
Stationary training equipment —

Part 8:

**Steppers, stairclimbers and climbers
— Additional specific safety
requirements and test methods**

Équipement d'entraînement fixe —

Partie 8: Monte-escaliers, escalators et simulateurs d'escalade —

Exigences spécifiques de sécurité et méthodes d'essai supplémentaires

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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.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

ISO 20957-8 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 136, *Sports, playground and other recreational facilities and equipment*, in collaboration with ISO Technical Committee TC 83, *Sports and other recreational facilities and equipment*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 20957-8:2005), which has been technically revised.

The main changes compared to the previous edition are as follows:

- the Scope has been simplified;
- the formulation has been aligned to ISO 20957-1;
- [Clause 5](#) has been specified and restructured;
- [Clause 6](#) has been specified and restructured.

A list of all parts in the ISO 20957 series can be found on the ISO website.

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Stationary training equipment —

Part 8:

Steppers, stairclimbers and climbers — Additional specific safety requirements and test methods

1 Scope

This document specifies safety requirements for stepper, stairclimber and climber machines (hereafter called training equipment) performed from either a standing or sitting position. The requirements are in addition to the general safety requirements of ISO 20957-1, with which this document is intended to be read in conjunction.

This document is applicable to stationary training equipment type stepper, stairclimber and climber training equipment, within classes S and H. Additional requirements are provided for accuracy class A.

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 4649:2010, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

ISO 20957-1, *Stationary training equipment — Part 1: General safety requirements and test methods*

EN 71-1, *Safety of toys — Part 1: Mechanical and physical properties*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20957-1 and the following apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

stepper

stationary training equipment where the feet move in a reciprocating motion where the foot is not required to leave the foot pedal

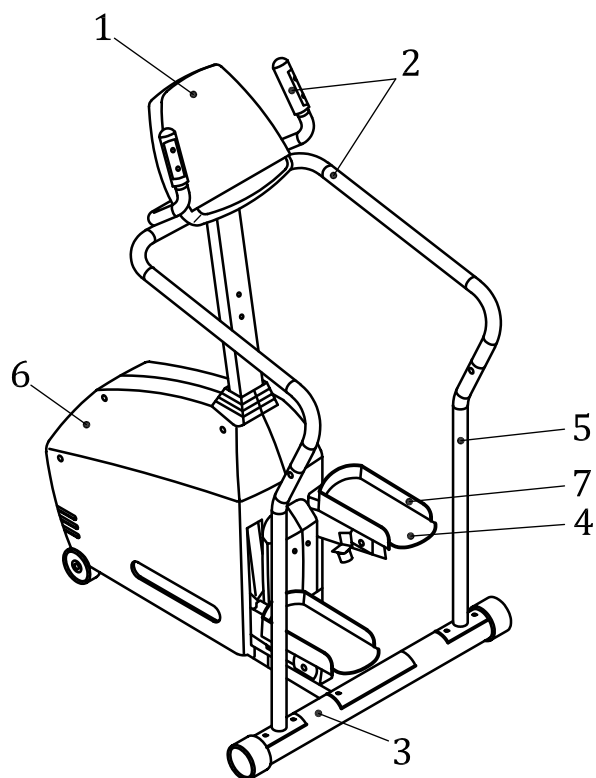
Note 1 to entry: See [Figure 1 a](#)).

3.2

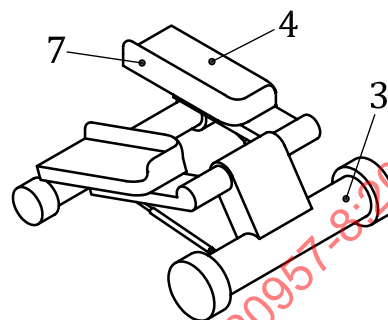
ministepper

stepper ([3.1](#)) with a hinge point height to the floor <200 mm

Note 1 to entry: See [Figure 1 b](#)).



a) Stepper



b) Ministepper

Key

- 1 display
- 2 hand grip
- 3 base frame
- 4 footplatform
- 5 handrail/handlebar
- 6 housing
- 7 footplatform guard

