

ES-2 Side Impact

The ES-2 side impact dummy is the next generation of the EuroSID1 dummy, incorporating many enhancements recommended by users and regulators around the world. The ES-2 was developed by the SID2000 program, a consortium of European researchers, automotive manufacturers and dummy manufacturers, and coordinated by TNO of the Netherlands.

Dummy Features

Head & Neck

The head is based on the Hybrid III 50th Male head and can now be equipped with a six-axis upper neck load cell to evaluate neck injury and head contact loads. Head rotational accelerations can optionally be measured. The neck is based on the EuroSID1 dummy and matches the human response to lateral flexion and can be calibrated with replaceable neck buffer elements. A lower neck six-axis load cell is also available.

Thorax/Abdomen

The Thorax consists of three rib modules with a sprung linear slide and hydraulic damper mounted inside a steel spring outer band. Linear potentiometers measure rib deflection and the viscous criteria. The arm is attached to a rotating shoulder/clavicle mechanism.

The ES-2 thorax has several enhancements over the EuroSID1 dummy. The rib module linear guides are modified to have minimal friction under non-lateral loadings. The shoulder clavicle is more flexible and has Teflon buttons to reduce friction. The back plate width is reduced to minimize seat interaction and a back plate load cell measures unintended seat contact.

The abdomen is a weighted deformable element with internal load cells to measure load transfer through the abdomen. The abdomen calibration corridors have been updated to improve biofidelity and reliability and a T12 load cell measures load transfer between the upper and lower torso. A neoprene jacket zips over the entire upper torso assembly.

Pelvis

The pelvis contains two deformable urethane iliac wings attached to the sacrum block with load cells at the lower lumbar spine and pubic symphysis. The pelvis flesh is simulated by a vinyl skin over urethane foam molding with foam inserts at the trochanters. A tilt sensor now measures the pelvic angle during test set up.

Legs

The ES-2 thighs use a high density foam for a more human-like mass distribution, and six axis femur load cells can be fitted to the dummy.

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.



Technical Specifications

Weight Specification

Body Segment	Mass (Kg)	Tol. (+/-)
Head Assembly	4.0	0.20
Neck Assembly	1.0	0.05
Thorax Assembly	22.4	1.00
Arm, Left or Right	1.3	0.10
Abdomen	5.0	0.25
Pelvis Assembly	12.0	0.60
Leg, Left or Right	12.7	0.60
Total Weight	72.4	1.20

Instrumentation

Location	Description	Channels
Head	Tri-axial Accel Pack	Ax, Ay, Az
	9 ACC Rotational Accel Pack	Wx, Wy, Wz, Ax, Ay, Az
Neck	6-Axis Upper Neck Load Cell	Fx, Fy, Fz, Mx, My, Mz
	6-Axis Lower Neck Load Cell	Fx, Fy, Fz, Mx, My, Mz
	3-Axis Shoulder Load Cell	Fx, Fy, Fz
	Tri-axial Accel Pack	Ax, Ay, Az
Thorax	3 Rib Displacements	Dy
	3 Rib Accelerations	Ay
	4-Axis Torso Back Plate LC	Fx, Fy, My, Mz
	Tri-axial Accel Pack	Ax, Ay, Az
Abdomen	4-Axis T12 Load Cell	Fx, Fy, Mx, My
	3 Abdomen Load Cells	Fy
Pelvis	3-Axis Lower Lumbar Spine LC	Fy, Fz, Mx
	Pubic Symphysis Load Cell	Fy
Legs	Tri-axial Accel Pack	Ax, Ay, Az
	6-Axis Femur Load Cell	Fx, Fy, Fz, Mx, My, Mz

Dimensions

Measurement	Dim (mm)	Tol. (+/-)
Total Sitting Height	909	9
Seat to Shoulder Joint	565	7
Seat to Lower Face of Thoracic Spine Box	351	5
Seat to Hip Joint	100	3
Sole to Seat, Sitting	442	9
Head Width	155	3
Shoulder/Arm Width	470	9
Thorax Width	327	5
Abdomen Width	280	7
Pelvis Lap Width	366	7
Head Depth	201	5
Thorax Depth	267	5
Abdomen Depth	199	5
Pelvis Depth	240	5
Back of Buttocks to Hip Joint	155	5
Back of Buttocks to Front Knee	606	9