INTERNATIONAL STANDARD

ISO 11334-1

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1994-11-15

Walking aids manipulated by one arm — Requirements and test methods —

Part 1: Elbow crutches

Aides à la marche manipulées avec un bras — Prescriptions et méthodes d'essai —

Partie 1: Cannes à appui antibrachial

Reference number
ISO 11334-1:1994(E)

Contents

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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 11334-1 was prepared by Technical Committee ISO/TC 173, *Technical systems and aids for disabled or handicapped persons*.

ISO 11334 consists of the following parts, under the general title *Walking aids manipulated by one arm — Requirements and test methods*:

— *Part 1: Elbow crutches*

— *Part 2: Axillary crutches*

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Walking aids manipulated by one arm — Requirements and test methods —

Part 1: Elbow crutches

1 Scope

This part of ISO 11334 specifies requirements and test methods for elbow crutches fully equipped with handgrip and tip. The methods specify testing of fatigue, separation, static load capacity and resistance to low temperature embrittlement. This part of ISO 11334 also gives the requirements relating to safety, ergonomics, performance, marking and labelling. The tests are based on everyday usage of elbow crutches when performing the through-swing gait.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 11334. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11334 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 9999:1992, *Technical aids for disabled persons — Classification.*

3 Definitions

For the purposes of this International Standard, the following definitions apply, with reference to figures 1, 2 and 3.

3.1 elbow crutch: Crutch with one leg, a handle and forearm support. Classification No.: 12 03 06 according to ISO 9999.

3.2 crutch size: Size of crutch in accordance with table 1.

3.3 handle; handgrip: That part of the crutch which is normally held in the hand when the crutch is in use.

3.4 handgrip support line: Line drawn through the lowest points, if any, at each end of that part of the handle on which the hand rests.

3.5 handgrip length: Distance, h, measured between the two lowest points on the handgrip support line. (See figure 2.)

3.6 handgrip width: Width of the handle measured horizontally at the thickest point where the hand rests. (See figure 2.)

3.7 datum: That point on the upper surface of the handle one-third of the length from the rear end of the handgrip length. (See figure 2.)

3.8 arm section: That part of the crutch which is above the inner end of the handgrip length.

3.9 leg section: That part of the crutch which is below the inner end of the handgrip length.

3.10 cuff: Forearm support as used on an elbow crutch to hold the forearm in the correct position and prevent sideways movement.

3.11 cuff support line: Line drawn from the inner end of the handgrip length and touching the inside rear bottom face of the cuff at maximum extension of the arm section. (See figure 1.)

3.12 cuff internal width: Maximum internal dimension, y, measured left to right. (See figure 3.)

3.13 cuff internal depth: Internal dimension, x, measured front to back. (See figure 3.)

3.14 cuff internal height: Inside measurement, z, of the cuff which is approximately parallel to the cuff support line and which supports the forearm. (See figure 2.)

3.15 tip: That part of the crutch which is in contact with the ground.

3.16 leg section axis: Line drawn from the inner end of the handgrip length and through the centre of the tip at maximum extension of the leg section.

3.17 arm section length: Distance, a, measured between the inner end of the handgrip length and the highest point where the cuff support line touches the inside rear face of the cuff.

3.18 leg section length: Distance, l, measured between the inner end of the handgrip length and the centre of the bottom of the tip.

3.19 support angle: Angle, α, formed by the leg section axis and the cuff support line. (See figure 1.)

3.20 grip angle: Angle, β, formed by the cuff support line and the handgrip support line. (See figure 1.)

4 Requirements and recommendations

4.1 Cuff

4.1.1 The cuff shall be securely fixed.

4.1.2 The inside dimensions of the cuff should be so designed that the arm, even when covered with clothes, may with comparative ease be inserted into and withdrawn from it. For the arm to escape, the cuff shall have an opening in the front. It shall be possible to increase this opening to 75 mm without permanently deforming the cuff by more than 5 mm.

4.1.3 The cuff inside surface should be approximately parallel to the cuff support line. This is taken care of if the cuff is hinged.

4.1.4 The cuff internal depth against the forearm shall be larger than half of the internal width.

4.1.5 The cuff internal height against the forearm should be at least 40 mm.

4.2 Handle/handgrip

4.2.1 The handle/handgrip may be adjustable but shall be securely fixed when in use.

4.2.2 The shape and/or the material of the handgrip should prevent the hand from sliding when gripped.

4.2.3 The handgrip width shall be not less than 25 mm and not more than 50 mm. This requirement does not apply to anatomic handgrips.

