INTERNATIONAL STANDARD

ISO 20957-9

Second edition
2016-10-15

Stationary training equipment —

Part 9: Elliptical trainers, additional specific safety requirements and test methods

Équipement d'entraînement fixe —

Partie 9: Appareils d'entraînement elliptiques, exigences spécifiques de sécurité et méthodes d'essai supplémentaires

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

Reference number
ISO 20957-9:2016(E)

© ISO 2016

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

COPYRIGHT PROTECTED DOCUMENT

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

© ISO 2016 – All rights reserved

Contents

Page

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

© ISO 2016 – All rights reserved

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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 83, *Sports and other recreational facilities and equipment*.

ISO 20957-9 was prepared by Technical Committee ISO/TC 83, *Sports and other recreational facilities and equipment* and by Technical Committee CEN/TC 136, *Sports, playground and other recreational facilities and equipment* in collaboration.

This second edition cancels and replaces the first edition (ISO 20957-9:2005), which has been technically revised. The main changes are as follows:

a) publication as an EN ISO;

b) formulation aligned with ISO 20957-1;

c) Clause 5 specified and restructured;

d) Clause 6 specified and restructured;

e) Normative references updated.

ISO 20957 consists of the following parts, under the general title, *Stationary training equipment*:

— *Part 1: General safety requirements and test methods*

— *Part 2: Strength training equipment, additional specific safety requirements and test methods*

— *Part 4: Strength training benches, additional specific safety requirements and test methods*

— *Part 5: Pedal crank training equipment, additional specific safety requirements and test methods*

— *Part 6 Treadmills, additional specific safety requirements and test methods*

— *Part 7: Rowing machines, additional specific safety requirements and test methods*

— *Part 8: Steppers, stairclimbers and climbers — Additional specific safety requirements and test methods*

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

 © ISO 2016 – All rights reserved

— *Part 9: Elliptical trainers, additional specific safety requirements and test methods*

— *Part 10: Exercise bicycles with a fixed wheel or without freewheel, additional specific safety requirements and test methods*

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

© ISO 2016 – All rights reserved

Introduction

This part of ISO 20957 contains additional requirements to ISO 20957-1. The requirements of this specific International Standard take precedence over those in the general standard.

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

© ISO 2016 – All rights reserved

Stationary training equipment —

Part 9:
Elliptical trainers, additional specific safety requirements and test methods

1 Scope

This part of ISO 20957 specifies additional safety requirements for elliptical trainers in addition to the general safety requirements of ISO 20957-1.

This part of ISO 20957 specifies safety requirements for cardiovascular equipment with a closed pattern motion and/or a reciprocating motion, where the user's feet are designed to be in contact with the footplatform, but not including steppers, performed from either a standing or seated position.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 20957-1:2013, *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.

3.1
elliptical trainer
stationary training equipment which can produce a continuous closed pattern motion and/or a reciprocating motion similar to an elliptical type of foot action used from a seated or standing position and can include upper body training devices

3.2
footplatform
surface designed to support the foot whilst performing the exercise determined by the manufacturer or for user mounting and dismounting

3.3
footplatform guard
part of the structure designed to help prevent the foot from moving off the footplatform to the inside or front

3.4
movable handlebar
handlebar that is linked to the pedals and moves during the exercise

EXAMPLE Levers used for upper body training.

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

© ISO 2016 – All rights reserved

3.5
seat system
seat, seat back rest, adjustment and mounting components

3.6
footplatform guard
part of the structure designed to help prevent the foot from moving off the footplatform to the inside or front

