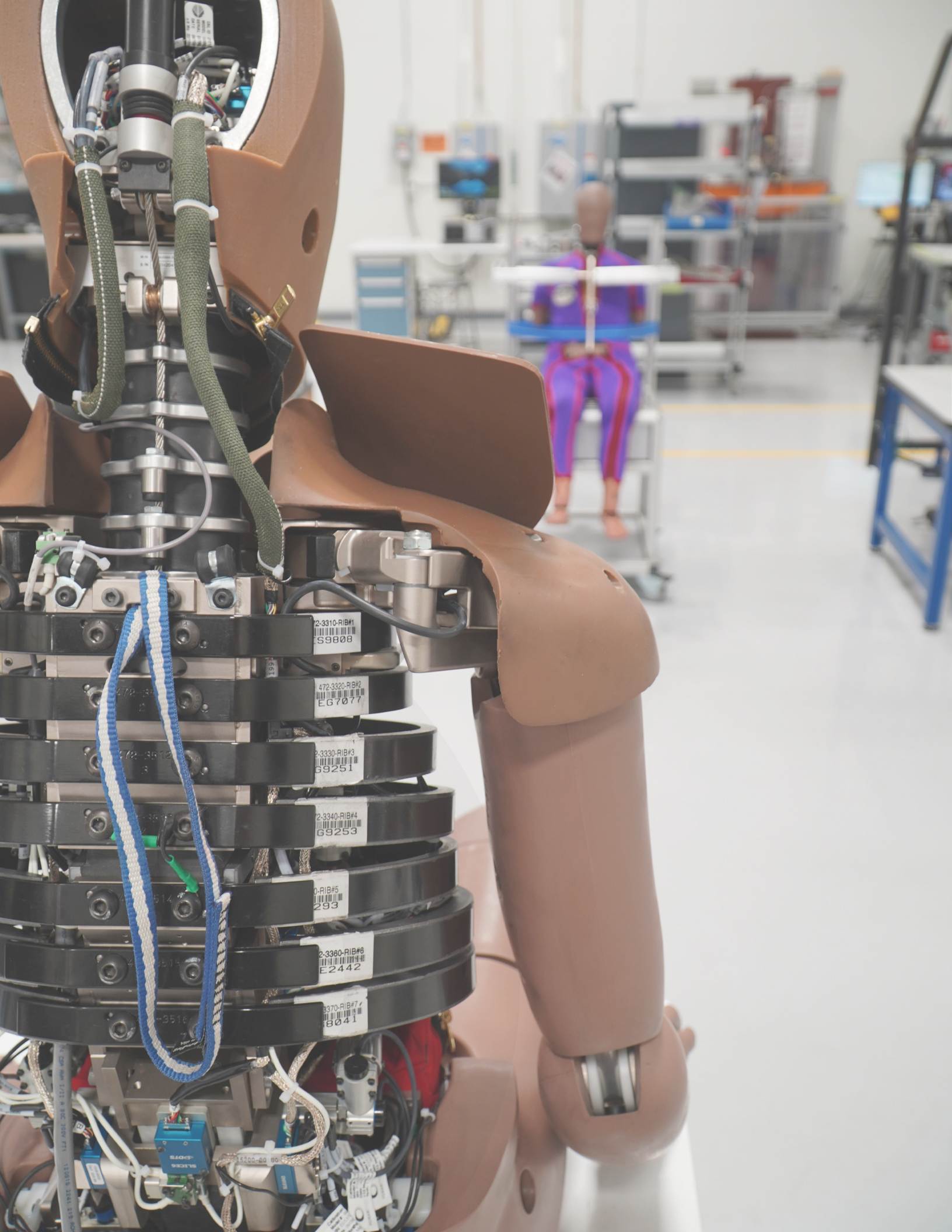


# THOR-50M

THE **ADVANCED** FRONTAL-IMPACT MALE TEST DEVICE



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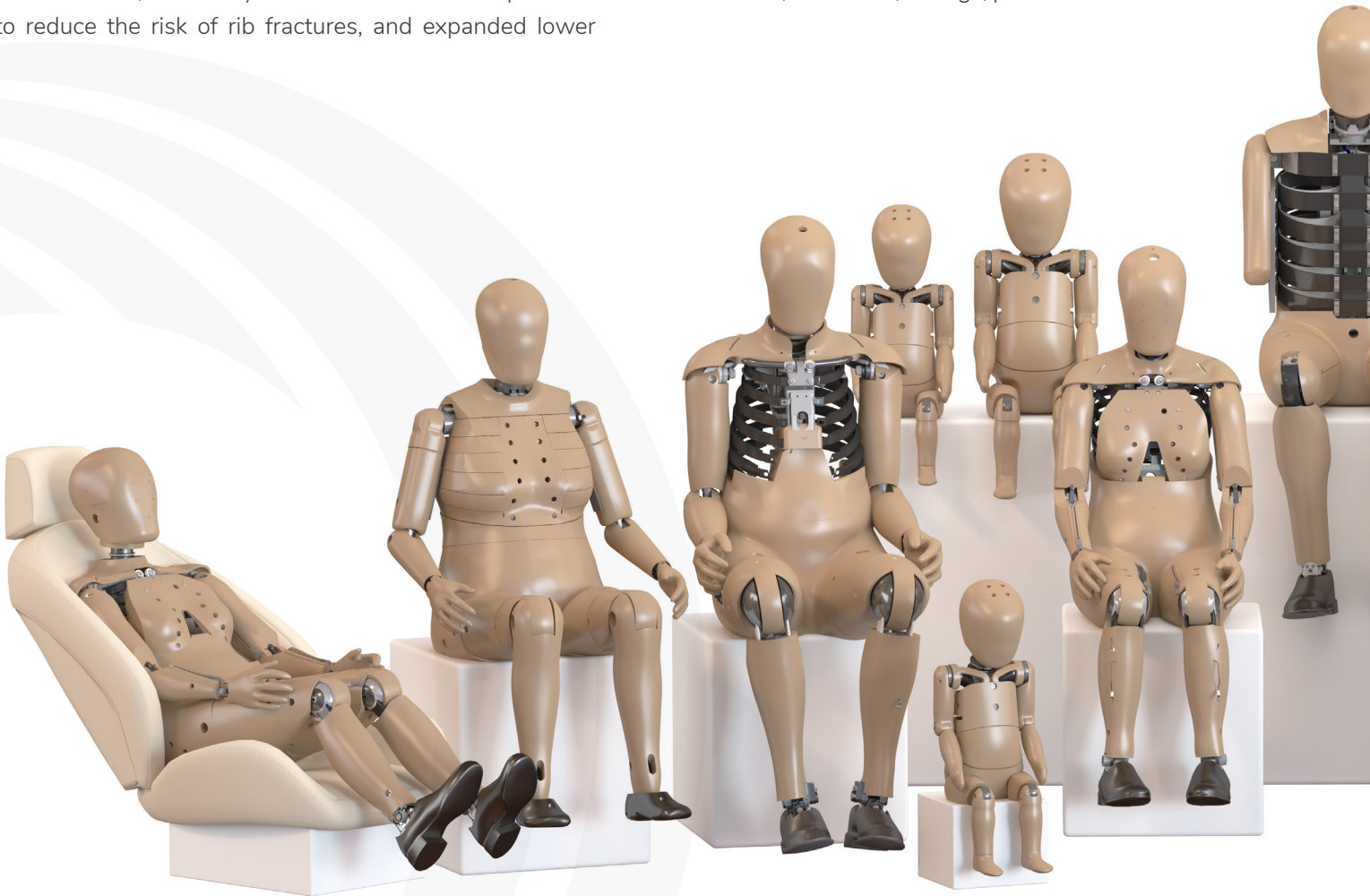
# THE NEXT GENERATION

