

ISO 20176:2020 (E)

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

Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms and definitions
4	Measurement procedure for the three-dimensional H-point machine
4.1	General
4.2	Summary of installation procedure
4.2.1	Summary
4.2.2	Measured versus design values
4.3	Prepare vehicle and seat
4.3.1	Vehicle
4.3.2	Seat
4.4	Determine the H-point travel path (optional)
4.5	Adjust seat to design intent
4.5.1	Move seat to design intent position
4.5.2	Torso angle and cushion angle
4.5.2.1	General
4.5.2.2	Standard audit: include seat and vehicle build variability
4.5.2.3	Optional audit: exclude seat build variability
4.5.3	Seat in front of test seat
4.6	Install HPM cushion and back pan assembly
4.6.1	Install the cushion pan
4.6.2	Install the back pan
4.6.3	Level the HPM
4.7	Load the HPM
4.7.1	Procedure
4.7.2	Summary table
4.7.3	Load the cushion pan
4.7.4	Load the back pan
4.8	Soak time
4.9	Record measurements — digitize HPM points
4.9.1	General
4.9.2	H-point
4.9.3	Torso angle and cushion angle
4.9.4	Lumbar support prominence
4.9.5	Summary of driver measurements
5	Optional measurements for driver seat
5.1	Leg and shoe installations
5.1.1	General
5.1.2	Mark accelerator pedal centreline
5.1.3	Install the shoe fixture
5.1.4	Install the shoe tool
5.1.4.1	Procedure
5.1.4.2	Interference
5.1.5	Install leg segments
5.2	Record measurements

- 5.2.1 General
 - 5.2.2 Shoe plane angle
 - 5.2.3 Ball of foot reference point
 - 5.2.4 Accelerator heel point
 - 5.2.5 Accelerator heel point to ball of foot reference point lateral offset
 - 5.2.6 Knee angle and ankle angle
 - 5.2.7 Thigh angle and hip angle
- 6 Optional measurements for the 2nd or succeeding row passenger seats**
- 6.1 Leg and shoe installation
 - 6.1.1 General
 - 6.1.2 Install the shoe tool
 - 6.1.3 Install leg segments
 - 6.1.3.1 General
 - 6.1.3.2 Reposition the shoe tool (if necessary)
 - 6.1.3.2.1 Conditional checks
 - 6.1.3.2.2 Interference
 - 6.1.3.2.3 Long-coupled seating
 - 6.1.3.3 Short-coupled seating
 - 6.2 Record measurements for rear passengers
 - 6.2.1 Summary of measurements
 - 6.2.2 Floor reference point
 - 6.2.3 Floor plane angle
 - 6.2.4 Knee clearance and legroom
- 7 Additional optional measurements**
- 7.1 Effective headroom
 - 7.1.1 When to install headroom fixture
 - 7.1.2 Install the headroom fixture
 - 7.1.3 Measure effective headroom
- 8 Remove the HPM**

Annex A (normative) Description of the three-dimensional H-point machine (HPM)

- A.1 Major components
 - A.1.1 General
 - A.1.2 Back pan assembly
 - A.1.3 Cushion pan
 - A.1.4 Lower leg segment
 - A.1.5 Thigh segment
 - A.1.5.1 Elements
 - A.1.5.2 Length of thigh and lower leg segments
 - A.1.6 Shoe tool and shoe fixture
 - A.1.7 Spring-loaded probe
 - A.1.7.1 Force
 - A.1.7.2 Load application sites
 - A.1.8 Inclinator (electronic level)
 - A.1.8.1 General
 - A.1.8.2 Inclinator lands
 - A.1.9 Weights
 - A.1.10 Headroom fixture
- A.2 Reference points and angles
 - A.2.1 Pivot locations
 - A.2.2 Support points
 - A.2.3 Divot points
 - A.2.4 Key reference points and lines
 - A.2.5 Posture angles and LSP

Annex B (informative) HPM specification and tolerances

- B.1 Tolerances
- B.2 Reference posture for specifications
- B.3 Shoe tool dimensions
- B.4 Lengths
- B.5 Widths

- B.6 Heights
- B.7 Radii
- B.8 Weight, HPM only
- B.9 Support points
- B.10 Divot point locations
- B.11 Muslin cloth
- B.12 Check that HPM is within tolerance specifications

Annex C (informative) HPM field checking procedures

- C.1 Purpose
- C.2 Equipment required for checking
 - C.2.1 User-provided equipment
 - C.2.2 Checking fixtures
 - C.2.2.1 Availability and tolerances
 - C.2.2.2 Cushion pan shims
 - C.2.2.3 LSP shims
 - C.2.2.4 Back pan shim
 - C.2.2.5 Back pan checking shims
 - C.2.2.6 H-point bushings
 - C.2.2.7 Thigh rod fixture
 - C.2.2.8 Knee pivot rod fixtures
 - C.2.2.9 Knee pivot slot fixture
 - C.2.3 Measurement equipment
 - C.2.3.1 CMM
 - C.2.3.2 Electronic level (HPM inclinometer)
- C.3 HPM measurement locations
- C.4 Summary of measurements and tolerances
- C.5 Checking procedures
 - C.5.1 Surface
 - C.5.2 Cushion pan
 - C.5.2.1 Setup
 - C.5.2.2.1 Method 1: Use the cushion angle inclinometer land
 - C.5.2.2.2 Method 2: Use divot points to define the cushion line
 - C.5.2.2.3 Check cushion angle difference
 - C.5.2.3 Check H-point height from level surface
 - C.5.2.4 Check C1 divot
 - C.5.2.5 Check H-point to back of cushion pan
 - C.5.2.6 Check cushion pan alignment
 - C.5.3 LSP scale checks at -15, +25, and 0
 - C.5.3.1 Setup
 - C.5.3.2 Check LSP -15
 - C.5.3.3 Check LSP +25
 - C.5.3.4 Check LSP 0
 - C.5.4 Back pan
 - C.5.4.1 Setup
 - C.5.4.2 Check for offset of back pan segments
 - C.5.4.3 Check pelvic segment offset from flat surface
 - C.5.4.4 Check torso angle (two methods)
 - C.5.4.4.1 Method 1: Use the torso angle inclinometer land
 - C.5.4.4.2 Method 2: Use divot points to establish the torso line
 - C.5.4.4.3 Check torso angle difference
 - C.5.4.5 Check H-point distance from level surface
 - C.5.4.6 Check B1 divot
 - C.5.4.7 Check B2 divot
 - C.5.5 Headroom probe
 - C.5.5.1 Setup
 - C.5.5.2 Check torso angle on the headroom probe
 - C.5.5.2.1 Measurement
 - C.5.5.2.2 Angular difference: CMM to inclinometer
 - C.5.5.2.3 Angular difference: probe land to back land
 - C.5.5.3 Check headroom scale
 - C.5.5.4 Check headroom probe tip alignment
 - C.5.6 Thigh segment

- C.5.6.1 Setup
- C.5.6.2 Check thigh angle
- C.5.6.3 Check thigh segment flatness
- C.5.6.4 Check thigh length
- C.5.7 Leg
- C.5.7.1 Setup
- C.5.7.2 Check ankle angle
- C.5.7.3 Check knee pivot to ankle pivot length
- C.5.7.4 Check knee pivot to flat level surface (bottom of shoe)
- C.5.7.5 Check knee angle scale

Annex D (informative) H-point design (HPD) tool description

- D.1 H-point design tool (HPD)
- D.2 File format
- D.3 Datum lines

Page count: 68