

# INTERNATIONAL STANDARD

# ISO 9462

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## Alpine ski-bindings — Safety requirements and test methods

*Fixations de skis alpins — Prescriptions de sécurité et méthodes d'essai*



Reference number  
ISO 9462:1993(E)

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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.

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.

International Standard ISO 9462 was prepared by Technical Committee ISO/TC 83, *Sports and recreational equipment*, Sub-Committee SC 3, *Ski bindings*.

This second edition cancels and replaces the first edition (ISO 9462:1988), of which it constitutes a technical revision.

Annex A forms an integral part of this International Standard. Annex B is for information only.

## Introduction

This International Standard is one of a series of International Standards dealing with the safety of ski-bindings, the other International Standards of the series being ISO 8061 and ISO 9465.

National standards, complying with legal regulations, may be more extensive, e.g. regarding

- combined loading<sup>1)</sup>,
- deflexion of the ski<sup>1)</sup>.

Concerning these aspects, International Standards are being prepared.

To verify the safety of ski-bindings it is necessary to use all the International Standards of the series, and also the national standards covering those aspects which are not yet standardized internationally.

This International Standard is limited to the so-called first category tests, for which the use of method A (developed in Germany (DIN) and Switzerland (BfU<sup>2)</sup>) and method B [developed in USA (ASTM)] leads, in principle, to equivalent results. This concerns release tests in simple torsion (movement around an axis perpendicular to the ski gliding surface) and in simple forward bending (movement around an axis parallel to the gliding surface and perpendicular to its longitudinal axis). As shown in clause 5, both methods are equivalent for tests in simple torsion and simple forward bending, because of the principle of action/reaction, under the following conditions:

- a) the torque applied in method A shall be a pure torque;
- b) the forces applied in method B shall be parallel, equal and opposite.

NOTE 1 Information concerning test conditions and results may be obtained from the Secretariat of ISO/TC 83/SC 3 (DIN, Germany).

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1) Tests to be carried out between those of 6.3.1 and 6.3.2.

2) Schweizerische Beratungsstelle für Unfallverhütung (Swiss accident-prevention office).

# Alpine ski-bindings — Safety requirements and test methods

## 1 Scope

This International Standard specifies the main characteristics of ski-bindings and describes, as an example, the test methods A and B.

This International Standard applies to ski-bindings for alpine skiing for children, juniors and adults.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 5355:1991, *Alpine ski-boots — Safety requirements and test methods*.

ISO 8061:1991, *Alpine ski-bindings — Selection of release torque values*.

ISO 9465:1991, *Alpine ski-bindings — Lateral release under impact loading — Test method*.

ISO 9838:1991, *Alpine ski-bindings — Test soles for ski-binding tests*.

## 3 Definitions

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

**3.1 alpine ski-binding:** System to ensure firm connection between boot and ski, fixing the heel low for

downhill skiing. The system releases the boot from the ski when certain loads reach preset values.

**3.2 release:** Detachment of the boot from the ski by release of the mechanism that ensures the connection between boot and ski.

This release is only considered effective when all the loads due to the boot/ski connection have dropped to values which present no danger to the skier.

**3.3 release values:** Maximum values of torques  $M_Z$  and  $M_Y$  (see figure 1), caused at the boot/ski connection by the two movements of torsion and forward bending.

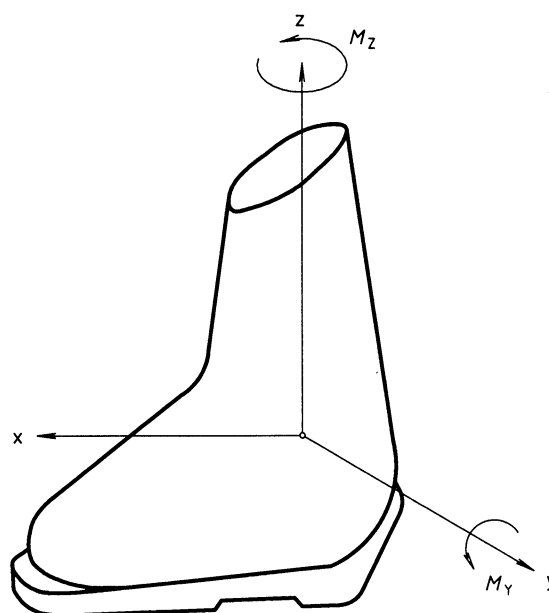


Figure 1 — Definition of the torques  $M_Z$  and  $M_Y$

These values are generally adjustable on current bindings which have a scale and an indicator displaying the setting level.

