

Empfehlung für eine Vorschrift

zur

Standardisierung und Kalibrierung von H-Punkt- und Kopfstützenmessgeräten

VDA
xxx

Certification of the H-Pt. and Backset measuring equipment and its calibration

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1. Introduction

1.1. Background

The Hip point or H-Pt. is an important value for the design of car interior and its seats. In many different specifications, regulations and legislations, eg. FMVSS202a, EuroNCAP, ECE R17, etc. the H-Pt. has to be measured. For this measurement is a so called Hip-Point-Manikin, HPM is necessary.

This manikin developed in the 50's by the US Army was adopted as US SAE standard SAE J826 in November 1962 for H-Pt. measurements. The manikin shells were defined with sectional cuts and the structure using a few dimensions and weights incorporating huge tolerances. Later on came a new development the ASPECT dummy, also called HPM II. Resulting in defining the old as HPM I.

Since its development the the HPM I was copied and manufactured by several companies. The moulds were always handmade according to the Reference templates. The production stopped after 300 HPM's as there were no more required and the moulds were subsequently scrapped.

A remakes of the HPM's was simply solved with cast negative forms from the existing shells. Over the years came several revisions of the SAEJ826 including further information about weight, measures and tolerances culminating in the the actual production.

At the moment there are most probably 1000 HPM I in use worldwide. However because of the above mentioned production history, they all differ in dimensions, forms and weight.

As IIWPG started with the evaluation of headrests regarding whiplash, RONA developed the HRMD as adaption for the HPM during the 90's. There to with the additional demands of FMVSS202a and EuroNCAP the H-Pt. and Backset gained increasingly more importance. Unfortunately checks using the HRMD's also showing some very illogical deviations.

This being highlighted by measuring comparisons made on the same seats using different HRMD's which producing very different results, subsequently recognised the big differences in manikins as the cause. Thereapon Thatcham introduced the GLORIA. As GLORIA is only based on the former tolerances and not the contours of the shells, the VDA seat safety committee decided to define exactly the HPM I and HRMD in contours, measurements and tolerances based on todays technical standard.

2. Objective

The VDA letter of recommendation XXXX comes in two steps.

First step is the precise definition of the HPM I and the HRMD in its dimensions, shape, positioning, weight and tolerances with special onus to the SAEJ826 NOV2008 to reduce the tolerances caused by the equipment to a minimum.

HPM I and HRMD have been defined independently to ensure their interchangeability.

Second step the calibration is the regular check of the functional dimensions of the equipment to keep and abide to the reached standard.

The data of shape, position, dimensions, weight and tolerances should be available for every user to give him the possibility to update the measuring device and to keep and abide to the standard.

This activity makes for every Manufacturer and Institute precise measuring of H-Pt. and Backset possible without incurring big tolerances. This resulting in large cost reduction, saving extensive series of measurements and comparisons incorporating expensive changes and eliminating retests. For Common practice and patency it would be appreciated if EuroNCAP Whiplash protocol, ECE R17 and/or IIWPG protocol would acknowledge and integrate the recommendation.

2.1. Application

The letter of recommendation applies to all HPM I and HRMD irrelevant of which manufacturer or year of manufacture used to measure H-Pt. and/or Backset of car seats or car package.

Focus concentrated on and with regard to the measurements of FMVSS202a, IIWPG and EuroNCAP Whiplash.

3. Standard of measuring Equipment

3.1. CAD-Data

The official shell data is a CAD file of IGES format

From: XX.XX.XX: XXXX.....XXXXX

Data available on request per mail, provider: GO-Design Engineering GmbH

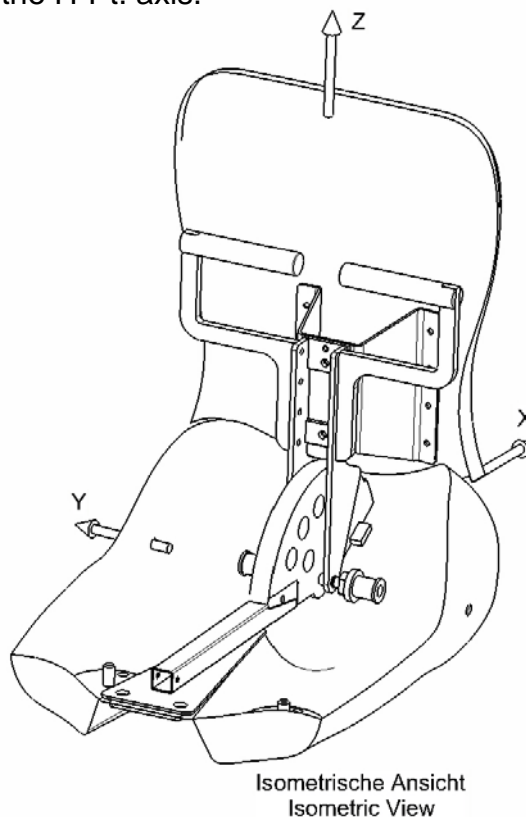
guenter.oeder@go-design.info www.go-design.info