4.2.4 The handgrip should be easy to clean, non-absorbent and should not include known toxic components.

4.3 Leg section and tip

4.3.1 The leg section shall end in a tip of a design which will prevent the leg section from piercing through it when tested in accordance with 5.3. The tip shall be replaceable but shall be secure when fitted.

The tip should be pliable, hard-wearing and have a high coefficient of friction against the walking surface. The tip tread against the walking surface should be such that any suction cup effect is avoided.

4.3.2 The part of the tip that is in contact with the walking surface shall have a minimum diameter of 35 mm.

4.4 Adjusting devices

4.4.1 The means of height adjustment shall not work loose when the crutch is in use.

4.4.2 Each of the height adjustments shall be clearly marked with its maximum allowable elongation.

4.4.3 It should be possible to operate the means of adjustment without the use of tools.

4.5 Materials

4.5.1 Structural load-carrying members moulded from plastics materials should be produced from virgin materials. If recycled materials are included, the components shall be of equivalent strength throughout the life of the crutch.

4.6 Finish

4.6.1 All parts of the crutch should be free from burr, sharp edges or projections that could cause damage to clothing or discomfort to the user.

4.6.2 The crutch should not rattle when in use.

4.6.3 The materials should not cause discolouring in normal use.

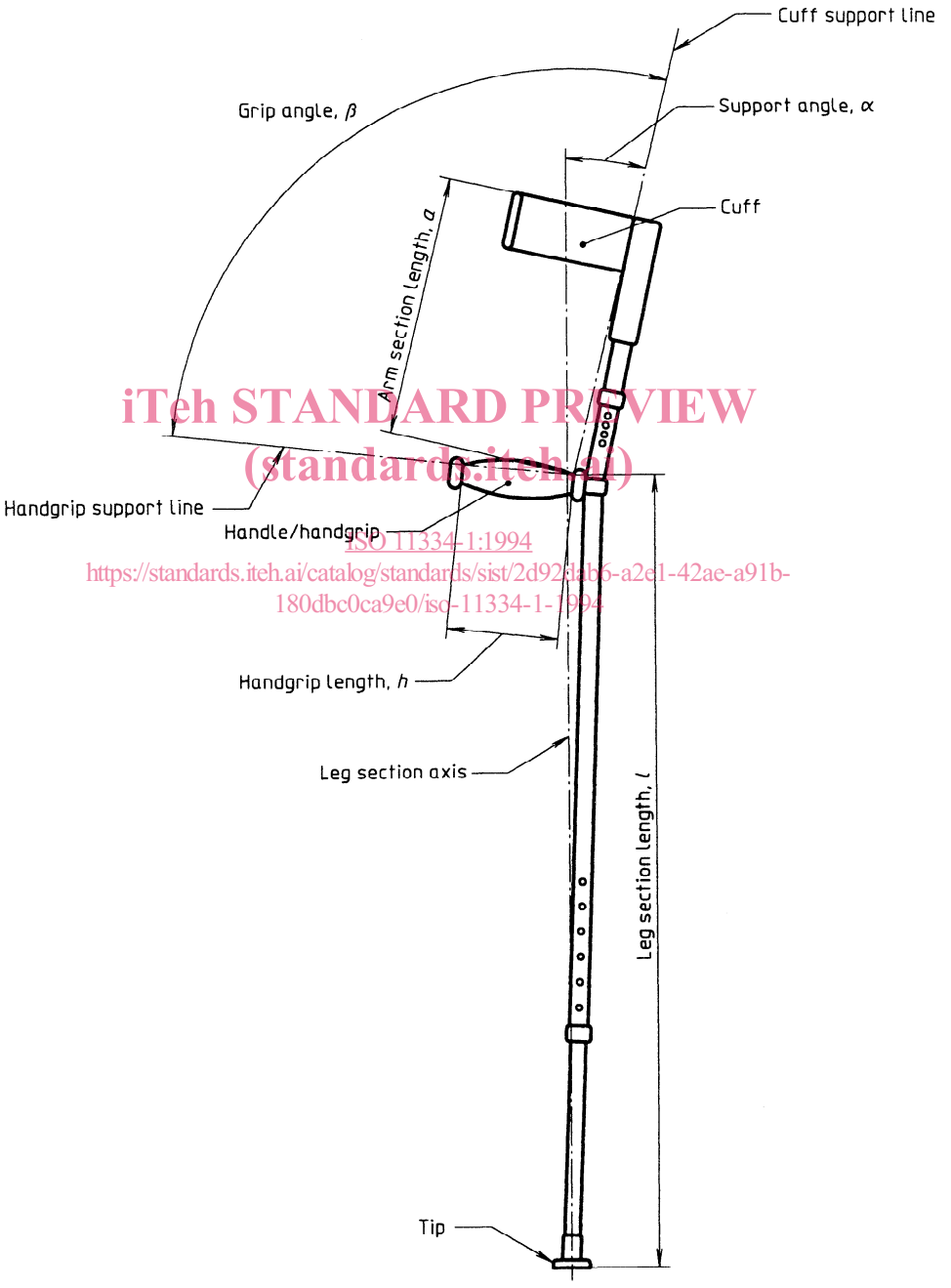

Figure 1 — Example of elbow crutch

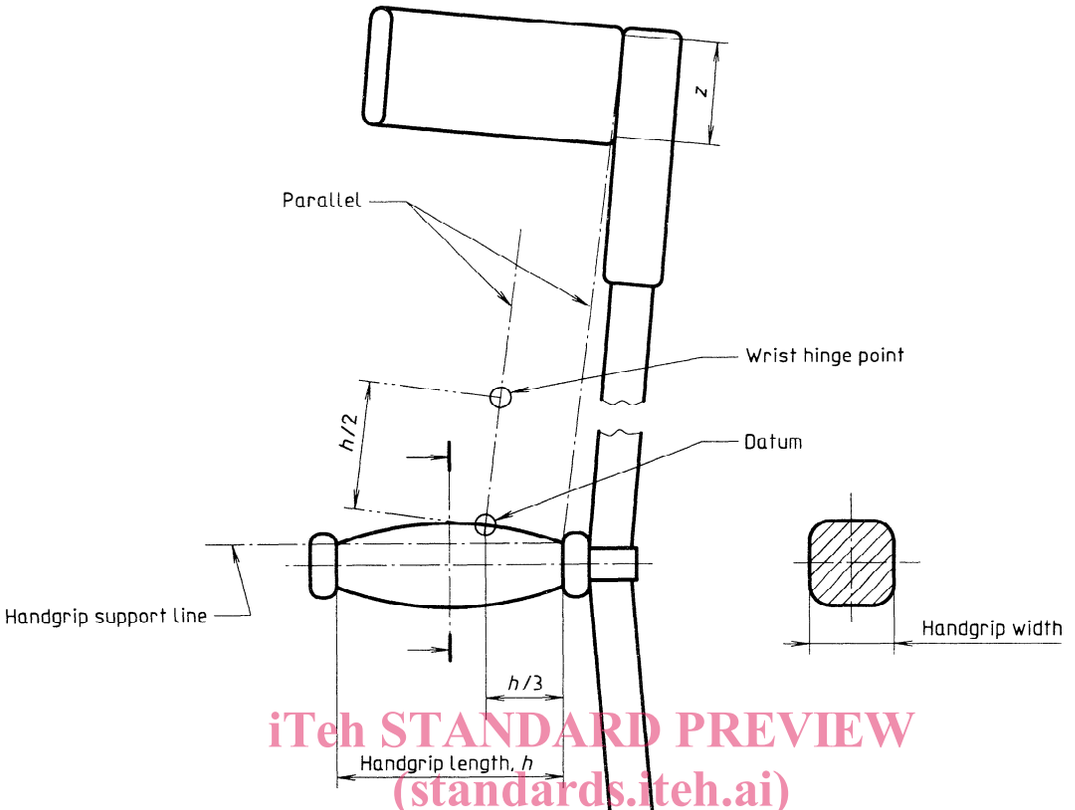

Figure 2 — Details of elbow crutch

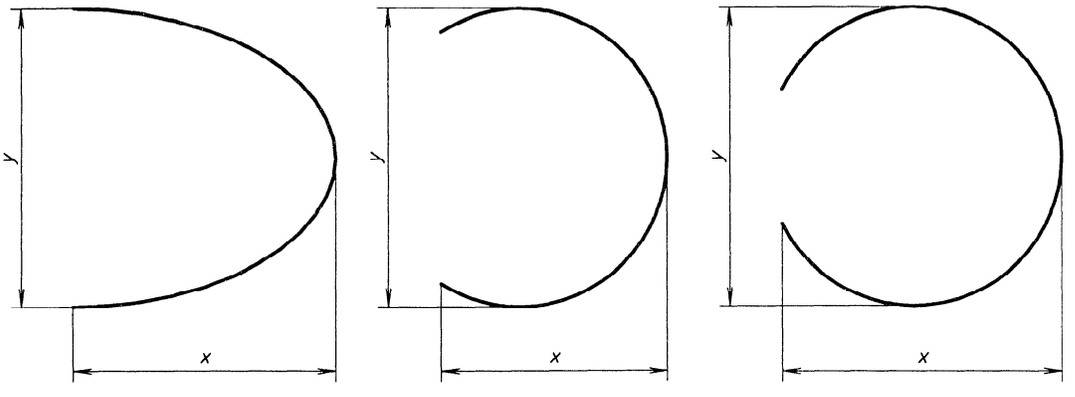

