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Ski-poles for alpine and touring skiing — Requirements and test methods

Bâtons de ski alpin et de ski de randonnée — Exigences et méthodes d'essai

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 83, *Sports and other recreational facilities and equipment*, Subcommittee SC 4, *Snowsports equipment*.

This fifth edition cancels and replaces the fourth edition (ISO 7331:2011), which has been technically revised. The main changes compared to the previous edition are as follows:

— editorial changes;

— addition of requirements and test methods for adjustable poles;

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Ski-poles for alpine and touring skiing — Requirements and test methods

1 Scope

This document defines the minimum requirements for safety in poles for alpine and touring skiing. It specifies test methods to check conformity with these requirements.

It is applicable to ski-poles for alpine and touring skiing in the following ranges of total length, l_T:

— group A, $l_T \geq 1\,050$ mm (adults' poles);

— group B, $1\,050 \text{ mm} > l_T \geq 700$ mm (junior poles);

— group C, $l_T < 700$ mm (children's poles).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

ISO 6508-2, *Metallic materials — Rockwell hardness test — Part 2: Verification and calibration of testing machines and indenters*

ISO 6508-3, *Metallic materials — Rockwell hardness test — Part 3: Calibration of reference blocks*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Symbols

The following symbols are used in the document.

A_G	is the upper surface, expressed in square centimetres, of the grip (impact area).
F_{-Z}	is the compressive force, expressed in newtons, in the axis of the ski-pole.
F_{+Z}	is the tensile force, expressed in newtons, in the axis of the ski-pole.
l_T	is the total length, in millimetres.

l_H is the length, expressed in millimetres, measured from the tip to the middle of the hand.

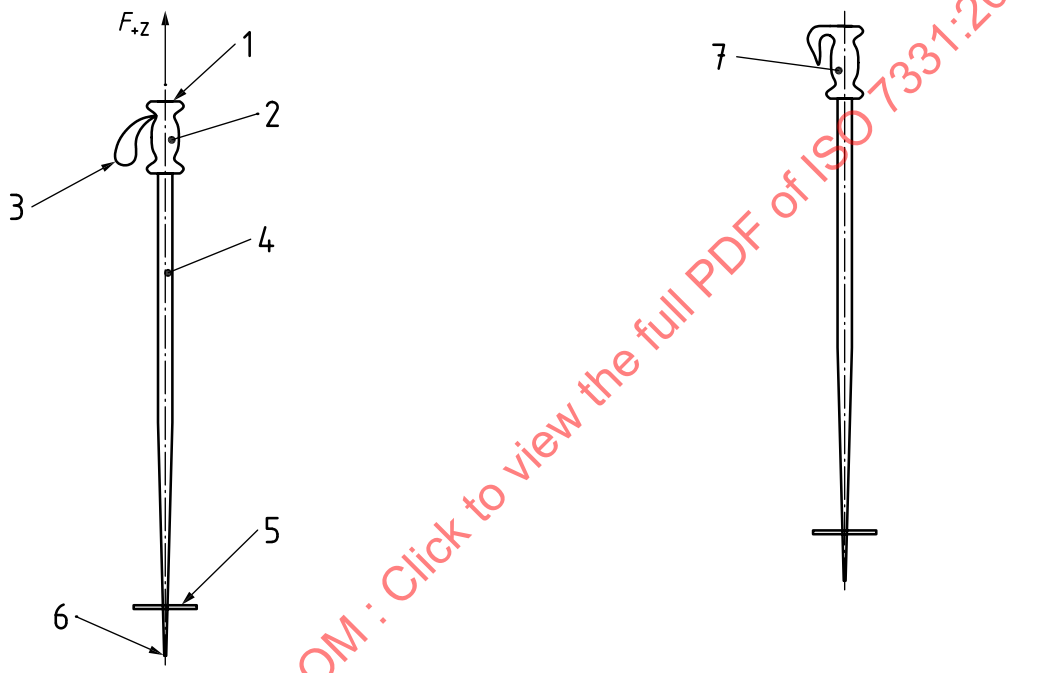
l_B is the length, expressed in millimetres, measured from the tip to the lower surface of the basket.

d_B is the basket maximum diameter, expressed in millimetres.