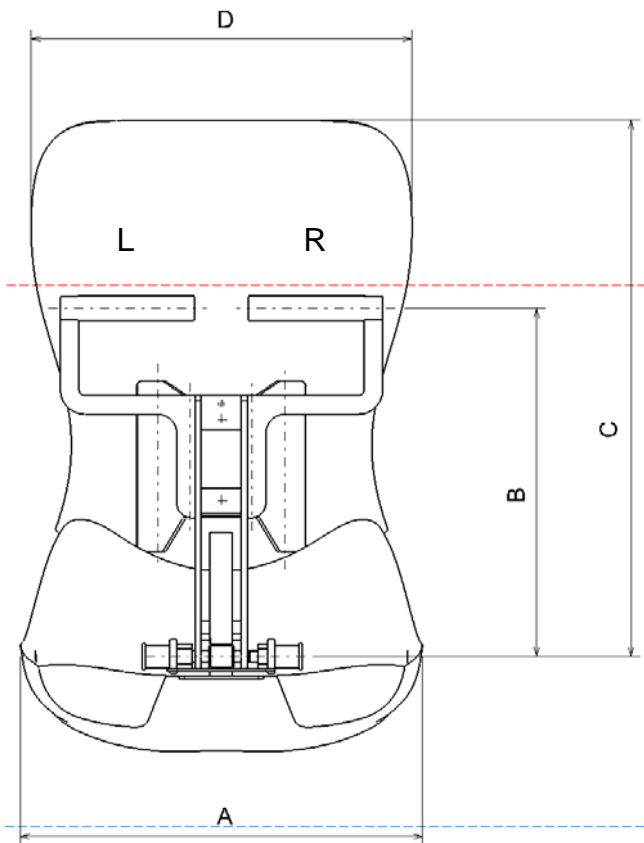
The position of the shell forms are defined within two offset surfaces of ± 0.7 mm similar to the form and position tolerances of the ISO 1101.

3.2. Dimension Sheet HPM I

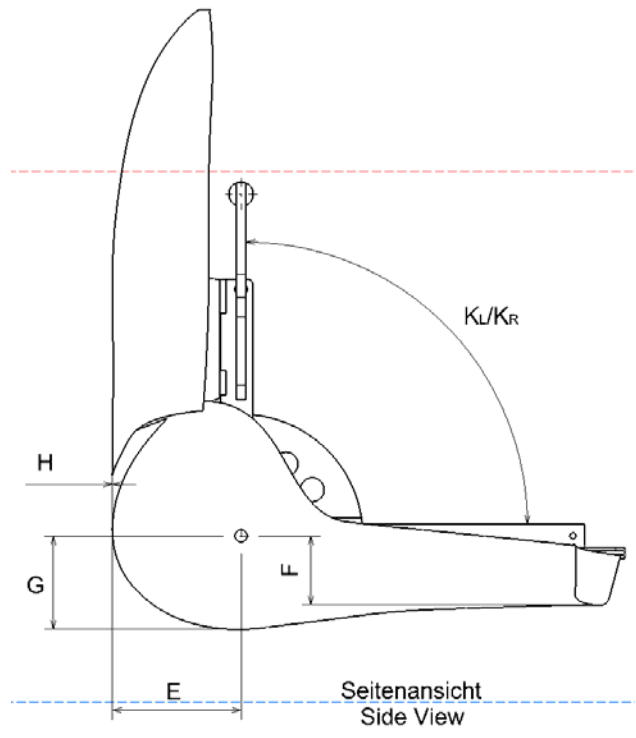
Shell dimensions and position related to the H-Point-Axis, (Values according to SAE NOV2008 have the SAE increments in The Brackets.)

Reference ist the coordinate system as shown in the isometric view with the point of origin defined in the middle of the H-Pt. axis.