NOTE 2 In the present state of the art, bindings are designed at least to release in torsion ( $\pm M_Z$ ) and in forward bending ( $+M_Y$ ).

**3.4 reference value:** Value, adjusted after a series of tests, used as a basis of comparison to evaluate the behaviour of the binding during the tests (see 6.3.1).

**3.5 type C bindings:** Bindings suitable for boot soles complying with type C of ISO 5355 which can be adjusted to at least the following release values:

- a)  $M_Z = 10 \text{ N}\cdot\text{m}$
- b)  $M_Y = 37 \text{ N}\cdot\text{m}$

**3.6 type CA bindings:** Bindings suitable for boot soles complying with types C and A of ISO 5355 which can be adjusted to at least the following release values:

- a)  $M_Z = 20 \text{ N}\cdot\text{m}$
- b)  $M_Y = 75 \text{ N}\cdot\text{m}$

**3.7 type A bindings:** Bindings suitable for boot soles complying with type A of ISO 5355.

**3.8 limit  $L_1$ :** Lowest possible position of the setting indicator.

**3.9 limit  $L_2$ :** Position of the indicator at the lowest mark on the setting scale.

**3.10 limit  $L_3$ :** Position of the indicator at the highest mark on the setting scale.

**3.11 limit  $L_4$ :** Highest possible position of the setting indicator.

## 4 Test conditions

### 4.1 Loading rate

The tests shall be performed quasi-statically, ensuring that the following indicative values of the torque gradient are respected:

- a) torsion release:

$$\frac{dM_Z}{dt} \leq 50 \text{ N}\cdot\text{m/s}$$

- b) forward bending release:

$$\frac{dM_Y}{dt} \leq 220 \text{ N}\cdot\text{m/s}$$

### 4.2 Accuracy of measurement

The measurement error of the release value in torsion shall be smaller than  $\pm 2 \%$  for values above  $50 \text{ N}\cdot\text{m}$  inclusive and  $\pm 1 \text{ N}\cdot\text{m}$  for values below  $50 \text{ N}\cdot\text{m}$ .

The measurement error of the release value in forward bending shall be smaller than  $\pm 2 \%$  for values above  $200 \text{ N}\cdot\text{m}$  inclusive and  $\pm 4 \text{ N}\cdot\text{m}$  for values below  $200 \text{ N}\cdot\text{m}$ .

The test equipment shall be designed to allow application of pure moments without any extraneous forces during the entire release process.

### 4.3 Test sole

The test sole shall be in accordance with ISO 9838.

Before the tests the sole shall be degreased, washed and dried.

### 4.4 Test ski

For the release tests in the laboratory, the bindings shall be mounted either on whole skis or on appropriate sections of skis. The complete skis used for this purpose shall have the characteristics given in table 1.

Table 1 — Test ski characteristics

Binding type	Length mm	Ski spring constant $c_M$ N/mm	Test force for $c_M$ N	Distance between supports
C	1 200 to 1 400	$8 \pm 0,5$	200	$0,85 \cdot l_p$ 1)
CA	1 600 to 1 800	$6 \pm 0,5$	300	
A	1 900 to 2 050	$5 \pm 0,5$	350	

1)  $l_p$  is the projected length.

## 5 Test methods A and B

### 5.1 Principle

The binding shall be mounted on a ski in accordance with the manufacturer's instructions. A test sole shall then be inserted in the binding.

In method A, the ski is rigidly connected to the test frame and the torque  $M_Z$  or  $M_Y$  is progressively applied to the sole until the binding releases. The peak value of  $M_Z$  or  $M_Y$  is recorded.

In method B, the sole is rigidly connected to the test frame through a sensor which measures the torques  $M_Z$  and  $M_Y$ . Forces are progressively applied to the ski until the binding releases. The peak value of  $M_Z$  or  $M_Y$  is recorded.

For a detailed description of both methods, see the appropriate test programmes.

