
**Footwear — Determination of
coefficient of friction for footwear and
sole components — Test method**

*Chaussures — Détermination du coefficient de frottement pour les
chaussures et éléments de semelle — Méthode d'essai*

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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 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 216, *Footwear*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 309, *Footwear*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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.

Footwear — Determination of coefficient of friction for footwear and sole components — Test method

1 Scope

This document provides a method for determining the coefficient of friction between footwear and floorings under conditions simulating those experienced in the phases of a typical walking step when slip is most likely to occur.

The method is applicable to all types of footwear and footwear components, outsole units, heel top pieces (top lifts) and sheet soling materials, excepting PPE footwear (Personal Protective Equipment) and special purpose footwear containing spikes, metal studs or similar.

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 13287:2019, *Personal protective equipment — Footwear — Test method for slip resistance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13287:2019 apply.

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 Principle

The footwear item and underfoot surface are brought into contact, subjected to a specified vertical force for a short period of static contact then moved horizontally relative to one another at a constant speed. The horizontal frictional force is measured at a given time after movement starts and the dynamic coefficient of friction is calculated for the particular conditions of the test.

5 Apparatus and materials

Use apparatus and materials in ISO 13287:2019, Clause 4.

NOTE Regarding standard shoemaking last in ISO 13287:2019, 4.1.1, other lasts with the same dimensions of STM603L^{TM1} lasts can also be used.

Additional materials/accessories to test samples according to [8.1](#) to [8.6](#):

5.1 Cellulosic insole material of around 2 mm in thickness for testing soles which are going to be used in the footwear with an insole (for testing according to [8.2](#) to [8.6](#)).

1) STM603LTM is the trade name of a product supplied by SATRA (<https://www.satra.com/>). This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

5.2 Means to secure the soles to the last, as mechanical means, double sided adhesive tape, seal, adhesives, bands, etc. (for testing according to 8.2 to 8.6).

5.3 Saw and/or sanding machine, for sample preparation (for testing according to 8.3 and 8.4).

5.4 Mechanical systems to attach to the equipment spigot small-sized top-pieces, bigger top pieces, Slider 96^{TM2}) test piece or other testing samples to the testing machine, that can be used to replace the shoemaking lasts or mechanical foots (for testing according to 8.5).

5.5 High-hardness rubber material of at least 50 mm × 50 mm (thickness of ≤2 mm), for small- sized top piece testing (for testing according to 8.5).

5.6 Metallic plate made of e. g. aluminium, of at least 180 mm × 80 mm and 2,5 mm thick, for sheet material testing (for testing according to 8.6).

6 Sampling and conditioning

6.1 Sampling

Two samples shall be tested, right foot and left foot whenever possible, with the exception of top pieces where 2 test pieces shall be tested and sheet material where 2 test pieces shall be tested per direction.

6.2 Conditioning

The test items shall be conditioned prior to the test at 23 °C ± 2 °C and 50 % ± 5 % HR (Relative Humidity) for a minimum of 24 h. If necessary, the sample may be removed from this standard atmosphere, provided that its temperature is maintained at 23 °C ± 2 °C, that testing starts within 30 min after removal from this standard atmosphere and that the testing is carried out at 23 °C ± 2 °C.

7 Preparation of sample and floor

All footwear test specimens shall be tested in the new condition so as to take account of the surface finish.

Use method described in ISO 13287:2019, Clause 7, for preparation of samples and floor prior to testing.

Worn footwear may be tested in the condition in which they are received.

It is possible to evaluate the friction after simulating real wear by ageing the footwear. In this case, the ageing method shall be reported with CoF (Coefficient of Friction) results of aged sample.

Prior to testing, condition test specimens according to 6.2.

8 Test method

8.1 Test modes and test conditions for footwear with low heel seat height

Test modes and conditions shall be those of ISO 13287:2019, excepting for children footwear, size below 34, in which a vertical force of 250 N instead of 400 N will be used

Common contaminant conditions for daily footwear may be the following:

- Detergent solution according to ISO 13287:2019, 4.12.

2) Slider 96TM is the trade name of a product supplied by Smithers Rapra (<https://www.smithers.com/home>). This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

- Glycerol solution according to ISO 13287:2019, 4.11.
- Water.
- Dry conditions (without contaminant).

