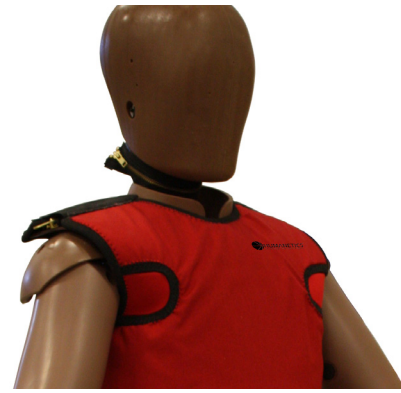


THOR-50M Design Change History

Publication Date: July 2016



Humanetics had worked with the National Highway Safety Administration (NHTSA) and European safety initiatives like FIT, APROSYS, and THORAX to deliver a new THOR-50M release in 2012 with much improved and anticipated modernizations.

Since delivering the first dummies to our customers, we've been actively seeking feedback to help us advance the THOR-M further. More than two dozen user-defined part improvements have been incorporated into the current design which substantially increases the usability, durability and value of the dummy.

It should be noted that apart from design updates Humanetics has introduced various production updates over the past years relating to durability. Production updates generally do not result in drawing changes and are not listed in the following.

Design Updates

Since the THOR-M release in 2012 a total of 27 component changes have been integrated into the latest shipments of the THOR-M ATD. Many of these changes have been running improvements made to the design and usability of the dummy as customer feedback became available.

As of March 2016 the design of the THOR-M dummy has been defined by the inclusion of NHTSA contracted updates as well as the Humanetics driven revisions fueled by customer feedback. The NHTSA THOR-50M draft Qualification Procedures Manual (Oct. 2015) defines the performance characteristics of a THOR-50M built to meet the 2014-09-29 drawing package. All of the integrated improvements since the referenced NHTSA drawing package are durability and function related updates that are not designed to influence performance specifications. We have been working with

NHTSA to secure placement of all of the latest improvements into the pre-regulated drawing package.

As NHTSA proceeds with the new NCAP proposal to incorporate the THOR-M dummy into its future protocols, Humanetics will strive to produce the best possible THOR ATD for the marketplace. Doing so will ensure customers receive dummies that can handle the new testing requirements and are faithful to the intent of the THOR design.

Design Updates by Category

These categories will be summarized in the following pages.

1. ASIS Load Cell Cap
2. Abdomen Foam
3. Lower Abdomen Bag
4. Neck Potentiometer Screw
5. Distribution Plate (Lower Abdomen)
6. Iliac Wing Redesign
7. Lift Strap
8. Thigh and Knee Flesh Fit
9. Shoulder Tab Washer
10. Jacket Velcro
11. Tilt Sensor Mounts
12. Neck Platform

Future Revisions

Discussions and feedback will continue to drive future enhancements to the design and durability of the THOR-M dummy. Humanetics will make every possible provision to ensure that THOR revisions that benefit customer usability are timely addressed and communicated through the proper channels.

(con't)

THOR-50M Design Change History (con't)

Humanetics Update Summary

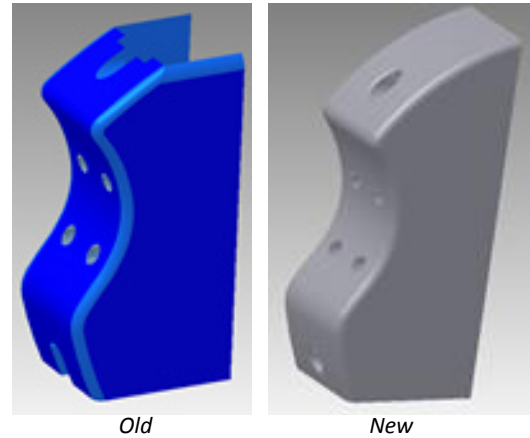
* NHTSA Qualification specifications were developed based on the 2014-09-29 drawing package.