### 5.2 Simple torsion test

Method A

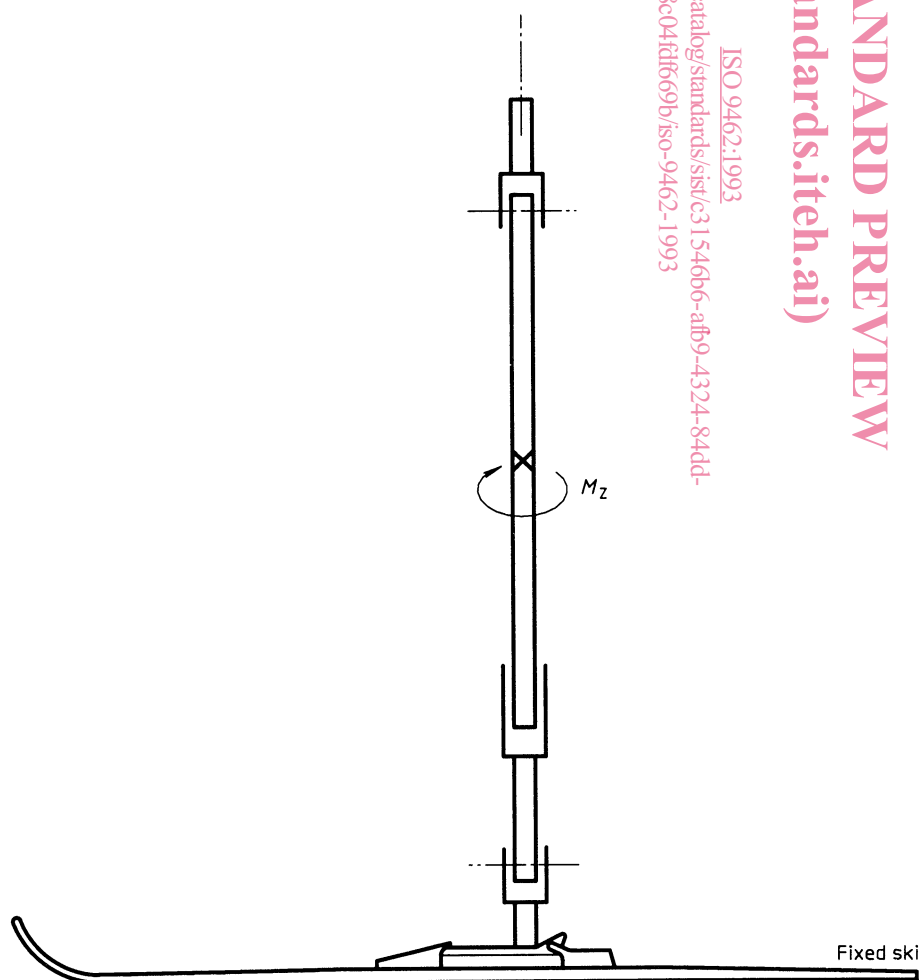


Figure 2 — Application of  $M_Z$  torque and measurement of  $M_{Z, \max}$

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Method B

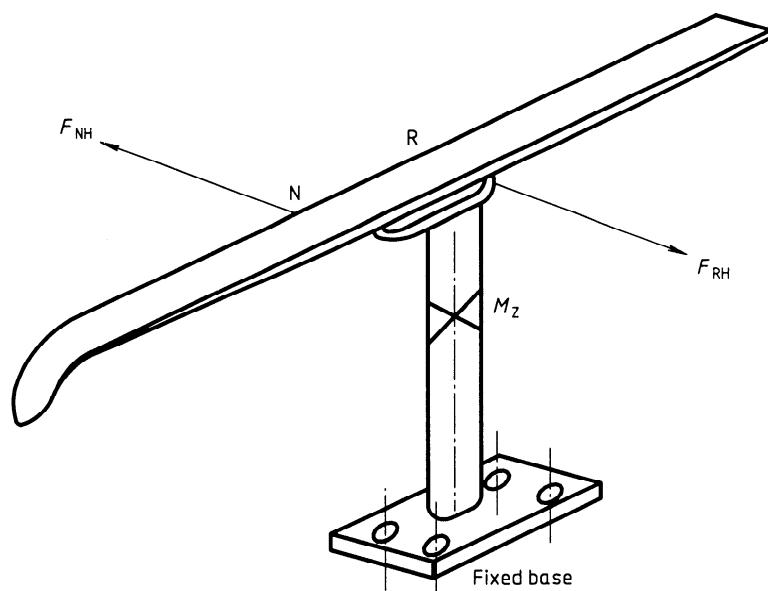


Figure 3 — Application of two equal forces  $F_{NH}$  and  $F_{RH}$  and measurement of  $M_{Z, \max}$  torque