Figure 3 — Cuff dimensions

4.7 Angles

4.7.1 The support angle, α, should be:

$15° \leqslant \alpha \leqslant 30°$

4.7.2 The grip angle, β, should be:

$100° \leqslant \beta \leqslant 108°$

4.7.3 The difference of grip angle minus support angle should be:

$\beta - \alpha \leqslant 90°$

4.8 Mechanical durability

4.8.1 When tested according to the fatigue test (5.3), the crutch shall not crack or break.

4.8.2 When tested according to the separation test (5.4), the upper and lower part of the crutch shall not come apart.

4.8.3 When tested according to the static loading test (5.5), the crutch shall stand the load and no part of the crutch shall crack or break.

4.8.4 When tested according to the low temperature test (5.6), no part of the crutch shall crack or break.

4.8.5 When tested according to tests 5.3, 5.4, 5.5 and 5.6, the crutch should not show any deformation resulting in a permanent set such as to impair the use of the crutch or adjusting mechanism(s).

5 Test methods

5.1 Testing environment

5.1.1 All tests, except where otherwise stated, shall be performed at an ambient temperature of 21 °C ± 2 °C.

5.1.2 All tests, if not otherwise specified, shall be performed with the crutch at its maximum height adjustment.

5.2 Sampling

5.2.1 Two crutches of the same type and model identification shall be tested, one for the fatigue test and the separation test, and the other for the static loading test and the low temperature tests.

5.2.2 Immediately before being tested, each crutch shall be inspected to check compliance with this International Standard and any apparent defects noted so that they shall not later be recorded as having been caused by the tests.