Category	Part Number	Qty	Part Description	Date	Reason
ASIS Load Cell Cap	11052	2	ASIS Load Cell Cover	12/19/13	Function
	472-4375	2	ASIS Structural Replacement	12/19/13	
Abdomen Foam	472-4628	1	Foam Middle Layer (Upper Abdomen)	8/28/14	Durability and Performance
	472-4766	1	Rear Foam Layer (Lower Abdomen)	8/28/14	
Lower Abdomen Bag	472-4763	1	Lower Abdomen Bag	10/24/14	Durability
Neck Potentiometer Screw	5001313	2	Screw BHCS M3 x 35	11/19/14	Function
Distribution Plate (Abdomen)	472-4762	2	Distribution Plate (Lower Abdomen)	11/21/14	Durability and Function
THOR Iliac Wing Redesign	472-4390-1	1	Iliac Wing Left	2/20/15	Durability
	472-4390-2	1	Iliac Wing Right	2/20/15	
	472-8510	1	H-Point Tool	2/20/15	
	472-4212	1	Pelvis Base Module	2/20/15	
	5001316	2	Screw LHCS M6 x 20	2/20/15	
Lift Strap	472-3116	1	Lift Strap	7/23/15	Function
	472-3115	1	Bracket, Lift Strap	7/23/15	
	5000291	2	Screw SHCS M5 x 10	7/23/15	
Thigh and Knee Flesh Fit	472-5502-6	2	Knee Flesh Left/Right	1/20/16	Handling
	472-5503-1-6	1	Thigh Flesh, Left	1/20/16	
	472-5503-2-6	1	Thigh Flesh, Right	1/20/16	
Shoulder Tab Washer	AXSDM050	2	Washer with Tab	1/29/16	Durability
Jacket Velcro	472-3901	1	Jacket Assembly	1/29/16	Durability
Neck Platform	472-2210	1	Head/Neck Mounting Platform	2/20/16	Durability
Tilt sensor mounts	472-3781	1	Tilt Sensor Mount, Lumbar Spine	2/29/16	Function
	472-3787	1	Tilt Sensor Assembly, Pelvis	2/29/16	
	472-3783	1	Tilt Sensor Mount, Lower Thorax	2/29/16	
	472-3765	1	Pelvis 7 lumbar mounting Block	2/29/16	
	472-3733	1	Thoracic Spine Adaptor Plate	2/29/16	
	472-3655	1	Lower Thoracic Spine Box	2/29/16	

THOR-50M Design Change History (con't)

ASIS Load Cell Cap

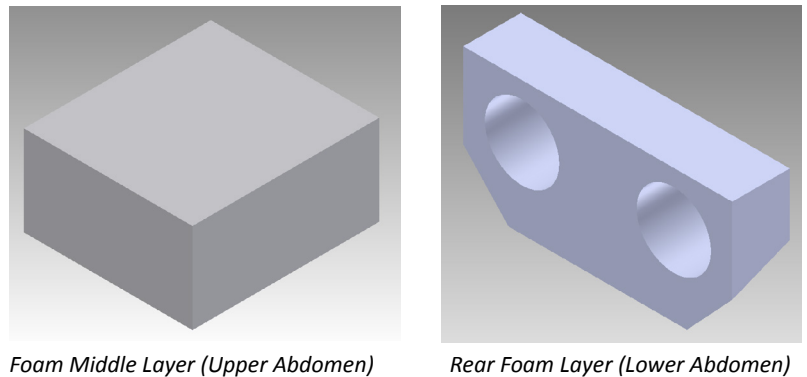
Both the ASIS Load Cell cap and the structural replacement are redesigned to avoid belt cutting.



ASIS Load Cell Cap	11052	2	ASIS Load Cell Cover
	472-4375	2	ASIS Structural Replacement

Abdomen Foam

Both the middle layer and the rear layer foams are upgraded to a stiffer material to address performance and durability issues.