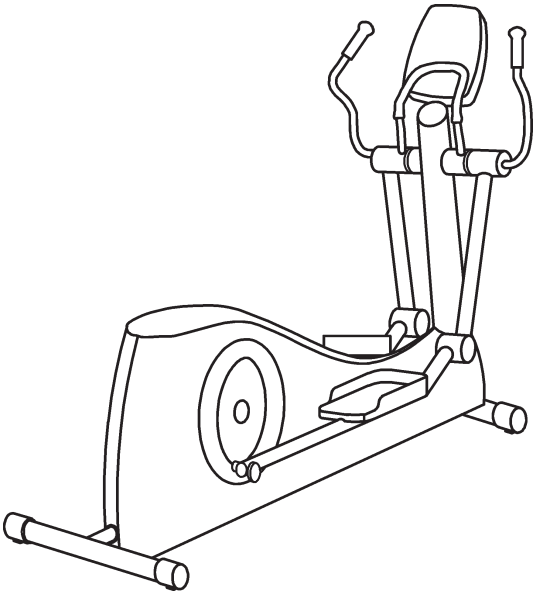
3.7
footplatform guard
part of the structure designed to help prevent the foot from moving off the footplatform to the inside or front

4 Classification

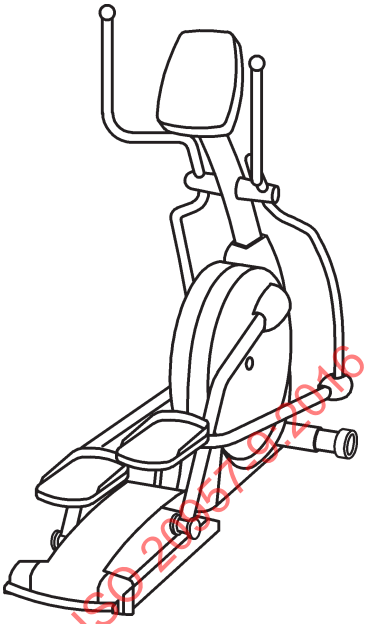
The classification as defined in ISO 20957-1:2013, Clause 4, applies. Examples for different types of elliptical trainers are given in Figure 1.

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

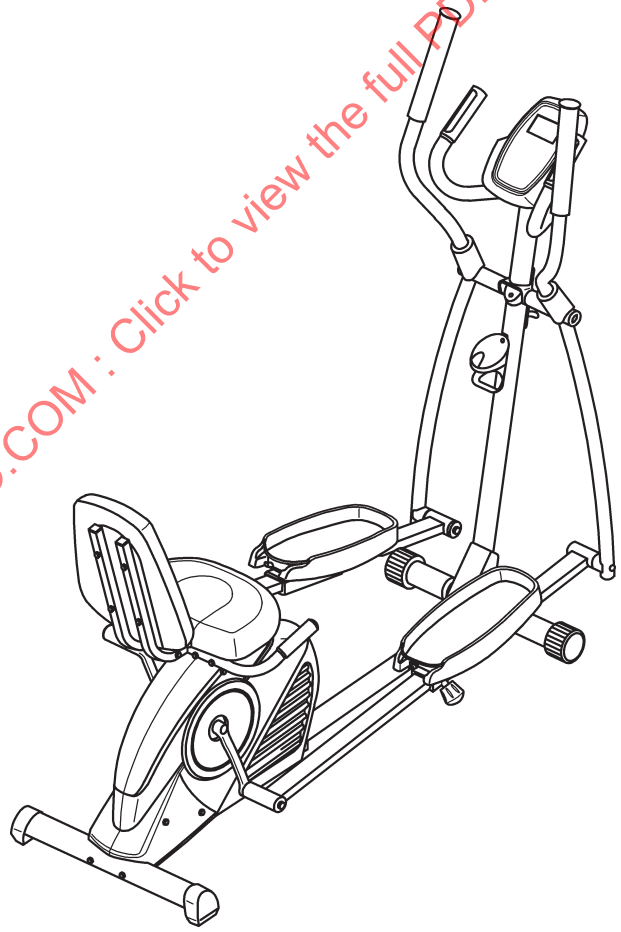
© ISO 2016 – All rights reserved



a) Rear drive elliptical trainer



b) Front drive elliptical trainer



c) Seated elliptical trainer

Figure 1 — Examples of elliptical trainers

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

© ISO 2016 – All rights reserved

5 Safety requirements

5.1 General

Depending on the design of the piece of equipment, the following additional requirements to ISO 20957-1 shall apply as appropriate.