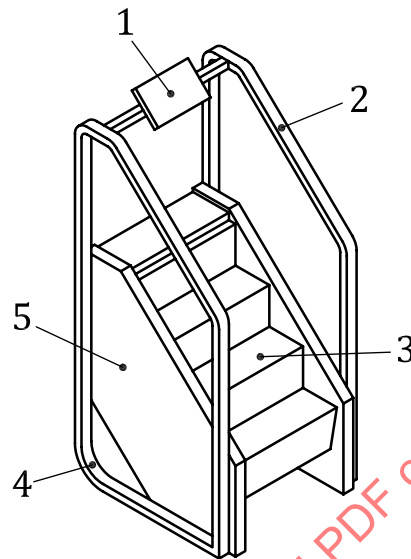
Figure 1 — Examples of steppers

3.3

stairclimber

stationary training equipment similar to a moving mechanical staircase or escalator where the user's foot must leave the staircase in order to perform the action of climbing

Note 1 to entry: See [Figure 2](#).



Key

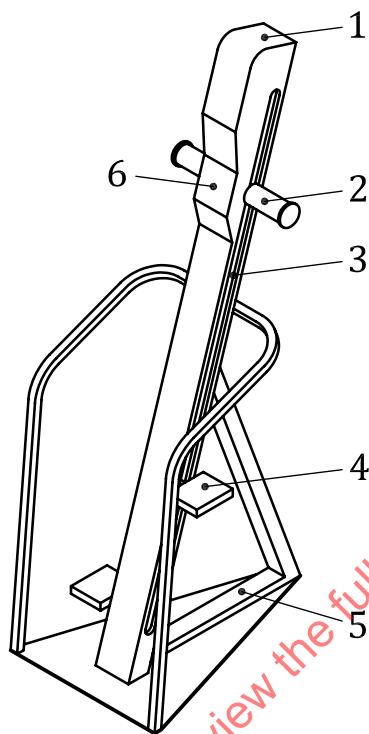
- 1 display
- 2 handrail
- 3 stair
- 4 base frame
- 5 housing

Figure 2 — Example of a stairclimber

3.4 climber

stationary training equipment that is equipped with feet and hand positions both of which can be moved in a reciprocating simulated climbing motion

Note 1 to entry: See [Figure 3](#).



Key

- 1 display
- 2 movable handgrip
- 3 track rail
- 4 foot pedal
- 5 base frame
- 6 resistance adjustment

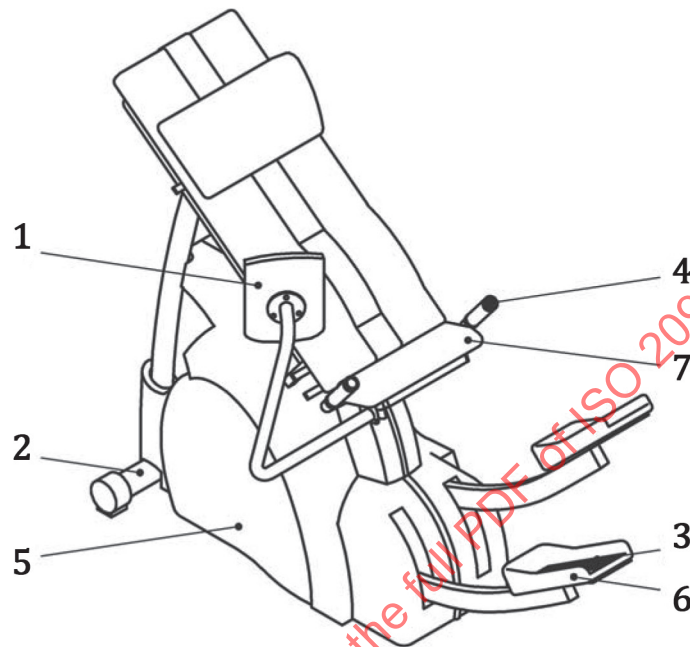
Figure 3 — Example of a climber

3.5

seated stepper

stationary training equipment where the feet move in a reciprocating motion where the foot is not required to leave the foot pedal performed in a seated or semi-recumbent position

Note 1 to entry: See [Figure 4](#).