Abdomen Foam	472-4628	1	Foam Middle Layer (Upper Abdomen)
	472-4766	1	Rear Foam Layer (Lower Abdomen)

Lower Abdomen Bag

The lower abdomen bag is updated to correct the sewing pattern and now includes a pleated bottom to enhance foam fit, IRTRACC placement and general durability.

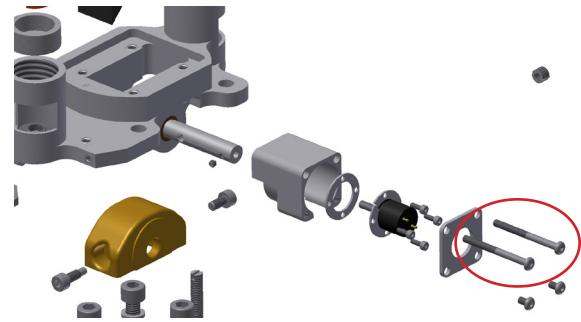


Lower Abdomen Bag	472-4763	1	Lower Abdomen Bag
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THOR-50M Design Change History (con't)

Neck Potentiometer Screw

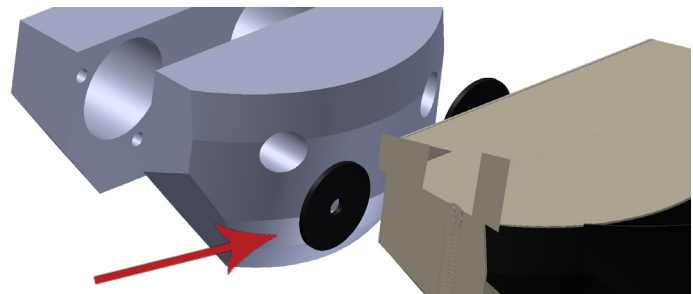
The neck pivot screw length is increased from 30mm to 35mm to ensure proper thread engagement (5001313 was 5000749).



Neck Potentiometer Screw	5001313	2	Screw BHCS M3 x 35
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Lower Abdomen Distribution Plate

The lower abdomen distribution plate is updated to include a radius on the face that interacts with the lower abdomen foam.

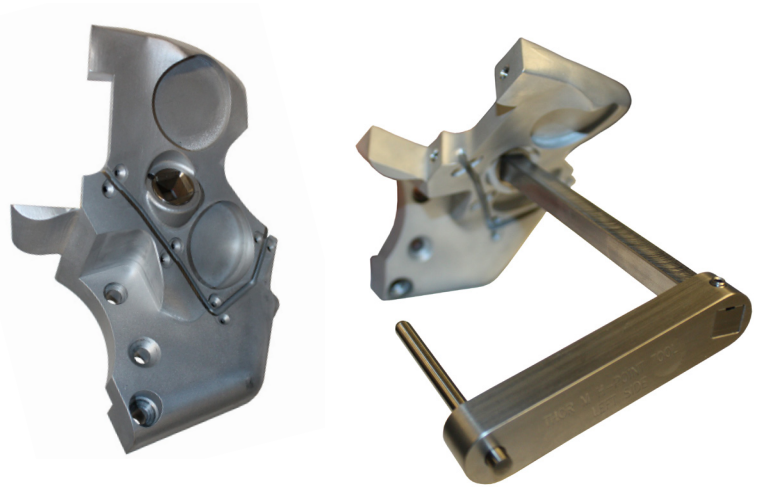


Distribution Plate (Abdomen)	472-4762	2	Distribution Plate (Lower Abdomen)
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Iliac Wing Design

To increase the iliac wing durability, several new design improvements are incorporated along with a new H-Point tool that interfaces with the new iliac wings in order to reduce pelvis angle measurement error.