5.2 Squeeze and shear points of external construction within the accessible area

Accessible parts of the elliptical trainer shall be free of squeeze and shear points.

Test in accordance with 6.2.

5.3 Temperature rise of external construction

Accessible parts of the elliptical trainer shall not have a temperature ≥65 °C.

Test in accordance with 6.3.

5.4 Handlebars

5.4.1 Movable handlebars

The movable handlebars shall show no permanent deformation of >3 %.

Test in accordance with 6.5.1.

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 any third party. The design may include, but is not limited to

a) the tip of the handlebar having a cross-section ≥50 mm and an edge radius ≥5 mm, or

b) the handlebar being bent into an inverted U-shape of at least 180°, so as to reduce risk of contact between the facial area and the tip of the handlebar.

Test in accordance with 6.1.1 and 6.1.2.

5.4.2 Non-movable handlebars

The non-movable handlebars shall show no permanent deformation of >3 % of the distance from the floor to the tip of the handlebar.

Test in accordance with 6.5.2.

5.4.3 Seat handlebars

The seat handlebars shall be tested with a vertical load equal to 2 times the maximum user's body mass specified in the user's manual or ≥2 000 N, whichever is greater, applied on each seat handlebar of the equipment one at a time and in the most onerous position.

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

All accessible edges shall be rounded with a radius of ≥2,5 mm.

Test in accordance with 6.5.3.

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

 © ISO 2016 – All rights reserved

5.5 Footplatforms

5.5.1 Non-slip surface

The footplatforms shall have a non-slip surface of ≥90 % of the total usable surface with a length of ≥300 mm and a width of ≥100 mm. The non-slip surface is defined as any surface with a coefficient of friction of >0,5.

Test in accordance with 6.11.

5.5.2 Guard

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

Seated elliptical trainers shall have an additional guard or heel restraint across ≥90 % of the rear of the footplatform where the movement of the footplatform exceeds an angle of 45° from the horizontal at any time during the movement.

Test in accordance with 6.1.1 and 6.1.3.

5.6 Stability

The training equipment shall not fall over.

Test in accordance with 6.6.

5.7 Endurance

The training equipment shall withstand

— 12 000 cycles for class H, and

— 100 000 cycles for class S.

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

Test in accordance with 6.7.

5.8 Seat system

The seat system shall withstand to a static force of the following:

— the maximum user's body mass ±5 % specified in the user's manual or ≥1 000 N, whichever is greater for class H;

— 1,5 times the maximum user's body mass ±5 % specified in the user's manual or ≥1 500 N, whichever is greater for classes S and I.

After releasing the force, the seat system shall not be broken and shall still function as intended by the manufacturer.

Test in accordance with 6.8.

5.9 Additional requirements for class A

The deviation of the measured mechanical power compared to the power indicated by the display shall not exceed ±5 W up to 50 W and ±10 % over 50 W.

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

© ISO 2016 – All rights reserved

Test in accordance with 6.9.

5.10 Additional requirements for class B

The power shall not be given in watts.

Class B equipment shall provide a consistently reproducible adjustment of the effort level within a range of ±25 %.

Test in accordance with 6.10.

5.11 Additional requirements for class C

The power shall not be given in watts.

Test in accordance with 6.1.2.

5.12 Additional instructions for use

In addition to ISO 20957-1:2013, 5.17, the following information shall be provided in the user's manual:

a) information that the elliptical trainer is not equipped with a free wheel and therefore the moving parts cannot be stopped immediately;

b) for class A, a warning, explaining that the individual human power which is required to carry out an exercise can be different than the mechanical power displayed;

c) information on how to mount and dismount the equipment safely (e. g. footplatform in the lowest position).

5.13 Additional warnings

For classes B and C, a warning shall be placed on the equipment indicating that it is not suitable for high accuracy purposes: "WARNING — This stationary training equipment is not suitable for high accuracy purposes."

If a heart rate system exists, for classes S and I, a warning with the following content shall be placed: "WARNING — Heart rate monitoring systems may be inaccurate. If you feel faint stop exercising immediately."