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5.3 Forward bending test

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Method A

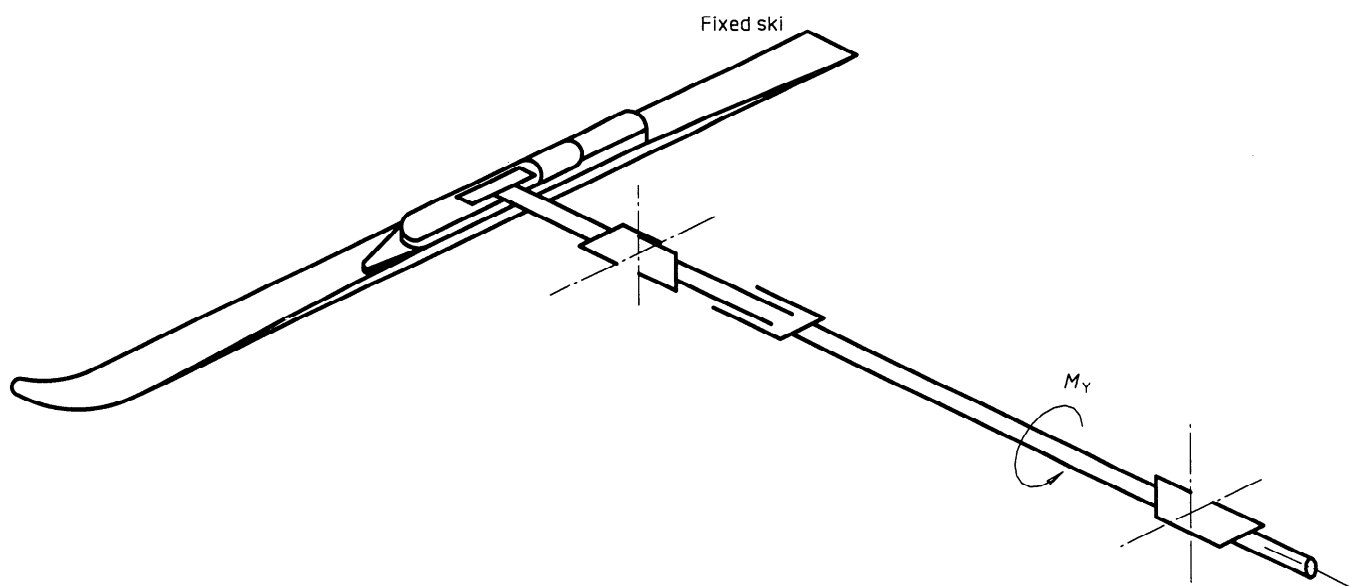


Figure 4 — Application of  $M_Y$  torque and measurement of  $M_{Y, \max}$



## Method B

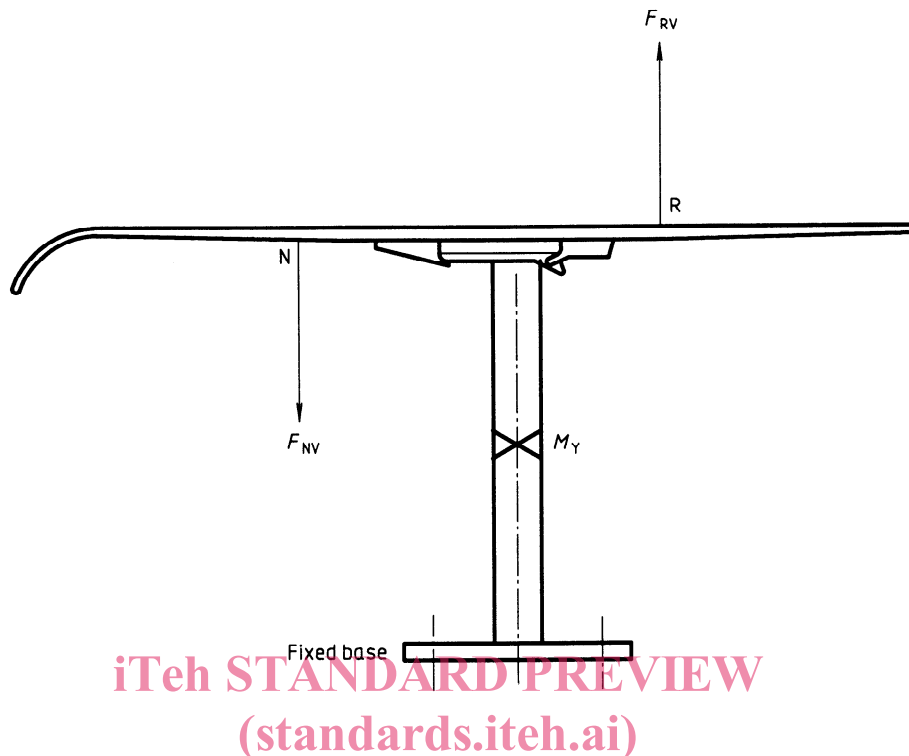


Figure 5 — Application of two equal forces  $F_{NV}$  and  $F_{RV}$  and measurement of  $M_{Y, \max}$

