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Rental ski shop practice — Sampling and inspection of complete and incomplete alpine ski-binding-boot systems in rental applications

Pratique pour la location dans les commerces de matériel de ski — Échantillonnage et contrôle des ensembles complets ou incomplets ski/fixation/chaussure dans les applications de location

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13993 was prepared by Technical Committee ISO/TC 83, *Sports and recreational equipment*, subcommittee SC 3, *Ski bindings*.

Annex A forms a normative part of this International Standard.

Introduction

The intent of this International Standard is to provide guidelines for performing functional inspections and adjustments of alpine ski-binding-boot systems. Adhering to these guidelines may help to reduce the risk of injuries resulting from improper mechanical functioning of releasable binding systems. However, skiing involves inherent and other risks. Injury can result from simply falling down, impact with an object or from many other actions. Many injuries are unrelated to binding function. Furthermore, even a properly functioning binding cannot release under all injury-producing loads. Therefore, the attention of the user of this International Standard is drawn to the fact that compliance with these guidelines in no way guarantees that injury can be prevented.

Rental ski shop practice — Sampling and inspection of complete and incomplete alpine ski-binding-boot systems in rental applications

1 Scope

This International Standard specifies a uniform method for the sampling and inspection of complete and incomplete alpine ski-binding-boot systems used in rental operations.

This International Standard is intended for any facility which rents complete and incomplete alpine ski-boot-binding systems as for example when the skier owns the boots.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 5355, *Alpine ski-boots — Safety requirements and test methods*

ISO 8061, *Alpine ski-bindings — Selection of release torque values*

ISO 8364, *Alpine skis and bindings — Binding mounting area — Requirements and test methods*

ISO 9462, *Alpine ski-bindings — Safety requirements and test methods*

ISO 11088, *Assembly, adjustment and inspection of an alpine ski/binding/boot (S-B-B) system*

ISO 11110, *Winter-sports equipment — Test devices for the setting of the functional unit ski/boot/binding — Requirements and tests*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
system
group of interacting components, usually comprised of a ski, boot and binding; designed to perform a retention and a release function

3.2
complete system
ski-boot-binding system where all the components are owned by the rental facility

3.3
incomplete system
ski-boot-binding system where some components (boot or ski/binding) are owned by the customer

3.4
interchangeable
applies to the free exchange of boots within a rental inventory without testing each new combination of system components

3.5
non-interchangeable
applies to the establishment of specific binding-boot combinations tested each time a new combination is created

3.6
reference binding
unit that is typical of the bindings in the inventory

3.7
reference boot
boot that is typical of the boots in the inventory and satisfies the requirements of A.1.3

3.8
indicator setting
setting displayed on the binding's release adjustment scale

3.9
initial indicator setting
release indicator setting derived from the binding manufacturer's adjustment chart

3.10
measured release value
release moment determined by the use of a test device of the type defined in annex A (see 3.11)

3.11
test result
middle quantitative value of three repetitions of the same test

3.12
selected reference moment
nominal release moment derived from a document compatible with ISO 8061 or information supplied by the binding or test device manufacturer

NOTE In the case where an algorithm or a table is used to provide reference moments, either value may be used. Any difference in values is usually insignificant.

3.13
inspection tolerance
accepted difference between the reference moment and the test result; it is ± 15 % of the reference moment, or ± 3 Nm for twist and ± 10 Nm for forward lean, whichever is greater, or 1 line up or down from the selected reference moment determined on the binding manufacturer's adjustment chart, and is used as the criteria for prompting consultation of the binding manufacturer's troubleshooting procedures or application of a correction factor, should procedures not be available

3.14
limit for correction
accepted difference between the reference moment and the test result(s), ± 30 % of the reference moment, or ± 5 Nm for twist and ± 20 Nm for forward lean, whichever is greater, or 2 lines up or down from the selected reference moment; it is used as the upper limit for application of a correction value

3.15
lubricated binding test
release test where the boot/binding interfaces are lubricated

3.16
clean versus lubricated tolerance
accepted difference between the test results with the clean and the lubricated binding, defined as not more than 20 % of the clean binding test, used whenever a functional test for binding-boot compatibility is required