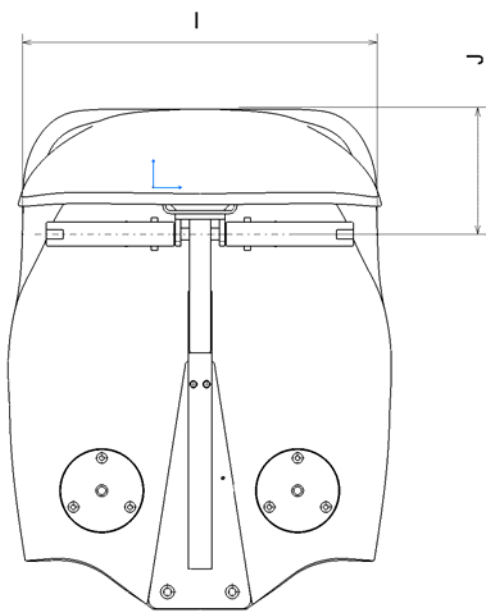




Vorderansicht
Front View



Seitenansicht
Side View



Draufsicht
Top View

Cushion Shellh point distance (I) 379 mm, ± 1 mmdistance H-Pt. to backside (E) 134,1 mm $\pm 0,5$ mmdistance femoral bottom (F) 72,6 mm ± 1 mmmax. width (A) $410/2$ mm = 205 mm $\pm 0,5$ mmmax. width (A, total) 410 mm ± 1 mmdistance H-Point to bottom (G) 97,6 mm ± 1 mm**Back Shell**max. width symmetry (D) 194 mm $\pm 0,5$ mmmax. width (D, total) 388 mm ± 1 mmposition upper edge (C) 548,6mm ± 2 mmback shell displacement in $-X$ direction (H) max. 0mm - 1 mm

3.3. Prüfmaße für die Blechstruktur

Weight Hangers
Z position left side (B) 356,4 mm \pm 1,
Z position right side (B) 356,4 mm \pm 1,
X axis position inner left side (J) to HRMD-Fl. 25 \pm 0,3
X axis position outer left side (J) to HRMD-Fl. 25 \pm 0,5
X axis position inner right side (J) to HRMD-Fl. 25 \pm 0,3
X axis position outer right side (J) to HRMD-Fl. 25 \pm 0,5

Torso Angle
torso angle on left and right wing (KL/KR) 90° \pm 0,5°

Head Room Probe
Torque of H-Pt. nut max. 3,4Nm
distance between H-Pt. and probe (at scale value 39 inch) 888,6 \pm 1mm
HRP in X position 90° \pm 1°
HRP in Y position 90° \pm 1°

Legs
Legs Knee Position
position at 10 %, 407,7 \pm 1 mm, left hand
position 10 %, 407,7 \pm 1 mm, right hand
position 50 %, 431,5 \pm 1 mm, left hand
position 50 %, 431,5 \pm 1 mm, right hand
position 95 %, 455,7 \pm 1 mm, left hand
position 95 %, 455,7 \pm 1 mm, right hand
Foot Axis X (X) b(f), c(g), d(h)
position 10 %, 392,7 \pm 1 mm, left hand
position 10 %, 392,7 \pm 1 mm, right hand
position 50 %, 417,1 \pm 1 mm, left hand
position 50 %, 417,1 \pm 1 mm, right hand
position 95 %, 458,7 \pm 1 mm, left hand
position 95 %, 458,7 \pm 1 mm, right hand