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Crash test dummy technology has evolved to develop a next generation of Anthropomorphic Test Devices (ATDs) that can better replicate a person's physiology.

These dummies have more sensors in the abdomen and pelvis to measure seat belt loads during impact, more facial sensors, more ways to measure chest compression to reduce the risk of rib fractures, and expanded lower

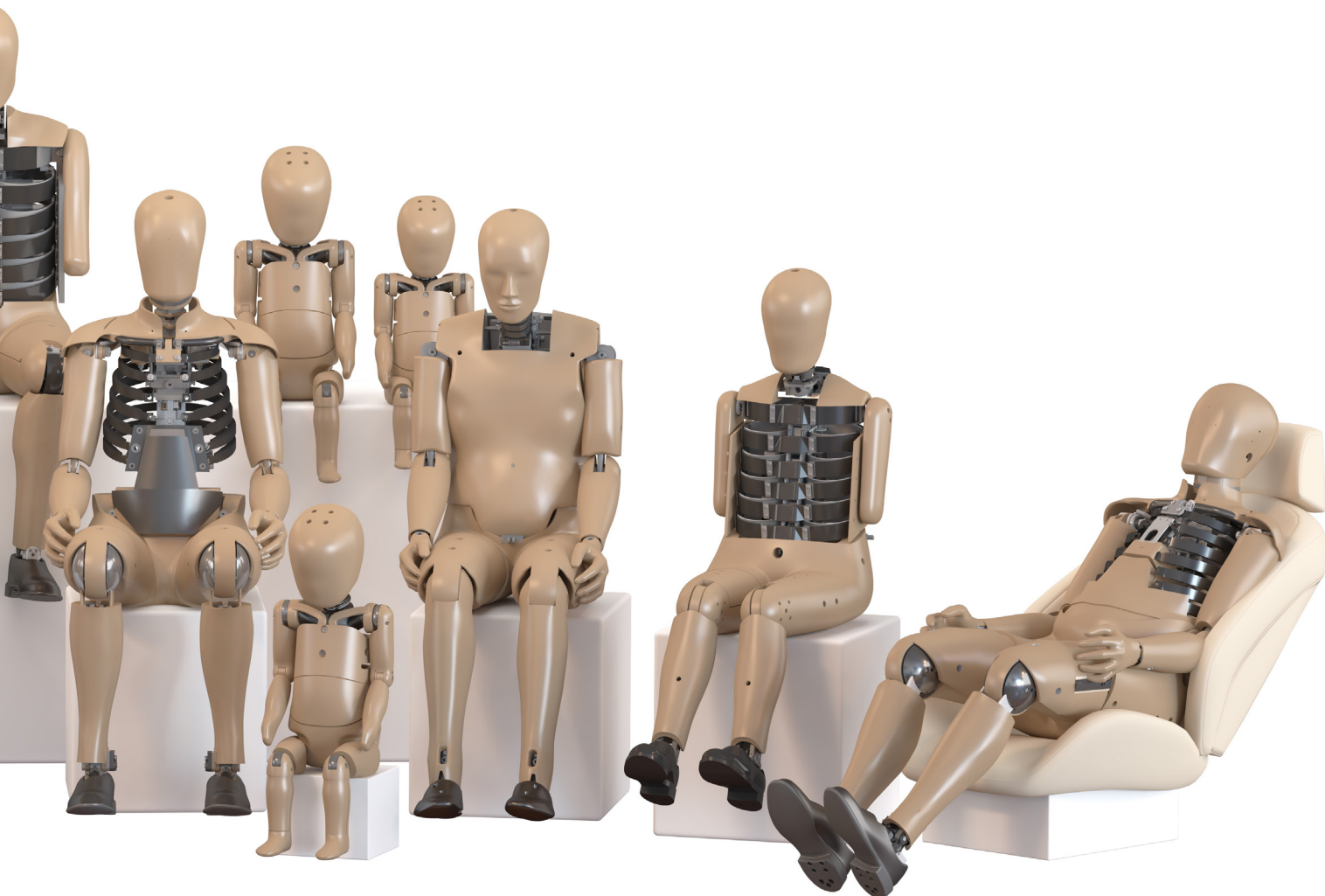
limb capabilities. Data provided by advanced dummies could help tune car design for safer and more effective seat belts, headrests, airbags, pedals and cabin structures.





## OUR LINEUP OF NEXT GENERATION ATDS:

THOR-50M	WorldSID-5F
THOR-5F	Elderly Female
THOR-AV-50M	Obese Male
THOR-AV-5F	BioRID
WorldSID-50M	Q-Dummy Children



# DECADES IN THE MAKING

---

THOR-50M is not completely new. He was conceived decades ago by the National Highway Safety Administration (NHTSA) and only in recent years began his final journey towards regulation.