5 Parts and categories of ski-poles

5.1 Parts of a ski-pole

Terms used to designate the different parts of a ski-pole are given in Figure 1.



a) Ski-pole featuring grip with a strap **b) Ski-pole featuring a strapless grip**

Key

1 upper surface of the grip, A_G
2 grip
3 strap
4 shaft
5 basket
6 tip
7 strapless grip

Figure 1 — Terms used to designate the parts of a ski-pole

5.2 Categories of ski-poles

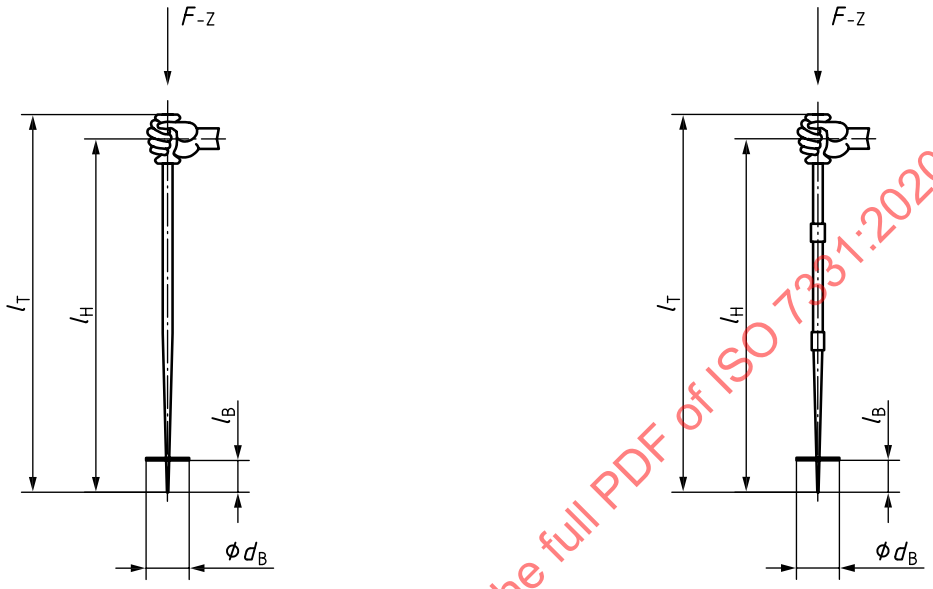
Two types of ski-poles are considered in this document: the alpine skiing poles and the ski-touring poles. Their length can be either adjustable or non-adjustable (see Figure 2). The alpine ski-poles are further divided in three categories, depending on their total length l_T, for the non-adjustable poles: group A, group B and group C (see Clause 1).

The length, $l_{H,}$ is determined by reference to the width of an average hand:

— group A: 93 mm;

— group B: 73 mm;

— group C: 57 mm.



a) Non-adjustable pole **b) Adjustable pole**

Figure 2 — Centre of rotation and dimensions

6 Requirements and test methods

6.1 Materials

The materials used shall meet the requirements specified in 6.4 to 6.13.

6.2 Test conditions

Unless otherwise specified, the test shall be carried out as a type test in the standard atmosphere at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) %.

The reference value for the quasi-static structure of force, *F*, with respect to time, *t*, is translated to a strain rate of ≤2 mm/s.

The test equipment shall be such that all measurable variables such as forces, temperatures, angles, lengths, surfaces, masses and time of oscillation can be measured or determined to the following accuracies:

— Forces, masses: ±2 %;

— Temperatures: ±2 °C;

— Angles: ±1°;

— Lengths of poles: ±1 mm;

— Radii and other lengths: ±0,2 mm.

6.3 Test sampling

The three longest and the three shortest poles from each group shall be submitted to the laboratory.

In addition, three poles of 1 200 mm length l_T from testing group A, and three poles of 1 000 mm length l_T from testing group B shall be submitted to the laboratory.

One long pole and one short pole shall be selected for the tests to be carried out in accordance with 6.4 to 6.13.

If one test sample fails these tests, the tests shall be repeated with two further test poles which shall both pass the repeated tests.

For adjustable touring ski-poles, three samples shall be tested. Adjustment according to the testing requirements to the minimum intended length/maximum intended length. All samples shall pass the test.