5.3 Fatigue test

5.3.1 Loading geometry

Apply the loading force as if via a dummy arm to the fully extended crutch. The dummy arm consists of a dummy hand clamped to the handle and hinged to a dummy forearm at the "wrist hinge point" shown in figure 2. The forearm rests against the cuff along the cuff support line shown in figure 1.

Apply the loading so that the resultant load line passes as if through the user's shoulder joint and the tip of the crutch. Calculate this using a vertical load vector which passes through the centre of the tip and a point at a distance X from the datum, towards the rear of the crutch, as shown in figure 4, and using the following empirical expression to calculate X. Round the result off to the nearest higher integer, in millimetres.

$$X = \left\{ \frac{h}{3} + \frac{l \times a \times \sin \alpha}{(l + a \times \cos \alpha) 0{,}65} \right\} \sin \alpha$$

where

h is the handgrip length, in millimetres;

l is the leg section length, in millimetres;

a is the arm section length, in millimetres;

α is the support angle, in degrees;

0,65 is the empirical factor.

The above does not preclude other methods of applying the force but equivalent force/load caracteristics shall be maintained.

The method of application of the force shall not restrain, stiffen or strengthen the handle or crutch.

5.3.2 Loading force

Apply a cyclic force of 550 N ± 2 % as specified in 5.3.1, or if the maximum mass of the user specified for the crutch deviates from the standard maximum user mass of 100 kg, apply a force of 5,5 N/kg of the maximum mass of the user ± 2 %. The force shall not be less than 275 N ± 2 %.