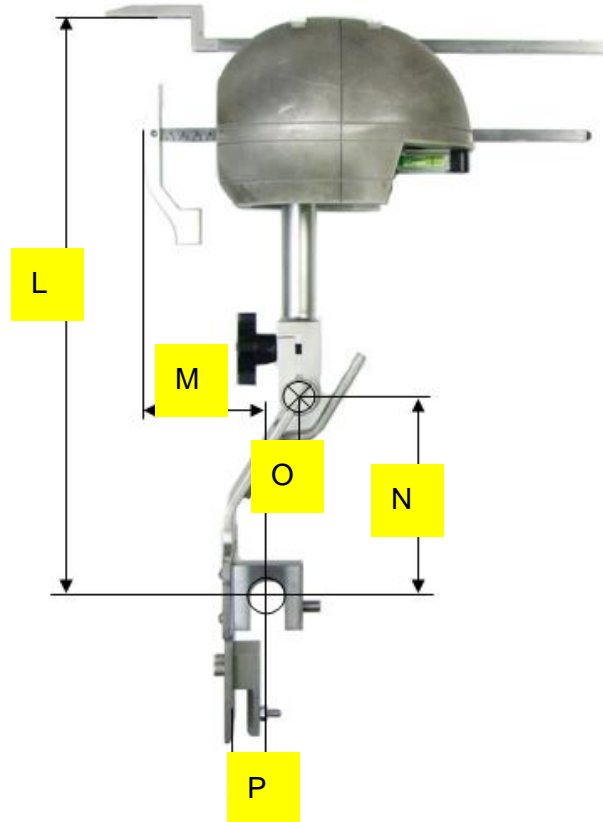
Legs
Knee Angle
knee angle scale outer left (90° ±0,5)
knee angle scale inner left (90° ±0,5)
knee angle scale left hand (50° ±0,5)
knee angle scale left hand (60° ±0,5)
knee angle scale left hand (70°±0,5)
knee angle scale left hand (80° ±0,5)
knee angle scale left hand (100° ±0,5)
knee angle scale left hand (110° ±0,5)
knee angle scale left hand (120° ±0,5)
knee angle scale left hand (130° ±0,5)
knee angle scale left hand (140° ±0,5)
knee angle scale left hand (150° ±0,5)
knee angle scale left hand (160° ±0,5)
knee angle scale left hand (170° ±0,5)
knee angle scale left hand (180° ±0,5)
knee angle scale left hand (90° ±0,5)
knee angle scale inner right hand (90° ±0,5)
knee angle scale right hand (50° ±0,5)
knee angle scale right (60° ±0,5)
knee angle scale right (70° ±0,5)
knee angle scale right (80° ±0,5)
knee angle scale right (100° ±0,5)
knee angle scale right (110° ±0,5)
knee angle scale right (120° ±0,5)
knee angle scale right (130° ±0,5)
knee angle scale right (140° ±0,5)
knee angle scale right (150° ±0,5)
knee angle scale right (160° ±0,5)
knee angle scale right (170° ±0,5)
knee angle scale right (180° ±0,5)

HPM Weights
HPM (without weights, legs, with HRP) 19700g \pm 300g
HPM (without weights, legs, without HRP) 17400g \pm 300g
HPM weight 1 (3920g \pm 10g)
HPM weight 2 (3920g \pm 10g)
HPM weight 3 (3920g \pm 10g)
HPM weight 4 (3920g \pm 10g)
HPM weight 5 (3920g \pm 10g)
HPM weight 6 (3920g \pm 10g)
HPM weight 7 (3920g \pm 10g)
HPM weight 8 (3920g \pm 10g)
HPM weight 9 (3920g \pm 10g)
HPM weight 10 (3920g \pm 10g)
HPM femoral weight 1 (3420g \pm 10g)
HPM femoral weight 2 (3420g \pm 10g)
HPM legs, without lower 2x 4400g = 8800g
HPM lower legs weight 1 (1230g \pm 10g)
HPM lower legs weight 2 (1230g \pm 10g)
total weight (77000g \pm 300g) with HRP
total weight (74700g \pm 300g) without HRP

3.4. Dimension Sheet HRMD

Reference are the dimensions defined by RONA/ICBC with measurmentes and additional tight tolerances necessary to reduce variations in the device.

HRMD
L) distance between weight hangers and Z probe (441mm \pm 0,5)
M) distance between weight hangers and backset probe (48mm \pm 0,3)
N) distance between weight hangers and HRMD axis in Z (148mm \pm 0,5)
O) distance between weight hangers and HRMD axis in X (23mm \pm 0,3)
P) distance between weight hangers and contact surface 25 mm \pm 0,3
Check and adjust level

HRMD together with HPMbackset probe scale value 80 mm \pm 0,5 mmheight of Z probe 796,6 mm \pm 0,5 mm**HRMD Weights**HRMD weight together with probes (8300g \pm 50g)ballast weight 1 (4800g \pm 10g)ballast weight 2 (4800g \pm 10g)

4. Calibration

4.1. Description

The actual experiences show shells and structur are easily damaged, bent or missaligned with rough or improper use. This can have effect in H-Pt. and backset results.

To ensure the precision measurement using the equipment over the years, it is recommended that the equipment be calibrated Annually . The calibration includes dimensiona checks and visual inspection.

Visual inspection criteria are: no scratches and/or breakages, worn paint or loose parts . The structure elements check of HPM and HRMD include: loose parts, unacceptable wear or play, damaged or deformed parts.