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## 6 Safety requirements and testing

### 6.1 General requirements

This subclause deals with general requirements covering topics where the evaluation is carried out visually.

#### 6.1.1 Function and form

**6.1.1.1** The binding shall release at least in two cases: when applying a torque  $M_Z$  about an axis perpendicular to the ski gliding surface and when applying a torque  $M_Y$  about an axis parallel to the ski surface and perpendicular to the longitudinal axis of the ski.

The binding is said to release when the mentioned torque reaches a maximum value (release value) and then drops to a value that is harmless for the skier. After release, all the loads applied by the ski and the boot on the leg shall remain under the dangerous level for all possible movements, and until all the risks associated with the coupling boot-ski have disappeared.

**6.1.1.2** The release level shall be clearly indicated by a scale covering all of the setting range anticipated by the manufacturer. The release shall still be possible at the upper limit (maximum setting). Settings above  $Z = 10$  shall be clearly differentiated from settings below  $Z = 10$  on the indicator scale.

**6.1.1.3** Each procedure of adjustment to the boot having an influence on the binding functioning shall be verifiable by the use of a clear indicator, or by any other means considered suitable by the operator for showing the correct adjustment.

**6.1.1.4** The binding shall be equipped with a ski-brake or allow for an easy and secure attachment of a leash.

**6.1.1.5** The design of the ski-brake or the leash shall be such that, after release, no unnecessary danger will occur to the skier.

**6.1.1.6** The binding shall have an external design which does not have a negative influence on skiing or cause unnecessary risk of injuries when used normally.

## 6.1.2 Handling

### 6.1.2.1 Mounting instructions

The manufacturer or the importer shall deliver mounting instructions that are easily understood to the sports shop. These instructions shall include at least

- a) the mechanical procedure for adjusting the release values of the binding;
- b) recommendations for determining the appropriate release values for the skier;
- c) the sole characteristics required for good functioning of the binding;
- d) the boot-sole requirements and preparation for mounting of additional elements, if necessary.
- e) preparation and mounting of the binding e.g. use of jig, compatibility with ski, etc.;
- f) the adjustment instructions necessary for accommodating different boot-sole lengths and heights, the centering of the sole and ways of controlling the length adjustment;
- g) ways of performing the basic functional tests after mounting;
- h) recommendation for setting the binding with a setting device;
- i) troubleshooting procedures for non-symmetric release and readjustment.

### 6.1.2.2 Instructions for use

An easily understood set of instructions for the skier shall be included with all bindings. These instructions shall contain at least

- a) warnings against important modifications of the recommended setting;
- b) instructions on how to step in and out of the binding, how to restore the binding to its initial position after release and how to open the binding after a fall in an awkward position;
- c) recommendations for avoiding problems, for example increase of the release level with time;
- d) instructions for maintenance, storage and control of the binding;
- e) recommendations for setting the binding by a specialist with a setting device and for controlling this setting each year;

- f) a warning that, when skiing in deep snow, the brake alone is not sufficient to avoid losing the ski.

## 6.2 Release tests — Setting, reproducibility and symmetry of release values

### 6.2.1 Requirements

#### 6.2.1.1 Scattering of values

The difference between each of the five values and their mean value shall not exceed  $\pm 10\%$  of that mean value.

#### 6.2.1.2 Symmetry in torsion

The difference between the mean of the five values of  $M_Z$  in one direction and the mean of the ten values of  $|M_Z|$  shall not exceed  $\pm 10\%$  of the latter.

#### 6.2.1.3 Accuracy of setting scale

The release value that corresponds to the indicator position of the setting scale is given in table 2.

For  $M_Z$ , the tolerance is  $\pm 5\text{ N}\cdot\text{m}$  for  $Z = 1$  and then increases linearly to  $\pm 10\text{ N}\cdot\text{m}$  for  $Z = 10$ .