Wings are now machined completely from solid aluminum stock instead of starting with a poured casting and then machining them to their final dimensions. Material was added to the inside geometry and radius and a cable channel was re-routed. Screw hole sizes were reduced and one bolt changed to a Low Head Cap Screw for strength. In order to offset the slight increase in mass of the iliac wings, the pelvis base module is also updated.



New Wing (left)

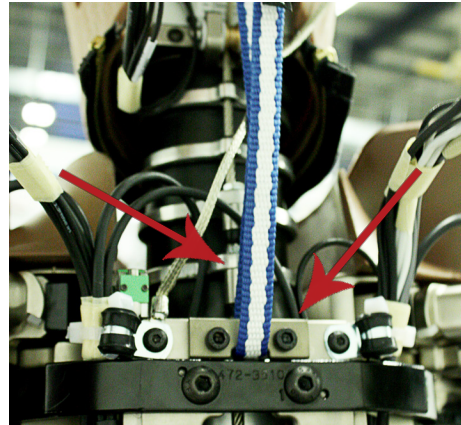
New H-Point Tool

THOR Iliac Wing Redesign	472-4390-1	1	Iliac Wing Left
	472-4390-2	1	Iliac Wing Right
	472-8510	1	H-Point Tool
	472-4212	1	Pelvis Base Module
	5001316	2	Screw LHCS M6 x 20

THOR-50M Design Change History (con't)

Lift Strap

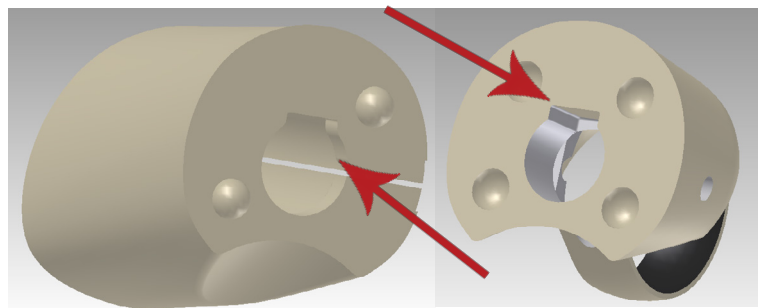
THOR-M ATDs are now supplied with a new blue and white nylon lifting strap with a greater load capacity. Along with the new lifting strap, a new mounting bracket was created in order to prevent sharp corners from cutting at the strap.



Lift Strap	472-3116	1	Lift Strap
	472-3115	1	Bracket, Lift Strap
	5000291	2	Screw SHCS M5 x 10

Thigh and Knee Flesh Fit

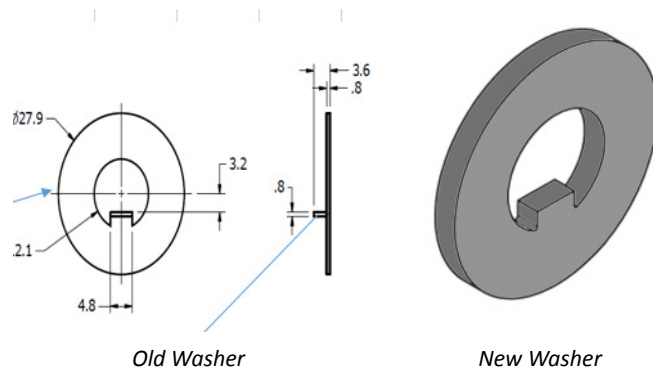
The internal cavities of the thigh and knee flesh are updated to improve the fit of the bone geometry.



Thigh and Knee Flesh Fit	472-5502-6	2	Knee Flesh Left/Right
	472-5503-1-6	1	Thigh Flesh, Left
	472-5503-2-6	1	Thigh Flesh, Right

Shoulder Tab Washer

To alleviate reports of bending and breaking tabs, the shoulder tab washer is improved to increase the durability.



Shoulder Tab Washer	AXSDM050	2	Washer with Tab
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THOR-50M Design Change History (con't)

Jacket Velcro

An layer of Cardura material is added to the top of the Jacket's shoulder to improve the durability of the Velcro.