Beginning in 2009, Humanetics began working with NHTSA and European initiatives to deliver a new, advanced frontal-impact male ATD with much improved and anticipated enhancements. Since then, THOR has seen even more improvements to amplify his reliability, durability and accuracy.

2021



China NCAP includes the THOR in their 2021 revision of testing protocols

NHTSA releases updated THOR drawing package + qualification procedures

Euro NCAP updates its offset frontal impact test to include **Humanetics** THOR-50M



2020



2018



Euro NCAP and ANCAP announce incorporating **Humanetics** THOR into their updated assessment protocols starting in 2020

**Humanetics** releases SBL-A and then SBL-B



2017



2015



NHTSA publishes RFC (request for comments) notice to update US NCAP incorporating the THOR-50M

**Humanetics** delivers the first 3 updated THOR-M (metric) dummies to NHTSA



2013



2009



NHTSA awards **FTSS/Denton (HUM)** THOR-50M Modification kit contract

THOR-NT drawing package released on NHTSA website



2005



# FUTURE OF CRASH-TECHNOLOGY

---

Our Test device for Human Occupant Restraint, or THOR, is the future of crash-technology, available today. THOR incorporates major advancements in biofidelity and sensing, with significantly expanded instrumentation and improved user handling. Available in adult male and female models, THOR is our most sophisticated ATD for assessing whole-body trauma in a variety of occupant restraint environments.

THOR-50M is an advanced frontal-impact 50th percentile adult male ATD. Descended from a series of prototypes and production models that have been in continuous refinement since 1995, the THOR-50M design is currently being validated by regulators and NCAPs worldwide for certified use in frontal impact tests. Humanetics is actively involved in addressing the test procedures, replacement parts and other refinements needed to ensure regulatory adoption.

THOR-50M is advanced in his design and usability. He can carry 150+ channels of instrumentation. His chest measurement is done on 4 points in a 3D manner while his abdomen has a 2-point, 3D function. His spine is equipped with flexible joints in both the thoracic and lumbar regions and his shoulders are designed for better interaction with restraints.

THE  
**MOST ADVANCED**  
ATD EVER CONCEIVED  
FOR WIDESPREAD  
ADOPTION

Find out more  
[humaneticsgroup.com](http://humaneticsgroup.com)





# PRODUCT SPECIFICATIONS

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# KEY FEATURES

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The primary design objectives of the THOR-50M development over the current Hybrid IIIs are to improve biofidelity in mass, geometry, and dynamic response, incorporate more specific instrumentation relevant to injury assessment, improve the repeatability of performance, include overload protection in severe test environments, and increase its user friendliness and modularity in design, for ease of assembly and disassembly.

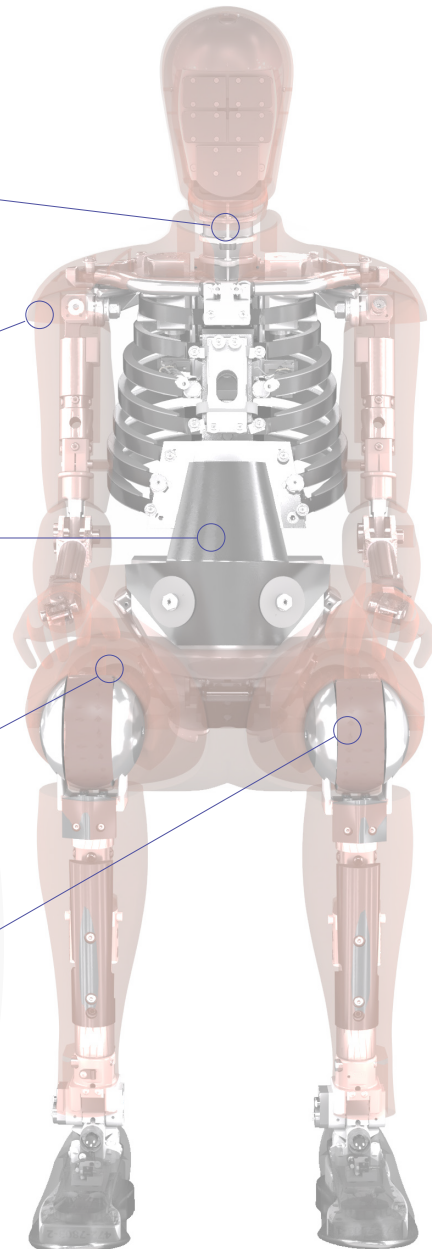
Improved representation of occipital condyle and bending shape

Enhanced restraint interaction

Flexible joints in thoracic and lumbar spine

Less coupling to femur motion

Biofidelic axial load response



# ATD

## BIOFIDELITY RANKING

---

ATDs are constructed to represent the human body's biomechanical properties accurately. According to NHTSA, the purpose of the Biofidelity Ranking System (BRS) is to objectively quantify response differences between human subjects and crash test dummies to evaluate how well a dummy replicates the behavior and response of a human.

**HYBRID-III 50<sup>TH</sup>**  
Hybrid-III Design

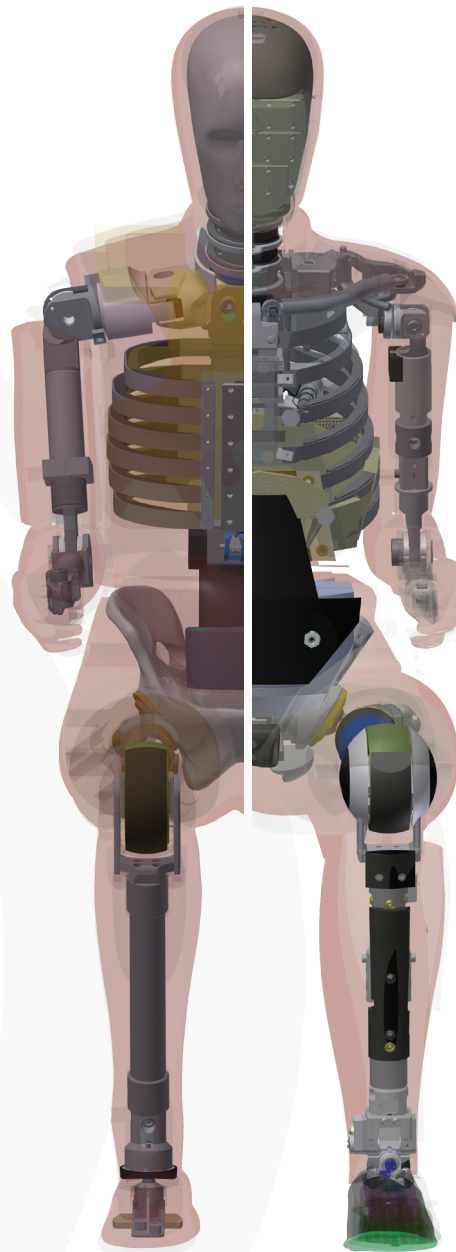
**2.70**  
**MARGINAL**

Overall BioRank Biofidelity Score

**THOR-50M**  
THOR Design

**1.43**  
**GOOD**

Overall BioRank Biofidelity Score



BRS Range	BRS ≤ 1.0	1.0 < BRS ≤ 2.0	2.0 < BRS ≤ 3.0	BRS ≥ 4.0
Biofidelity	Excellent	Good	Marginal	Poor