The heart rate warning shall be placed in a conspicuous position on the display console. All other warnings shall be placed in a conspicuous position.

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 Performance test

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

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

 © ISO 2016 – All rights reserved

6.2 Testing of squeeze and shear points

Apparatus:

— test finger probe B in accordance with EN 71-1 for class H;

— test finger probe in accordance with ISO 20957-1:2013, 6.8, for class S;

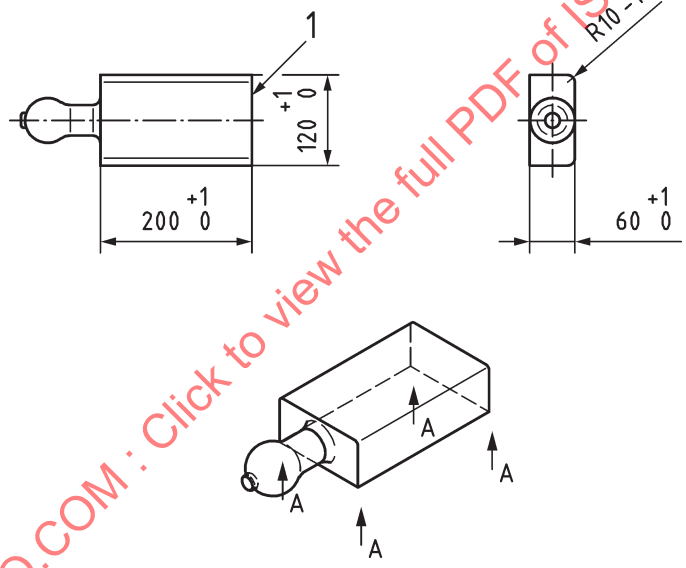
— test foot probe in accordance with Figure 2.

Approach all moving parts from all sides with the test finger probes to determine whether the fingers can become trapped.

The test foot probe in accordance with Figure 2 shall be placed below a height of 60 mm measured from the floor in such a way that at least 3 points A rest upon the floor and/or upon the equipment. In this position, the test foot probe shall not be trapped by moving parts.

Determine whether the test finger probe and/or the test foot probes are trapped.

Dimensions in millimetres



Key

1 front

A points to rest upon for measuring the minimum clearance of 60 mm

Figure 2 — Test foot probe

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

6.3 Testing of temperature rise

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

Test room temperature: between 18 °C and 25 °C.

Carry out these tests using (100 ± 5) kg test subjects.

Operate the elliptical trainer at (60 ± 6) min^{-1} for 20 min.

The resistance shall be set at the maximum resistance or reduced until 60 min^{-1} can be maintained without a pause between cycles.

Note whether the temperature of accessible parts of the elliptical trainer has exceeded 65 °C.

© ISO 2016 – All rights reserved

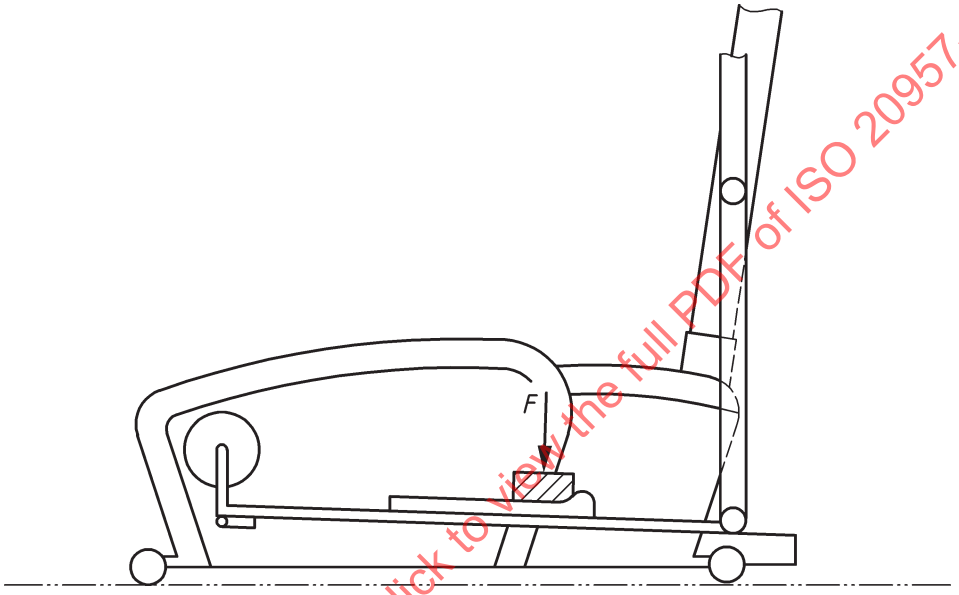
For speed-dependent elliptical trainers, carry out the test using a load of 100^{+1}_{0} kg and a pedalling speed producing a mechanical power of (180 ± 18) W.

