



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

This standard is issued under the fixed designation F 939; 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.

INTRODUCTION

The intent of this practice is to provide guidelines for the selection of release torque values for Alpine ski/boot/binding systems. Adhering to these guidelines may help to reduce the risk of injuries resulting from improper release torque selection. However, skiing involves inherent and other risks. Injury can result from simply falling down, impact with another object, or from many other actions. Many injuries are unrelated to binding release characteristics. Furthermore, even a properly adjusted binding cannot release under all injury-producing loads. 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 information for the selection of release torque values for Alpine ski bindings. It gives information necessary for determining release torque values for an individual to 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, and

1.3.3 The skier encounters exceptional snow or terrain conditions not commonly found within ski area boundaries.

1.4 This practice may be inappropriate for nonmechanical 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 but 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 F 1063; for rental applications consult Practices F 1064 and F 1065.

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:

F 504 Test Method for Measuring the Quasi-Static Release Moments of Alpine Ski Bindings²

F 1063 Practice for Functional Inspections and Adjustments of Alpine Ski/Boot/Binding Systems²

F 1064 Practice for Sampling and Inspection of Complete Alpine Ski/Boot/Binding Systems in Rental Applications²

F 1065 Practice for the Inspection of Incomplete Alpine Ski/Boot/Binding Systems in Rental Applications²

2.2 ISO Standard:

8061 Method for the Selection of Release Torque Values³

3. Terminology

3.1 Definitions:

3.1.1 The moments M_1 and M_3 are defined in Method F 504.

3.1.2 The designations I, II, and III refer to the type of skiing undertaken by the skier and can be defined as follows:

3.1.2.1 *I*—Skiers who designate themselves as Type I receive lower than average release/retention settings. This corresponds to an increased risk of inadvertent binding release in

¹ This practice is under the jurisdiction of ASTM Committee F-27 on Snow Skiing and is the direct responsibility of Subcommittee F27.10 on Binding Test Procedures.

Current edition approved Dec. 10, 1999. Published February 2000. Originally published as F 939 – 85. Last previous edition F 939 – 93.

² *Annual Book of ASTM Standards*, Vol 15.07.

³ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

order to gain releasability in a fall. This type also applies to entry level skiers uncertain of their classification.

3.1.2.2 *II*—skiers not classified as in Type I or III.

3.1.2.3 *III*—Skiers who designate themselves as Type III receive higher than average release/retention settings. This corresponds to decreased releasability in a fall in order to gain a decreased risk of inadvertent binding release.

3.1.2.4 Skiers who desire release/retention setting lower than Type I may designate themselves (I–)

3.1.2.5 Skiers who desire release/retention settings higher than Type III may designate themselves (III+)

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

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

3.1.3 Skiers may select skier type designations that are different for twist and forward lean. In such cases the selection will be indicated by a slash (/) separating twist and forward lean selections, in that order (T/H).

4. General Instructions

4.1 These methods are applicable to torque-measuring systems testers. If force-measuring testers are to be used, it is necessary to calculate the release force. The release force, F_r , in newtons is given by the following equation:

$$F_r = \frac{M}{l} \quad (1)$$

where:

M = release torque, N·m, and

l = lever arm, m (that is, the distance from the point of force application by the tester to the point about which the boot or plate pivots).

NOTE 2—The effective lever arm should be determined empirically.

5. Mass Method

5.1 A range of release torque values based on the mass of the skier can be calculated from the equations given in 5.1.1-5.1.3 for twist.

5.1.1 *Upper Limit for Twist*, M_{-1} , in newton-metres is determined by the following equations:

5.1.1.1 If the mass of the skier is less than 70 kg:

$$M_1 = 0.84 m_s + 4 \quad (2)$$

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

$$M_1 = 0.69 m_s + 15 \quad (3)$$

where m_s is the mass of the skier in kilograms.

5.1.2 *Lower Value for Twist*, M_1 , in newton-metres is determined by the following equations:

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

$$M_1 = 0.71 m_s \quad (4)$$

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

$$M_1 = 0.59 m_s + 9 \quad (5)$$

where m_s is the mass of the skier in kilograms.

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

$$m_{r\max} = 100(h - 1) \quad (6)$$

for $h > 1.5$ m where (h) is the height of the skier in metres.

5.3 The recommended release torque should be corrected by applying the skier type correction and the age correction.

5.3.1 The skier type correction should be – (10 to 20) % for I, 0 % for II, and + (10 to 20) % for III or 3 Nm, whichever is greater. Corrections of 3 Nm or less may be rounded off to zero.

5.3.2 The age correction for skiers age 50 years and above should be – (10 to 20) % or 3 Nm, whichever is greater.

5.4 The release torque in forward lean, M_3 , should be calculated in terms of the skier type and age corrected value of M_1 in newton-metres by the following equation:

$$M_3 = M_1(3.6 + 0.0065 \text{ N}^{-1} \text{ m}^{-1} M_1) \quad (7)$$

5.4.1 The M_1 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.