Jacket Velcro	472-3901	1	Jacket Assembly
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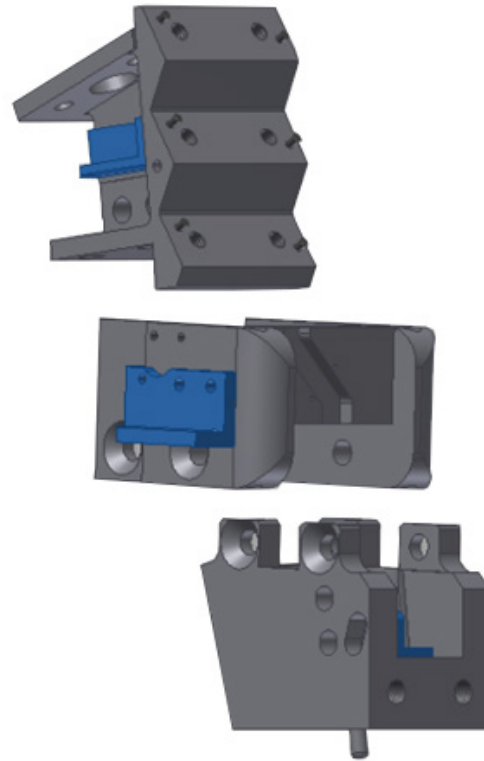
Tilt Sensor Mounts

Humanetics has improved the mounting accuracy of several tilt sensor mounts located within the THOR-M ATD.

After investigating the tolerances in the mounting of tilt sensors within the body of the THOR-M, Humanetics found that there was enough 'play' with the leveling of the mounts to cause zeroing errors when installing the sensors.

The differences in diameter of the bolt holes in the mounts and the actual bolts can allow up to 6 degrees of variance in the leveling of the mount on the base parts. This variance can affect the positioning of the tilt sensors and change the accuracy of the readings.

The mounts and the base parts are updated to use locating dowel pins to decrease variance. The addition of dowel pins will position the mount more accurately with less than 0.25 degrees of tolerance, reducing the effect of the bolt holes in the leveling of the mounts.



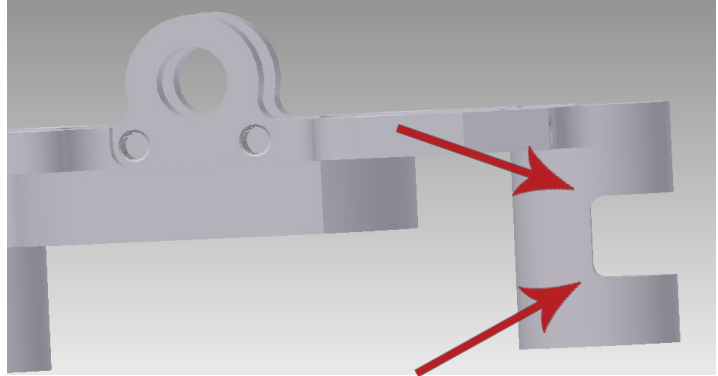
Lower Thorax, Lumbar Spine, and Pelvis Lumbar Mounting Blocks

Tilt sensor mounts	472-3781	1	Tilt Sensor Mount, Lumbar Spine
	472-3787	1	Tilt Sensor Assembly, Pelvis
	472-3783	1	Tilt Sensor Mount, Lower Thorax
	472-3765	1	Pelvis 7 lumbar mounting Block
	472-3733	1	Thoracic Spine Adaptor Plate
	472-3655	1	Lower Thoracic Spine Box

THOR-50M Design Change History (con't)

Neck Platform

The addition of radii to the Head/Neck mounting platform are added to improve the durability.



Neck Platform	472-2210	1	Head/Neck Mounting Platform
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For questions please contact your Account Manager or Customer Service Representative.