6.4 Total length

6.4.1 Requirement

The total length l_T shall not vary from the given length by more than ±10 cm. For adjustable touring ski-poles, variation of total length to ±15 mm is allowed. Furthermore, the lengths of one pair of ski-poles shall not differ by more than 7 mm.

6.4.2 Testing

Determine lengths of all test samples indicated in 6.3.

6.5 Outward design

6.5.1 Requirement

Sharp design (except the tip) and rough surfaces, which can cause injury, shall be avoided.

6.5.2 Testing

Check visually.

6.6 Anti-catching design

6.6.1 Requirement

The ski-pole shall be designed to limit the strain that can be transmitted to the wrist and arm of the skier, should the pole get caught during skiing. This requirement can be met by a design according to 6.9.3 or 6.12.4, or by a strapless grip.

6.6.2 Testing

Test according to 6.9.3 or 6.12.4 or carry out a visual and functional test.

6.7 Release mechanism

6.7.1 Function

If so equipped, a release mechanism shall be manufactured so that it functions correctly in environmental conditions encountered during skiing.

6.7.2 Temperature and ice conditions

6.7.2.1 Requirement

If a release mechanism is provided in the shaft, the compressive force in the axis of the pole necessary to cause the release at a temperature of –20 °C and in icy conditions, and at a temperature of 20 °C, shall not vary by more than 30 %.

In addition, the release force at –20 °C and in icy conditions shall not exceed the values given in 6.9.3.

6.7.3 Testing

Determine the release force at 20 °C five times per function on one test sample and calculate the mean value.

Store the release mechanism at a temperature of –5 °C until this temperature is reached. Determine the release force once and compare it with the mean value at 20 °C.

Again, determine the release force at 20 °C five times on one test sample and calculate the mean value.

Spray the vertically placed ski-pole with water at 10 °C or more for 1 min from a distance of 1 m. Store the pole vertically at –5 °C until it reaches this temperature, then determine the release force once and compare it with the mean value at 20 °C.

6.7.4 Fatigue conditions

6.7.4.1 Requirement

The release mechanisms shall be protected against wear so that they still function correctly after 100 releases.

The release forces shall not vary by more than 20 % after the fatigue test.

6.7.4.2 Testing

Carry out 100 releases on each release mechanism; compare the mean value of the first five releases with the mean value of the last five.

6.8 Grip

6.8.1 Shape

6.8.1.1 Requirement

The shape of the grip shall be designed to facilitate good control of the pole, i.e. the grip shall be shaped to the hand and shall not be slippery. With all grips, whether straps are included or not, the shape of the moulded portion shall not be such as to force the thumb outward or upward beyond the edge of the impact area, A_G, of the top of the handle/grip.

6.8.1.2 Testing

This is accomplished by both visual and manual means.

6.8.2 Impact area

6.8.2.1 Requirement

The impact area, A_G, shall be:

— group A: ≥10 cm^2;

— group B: ≥10 cm^2;

— group C: ≥7 cm^2.

6.8.2.2 Testing

Designate the largest section, taken from the outer contour at a level between 0 mm and 10 mm from the upper edge of the grip and at a slope of between 0° and 10° to the perpendicular; this shall be the impact area.

In the case of deformable surfaces of the grip, this measurement can be carried out at a compressive force of 400 N.

6.8.3 Edges

6.8.3.1 Requirement

Edges on the grip, which could cause injury, shall have a radius of at least 2 mm. Soft grips (with a hardness of <80 Shore A at –10 °C) may have a radius of at least 1 mm.

6.8.3.2 Testing

This is accomplished by both visual and dimensional means.

6.8.4 Piercing resistance

6.8.4.1 Requirement

The piercing resistance of the impact area, A_G, to the top of the shaft, i.e. the force necessary for the shaft to pierce the impact area upwards, shall be higher than 1 500 N, or than the maximum release force of those poles with a release mechanism.

6.8.4.2 Testing

Press a test sample against a fixed abutment by means of a plate (see Figure 3).

When a force is applied according 6.8.4.1, the shaft shall not pierce the end of the grip. Carry out the test quasi-statically.