Key

- 1 display
- 2 base frame
- 3 footplatform
- 4 handrail/handlebar
- 5 housing
- 6 footplatform guard
- 7 seat

Figure 4 — Example of a seated stepper

3.6

dependent action

action in which the movement of one foot pedal is linked to the movement of the other foot pedal

3.7

independent action

action in which the movement of one foot pedal is not linked to the movement of the other foot pedal

3.8

cycle

<steppers, stairclimbers and climbers> action in which one foot returns to its initial position

Note 1 to entry: A cycle counts as two steps.

3.9

footplatform

surface designed to support the foot whilst performing the exercise determined by the manufacturer or for user mounting and dismounting

[SOURCE: ISO 20957-9:2016, 3.2]

3.10

footplatform guard

rigid part of the structure designed to help prevent the foot from slipping off the *footplatform* (3.9)

Note 1 to entry: See [Figure 1](#) and [Figure 5](#).

[SOURCE: ISO 20957-9:2016, 3.3, modified — “Moving” has been replaced by “slipping”, “rigid” has been added, direction of prevented foot movement has been deleted and note has been added.]

4 Classification

ISO 20957-1 applies.

5 Safety requirements

5.1 General

Depending on the design of the piece of training equipment, the requirements in accordance with [5.2](#) to [5.11](#) shall apply as appropriate.

5.2 External construction

5.2.1 Additional requirements for squeeze and shear points within the accessible area

In addition to the requirements in ISO 20957-1, for ministeppers of class H, the test finger probe B according to EN 71-1 shall not get entrapped when inserted from any direction.

5.2.2 Temperature of accessible surfaces

In addition to the requirements of ISO 20957-1, within 10 s after the test, accessible surfaces of the training equipment shall not have a temperature $>65\text{ }^{\circ}\text{C}$.

Test in accordance with [6.2](#).

5.3 Intrinsic loading

ISO 20957-1 applies.

Test in accordance with [6.3](#).

5.4 Handrails/handlebars

The handrails/handlebars shall be tested with a vertical load of 1 000 N applied on each handrail/handlebar of the training equipment one at a time and in the most onerous position.

The handrails/handlebars shall be tested with a horizontal load of 500 N applied on each handrail/handlebar of the training equipment one at a time and in the most onerous position.

After the test, the training equipment shall not be broken and shall still function as intended by the manufacturer.

Test in accordance with [6.4](#).

5.5 Footplatforms and stairs

5.5.1 Footplatforms

The footplatforms shall have a non-slip surface of ≥ 150 mm (length) by ≥ 100 mm (width) or 90 % of the total usable surface. Non-slip surfaces shall have a coefficient of friction of $>0,5$.

Test in accordance with [6.5](#).

The footplatform shall have a guard with ≥ 30 mm height along ≥ 80 % of the length of the inside edge of the platform. If there are potential squeeze and/or shear points in the area of the front or outside edge of the footplatform, additional guards shall be added to the same requirement as the inside guard.

NOTE The footplatform guards are intended to prevent squeeze and shear points in the foot area. Therefore, the distance between the moving pedals can be ≥ 25 mm.

Seated steppers shall have an additional guard or heel restraint across ≥ 90 % of the rear of the footplatform where the movement of the footplatform is $>45^\circ$ from the horizontal.

5.5.2 Stairs

The stairs shall have a non-slip surface of ≥ 200 mm (length) by ≥ 500 mm (width) or 90 % of the total usable surface. Non-slip surfaces shall have a coefficient of friction of $>0,5$.

Test in accordance with [6.5](#).

5.6 Endurance

The training equipment shall withstand

- 12 000 cycles for class H, and
- 100 000 cycles for class S.

After the test, the training equipment shall not be broken and shall still function as intended by the manufacturer.

Test in accordance with [6.6](#).

5.7 Freewheel

In the case of air fan or flywheel resistive system steppers, the transmission assembly shall be of a free wheel type.

Test in accordance with [6.1.2](#) and [6.1.4](#).

5.8 Additional requirement for class A

For each test conducted, the difference between the displayed power and the measured or calculated input power (averaged over the 10 min test period) shall not exceed ± 5 W for input power ≤ 50 W and ± 10 % for input power > 50 W.

Test in accordance with [6.7](#).

5.9 Additional requirements for stairclimbers

5.9.1 Stepping on and stepping off

A system shall be provided to prevent unintentional movement of the stairs during stepping on and stepping off the stairclimbers for a value of 1,5 times the maximum user's body mass as specified in the user's manual.