The dimensional check is similar to the Certification, reduced to the main and functional dimensions according to the following dimensional Check List.

The calibrations can be done with a 3D measuring arm or machine or simply in a proper calibration device, as it is exemplary designed for the HPM I. It is important that the middle of the H-Pt. axis is used as reference. For the alignment see also SAE J826 NOV2008 C5.2.1.

4.2. Check List / Dimension Sheet HPM I

Cushion Shell
H point distance (I) 379 mm, ± 1 mm
distance between H-Pt. and backside (E) 134,1 mm $\pm 0,5$ mm
distance between femoral bottom (F) 72,6 mm ± 1 mm
max. width (A) $410/2$ mm = 205 mm $\pm 0,5$ mm
max. width (A, total) 410 mm ± 1 mm
distance H-Pt. To bottom (G) 97,6 mm ± 1 mm

Weight Hangers
Z position left hand (B) 356,4 mm ± 1 ,
Z position right hand (B) 356,4 mm ± 1 ,
X axis position inner left side (J) to HRMD-FI. 25 $\pm 0,3$
X axis position outer left side (J) to HRMD-FI. 25 $\pm 0,5$
X axis position inner right side (J) to HRMD-FI. 25 $\pm 0,3$
X axis position outer right side (J) zu HRMD-FI. 25 $\pm 0,5$

Torso Angletorso angle at left wing (KL/KR) $90^{\circ} \pm 0,5^{\circ}$ **4.3. Dimension Sheet HRMD****HRMD**L) distance between weight hangers and Z probe (441mm $\pm 0,5$)M) distance between weight hangers and backset probe (48mm $\pm 0,3$)N) distance between weight hangers and HRMD axis in Z (148mm $\pm 0,5$)O) distance between weight hangers and HRMD axis in X (23mm $\pm 0,3$)P) distance between weight hangers and contact surface 25 mm $\pm 0,3$

check and adjust level

HRMD together with HPMbackset probe scale value 80 mm $\pm 0,5$ mmheight of Z probe 796,6 mm $\pm 0,5$ mm**5. Perspective**

A higher standard of measuring equipment will be ensured using the described activities .

Several measurement comparisons have shown that the procedure SAEJ826 allows a big range of variation and interpretation. The variations will increase with less intensively trained Technicians. It is Crucial that the procedure be described in detail. Training and certification of the operators is absolutely necessary, this Process is already partially integrated.

6. Annex

6.1. Terminology

ASPECT-Dummy: also called HPM II dummy, initiated by the SAE HADD committee and developed by the US automotive industry to replace the HPM I.

Backset: distance between headrest and head in car seats

CAD: Computer Aided Design

ECE: Economic Commission for Europe

ECE R17: ECE's technical regulation about seats and headrests in vehicles

EuroNCAP: European New Car Assessment Program, European consumer organisation for cars

FMVSS: Federal Motor Vehicle Safety Standard, safety standard of the United States for vehicles in responsibility of the NHTSA (National Highway Traffic Safety Administration) similar to ECE in Europe

FMVSS202a: US safety standard about headrests in vehicles

GLORIA: device to calibrate the HPM I and developed by members of the IIWPG

HPM I: Hip Point Manikin of first generation also called the „Oscar“

H-Point: Hip Points are theoretical points on both sides of the pelvis that represent the axis of rotation between torso and pelvis, which refers to the axis of rotation between cushion and back of the HPM.

HRP: Head Room Probe, adjustable in length and angle, mounted on the H-Pt. axis to measure head room distance and clearance between headrest and ceiling

ICBC: Insurance Corporation of British Columbia, Canada

IGES: Initial Graphics Exchange Specification, data standard format for CAD data exchange

IIWPG: International Insurance Whiplash Prevention Group

HRMD: Head Restraint Measuring Device, used together with the HPM I to measure the horizontal and vertical distance between head and headrest

RONA: RONA Kinetics & Associates Ltd., Vancouver, Kanada, research and testing institute for biomechanics

SAE: Society of Automotive Engineers, institute of the US for standardization of vehicles and traffic technology

SAEJ826 NOV2008: SAE standard, released in November 2008, describes the HPM I and the measuring procedure

Thatcham: English insurance institute for vehicles

Weight Hangers WH: horizontal shafts on the structure of the back of the HPM I to add torso weights and to fix the HRMD

Whiplash: displacement of the head together with deformation of the upper spine during a rear impact at low speed