

HRMD Positioning Tool

(Head Restraint Measurement Device)

Introduction



Copyright Protection



A separate valid License issued by Arup or authorized Arup Software distributor is required to access the required models and use the HPM/HRMD tools in PRIMER. No extra licence is necessary to run in Ansys LS-DYNA.

Any unauthorized usage or distribution of this software is not permitted.

**For a detailed tutorial and information on the licence for this tool, please contact our support team.*



Introduction

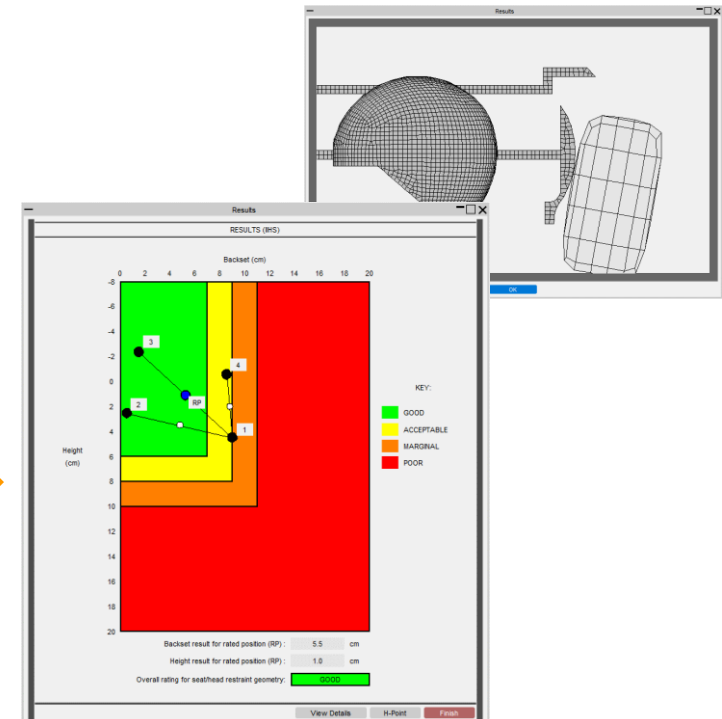
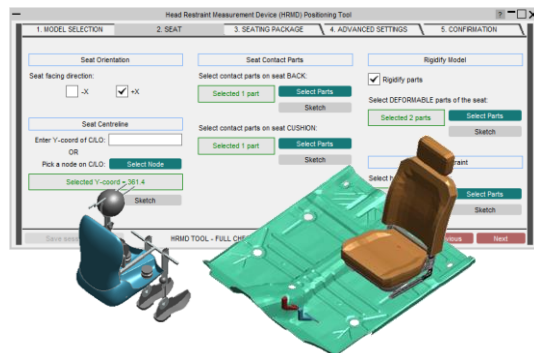
The HRMD (Head Restraint Measurement Device) Positioning Tool is a script that enables users to perform assessments of seat and head restraint geometries within the LS-DYNA suite. The script works in conjunction with Arup's HPM and HPM w. HRMD (H-Point Machine with Head Restraint Measurement Device) models, produced in accordance with SAE J826 NOV2015, *Devices for Use in Defining and Measuring Vehicle Seating Accommodation*. The model is supplied with the script in S1 (m kg s), S2 (mm T s) and S3 (mm kg ms) units systems.

The script provides the full LS-DYNA input deck for running H-point drops by performing automatic positioning of the HPM system and configuring all required contacts, sensors, velocities and other boundary conditions. Based on validation and verification work performed, it is recommended to run LS-DYNA Double Precision in conjunction with this tool.

The script also enables users to determine the static score for their seat and head restraint geometry in-line with the procedure of their chosen assessing body. Procedures currently supported by the HRMD Tool include:

1. [IIHS](#) (Insurance Institute for Highway Safety)
2. [NHTSA](#) (National Highway Traffic Safety Administration)
3. [EuroNCAP Front](#) (European New Car Assessment Programme)
4. [EuroNCAP Rear](#)
5. [C-NCAP](#) (China – New Car Assessment Programme)


(Please refer to the disclaimer at the rear of this document)