During the test, the staircase shall not move.

Test in accordance with [6.8](#).

5.9.2 Manual stopping system

The training equipment shall have a mechanical switch to stop within a half cycle movement at least on one handrail/handlebar as well as in front of the user. The mechanical switch in front of the user shall be within 180 mm parallel to the centreline of the staircase.

Test in accordance with [6.1.1](#) and [6.1.2](#).

5.9.3 Automatic stopping system to reduce the risk of entrapment

The training equipment shall be fitted with a means which automatically stops movement to reduce the risk of foot entrapment between the moving stairs and the floor or structure.

Test in accordance with [6.9](#).

5.10 Additional requirements for seated steppers

5.10.1 Movable handlebars

Movable handlebars shall withstand a load equal to the maximum user's body mass as specified in the user's manual or $\geq 1\,000$ N, whichever is greater, in the direction of the movement.

Movable handlebars shall withstand a load equal to 20 % of the maximum user's body mass or 200 N, whichever is greater, at 90° to the direction of the movement.

After the test, the movable handlebars shall not be broken and shall still function as intended by the manufacturer.

Test in accordance with [6.10.1](#).

The ends of movable handlebars shall be designed to reduce the risk of eye socket penetration to the facial area during the intended use for the user and third parties. The design may include, but is not limited to:

- a) the tip of the movable handlebars having a diameter of ≥ 50 mm and an edge radius of ≥ 5 mm; or
- b) movable handlebars being bent into an inverted U-shape of $\geq 180^\circ$ so as to reduce risk of contact between the facial area and the tip of the movable handlebars.

Test in accordance with [6.1.1](#) and [6.1.2](#).

5.10.2 Non-movable handlebars

Non-movable handlebars shall withstand a horizontal load equal to the maximum user's body mass as specified in the user's manual or $\geq 1\,000$ N, whichever is greater.

Non-movable handlebars shall withstand a vertical load of two times the maximum body mass specified in the user's manual or $\geq 2\,000$ N, whichever is greater.

After the test, the non-movable handlebars shall not be broken and shall still function as intended by the manufacturer.

Test in accordance with [6.10.2](#).

5.10.3 Seat handlebars

Seat handlebars shall withstand a vertical load of two times the maximum body mass specified in the user's manual or $\geq 2\,000$ N, whichever is greater.

After the test, the seat handlebars shall not be broken and shall still function as intended by the manufacturer.

Test in accordance with [6.10.3](#).

5.10.4 Seat backrest

The seat backrest shall withstand a static load of:

- the maximum user's body mass as specified in the user's manual or $\geq 1\,000$ N, whichever is greater, for class H;
- 1,5 times the maximum user's body mass as specified in the user's manual or $\geq 1\,500$ N, whichever is greater, for classes S and I.

After the test, the seat and seat adjustments shall not be broken and shall still function as intended by the manufacturer.

Test in accordance with [6.10.3](#).

5.11 Additional instructions for use

In addition to ISO 20957-1, the instructions for use shall be supplied with each stepper, stairclimber and climber and shall include at least information on how to step on and step off the stairclimbers.

6 Test methods

6.1 General

6.1.1 Dimensional check

The measurement shall be done with appropriate measurement devices.

6.1.2 Visual examination

The visual examination shall be done under proper lighting.

6.1.3 Tactile examination

The tactile examination shall be done without gloves.

6.1.4 Performance test

The tested mechanism shall be actuated as intended by the manufacturer.

6.2 Testing of temperature of accessible surfaces

Apparatus: contact thermometer with an accuracy of ± 1 °C.

The test of the temperature of accessible surfaces shall be conducted with a (100 ± 5) kg test subject or a force-controlled test device.

The step height, when measured at the centre of the footplatform, shall be (180 ± 5) mm. If the maximum possible step height of the training equipment is <175 mm, the maximum possible step height of the training equipment shall be used.

For speed-independent training equipment, the training equipment shall be operated at (40 ± 4) cycles/min at the maximum resistance. If (40 ± 4) cycles/min cannot be maintained at the maximum resistance, the resistance may be reduced until (40 ± 4) cycles/min can be maintained without a pause between step cycles.