3.17
inward versus outward tolerance
accepted difference between test results about an axis perpendicular to the plane of the ski, usually from the toe-piece component, and defined as within the inspection tolerance

3.18
troubleshooting
binding manufacturer's recommendations or procedures for analysing system failure

3.19
corrective action
procedures other than readjustment of the indicator setting to include repair or replacement of system components

3.20
correction value
value which must be added to or subtracted from the initial indicator setting to bring the test result within the inspection tolerance

3.21
rental skier day
number of rental skiers (units) processed through a ski rental facility in a 24 h-period

3.22
random sampling
procedure in which every sampling unit in the inventory has an equal chance of being included in the sample

3.23
deviation
difference between the measured moment and the selected reference moment, expressed as a percentage of the selected reference moment

3.24
class I deviation
minor deviation that does not require corrective action, defined as ± 16 % to ± 30 %, or 2 lines up or down from the selected reference moment

NOTE Class I deviations are used to determine the frequency of sampling.

3.25
class II deviation
deviation that prompts inspection of the entire inventory and corrective action, defined as ± 30 % to ± 45 %, or 3 lines up or down from the selected reference moment

3.26
class III deviation
major deviation that prompts corrective action and a review of all procedures, defined as more than ± 45 %, or more than 3 lines up or down from the selected reference moment

NOTE The in-season sampling and inspection programme is designed to render the occurrence of a class III deviation unlikely.

4 Summary of practice

4.1 Prior to the beginning of each season, boots and bindings are inspected for compatibility and interchangeability using a test device.

4.2 At specified intervals throughout the operating season samples are taken from rental inventory and inspected. Test results are used to determine sampling frequency and prompt corrective action when specified tolerance are exceeded.

5 Test device

All tests specified in this International Standard are made with a device which measures the release moment. Such a device should conform to ISO 11110.

6 Equipment inspection requirements

6.1 Preseason inspection

6.1.1 Prior to the beginning of each season and whenever new inventory is added, an inspection shall be made of the components of the system. Units which do not meet the specified tolerances are repaired, modified or replaced.

NOTE Before the season, boots and bindings are checked for compatibility and interchangeability by means of visual inspection, functional tests and release measurements.

6.1.2 A visual inspection for compatibility and interchangeability is performed on all boots in accordance with procedures recommended by the binding manufacturer.

6.1.3 As a check on boots which are new to inventory, a single unit sample, by make, model and size, is taken and tested in accordance with the procedures in clause 8. If a boot fails, all boots in the category are visually inspected for the defect and as a check, a 16 unit (or less if 16 are not available) random sample taken and tested in accordance with the procedures in clause 8. If any boots in this sample fail, all remaining boots in the category are tested.

6.1.4 As a check on boots which have been accepted into inventory in a prior season, a 5 % (not less than 16 nor more than 80 units) sample is taken and tested in accordance with the procedures in clause 8. If a boot fails, all boots in that make, model or age category are visually inspected for the defect and tested in accordance with the procedures in clause 8. All remaining boots in the inventory are also visually inspected for the defect. If the defect is found in another boot category, all boots in that category are also tested in accordance with the procedures in clause 8.

6.1.5 Boots which meet the criteria for compatibility but do not meet the criteria for interchangeability are used in non-interchangeable rental programmes only.

6.1.6 Preseason tests for compatibility or interchangeability, or both, of the boot need not be made if the binding manufacturer's current operating procedures specifically state that the boot is not a functional component of the system and that such tests are unnecessary.

6.1.7 Bindings used in an interchangeable rental programme are inspected for appropriate function and valid release indicators in accordance with the procedures in clause 8.

6.1.8 All bindings used in a non-interchangeable system are tested for appropriate function and valid release indicators whenever a new system is created, whenever called for as a result of the sampling procedure or when recommended by the binding manufacturer.

6.1.9 Bindings which incorporate a single means of adjustment for all release directions are tested in either twist or forward lean but need not be tested for both during the preseason inspection. However, a 5 % (but not less than 16 nor more than 80 units) random sample is tested in both directions by the procedure in clause 8. If a binding fails, a visual inspection for the defect is conducted on all bindings. All bindings, in any binding category in which a defective unit is found, are tested in accordance with the procedure in clause 8.