See also ISO 13732-1.

6.4 Testing of intrinsic loading

The required test load, *F*, according to ISO 20957-1:2013, 5.14.1, shall be applied without shock for 5 min in the lowest position to one footplatform. The load should be applied over a surface area of $\left(90^{\ 0}_{-1}\right)$ mm × $\left(90^{\ 0}_{-1}\right)$ mm in the most onerous position (see Figure 3).

Repeat for the other footplatform.



Key

F force

Figure 3 — Test of intrinsic loading

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

6.5 Testing of handlebars

6.5.1 Movable handlebars

For each movable handlebar, load the footplatform with a nominal load on the same side as the movable handlebar being tested. Apply a test force of the maximum user's body mass or 1 000 N, whichever is greater, in a dynamic direction using a (80 ± 5) mm wide belt in the most onerous position for a period of 5 min.

Then test the moveable handlebar at 90° to the dynamic direction. Apply a test force of 20 % of the maximum user's body mass or 200 N, whichever is greater, in the most onerous position for a period of 5 min.

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

 © ISO 2016 – All rights reserved

6.5.2 Non-movable handlebars

For each non-movable handlebar, apply a test force of 1 000 N vertically using a (80 ± 5) mm wide belt in the most onerous position of each handlebar for a period of 5 min.

Then apply a force of 500 N using a (80 ± 5) mm wide belt in the same position as in the vertical test but in the horizontal direction of each handlebar for a period of 5 min.

6.5.3 Seat handlebars

For seat handlebars, load the handlebars with a (80 ± 5) mm wide belt. Apply a pre-load of 5 % of the test load as described in 5.4.3 simultaneously to each handle in the downward direction for 1 min and measure the position (distance from the floor) of the handlebar. Then apply 50 % of the test load as described in 5.4.3 simultaneously to each handle in the downward direction for (3 ± 1) min. After the release of the test load, measure the deformation whilst under pre-load.

6.6 Testing of stability

Carry out the test according to ISO 20957-1:2013, 6.2, while operating the equipment at (60 ± 6) min^{-1} for 1 min.

6.7 Endurance testing

6.7.1 Speed-independent elliptical trainers

For speed-independent elliptical trainers, carry out the following test in the most onerous position:

a) set the equipment at 80 % of the maximum resistance;

b) load each pedal of the equipment with a mass of 50 % of the maximum user's body mass or 50 kg, whichever is greater, in the dynamic direction;

c) load moving handlebars with a mass of 10 % of the maximum user's body mass or 10 kg, whichever is greater;

d) carry out the exercise at (60 ± 6) min^{-1}.

6.7.2 Speed-dependent elliptical trainers

For speed-dependent elliptical trainers, carry out the following test in the most onerous position:

a) load each pedal of the equipment with a mass of 50 % of the maximum user's body mass or 50 kg, whichever is greater;

b) load moving handlebars with a mass of 10 % of the maximum user's body mass or 10 kg, whichever is greater, in the dynamic direction;

c) carry out the exercise at (60 ± 6) min^{-1}.