For speed-dependent training equipment, the training equipment shall be operated at a speed that produces a mechanical power of (180 ± 18) W for the user's body mass of the test subject.

NOTE The following formula can be used for the calculation: $P = F \cdot S$

where

P is the power, in watt;

F is the resistance force, in newton;

S is the speed, in metre per second.

A test consists of continuous operation of the machine for 20 min at the defined speed and resistance levels.

Monitor the temperature and note if it is >65 °C.

6.3 Testing of intrinsic loading

6.3.1 General

The base frame of training equipment shall not be fixed to the floor during the test unless required in the instructions for use.

6.3.2 Stepper or climber with independent action

Block the training equipment in a way that the resistance mechanism and the structure of the footplatform are loaded in the most onerous position.

Apply 50 % of the required test load F vertically over a surface area of 90 mm × 90 mm in the most onerous position for 5 min to each footplatform simultaneously.

6.3.3 Stepper or climber with dependent action

Set the footplatforms in their mid-range position.

Apply 50 % of the required test load F vertically over a surface area of 90 mm × 90 mm in the most onerous position for 5 min to each footplatform simultaneously.

6.3.4 Stairclimber

Lock the resistance mechanism so that the staircase is stationary.

Apply the required test load F vertically over a surface area of 90 mm × 90 mm without shock for 5 min to a stair in the most onerous position.

6.4 Testing of handrails/handlebars

Apply the test force by means of a belt with a width of (80 ± 5) mm for a period of 5 min for both tests.

6.5 Testing of friction

Apparatus:

- test device to produce pulling force;
- cylindrical friction piece with rubber disc according to ISO 4649:2010, B.2, and a mass of (10 ± 1) kg (see [Figure 5](#)).

Place the dust-free footplatform surface to be tested in a horizontal position.

Roughen the friction surface of the friction piece over a strip of abrasive paper of grain size 60 to 63.

Pull the friction piece over a length of ≤ 150 mm at a constant speed of (150 ± 10) mm/min over the horizontal surface of the footplatform. The friction factor is calculated with [Formula \(1\)](#):

$$k = \frac{F_p}{F_n} \quad (1)$$

where

k is the friction factor;

F_p is the recorder pulling force, in newton;

F_n is the nominal force, in newton.

NOTE The measured force is related to the resistance of slipping.