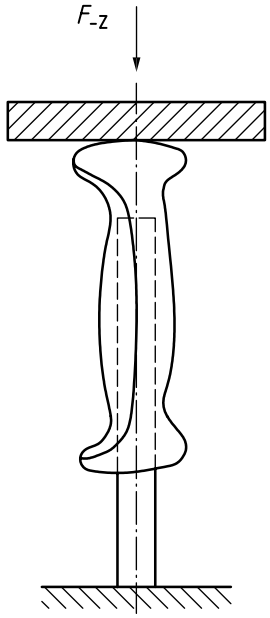


Figure 3 — Test arrangement for piercing resistance

6.8.5 Pulling-off force

6.8.5.1 Requirement

The force needed to pull the grip from the shaft shall be:

— group A: ≥350 N;

— group B: ≥350 N;

— group C: ≥300 N.

6.8.5.2 Testing

Carry out the test on a test sample in accordance with Figure 4.

Carry out the test quasi-statically.

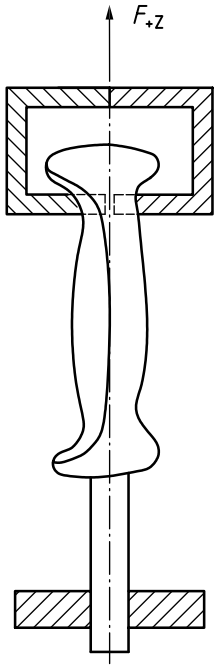


Figure 4 — Test arrangement for pulling-off force

6.8.6 Strapless grips

6.8.6.1 Requirement

The bow of strapless grips shall be designed in such a way that the risk of catching or twisting the wrist is reduced.

6.8.6.2 Testing

This is accomplished by visual means.

6.9 Straps

6.9.1 Width

6.9.1.1 Requirement

Straps shall have the following width where in contact with the hand:

— group A: ≥16 mm;

— group B: ≥14 mm;

— group C: ≥12 mm.

6.9.1.2 Testing

This is accomplished by both visual and dimensional means.

6.9.2 Minimum strain in support direction

6.9.2.1 Requirement

Straps with a supporting function (i.e. groups A and B) shall withstand a force in the loading direction –Z, of ≥ 350 N.

Straps in group C have no supporting function.

6.9.2.2 Testing

Carry out the test quasi-statically according to Figure 5 by applying the force in the direction –Z.

6.9.3 Release function

6.9.3.1 Requirement

Straps with a release function shall have the following range of release values in the direction +Z within a range of temperature from +20 °C to −5 °C:

— group A: 80 N to 240 N;

— group B: 60 N to 180 N.

6.9.3.2 Testing

Determine release forces in direction +Z quasi-statically according to Figure 5.

Carry out 100 releases on each release mechanism, compare the mean value of the first five with the mean value of the last five.

Dimensions in millimetres

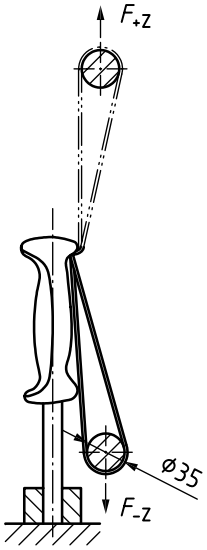


Figure 5 — Test arrangement for the strap

6.10 Shaft

6.10.1 Minimum compressive force

6.10.1.1 Requirement

The shaft shall be designed to withstand compressive forces and bending moments occurring during all aspects of skiing without plastic deformation or fracture.

No permanent deformation shall occur when loading the pole with a compressive force in the axis of the pole of:

— group A: 320 N;

— group B: 320 N;

— group C: 220 N.

On adjustable poles (see Figure 2 b), the length adjustment system shall be designed to withstand a compressive force F_{-Z} of 550 N without slipping.

For adjustable touring poles:

The shaft shall be designed according to its strength so that it withstands the compressive forces occurring during the intended use with an elastic deformation of ≤1 mm, but without breakage or kink.

After a load of the stick with a compressive force of 320 N along the longitudinal axis of the stick, no permanent deformation may occur.

The requirement is fulfilled if:

a) after loading the shaft with the compressive force and a test path ≤30 mm; or

b) a compressive force of >450 N is achieved.

If the shaft withstands a compressive force of only 220 N, the maximum length, l_T, shall be limited to 135 cm.

6.10.1.2 Testing

Test the longest ski-pole of one series, taking l_H as the test length. Carry out the test quasi-statically between two parallel plates and with the pole fixed off-centre (see Figure 6). Test bent poles in such a way that buckling is promoted.