The lower the BioRank score, the more biofidelic the ATD response is. A BioRank score less than 2 is desirable.

# INSTRUMENTATION BY CHANNELS

## HYBRID-III 50<sup>TH</sup> Hybrid-III Design

## THOR-50M THOR Design

Head

**3 CHANNELS**

In head center of gravity, COG

Neck

**12 CHANNELS**

Upper and lower neck

Upper Torso

**8 CHANNELS**

Spine and thorax

Lower Torso

**9 CHANNELS**

Lumbar, ASIS and pelvis

Lower Extremity

**19 CHANNELS**

Femur and tibia

**< 75**

DATA CHANNELS

Available for injury sensing

Head

**14 CHANNELS**

Includes tilt, facial, and angular rate sensor (ARS)

Neck

**15 CHANNELS**

Upper and lower neck

Upper Torso

**36 CHANNELS**

Chest, clavicle, spine and thorax

Lower Torso

**27 CHANNELS**

Abdomen, pelvis, ASIS, lumbar and acetabulum

Lower Extremity

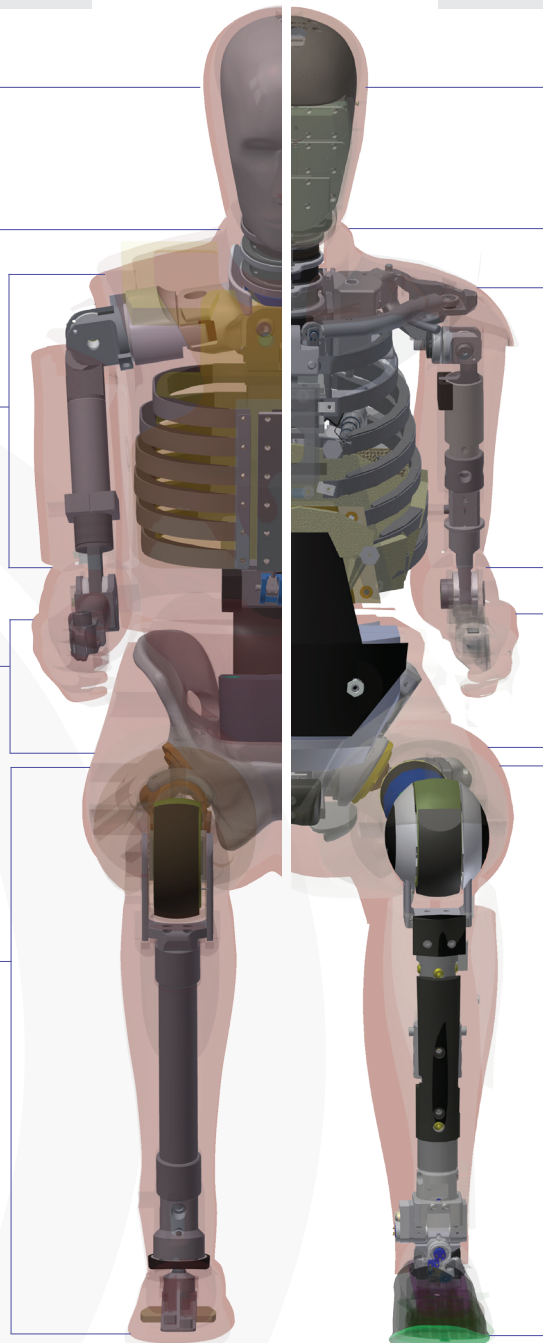
**58 CHANNELS**

Femur, knee, tibia, achilles, ankle and feet

**150+**

DATA CHANNELS

Available for injury sensing



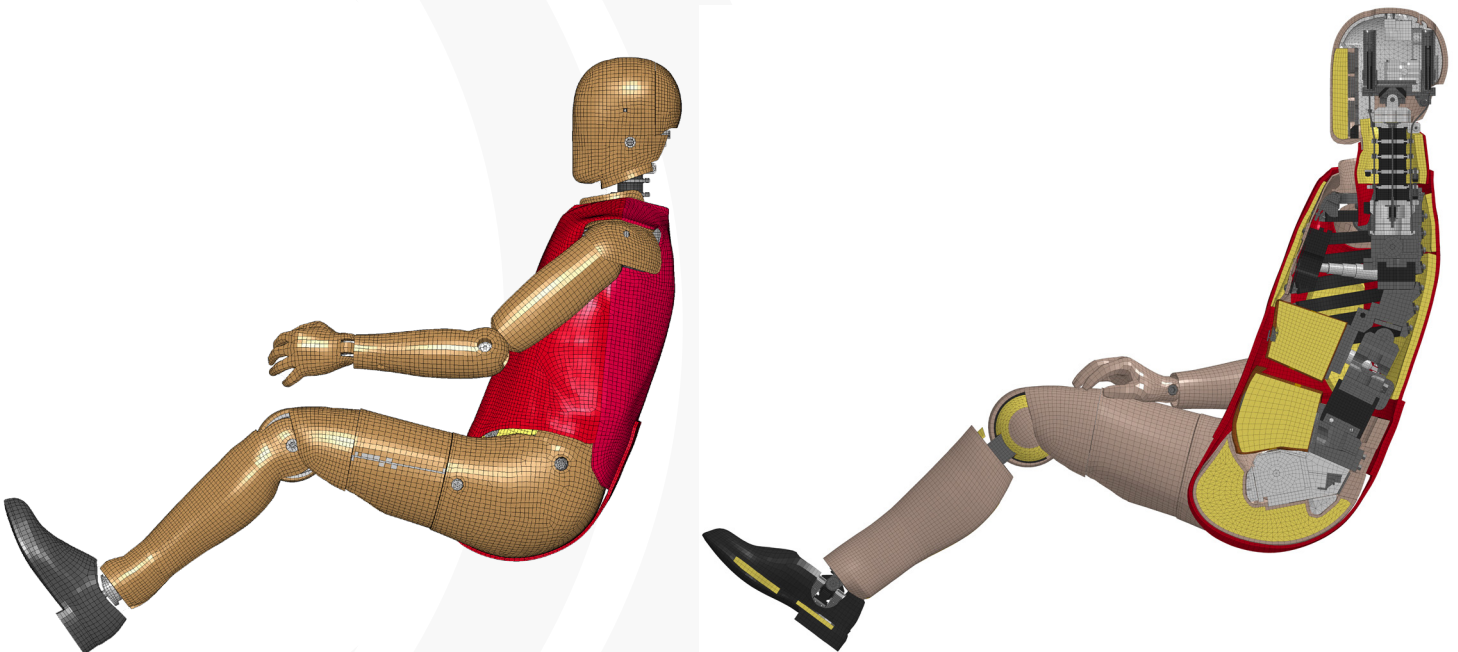
# VIRTUAL ATD MODELS

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Using computer-aided design (CAD) and finite element analysis (FEA), our developers have created a portfolio of products and platforms to enable engineers to run unlimited iterations of real-world crash tests in virtual simulations. Virtual crash test dummies can be transferred into a virtual vehicle environment, thereby opening up the possibility to carry out unlimited simulations of real-world crash scenarios.

Humanetics is the only company in the world that provides a diverse portfolio of both physical crash dummies as well as their virtual counterpart. Through our physical dummy design and testing, we have direct access to CAD geometry, material data, components and dummies. Our research and development involved in the manufacturing of physical crash test dummies feeds directly into our Finite Element models, resulting in the highest level of predictability and robustness. Humanetics offers the