6.2 In-season inspection

6.2.1 At regular intervals, as specified in clause 7, samples are taken from the rental inventory and evaluated in accordance with the procedures in clause 8.

NOTE During the whole season samples are regularly taken from the rental inventory and checked. The results of the tests determine the frequency of sampling and the corrective actions.

6.2.2 The inventory fails the sample if a class I deviation is detected in more than 20 % of the units in the sample, or if a single class II deviation is detected.

6.2.3 If a class II deviation is detected in the sample, the cause shall be identified, the entire rental inventory inspected for the defect and appropriate corrections made and additional sampling tests made in accordance with 7.2.

Class I deviations when detected need not be corrected.

6.2.4 If a class III deviation is detected in the sample, all pertinent procedures as defined by the binding manufacturer are reviewed and corrective action taken and additional sampling test made in accordance with 7.2.

6.3 System inspection of incomplete rental system used with customer owned components

6.3.1 If the skier is offering his or her boots for use with the shop's skis and bindings or offering his/her own ski/bindings for use with the shop's boots, then the equipment should be assembled, adjusted and inspected in accordance with the procedures described in 6.3.2 or 6.3.3.

6.3.2 The equipment is assembled, adjusted, and inspected in accordance with normal rental procedure as defined in this practice, provided a new-to-inventory, as described in this practice, has been conducted on the make, model, and shell size of the boot presented to the facility during the rental transaction. The condition of the boot presented to the facility should be representative of the shop's inventory (visual inspection).

6.3.3 The equipment is assembled, adjusted and inspected in accordance with normal rental procedures as defined in this practice, provided the boot meets the specific requirements of the binding manufacturer.

6.3.4 If the customer is offering his own ski/bindings for use with the shop's boots, then the equipment should be assembled, adjusted, and inspected in accordance with the normal procedures used during the inspection of the user owned equipment as defined in ISO 11088. Follow this procedure also when the customer's boot fails the inspection in 6.3.2, or the boot does not meet the inventory requirements in 6.3.1.

7 Sampling requirements

7.1 Sample size

7.1.1 Sample size is 5 % of inventory, but not less than 16 nor more than 80 units. If the inventory is less than 16 units the sample size is complete when the entire inventory has been inspected.

7.1.2 Sample size may be based on average daily output if rental output drops below 50 % of capacity over the sampling interval.

7.1.3 The sample is taken at any time during the sampling interval or may be spread over the period.

7.1.4 The sample represents both inventory available for rental and equipment in the condition in which it is returned, with an equal number of units drawn from each group.

7.2 Sampling frequency

7.2.1 A sample of the size specified in 7.1 is taken every seven days of operation. If the sample does not meet the requirements, daily sampling is instituted. Daily sampling is continued until two consecutive samples have passed. Normal sampling is then resumed. After two consecutive weeks of normal sampling have been conducted without a sample failure, the facility institutes a reduced sampling schedule of one sample per 14-day operation. If any sample fails on the reduced schedule, a daily schedule is instituted.

7.2.2 Facilities which have an average daily output of fewer than 160 pairs of rental bindings (averaged on a weekly basis), may adopt an alternative procedure and sample, over the sampling interval, 5 % of average daily output, and delay evaluation of the inspection results until a total of 16 units have been accrued. However, if a single class II or class III deviation is detected at any time, corrective action as described in 6.2.2 and 6.2.3 is taken. This alternative method is used with a normal (weekly) or daily sampling schedule but is inappropriate for the reduced schedule as described in 7.2.1.

8 Sampling and inspection procedures

8.1 Preseason check

8.1.1 General

Perform all tests in accordance with annex A.

8.1.2 Boot inspection

Unless otherwise specified by the binding manufacturer, inspect boots as follows:

a) select two reference bindings of the same model;

b) clean and lubricate both bindings where the boot will contact them;

c) adjust both bindings to obtain the test result as specified by the binding manufacturer using a typical boot of the sole length to be inspected;

d) clean the lubricant from one binding with a liquid dishwashing detergent or cleaner recommended by the binding manufacturer. Clean all contact points and clearly label the binding to indicate that it has been cleaned. Clearly label the remaining binding to indicate that it has been lubricated;

e) select all boots of a given sole length and visually inspect as specified by the binding manufacturer;

f) make all necessary binding-to-boot adjustments as specified by the binding manufacturer to accommodate the selected boots;

g) using the clean binding and the testing device, observe the twist test result in one direction only;

h) using the clean binding and the testing device, observe the forward lean test result, unless the binding manufacturer specifies that the test is not required to further verify compatibility;

i) using the lubricated binding and the testing device, observe the twist test result(s) in both directions;

j) using the lubricated binding and the testing device, observe the forward lean test result unless the binding manufacturer specifies that the test is not required to further verify compatibility.

