Practice **F1064**.

1.7 *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

F504 Test Method for Measuring the Quasi-Static Release Moments of Alpine Ski Bindings

F1061 Specification for Ski Binding Test Devices

F1063 Practice for Functional Inspections and Adjustments of Alpine Ski/Binding/Boot Systems

F1064 Practice for Sampling and Inspection of Complete and Incomplete Alpine Ski/Binding/Boot Systems in Rental Applications

2.2 *ISO Standard*:³

8061 Method for the Selection of Release Torque Values

3. Terminology

3.1 *Definitions*:

¹ This practice 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 Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

3.1.1 *release/retention settings*—release torque of the ski/boot/binding system in twist (M_z) and forward lean (M_y) as defined in Test Method F504.

3.1.2 *skier type*—classification selected by the skier for the type of skiing to be undertaken.

3.1.2.1 *I*—designation that provides lower than average release/retention settings; corresponds to an increased risk of inadvertent binding release in order to gain releasability in a fall; also applies to entry-level skiers uncertain of their classification.

3.1.2.2 *II*—designation that provides average release/retention settings appropriate for most recreational skiing; applies to skiers not classified as in Type I or III.

3.1.2.3 *III*—designation that provides higher than average release/retention settings; corresponds to decreased releasability in a fall in order to gain a decreased risk of inadvertent binding release.

3.1.3 (*/*)—symbol that separates skier type designations; used when, as a result of troubleshooting, different skier types have been selected for determining twist (M_x) and forward lean (M_y) release/retention settings; shown in the order (twist/forward lean) or (T/H) to denote toe piece (T) and heel piece (H) of the ski binding. Other conventions may be used to record different skier types for twist and forward lean when required by the documentation.

NOTE 1—See Appendix X2 for examples of other definitions of skier type.

3.1.4 *normal settings*—release/retention settings derived through the use of Skier Types I, II, and III.

3.1.5 *discretionary settings*—release/retention settings higher or lower than the normal setting range

3.1.5.1 (*-*)—symbol that when placed to the left of Type I provides release/retention settings lower than Type I; corresponds to a further increase in the risk of inadvertent binding release in order to gain increased releasability in a fall.

3.1.5.2 (*+*)—symbol that when placed to the right of Type III provides release/retention settings higher than Type III; corresponds to a further decrease in releasability in a fall in order to gain a decreased risk of inadvertent binding release.

4. Significance and Use

4.1 The use of these definitions in determining the release setting may be inappropriate for some types of competitive skiing or competition training.

4.2 The release torque values derived through these procedures are applicable to ski binding test devices defined by Specification F1061.

5. Procedures

5.1 A range of twist release torque values (M_z) based on the mass of the skier is calculated from the equations given in 5.1.1 – 5.1.3.

5.1.1 *Upper Limit for Twist, M_z* —in N-m is determined by the following equations:

$$M_z = 0.84 m_s + 4 \quad (1)$$

5.1.1.2 If the mass of the skier is greater than or equal to 70 kg:

$$M_z = 0.69 m_s + 15 \quad (2)$$

where:

m_s = the mass of the skier in kg.

5.1.2 *Lower Value for Twist, M_z* , in N-m is determined by the following equations:

5.1.2.1 If the mass of the skier is less than 75 kg:

$$M_z = 0.71 m_s \quad (3)$$

5.1.2.2 If the mass of the skier is greater than or equal to 75 kg:

$$M_z = 0.59 m_s + 9 \quad (4)$$

where:

m_s = is the mass of the skier in kg.

5.1.3 Ski binding manufacturers should not recommend release torque values higher than the upper limit of this range but may recommend settings below the lower limit. Manufacturers may provide additional information to guide the installer and user in the selection of such values.

5.2 If the mass of the skier is greater than the maximum recommended mass for his or her height (h), use release torque values corresponding to his or her maximum recommended mass, $m_{r\max}$, which is given by the following equation:

$$m_{r\max} = 100(h - 1) \quad (5)$$

for $h > 1.5$ m,

where:

h = s the height of the skier in m.

5.3 The recommended release torque is adjusted for skier type, age, and other factors as follows:

5.3.1 The skier type adjustment for normal settings is – (10 to 20) % for I, 0 % for II, and + (10 to 20) % for III or 3 Nm, whichever is greater. The adjustment for discretionary settings should be (10 to 20) % less than the Type I setting for (–)I and (10 to 20) % greater than the Type III setting for III(+), or 3 N-m, whichever is greater.

5.3.2 The age adjustment for skiers age 9 years and younger or 50 years and older is – (10 to 20) % or –3 Nm, whichever is greater.