THOR-50M FE models in all four major crash analysis codes: ANSYS LS-Dyna, ESI PAM-CRASH, Altair RADIOSS, and Simulia Abaqus. With virtual certification on the horizon, the THOR-50M model brings the advantages of the most advanced male crash test dummy to the virtual environment. The Humanetics THOR 50M simulation model always represents the latest hardware build level.



# THE HUMANETICS ECOSYSTEM ADVANTAGE

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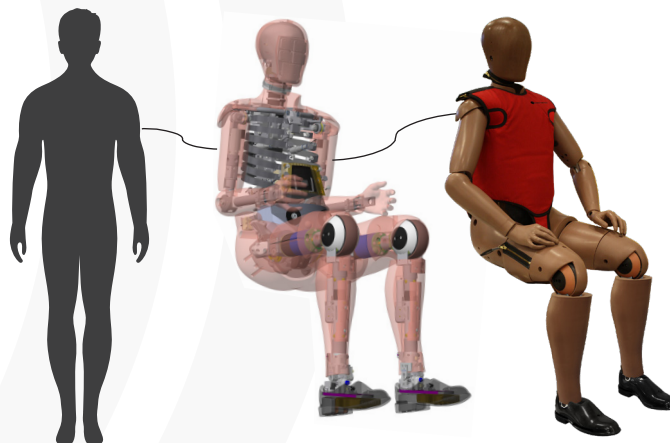
Humanetics has earned its reputation as a global leader in the development and manufacturing of crash test products by providing a complete ecosystem that covers every aspect of safety testing. From virtual simulations to physical crash test dummies, Humanetics offers a seamless workflow that ensures the most accurate and reliable results throughout the testing process.

Humanetics' toolkit begins with state-of-the-art digital simulations. Leveraging advanced computer-aided engineering (CAE) technologies, Humanetics allows manufacturers to conduct thorough virtual crash tests before any physical prototypes are created. This not only accelerates the product development cycle but also minimizes costs associated with physical testing.

The virtual phase seamlessly transitions into physical testing, where the accuracy of the simulations is rigorously validated. Humanetics' virtual testing solutions ensure that the digital model faithfully represents real-world scenarios, providing engineers with unparalleled insights into the performance of their designs.

Humanetics original legacy is in the development of physical crash test products. Our (Anthropomorphic Test Devices) ATDs are engineered with precision and attention to detail, ensuring that they accurately replicate the biomechanics of the human body. From head-to-toe, Humanetics' ATDs are designed to provide the most realistic and reliable data possible.

**Through our physical dummy designs and testing, we have direct access to complex geometry and material data to ensure the consistency of our digital twins so the physical and virtual worlds perform as identical as possible.**