8.1.3 Boot evaluation

Evaluate the results for each boot as follows:

a) in each lubricated binding test the inward and outward test results should be within the inspection tolerance centred on the value specified by the manufacturer in 8.1.2 c);

b) the test result in twist observed in the clean binding test should be within the limit for correction centred on the twist release value specified by the manufacturer in 8.1.2 c);

c) the test result observed in the lubricated binding test in forward lean should be within the inspection tolerance centred on the twist release value specified by the manufacturer in 8.1.2 c);

d) the forward lean test result observed in the clean binding test should be within the limit for correction centred on the forward lean release value specified by the manufacturer in 8.1.2 c);

e) remove from inventory any boot which does not satisfy 8.1.3 b) and 8.1.3 d), and which cannot be corrected;

f) do not use in an interchangeable ski-boot-binding system any boot which does not satisfy 8.1.3 a) and 8.1.3 c) and which cannot be corrected.

8.1.4 Binding inspection

Inspect bindings as follows:

a) select a reference boot with sole length as specified by the binding manufacturer or that is commonly used with equipment. Bindings to be used in a non-interchangeable rental programme shall be inspected using the boot to which they are to be mated;

b) clean and then lubricate the boot;

c) adjust the binding's indicator to the setting specified by the binding manufacturer or to the setting that will be pre-set and used during the season;

d) exercise the boot/binding system through the range of elastic travel as specified by the binding manufacturer. This exercise shall include at least one release of the boot or plate from the binding in each direction of release specified by the manufacturer;

e) using the release testing device, observe the test result in each direction of release specified by the manufacturer;

f) make all other inspections specified by the binding manufacturer.

8.1.5 Binding evaluation

Evaluate the test results for each binding as follows:

a) the inward and outward test results in twist shall be within the inspection tolerance. If the test results fall near the opposite limits of the inspection tolerance, the binding manufacturer's procedure for evaluation of non-symmetrical release shall be implemented;

b) the test results in each direction of release shall be within the inspection tolerance;

c) remove from inventory any binding which does not satisfy 8.1.5 a), 8.1.5 b) and the requirements of the binding manufacturer unless it can be repaired or a correction value is applied. Consult the binding manufacturer to be certain that any correction procedure meets the manufacturer's criteria.

8.2 In-season routine sampling and inspection

8.2.1 General

Sample the inventory in accordance with clause 7 and perform all tests in accordance with annex A.

8.2.2 Preconditioning for sample inspection

A visual inspection and preconditioning, in accordance with the manufacturer's recommendations shall be made each time the equipment is rented and prior to sample testing. All procedures routinely performed immediately prior to equipment rental shall be performed prior to sample inspection of such equipment. All procedures recommended to be performed by the end-user shall be performed prior to sample inspection of returned equipment.

8.2.3 Sample inspection

Inspect each sample unit in the following sequence:

a) make a visual inspection of all binding-to-boot fitting indicators;

b) observe the test result in forward lean;

c) inspection forward lean elastic travel in accordance with A.1;

d) observe the test result in twist (one direction only);

e) inspect elastic travel in all other directions of release in accordance with A.1;

f) perform all other tests and inspections required by the binding manufacturer.

8.2.4 Evaluation

Evaluate the results of the sample inspection as follows:

a) classify test results that exceed the inspection tolerance by deviations. Count any unit which fails a functional or visual inspection as a class I deviation;

b) note any class II or III deviations in the sample and take corrective action as defined in 6.2.3 and 6.2.4, and resume sampling in accordance with 8.2;

c) note the percentage of class I deviations in the sample and determine the pass-fail status of the sample as defined in 6.2.2;

d) determine the schedule for future sampling based on the inspection results and the criteria defined in 7.2.