8.2 Test modes and test conditions for unit soles

Attach a 2 mm thick sheet of cellulosic material to the outsole simulating an insole. In special cases as "bio" soles (anatomical shape), that do not have an insole, do the test without the cellulosic material.

Secure the mechanical foot firmly for the flat test mode, or secure the last for the heel or forepart test mode, using double sided adhesive tape or other mechanical means that do not affect the testing surface. The forepart area of the outsole shall always match the forefoot area of the last (see [Figure 1](#) for the particular case of testing soles in flat mode with artificial foot).

In the heel test mode, avoid separation between the waist area of the sole and the waist area of the last over sliding, since the heel might be dragged backwards and flattened. Should this occur, use laces, adhesive tape or any other mechanical method to fasten the outsole and last waist areas together.

Where the feather edge is not visible on the outsole and the position of the last upon the outsole (this information shall be provided by the test orderer) is unknown, place the last at 10 mm from the rear or front edge of the outsole, thus leaving the estimated space that the upper may fill.

When the outsole matches several sizes, place the size of the last that best suits the outsole length following the indications in the previous paragraph, and report the last size used.

Once the sample is ready, carry out the test according to the normal procedure described in [8.1](#), using the vertical force according to the sample size.

If soles are those used in high heeled footwear, flat and heel mode cannot be carried out.

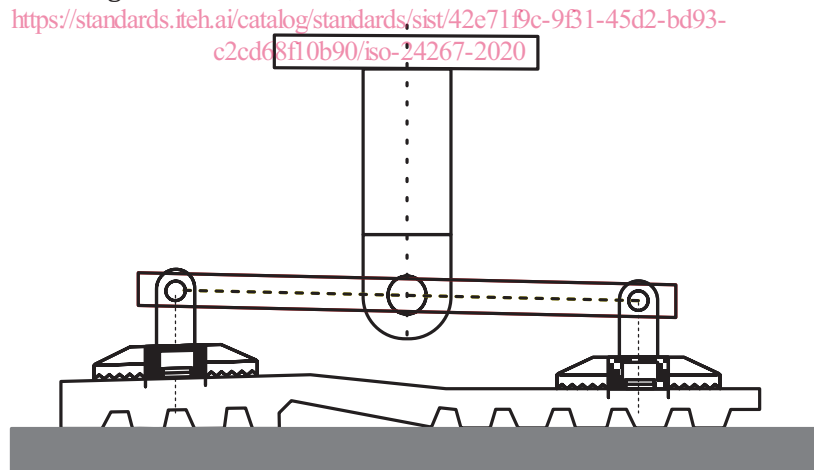


Figure 1 — Testing soles in flat mode with artificial foot

8.3 Footwear or soles with heel and forepart moulded in one piece with full contact with the floor in the waist area

See [Figure 2](#).

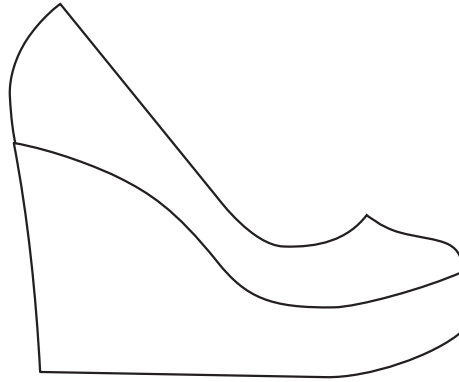


Figure 2 — Footwear or sole with full contact with the floor in the waist area

8.3.1 Samples with heel seat height lower than 80 mm

Carry out the test in flat mode as described in ISO 13287:2019 with the mechanical foot, provided that it can be fitted. In these cases, the verticality of the central axis of the mechanical foot is lost, to a greater or lesser extent, depending on the heel elevation of the footwear. See [Figures 3](#) and [5](#).

For the heel and forepart test modes, flatten the outsole by removing all of the heel elevation, by means of some machining method and proceed with the tests normally with the shoemaking last.

When the footwear features a removable top piece, it may be removed carefully so as not to cause any damage and tested individually according to the procedure described for the test on top pieces ([8.5](#)). In this case, the vertical force depends on the size of the shoe (higher or lower than 40).