# THE HUMANETICS WORKFLOW ADVANTAGE

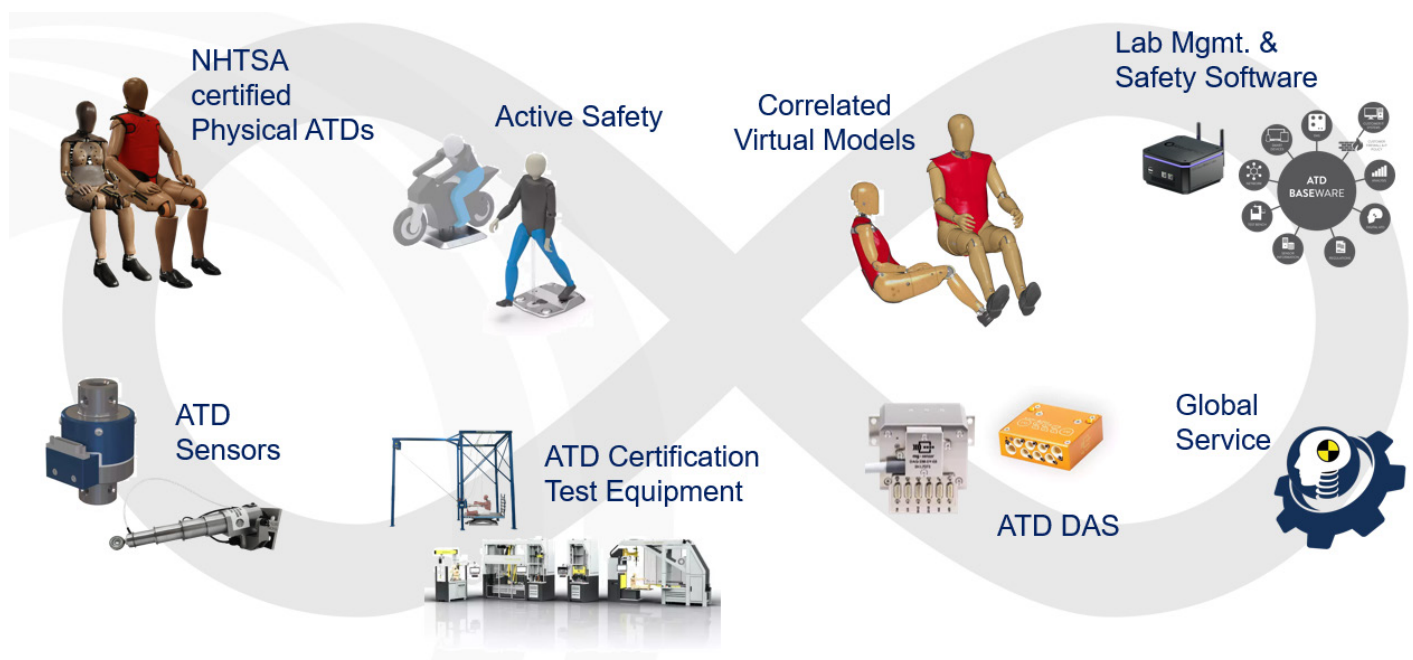
Humanetics' closed-loop workflow ensures a seamless transition from digital simulations to physical testing with integrity and feedback control. This integration minimizes the risk of discrepancies between the virtual and real-world results, providing engineers with the confidence that the safety features designed in the digital realm will translate accurately to physical products.

Humanetics provides a comprehensive range of testing products such as crash test dummies, digital twins, active safety platforms, calibration systems, lab management software, and precision sensor technologies. This integrated ecosystem ensures seamless collaboration and compatibility among our solutions.

With a complete workflow in place, Humanetics guarantees the integrity of the testing process. The closed-loop system eliminates potential gaps or

inconsistencies in the workflow, providing a holistic and reliable approach to crash testing. Manufacturers can trust that the results obtained from Humanetics' products accurately reflect the performance of their vehicles in real-world collision scenarios.

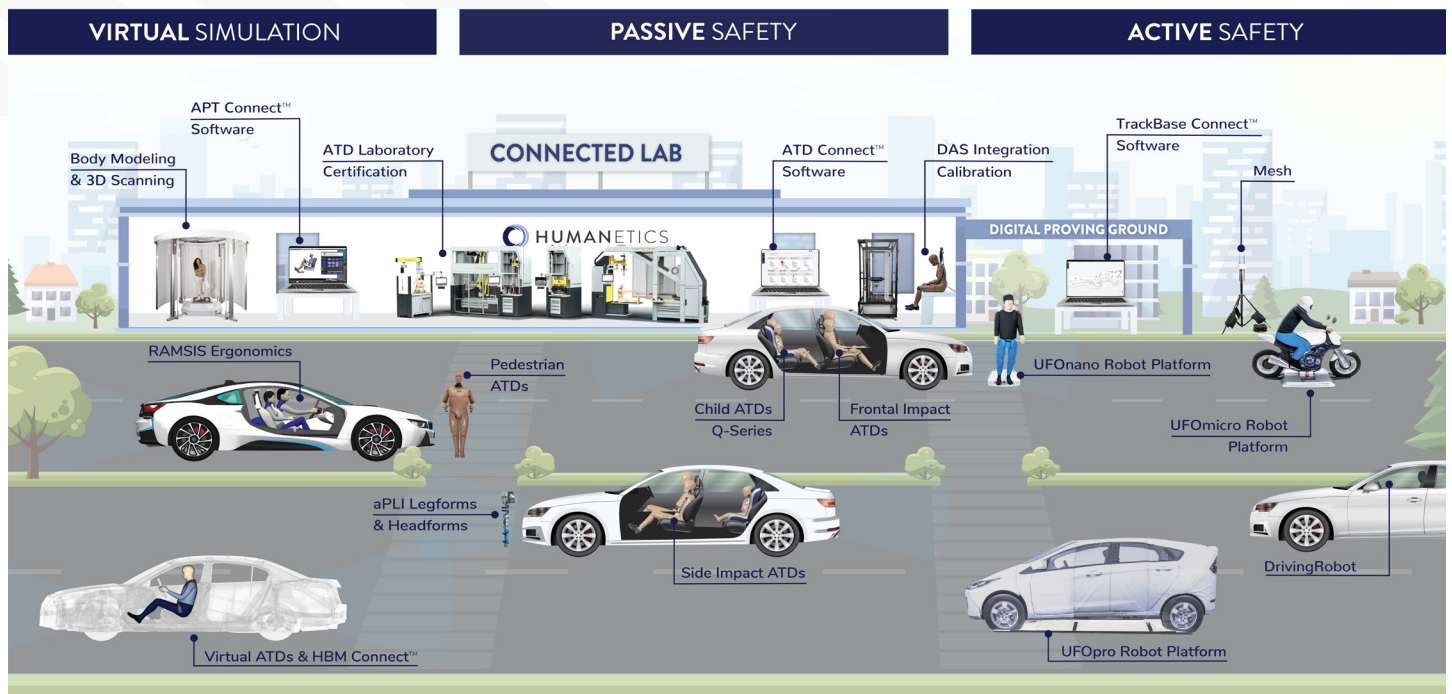
For example, Humanetics creates data models and simulation software that accelerate design and test, improve safety & comfort, and reduce development cost and time to market.





By seamlessly integrating digital software and management tools into the test lab, we can offer the capabilities to connect not only ATDs and sensor solutions but also test systems with each other, analysis software and cloud solutions. Our products provide the ability for connected and integrated lab management, ensuring measurement accuracy and repeatability.