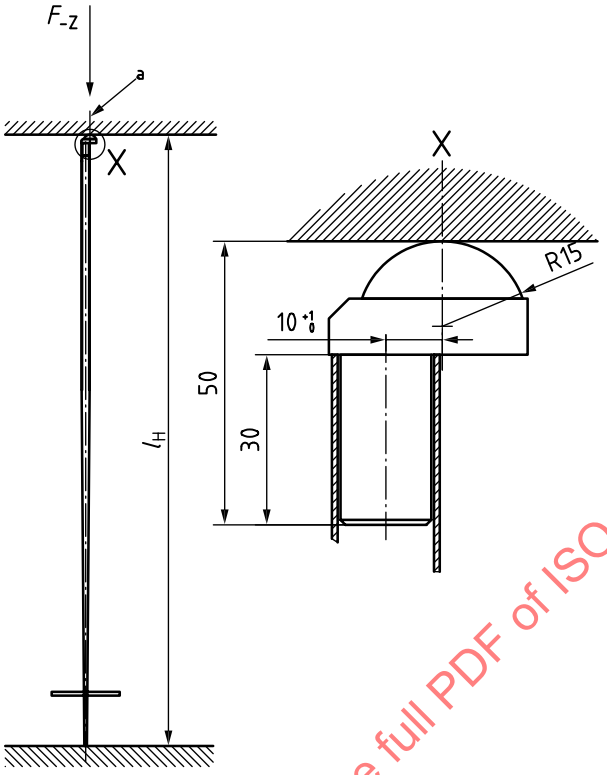
For adjustable poles, the following additional requirements apply:

a) Rotary fittings are set for the purpose of testing with a torque of (1,5 ± 0,1) Nm.

b) Rocker locks shall be set to close the lever with a force of ≤75 N.

c) Adjustable poles shall be fixed at their maximum intended adjustment length

Dimensions in millimetres



Key

a line of effective applied force

l_H test length

F_{-Z} compression force

Figure 6 — Test arrangement for the off-centre test

6.10.2 Point of buckling

6.10.2.1 Requirement

In the test, the ski-pole shall neither break into two parts nor show long and stick out material filaments when compressed to 2/3 l_H.

6.10.2.2 Testing

Test in accordance with 6.10.1.2.

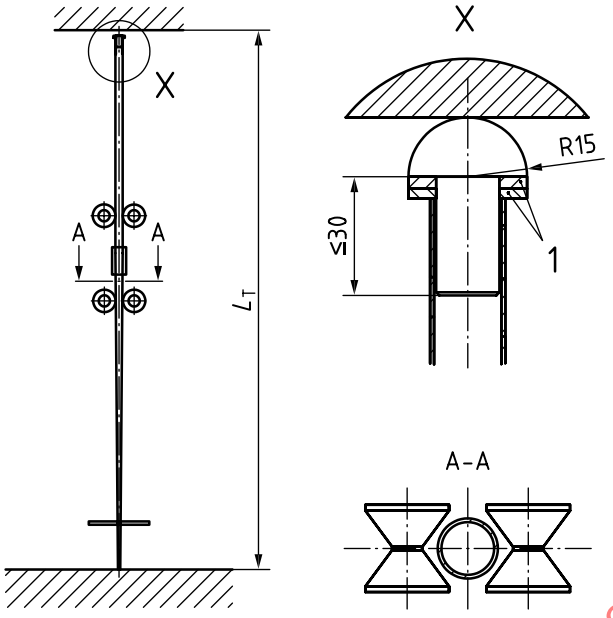
6.11 Clamping force

If there are used clamping systems to adjust the length of the ski-poles, which are fixed in the radial direction to the longitudinal axis of the ski-pole (twist locking systems), the clamping-system shall be designed in a way that the supporting force of the ski-pole does not decrease by >25 % of the minimum compressive force after ¼ turn in the opening direction (reverse turn security).

The test shall be according to 6.10.1.2. Fix the shaft in the minimum adjusting length L_T. The shaft has to be supported sidewise against buckling under the load during the testing, see Figure 7.