Annex A
(normative)

Functional and release test requirements

A.1 Description of functional inspections

A.1.1 Test for elastic travel and recentring

The assembly shall be manipulated to check that the boot or plate can travel a distance specified by the manufacturer and return freely to within 2 mm of the original position. This test should be made in all directions of release and in a manner specified by the binding manufacturer. If no displacement is specified, then 5 mm measured at the toe or heel, as appropriate, should be used and the test made by any device or method capable of displacing the boot or plate the necessary distance.

A.1.2 Test for symmetrical release

The system should be tested for twist release in both the inward and outward directions with a device of the type specified in ISO 11110. (This is not necessary for in-season inspection.)

A.1.3 Test of boot/binding compatibility

The boot shall be of a shape, composition, construction and condition acceptable to the binding manufacturer. Functional inspections specified by the binding manufacturer determining the compatibility of the boot and the binding shall be performed.

If no functional inspection procedures are specified by the binding manufacturer, a functional inspection should be made to determine the difference in release torque between a clean, dry system and the same system after lubrication of all boot-binding interfaces. This inspection shall be made in all directions of release specified by the binding manufacturer, using a device of the type specified in ISO 11110.

If there is reason to believe that the boot-binding interface has been contaminated with a lubricant prior to the tests, a common dishwashing soap or detergent may be used, provided all surfaces are flushed with clean water afterward.

A.2 Release torque inspection

A.2.1 Tests for twist release

This test is made to determine the moment required to release the binding in twist about an axis at right-angles to the plane of the boot sole. Test is carried out using a device of the type described in ISO 11110. Test results may be used to calibrate the binding to the desired release moment or to validate the indicator and determine an appropriate indicator correction value, if appropriate. Tests may be carried out on the entire release system or using a reference boot (pre-season tests only). No correction value should be applied until all troubleshooting procedures recommended by the binding manufacturer have been carried out.

A.2.2 Tests for forward lean release

This test is made to determine the moment required to release the binding in forward lean. It is carried out using a device of the type described in ISO 11110. If no independent means is provided to adjust the forward lean release, this test is used to check that the ratio of twist to forward lean is as specified by the manufacturer. Test results may be used to calibrate the binding to the desired release moment or to validate the indicator and determine an indicator correction, if appropriate. Tests may be carried out on the entire release system using a reference boot (pre-season tests only). No correction value should be applied until all troubleshooting procedures recommended by the binding manufacturer have been carried out.

A.2.3 Other release tests

Tests of the type in A.2.1 and A.2.2 should be made in any other direction specified by the manufacturer and in any directions for which an independent release adjustment is provided.

A.3 Test conditions

A.3.1 Release indicator setting for functional tests

Functional tests are made at approximately mid-range on the release adjustment scale of the binding unless the binding is to be locked or preset at a specified setting. Unless otherwise specified by the manufacturer, 20 Nm, 43 Nm or 67 Nm in twist and 75 Nm, 165 Nm and 271 Nm in forward lean are used as appropriate.

A.3.2 Release indicator setting for validating release indicator

Tests to validate the release indicator of the binding are made at approximately mid-range on the scale or the selected preset setting, unless otherwise specified by the manufacturer.

A.3.3 Preconditioning binding

A.3.3.1 The binding is cycled three times in all directions prior to calibration or validation of the release indicator.

A.3.3.2 The use of a lubricant in the tests is not intended to improve performance of the system in use, but to reduce the influence of friction. A common dishwashing soap may be used as a lubricant. Other lubricants may also be used if they can be removed completely with water and soap. The lubricant shall be applied in a thin film on all boot/binding interfaces.

A.3.3.3 Unless the procedure of the shop includes pre-conditioning prior to each rental, bindings tested as part of the in season sampling and inspection programme are not pre-conditioned.

A.3.4 Temperature

Tests are performed at normal room temperatures between 10 °C and 25 °C.

A.3.5 Load rate

Tests should be performed at a load rate specified by the manufacturer of the test device or in accordance with the recommendations of the binding manufacturer. If no recommendations are provided, the load required to release the boot or plate from the binding should be applied smoothly such that the time to achieve release is between 1 s and 5 s.

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