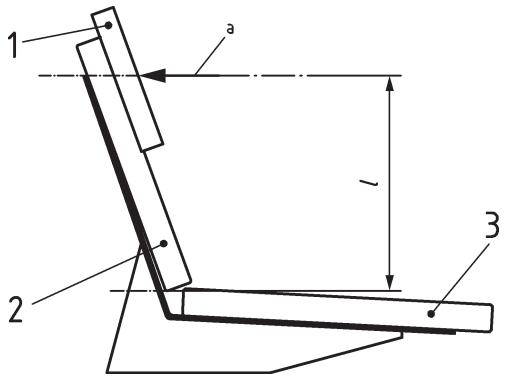
6.8 Testing of seat system

Fix the machine to prevent tilting and/or slipping.

Apply, using a (300 ± 5) mm × (300 ± 5) mm plate, a pre-load of 10 % of the test load described in 5.8, horizontally, at l = (500 ± 25) mm from the upper seat level or 50 mm below the upper end of the backrest if smaller (see Figure 4). Set the vertical of the centre of the plate to zero. Then apply the test load for 3 min. Release the load down to the pre-load level.

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

© ISO 2016 – All rights reserved



Key

1 plate
2 back rest
3 seat
l force application height/permanent deformation reference distance
a Force applied horizontally.

Figure 4 — Testing of seat system

6.9 Testing of additional requirements for class A

6.9.1 General

The test apparatus shall have an accuracy of ±1 %. The mechanical power can be measured directly at the pivot point.

6.9.2 Speed-independent elliptical trainers

Carry out the test as follows:

a) pedal the training equipment for 1 h at the maximum power (resistance) at a speed of (60 ± 1) min^{-1};

b) cool down the training equipment to room temperature;

c) adjust the training equipment to (25 ± 2,5) W at (40 ± 1) min^{-1};

d) compare the power of the test apparatus with the power read out on the equipment display;

e) pedal for 15 min, after 15 min measure the power and compare again to the reading on the display without stopping the equipment;

f) cool down the training equipment to room temperature.

Then carry out the above procedure with the following values:

— (50 ± 2,5) W at (50 ± 1) min^{-1};

— (100 ± 5) W at (50 ± 1) min^{-1};

— (150 ± 7,5) W at (60 ± 1) min^{-1};

— (200 ± 10) W at (60 ± 1) min^{-1};

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

 © ISO 2016 – All rights reserved

— non-tested free chosen value in the range of 25 W and 200 W at the speed between 40 min^{-1} and 80 min^{-1}.

6.9.3 Speed-dependent elliptical trainers

Carry out the test as follows:

a) pedal the training equipment at a speed of (70 ± 1) min^{-1} for 1 h;

b) cool down the training equipment to room temperature;

c) pedal the training equipment at a speed of (40 ± 1) min^{-1};

d) compare the power of the test apparatus with the power read out on the equipment display;

e) pedal for 15 min, after 15 min measure the power and compare again to the reading on the display without stopping the equipment;

f) cool down the training equipment to room temperature.

Carry out the above procedure for the following values:

— (50 ± 1) min^{-1};

— (60 ± 1) min^{-1};

— (70 ± 1) min^{-1};

— non-tested free chosen value in the range of 40 min^{-1} and 70 min^{-1}.

6.10 Testing of power repeatability for class B

The test apparatus shall have an accuracy of ±1 %. The mechanical power can be measured directly at the pivot point.

Carry out the test as follows:

a) pedal the training equipment for 1 h at (100 ± 5) W at (60 ± 1) min^{-1}, after conditioning cool down the training equipment to room temperature;

b) set the load adjustment system of the training equipment to a middle value of the adjustment range of resistance, when pedalled at (60 ± 1) min^{-1};

c) measure the power within 30 s;

d) set the load adjustment system of the training equipment to the highest value of the adjustment range of resistance, when pedalled at (70 ± 1) min^{-1};

e) pedal the training equipment for 15 min;

f) return to the same measurement setting, as in b);

g) measure again the power within 30 s.

Compare the values measured in c) and g). The value in g) shall not vary by more than ±25 % of the value in c).

Determine whether the deviation between the values measured in c) and g) is within the tolerance according to 5.10.

STANDARDSISO.COM : Click to view the full PDF of ISO 20957-9:2016

© ISO 2016 – All rights reserved