

# Hybrid III 50th Male

The Hybrid III 50th Percentile Male Crash Test Dummy is the most widely used crash test dummy in the world for the evaluation of automotive safety restraint systems in frontal crash testing. Originally developed by General Motors, the Hybrid III 50th design is now maintained and developed by Humanetics in conjunction with the Society of Automotive Engineers' (SAE) Biomechanics Committees and the National Highway Transport and Safety Administration (NHTSA). The dummy is a regulated test device in the USA Code of Federal Regulations (Part 572, Subpart E) and also in the European ECE Regulations. It is considered to have excellent biofidelity and instrumentation capability. Recent revisions have improved the biofidelity in the femur range of motion and the ankle and foot. The dummy can also be used in many non-automotive applications such as wheelchairs and medical and sport equipment.

A sternum assembly connects to the front of the ribs and includes a slider for the chest deflection rotary potentiometer. The angle between the neck and upper torso is determined by the construction of the neck bracket which can incorporate a six-axis neck transducer. A two-piece aluminum clavicle and clavicle link assemblies have cast integral scapulae to interface with shoulder belts.

## Lower Torso

A curved cylindrical rubber lumbar spine mounts provides human-like slouch of a seated person and mounts to the pelvis through an optional three axis lumbar load cell. The pelvis is a vinyl skin/urethane foam molded over an aluminum casting in the seated position. The ball-jointed femur attachments carry bump stops to reproduce the human leg to hip moment/rotation characteristics. The femur, tibia and ankle can be instrumented to predict bone fracture and the knee can evaluate tibia to femur ligament injury. The foot and ankle simulates heel compression and ankle range of motion.

## Simulation Models

Humanetics offers highly detailed and fully validated Finite Element (FE) models of its dummies in the codes LS-DYNA, PAM-CRASH, ABAQUS and RADIOSS, along with FE modeling consultancy services.

## Dummy Features

### Head & Neck

The skull and skull cap are one piece cast aluminum parts with removable vinyl skins. The neck is a segmented rubber and aluminum construction with a center cable. It accurately simulates the human dynamic moment/rotation flexion and extension response.

### Upper Torso

The rib cage is represented by six high strength steel ribs with polymer based damping material to simulate human chest force-deflection characteristics. Each rib unit comprises left and right anatomical ribs in one continuous part open at the sternum and anchored to the back of the thoracic spine.



# Technical Specifications

## Weight Specification

Body Segment	Mass (lb)	Tol. (lb +/-)
Head	10.0	.1
Neck	3.4	.1
Upper Torso	37.9	.3
Lower Torso	50.8	.3
Upper Arm (Left or Right)	4.4	.1
Lower Arms & Hands (Left or Right)	5.0	.2
Upper Leg (Left or Right)	13.2	.2
Lower Legs & Feet (Left or Right)	12.0	.3
Total Weight	171.3	2.6

## Instrumentation

Location	Description	Channels
Head	3 Accelerometers in a Triax array, up to 15 Accelerometers	Ax, Ay, Az (used for HIC) 5X Ax, Ay, Az Head Rotation
Neck	Six-Axis Upper Neck Load Cell Six-Axis Lower Neck Load Cell	Fx, Fy, Fz, Mx, My, Mz Fx, Fy, Fz, Mx, My, Mz
Clavicle	Biaxial Load Cell (Left & Right)	Fx, Fz
Humerus	Four-Axis Load Cell (Left & Right)	Fx, Fy, Mx, My
Thorax	3 Accelerometers in a triaxial array Chest Displacement Transducer Four-Axis Rib/Spine Load Cell Five-Axis Thoracic Spine Load Cell	Ax, Ay, Az (Chest Accel) Dx (Std. Equipment) Fx, Fy, Fz, My Fx, Fy, Fz, Mx, My
Lumbar Spine	Three-Axis Lumbar Spine Load Cell	Fx, Fz, My
Pelvis	3 Accelerometers or Triax Pack Submarining Load Bolts	Ax, Ay, Az Fx (3 per side)
Femur	Uniaxial Femur Load Cell or Six-Axis Upper Femur Load Cell	Fx (per leg) Fx, Fy, Fz, Mx, My, Mz (per leg)
Knee	Knee Displacement	Dx (per knee)
Lower Legs*	Biaxial Knee Clevis Load Cells Four Axis Upper Tibia Load Cells Four Axis Lower Tibia Load Cells	Fz (per leg) Fx, Fz, Mx, My (per leg) Fx, Fy, Mx, My (per leg)
Ankle	Five-Axis Load Cell	Fx, Fy, Fz, Mx, My (per leg)
Toe	Toe Load Cell	Fz (per foot)

\*Special four channel configurations are available in the upper & lower tibia load cells.

## Dimensions

Measurement	Dim. (in)	Tol. (in +/-)
Total Sitting Height	34.8	.2
Shoulder Pivot Height	20.2	.3
H-Point Height	3.4	.1
H-Point from Seat Back	5.4	.1
Shoulder Pivot from Backline	3.5	.2
Thigh Clearance	5.8	.3
Elbow to Wrist Pivot	11.0	.3
Skull Cap to Backline	1.7	.1
Shoulder to Elbow	13.3	.3
Elbow Rest Height	7.9	.4
Buttock to Knee	23.3	.5
Popliteal Height	17.4	.5
Knee Pivot to Floor	19.4	.3
Buttock Popliteal Length	18.3	.5
Chest Depth	8.7	.3
Foot Length	10.2	.3
Foot Width	3.9	.3
Shoulder Width	16.9	.3
Hip Width at H-Point	14.3	.3
Chest Circumference	38.8	.6
Waist Circumference	33.5	.6
Ref. Location for Chest Circumference	17.0	.1
Ref. Location for Waist Circumference	9.0	.1