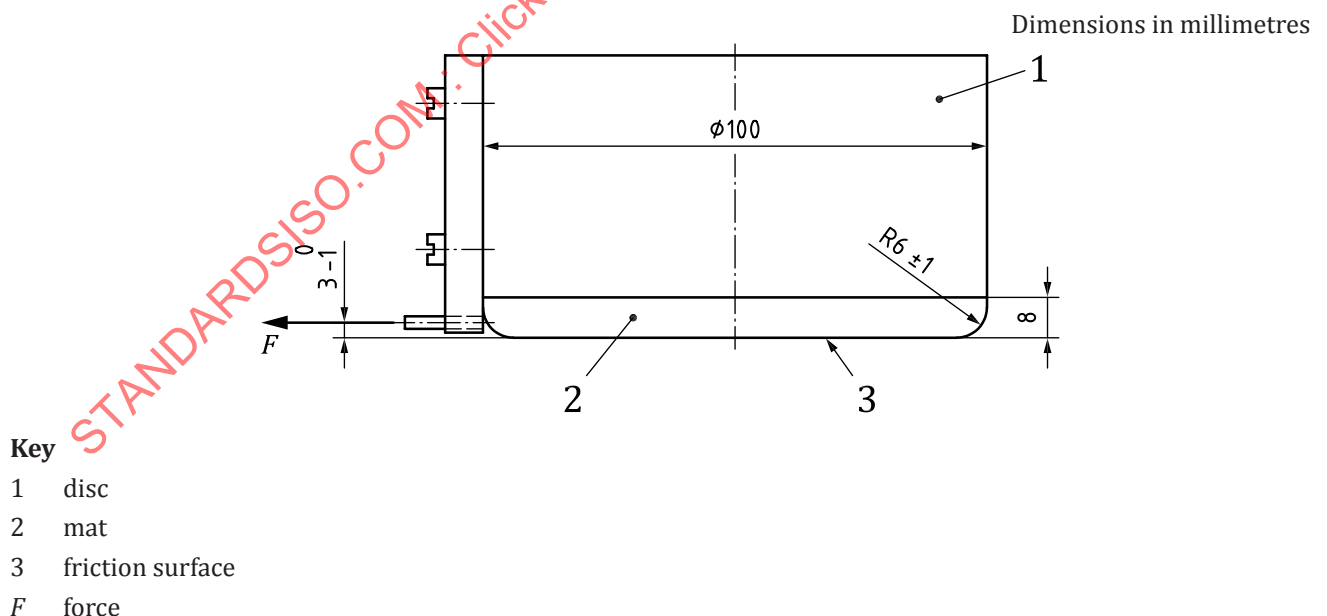


Figure 5 — Friction piece

6.6 Endurance testing

6.6.1 General

Endurance tests should be conducted with a test device applying a load equal to the maximum user's body mass as specified in the user's manual. If a maximum user's body mass is not specified in the user's manual, a load of $(1\,000 \pm 50)$ N shall be used.

Perform the endurance test for class H as follows:

- a) operate the training equipment for 20 min and rest for 15 min;
- b) continue pattern until number of 12 000 cycles is reached.

Perform the endurance test for class S as follows:

- a) operate the training equipment for 10 h continuously and rest until the training equipment cools down to room temperature;
- b) continue pattern until number of 100 000 cycles is reached.

6.6.2 Endurance testing for stairclimbers

Set the stairclimber to (40 ± 4) cycles/min and carry out the test in accordance with [6.6.1](#).

6.6.3 Endurance testing for steppers

For speed-independent steppers, adjust the resistance such that the test device can perform the test at (40 ± 4) cycles/min with a step height, when measured at the centre of the footplatform, of (180 ± 5) mm. If the maximum possible step height of the training equipment is <175 mm, the maximum possible step height shall be used. If the (40 ± 4) cycles/min cannot be achieved, the device shall be tested as a speed-dependent stepper.

For speed-dependent steppers, perform the test with a step height, when measured at the centre of the footplatform, of (180 ± 5) mm. If the maximum possible step height of the training equipment is <175 mm, the maximum possible step height shall be used. The test shall be conducted at a step speed which produces an average mechanical power of (180 ± 18) W.

NOTE The following formula can be used for the power calculation:
$$P = \frac{F \cdot S \cdot h}{60\,000}$$

where

- P is the power, in watts;
- F is the resistance force, in newton;
- S is the speed, in steps per minute;
- h is the step height, in millimetres;
- 60 000 is a conversion factor for units (min/s · mm/m).

6.7 Testing of the additional requirements for class A

Compare the mechanical power input to the power display.

Determine the mechanical power input by calculating the input force over distance (range of movement) and time.

Initially, operate the training equipment for ≥ 2 h (at the maximum power for adjustable training equipment) at 40 cycles/min.

Cool down the training equipment to room temperature.

Operate the training equipment for a 10 min test period in each of the following settings:

- a) $(50 \pm 2,5)$ W at 30 cycles/min;
- b) (100 ± 5) W at 30 cycles/min;
- c) $(150 \pm 7,5)$ W at 40 cycles/min;
- d) (200 ± 10) W at 40 cycles/min;
- e) a non-tested free chosen value in the range of 50 W to 200 W at a speed range of 30 cycles/min to 40 cycles/min.

The power input shall be an average of the 10 min test period. For each setting tested, the display power shall not deviate from the average input power by more than ± 5 W for input power ≤ 50 W or within ± 10 % for input power > 50 W.

The test apparatus for measuring force, distance, and time shall be accurate to ± 1 % for each of the three variables.

6.8 Testing of stepping on and stepping off

Set up the training equipment for stepping on and stepping off as specified in the user's manual.

Apply the required test load vertically over a surface area of 90 mm $\times$ 90 mm for 5 min to a stair in the most onerous position.

6.9 Testing of stopping system and clearance between moving stairs and floor or structure

Approach all squeeze and shear points under the moving stairs from all directions with the test foot probe (see [Figure 6](#)).

Approach with the test foot probe in all orientations between the moving stairs and floor or structure to determine whether the stairs stop as required.