5.4 The release torque in forward lean, M_y , is calculated in terms of the skier type and age adjusted value of M_y in N-m by the following equation:

$$M_y = M_z(3.6 + 0.0065 \text{ N}^{-1} \text{ m}^{-1} M_z) \quad (6)$$

5.4.1 The M_z value used for this calculation may be based on any value that meets the requirements of 5.1.1 – 5.3.2.

5.5 The equations in Section 5 provide recommended release torque values as functions of the input data. If a calculator is not used or its use is not required by the binding manufacturer or binding tester manufacturer the discrete values given in Appendix X1 may be considered an acceptable approximation of the functions provided in this practice. When calculating the

upper and lower limits for the range of twist release torque values (Mz) for use in **Table X1.1**, the Mz value to be used will reflect any adjustments for skier type as well as age.

5.6 Appendix **X1.3.1** provides an example of information for skiers dissatisfied with the release/retention performance of their ski/boot/binding system.

6. Keywords

6.1 discretionary settings; normal settings; release/retention settings; release system; release torque; ski binding; skier type

APPENDIXES

(Nonmandatory Information)

X1. EXAMPLE OF A RELEASE VALUE SELECTION TABLE USING DISCRETE VALUES

X1.1 Skier Type Selection

X1.1.1 Refer all skiers to the Skier Type Classification Poster, **Appendix X2**, and check that the skier's selection is recorded clearly.

X1.1.2 When troubleshooting release/retention problems, refer skiers who, from experience, have been dissatisfied with their release/retention settings to the Information for Skiers Requesting Discretionary Settings, **Appendix X3**.

X1.1.2.1 If a skier selects different skier types for toe and heel piece, record the choice with a (/) separating the two types, in the order toe/heel (T/H).

X1.1.3 If a skier selects discretionary settings lower than those derived from Type I, record this selection with a (–) symbol to the left of Type I.

X1.1.4 If a skier selects discretionary settings higher than those derived from Type III, record this selection with a (+) symbol to the right of Type III.

X1.2 Skier Code Determination

X1.2.1 Note the skier's weight, height, age, and skier type.

X1.2.2 In **Table X1.1** find the skier code that corresponds to the skier's weight and the skier code that corresponds to the skier's height.

X1.2.3 If the skier codes are different, select the skier code closer to the top of the table.

X1.2.4 This skier code is for a Type I skier. For a Type II skier, move down the table one skier code. For a Type III skier, move down the table two skier codes. This classification is not recommended for skiers 47 lb (21 kg) and under.

X1.2.5 If the skier is age 9 and younger or 50 and older, move up the table one skier code.

X1.2.6 If separate toe and heel skier types were selected by the skier, steps 4 and 5 above must be repeated for the second skier type and the resulting skier codes recorded in the order T/H.

X1.3 Release Torque Determination

X1.3.1 Discrete Twist and Forward Lean release torque values are located at the intersection of the Skier Code row and the Reference Torque column in **Table X1.1**.

TABLE X1.1 Release Value Selection

| Skier Weight | Skier Height | Skier Code | Reference Torque, N-m | |
|---|---|------------|-----------------------|--------------|
| | | | Twist | Forward Lean |
| 22 to 29 lbs ^A (10 to 13 kg) | | A | 5 | 18 |
| 30 to 38 lbs ^B (14 to 17 kg) | | B | 8 | 29 |
| 39 to 47 lbs (18 to 21 kg) | | C | 11 | 40 |
| 48 to 56 lbs (22 to 25 kg) | | D | 14 | 52 |
| 57 to 66 lbs (26 to 30 kg) | | E | 17 | 64 |
| 67 to 78 lbs (31 to 35 kg) | | F | 20 | 75 |
| 79 to 91 lbs (36 to 41 kg) | | G | 23 | 87 |
| 92 to 107 lbs (42 to 48 kg) | | H | 27 | 102 |
| 108 to 125 lbs (49 to 57 kg) | 4 ft, 10 in. or less (148 cm or less) | I | 31 | 120 |
| 126 to 147 lbs (58 to 66 kg) | 4 ft, 11 in. to 5 ft, 1 in. (149 to 157 cm) | J | 37 | 141 |
| 148 to 174 lbs (67 to 78 kg) | 5 ft, 2 in. to 5 ft, 5 in. (158 to 166 cm) | K | 43 | 165 |
| 175 to 209 lbs (79 to 94 kg) | 5 ft, 6 in. to 5 ft, 10 in. (167 to 178 cm) | L | 50 | 194 |
| 210 lbs or greater (95 kg or greater) | 5 ft, 11 in. to 6 ft, 4 in. (179 to 194 cm) | M | 58 | 229 |
| | 6 ft, 5 in. or greater (195 cm or greater) | N | 67 | 271 |
| | | O | 78 | 320 |
| | | P | 91 | 380 |
| | | | 105 | 452 |
| | | | 122 | 536 |
| | | | 142 | 640 |

^A For skiers 29 lbs and under, no further correction is appropriate.

^B For skiers 38 lbs and under, Skier Type–I is inappropriate.