For  $M_Y$ , the tolerance is calculated by taking into account the relationship between  $M_Y$  and  $M_Z$  given in table 2.

NOTE 3 To determine the tolerances on  $M_Z$  and  $M_Y$ , use figures B.1 and B.2.

This requirement applies to each of the mean values of the ten values of  $|M_Z|$  and each of the mean values of the five values of  $M_Y$  corresponding to the settings  $L_2$ ,  $1/3$ ,  $2/3$  and  $L_3$ .

For the highest setting (limit  $L_4$ , i.e. off the scale), these mean values shall not exceed the mean values corresponding to limit  $L_3$  by more than  $20\%$ .

### 6.2.2 Testing

The test shall be carried out on four bindings randomly chosen from a set of six bindings. If the preceding requirements in 6.2.1 are not fulfilled, two of the four bindings can be replaced by the remaining two bindings in this set.

#### 6.2.2.1 Choice of settings

The tests shall be carried out at ambient temperature ( $23\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ ), with the sole and bindings dry, for the following settings:

- limit  $L_2$ ;
- at approximately one-third of the scale;

- at approximately two-thirds of the scale;
- limit  $L_3$ ;
- limit  $L_4$ .

The tests shall be carried out using the sole length corresponding to the setting mark, according to table 2.

**Table 2 — Setting scale**

Setting mark	Release torques		Sole length $l$ mm
	$M_Z$ N·m	$M_Y$ N·m	
0,5	5	18	200
1	10	37	225
1,5	15	55	243
2	20	75	258
2,5	25	94	270
3	30	114	280
3,5	35	134	290
4	40	154	298
4,5	45	175	306
5	50	196	314
5,5	55	218	320
6	60	239	327
6,5	65	261	333
7	70	284	339
7,5	75	307	344
8	80	330	350
8,5	85	353	355
9	90	377	360
9,5	95	401	364
10	100	425	369

For each setting, each of the four bindings is released five times in torsion to the right ( $+M_Z$ ), five times in torsion to the left ( $-M_Z$ ) and five times in forward bending ( $M_Y$ ).

### 6.2.2.2 Calculation of mean values

For each setting and each binding, the following values are calculated:

- mean value of the five values of  $+M_Z$ ;
- mean value of the five values of  $-M_Z$ ;
- mean value of the ten values of  $|M_Z|$ ;
- mean value of the five values of  $M_Y$ .

## 6.3 Evaluation of reproducibility of release under different influences

The tests described in this subclause shall be carried out in the following order on the four bindings already used for the tests in 6.2.2.

### 6.3.1 Reference values

The bindings shall be set in order to release for one pair of the values  $M_Z/M_Y$  indicated below:

$l = 250$  mm for

$$M_Z = 20 \text{ N}\cdot\text{m} \pm 2 \text{ N}\cdot\text{m}$$

$$M_Y = 75 \text{ N}\cdot\text{m} \pm 5 \text{ N}\cdot\text{m}$$

$l = 305$  mm for

$$M_Z = 40 \text{ N}\cdot\text{m} \pm 3 \text{ N}\cdot\text{m}$$

$$M_Y = 154 \text{ N}\cdot\text{m} \pm 10 \text{ N}\cdot\text{m}$$

$l = 320$  mm for

$$M_Z = 60 \text{ N}\cdot\text{m} \pm 3 \text{ N}\cdot\text{m}$$

$$M_Y = 240 \text{ N}\cdot\text{m} \pm 10 \text{ N}\cdot\text{m}$$

$l = 340$  mm for

$$M_Z = 80 \text{ N}\cdot\text{m} \pm 4 \text{ N}\cdot\text{m}$$

$$M_Y = 330 \text{ N}\cdot\text{m} \pm 15 \text{ N}\cdot\text{m}$$

Use the pair which lies nearest to the release value corresponding to the middle of the  $L_2/L_3$  range of the binding.

The boot-sole length  $l$  shall also be indicated. The tests shall be carried out at ambient temperature ( $23 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ ), with sole and bindings dry.

Each binding shall be released five times in torsion to the right or to the left (for all subsequent tests the direction shall be maintained) and five times in forward bending.

The mean value of each group of five release values is considered as the reference value.

This setting remains the same for all of the following tests (6.3.2 to 6.7.2).

### 6.3.2 Low temperature exposure

#### 6.3.2.1 Requirements

The difference between each of the release values and the corresponding reference value shall not exceed 35 % for bindings of type C and CA and 30 % for bindings of type A.