- Low Variation
- Seamless Integration
- High Efficiency
- Data Integrity
- Speed to market
- Lower long-term costs
- Management of increased development complexity across disciplines

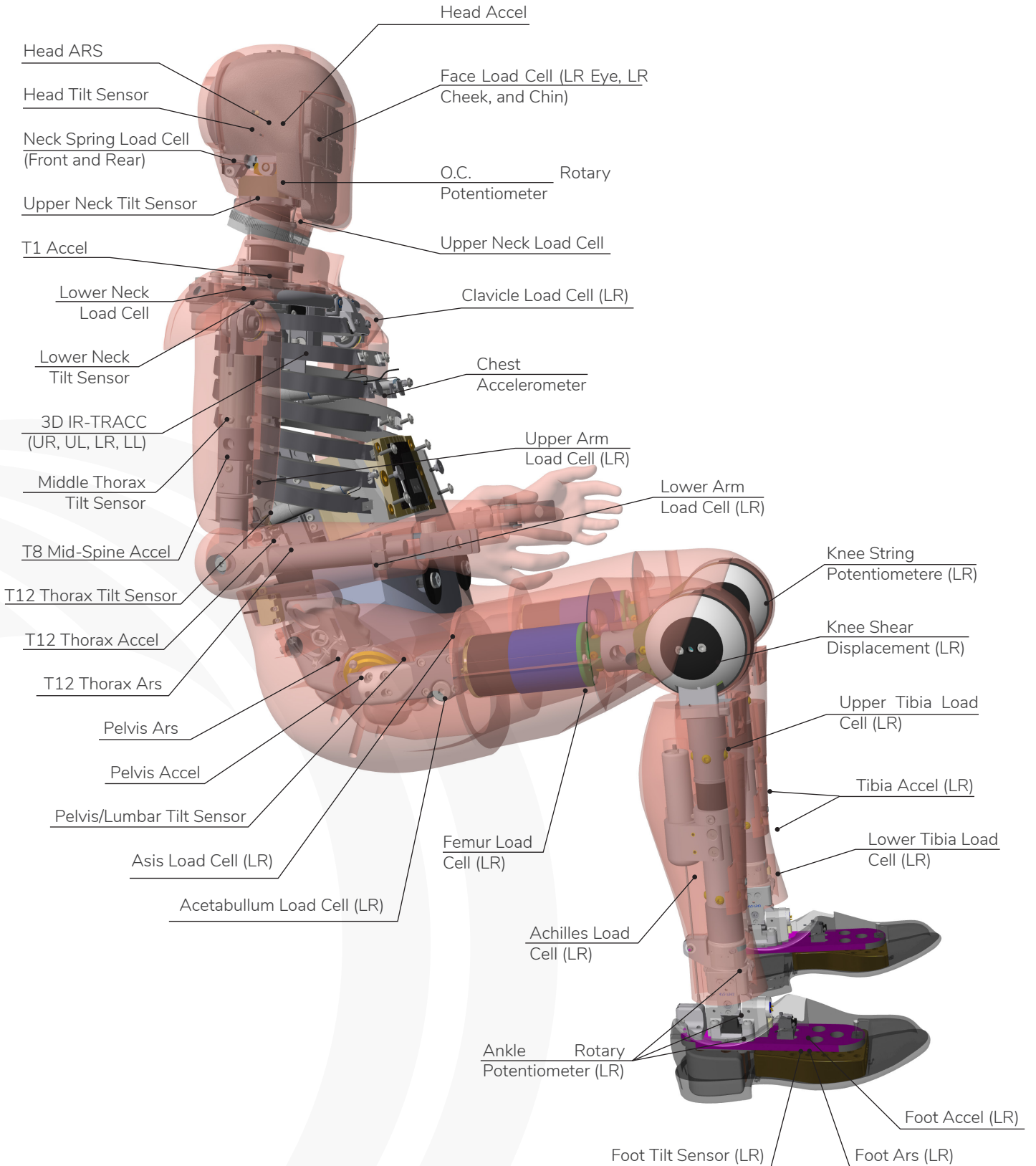


# HUMANETICS SENSORS

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We develop special sensors to measure the forces that break bones and cause injuries. These readings are controlled and repeatable, providing vehicle development engineers with reliable data to enhance and refine product safety.

Thanks to our advanced engineering and meticulous manufacturing, Humanetics dummies are highly sophisticated platforms that deliver trusted sensory intelligence.

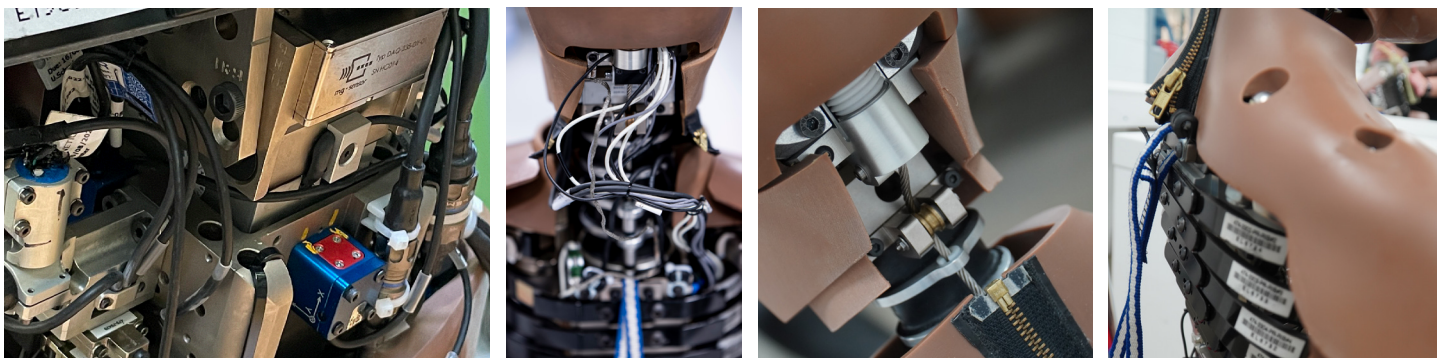


# SENSOR OPTIONS

Humanetics is the industry leader in the design and manufacturing of ATD load cells. We developed the first load cells for the Hybrid-III 50th in 1974 and now offer over 1000 load cells for all ATDs on the market. The THOR-50M, can accommodate a full range of sectional load cells.