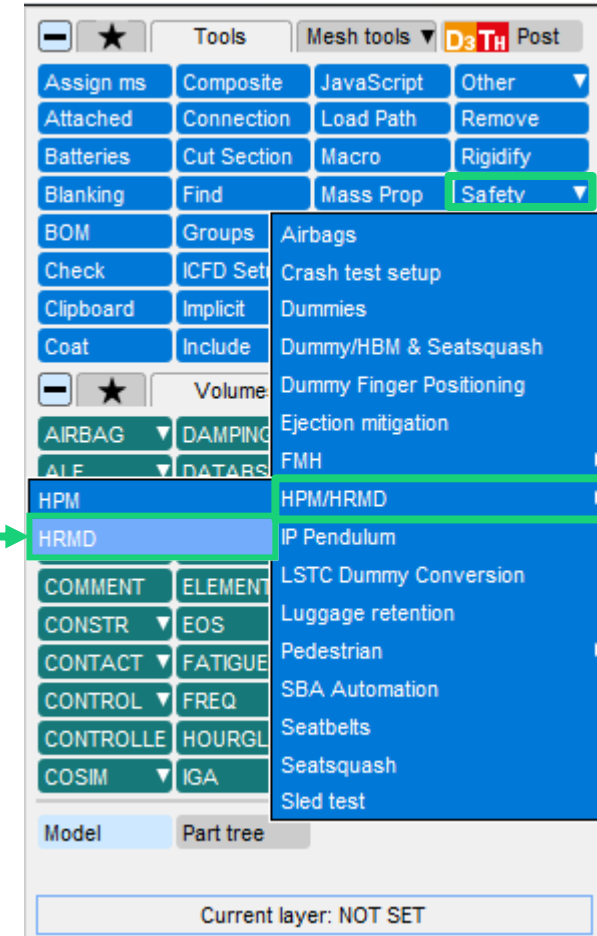
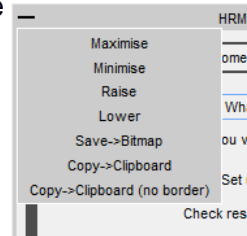
Run the HRMD Positioning Tool in Primer

To run The HPM Tool, open PRIMER and click
Tools → **Safety** → **HPM/HRMD** → **HRMD**.

Helpful Tips:

Help can be found throughout HRMD Setup by clicking the  buttons and by **hovering** over instructions given in the graphical interface.

If **you** wish to save any of the images/windows shown click in the top left corner of the window and select **Save->Bitmap**.



Welcome Window

When you run the HRMD Tool you will be presented with the [Welcome Window](#):

You will need to select the body whose procedure you would like to follow for positioning and taking measurements: [IIHS](#), [NHTSA](#), [Euro NCAP Front](#), [C-NCAP](#), or [Euro NCAP Rear](#).

The [Welcome Window](#) allows you to select which of the three main parts of the HRMD Tool you would like to use:

1. Full Check

Use the HRMD Tool to produce the full input deck ready to submit a H-Point drop analysis to LS-DYNA. The script will put the HPM in an appropriate initial position in your seating package model and prepare all required keyword cards. The analysis will position the HPM as per the relevant documentation allowing an accurate assessment of head restraint geometry to be made using the next part of the script.

2. Full Check Results

Once the analysis prepared in part 1 has completed you can use this part of the HRMD Tool to retrieve the H-Point and manikin back angle, and to perform the head restraint assessment.

3. Quick Check Results

If you already know the H-Point of your seat and HPM back angle you can use this option to go straight to performing the head restraint assessment, without the need to run an LS-DYNA analysis. Results are approximate using this method.

Disclaimer



Whilst every effort has been made to ensure that the HRMD Positioning Tool accurately follows the procedures outlined in the documents below, neither Arup, nor any of its affiliates, can accept any responsibility for negative consequences resulting from the use of the HRMD Positioning Tool or the associated HPM and HPM w. HRMD models.

Users are strongly recommended to consult the relevant regulations to familiarise themselves with the contained actions and terminology before using the HRMD Positioning Tool.

The following documents were used as a basis for the HRMD Positioning Tool:

- NHTSA, January 2011, TP-202aS-01, *Laboratory Test Procedure for FMVSS 202aS, Head Restraints – Dimensional and Static Testing*.
- IIHS, Feb 2016, *Vehicle Seat/Head Restraint Evaluation Protocol Static Geometric Criteria (Version IV)*.
- Euro NCAP, May 2023, *The Dynamic Assessment of Car Seats for Neck Injury Protection Testing Protocol (Version 4.2)*.
- Euro NCAP, Oct 2018, *Rear Whiplash Test Protocol (Version 1.1)*.
- Euro NCAP, Dec 2023, *Assessment Protocol – Adult Occupant Protection (Version 9.3)*.
- China Automotive Technology and Research Center, 2018, *C-NCAP Management Regulation (2018)*.
- SAE, November 2015, J826_201511, *Devices for Use in Defining and Measuring Vehicle Seating Accommodation*.



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