
**Road vehicles — H-point machine
(HPM-II) — Specifications and
procedure for H-point determination**

*Véhicules routiers — Machine point H (HPM-II) — Spécifications et
procédure pour la détermination du point H*

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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 22, *Road vehicles*, Subcommittee SC 39, *Ergonomics*.

This third edition cancels and replaces the second edition (ISO 20176:2011), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- minor editorial changes;
- removal of reference to the cancellation and replacement of ISO 6549:1999.

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.

Introduction

The tools and procedures for H-point determination given in this document are based on SAE J4002.

H-point devices are used during vehicle design and development to establish interior reference points and dimensions for occupant packaging, and to validate the location of these key reference points and dimensions on physical properties during audits.

H-point devices are also used for the design and validation of seats. However, in these instances, the reference points and dimensions are defined relative to the seat structure or surface, rather than the vehicle's interior. The procedures for positioning the H-point devices in seats do not require the use of the shoe tool or leg segments.

For convenience and simplicity, many terms associated with H-point devices use human body parts in their name. However, they should not be construed as measures that indicate occupant accommodation, human capabilities, or comfort. H-point devices do not represent the size or posture of any category of occupant.

Key differences from ISO 6549

Compared to the H-point machine (HPM) specified in ISO 6549, the HPM specified in this document provides improved repeatability, greater ease of use, as well as additional features and measurement capabilities. All efforts were made to achieve these improvements while minimizing their impact on the location of reference points and measurements. Several of the changes are discussed below.

1) **Separate components**

For this HPM, the legs (upper and lower), shoe, cushion pan and back pan are all separate pieces. This greatly improves the ease of installation.

2) **“Legless” manikin**

The H-point location is defined without having to attach the legs. This is a major advantage. The procedure specified in this document is based on installing the HPM without legs. Use of legs is optional.

3) **Shoe tool**

Several improvements were made to the shoe tool and how it is positioned in the vehicle, including:

- i) replacing the pedal reference point (PRP) with a new ball of foot reference point (BOFRP);
- ii) specifying a new procedure for positioning the shoe on the pedal.

4) **Cushion angle**

The cushion angle is now measured independently of thigh angle, and at the same time the other measurements are made. With the ISO 6549 HPM, cushion angle was measured from the thigh line, and required a separate installation of the HPM.

5) **Lumbar support**

The articulation of the back pan assembly allows the HPM specified in this document to be better seated in contoured seats. It also provides a measurement of lumbar support prominence (LSP). This measurement provides an indication of the amount the seat back is contoured to provide support for the lumbar spine. The contour of the back pan assembly is most similar to the ISO 6549 H-point machine when the HPM is in a neutral posture (LSP equals zero).

Changes from ISO 20176:2011

The procedures for auditing the seat are unchanged from the second edition.

In the second edition, the most significant change was that the ball of foot (BOF) of the shoe does not have to be on the pedal surface. The HPM shoe can contact the pedal at any point(s) on the bottom of the shoe. The term pedal reference point (PRP) was deleted (since the BOF may not be on the pedal) and replaced by a new term called the ball of foot reference point (BOFRP). The accelerator heel point (AHP) to BOF distance was changed from 200 mm to 203 mm to be consistent with ISO 6549, SAE J1100, and vehicle manufacturers around the world.

In addition, the following physical modifications were made to the HPM. The flat part of the shoe bottom was extended from 200 mm to 203 mm. A new scale was added to the top of the shoe to aid in determining the pedal contact point (PCP). A new H-point divot was added to allow coordinate measuring machine (CMM) point taking from above. The knee angle scale was recessed to improve its durability and reoriented to improve its readability. Several figures were revised to illustrate these changes.

Finally, the terms pedal plane and pedal plane angle (PPA) were replaced by shoe plane and shoe plane angle (SPA). These new terms more accurately convey the meaning. SPA is a side view angle that is provided by the vehicle manufacturer.

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