If the samples are deformed during the test, carry out the test with the 2 mm thick sheet of cellulosic material attached to the outsole simulating the insole, in order to maximize the contact between the sole and the floor.

8.3.2 Samples with heel seat height higher than 80 mm

For the flat test mode, flatten the heel seat area of the outsole down to 80 mm, by means of some machining method and proceed with the test as described in ISO 13287:2019. To this end, when dealing with footwear, remove the upper to start with the process required. See [Figures 4](#) and [5](#).

For the heel and forepart test modes, flatten the outsole by removing all of the heel elevation, by means of some machining method and proceed with the tests normally with the shoemaking last.

When the footwear features a removable top piece, it may be removed carefully so as not to cause any damage and tested individually according to the procedure described for the test on top pieces ([8.5](#)). In this case, the vertical force depends on the size of the shoe (higher or lower than 40).

If the samples are deformed during the test, carry out the test with the 2 mm thick sheet of cellulosic material attached to the outsole simulating the insole, in order to maximize the contact between the sole and the floor.

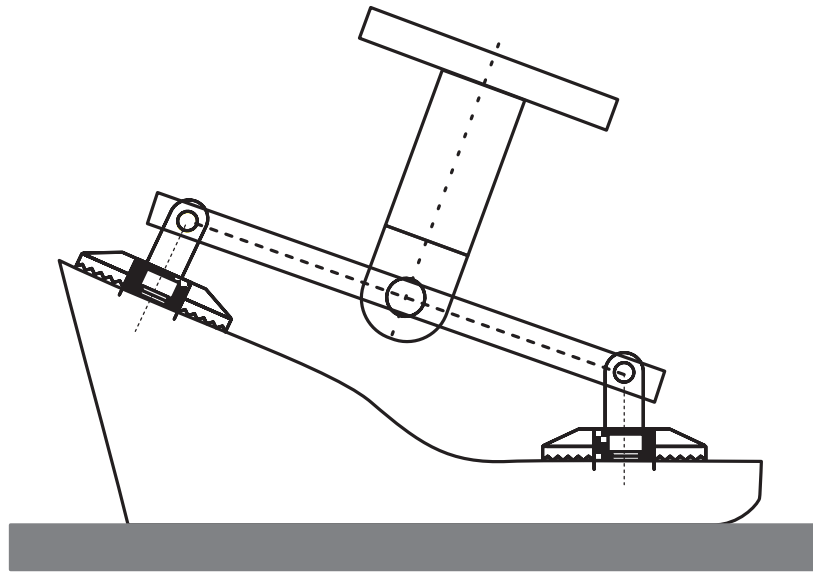


Figure 3 — Heel height lower than 80 mm

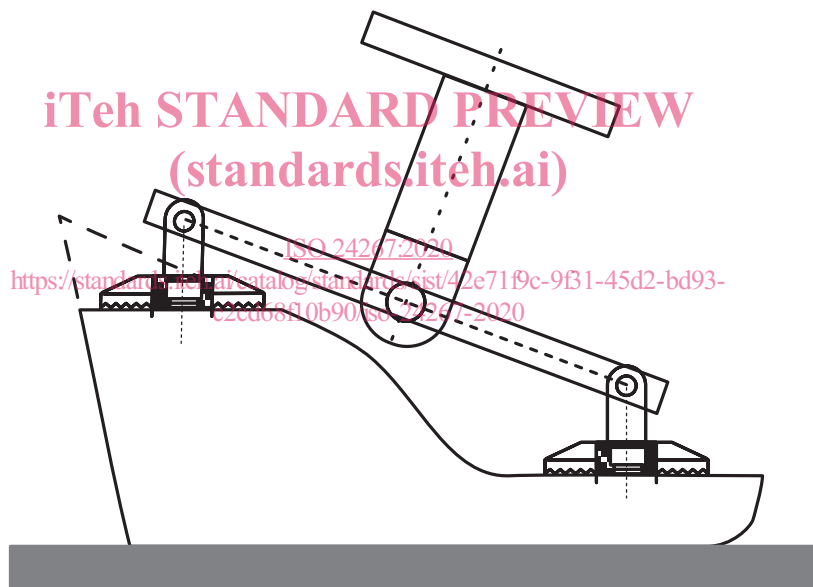


Figure 4 — Heel height higher than 80 mm