If there are used clamping systems to adjust the length of the ski-poles, which are not fixed in the radial direction to the longitudinal axis of the ski-pole, these clamping systems have to be designed in a way that the adjustment of the clamping force does not unintentionally change during the intended use.

Dimensions in millimetres



Key

L_T test length

F_{-Z} compression force

1 compensation ring

Figure 7 — Test arrangement for adjustable poles

6.12 Basket

6.12.1 Dimensions

6.12.1.1 Requirement

The dimensions of d_B and l_B shall be chosen to meet the requirements of 6.13.2.

6.12.1.2 Testing

Test in accordance with 6.13.2.

6.12.2 Resistance

6.12.2.1 Requirement

The basket on the ski-pole shall withstand, without fracture, a surface force corresponding to the following forces in the direction –Z at a temperature of –20 °C:

— group A: 500 N for –Z and 350 N for Z;

— group B: 500 N for –Z and 350 N for Z.

6.12.2.2 Testing

Carry out the test quasi-statically at a temperature of –20 °C on one test sample each in accordance with Figure 8 (direction –Z).

Dimensions in millimetres

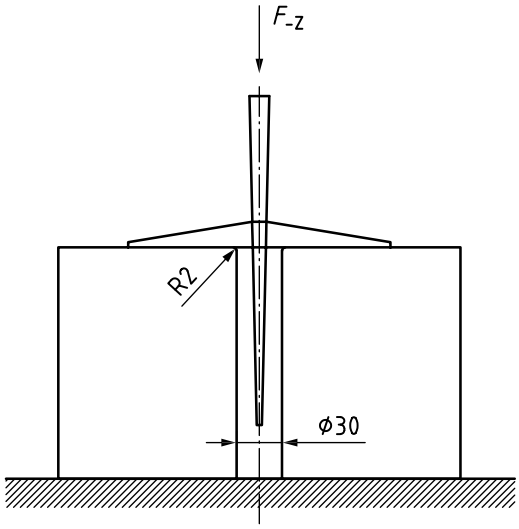


Figure 8 — Test arrangement for the basket and basket fixing in the direction of compression

6.12.3 Basket fixing

6.12.3.1 Requirement

The fixing of the basket shall withstand forces according to 6.12.2 without fracture in both directions Z and –Z at a temperature of –20 °C.

During the resistance test the movement of the basket on the shaft shall not exceed ±3 mm.

6.12.3.2 Testing

Carry out the test quasi-statically at a temperature of –20 °C on one test sample each in accordance with Figure 9 (direction Z).

Dimensions in millimetres

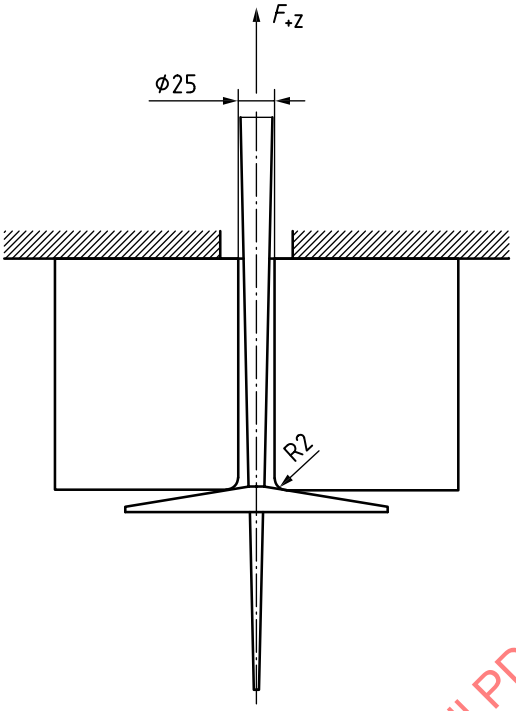


Figure 9 — Test arrangement for the basket fixing in the direction of the tensile force

6.12.4 Anti-catching design of basket

6.12.4.1 Requirement

If there is neither a strapless grip nor a release function strap, it shall be possible to pass the basket through a gap with a maximum force according to 6.9.3.1 at −20 °C and according to Figure 10.

For touring ski-poles the testing has to be done according to Figure 11

The basket pattern shall be designed to reduce the risk of catching.

6.12.4.2 Testing

Carry out the test in accordance with Figure 10 and Figure 11.