## Load Cell Matrix

M O D E L NUMBER	DESCRIPTION	AXIS	CHANNELS
10382J	FACIAL-J-211	FX	1
IH-11450J	LOWER NECK J-211	FX FY FZ MX MY MZ	6
IH-11610J	UPPER NECK J-211	FX FY FZ MX MY MZ	6
IH-11460J	THORACIC SPINE J-211	FX FY FZ MX MY MZ	6
IH-11660J	CLAVICLE J-211 (Left Side)	(2X) FX & (2X) FZ	4
IH-11670J	CLAVICLE J-211 (Right Side)	(2X) FX & (2X) FZ	4
IH-12500J	UPPER ARM J-211	FX FY FZ MX MY MZ	6
IH-11560J	LOWER ARM J-211 (Right Side)	FX FY FZ MX MY MZ	6
IH-11550J	LOWER ARM J-211 (Left Side)	FX FY FZ MX MY MZ	6
IH-11490J	ASIS J-211 (Left Side)	FX MY	2
IH-11500J	ASIS J-211 (Right Side)	FX MY	2
IH-11470J	ACETABULUM J-211 (Left Side)	FX FY FZ	3
IH-11480J	ACETABULUM J-211 (Right Side)	FX FY FZ	3
IH-11510J	FEMUR J-211	FX FY FZ MX MY MZ	6
IH-11800J	UPPER TIBIA J-211	FX FY FZ MX MY	5
IH-11820J	LOWER TIBIA J-211	FX FY FZ MX MY	5
10389J	ACHILLES J-211	FZ	1
Hybrid-III 50th Lower Legs			
(Various)	FEMUR J-211 (Hybrid-III leg option)	Up to 6 Axis	(6)
(Various)	UPPER TIBIA J-211 (Hybrid-III leg option)	Up to 5 Axis	(5)
(Various)	LOWER TIBIA J-211 (Hybrid-III leg option)	Up to 5 Axis	(5)



The THOR-50M has channel package to optimize the data collection requirements of next generation analysis.

## Additional Instrumentation Available

### INSTRUMENTS

Head Accelerometers (CG)

Head Accelerometers (Top)

Head Accelerometers (Side)

Head Accelerometers (Rear)

Head CG Angular Rate Sensor

O.C. Rotary Potentiometer

T1 Accelerometer (Tri-pack)

Mid Sternum Accelerometer

Thorax Accelerometer (Tri-pack)

T12 Accelerometer (Tri-pack)

Thorax Angular Rate Sensor

3D IR-TRACC or S-TRACK Upper Thorax (Left)

3D IR-TRACC or S-TRACK Upper Thorax (Right)

3D IR-TRACC or S-TRACK Lower Thorax (Left)

3D IR-TRACC or S-TRACK Lower Thorax (Right)

Upper Abdomen Accelerometer

3D IR-TRACC or S-TRACK Abdomen (Left)

3D IR-TRACC or S-TRACK Abdomen (Right)

Pelvis CG Accelerometer (Tri-pack)

Pelvis Angular Rate Sensor

Knee Shear Displacement Potentiometer

Tibia Accelerometer

Ankle Rotation Potentiometer X Y Z

Foot Accelerometer

# THOR-50M PACKAGES

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# SIMPLIFIED INSTRUMENTATION

Packaged for **convenience**, **usability** and **simplification**.

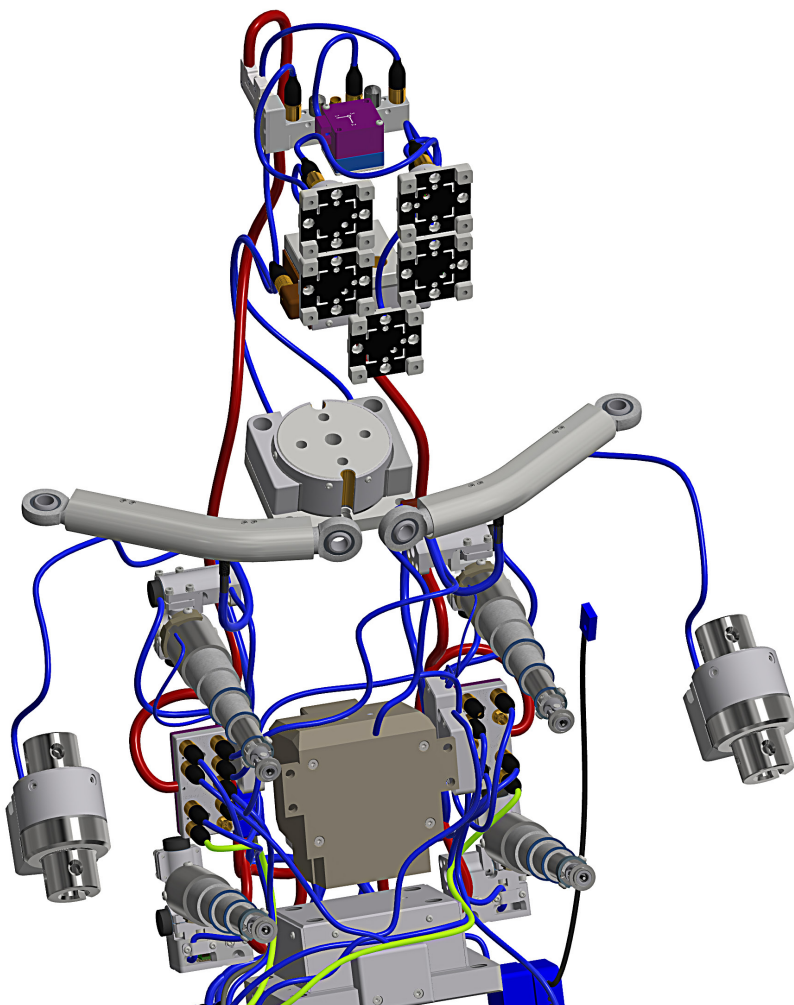
A tier of standardized option menus have been created for the THOR as part of the ATD complexity reduction initiative in an effort to simplify the purchasing process for integrated ATDs. We have instrumentation and channel configurations to match NHTSA and various NCAP specifications.

These package options offer sets of predetermined channel counts of load cells, accelerometers, and angular rate sensors conveniently bundled together for optimal usability. Moreover, the standard delivery time will be greatly reduced as a result of streamlining the ATD production and assembly processes.

Historically, most integrated ATDs are coupled with a choice of on-board data acquisition systems with customer specific instrumentation, and they have typically been engineer-to-order items that require unique build designs for each dummy. To minimize the sometimes unnecessary customization, customers now have the option to purchase the standardized packages with preset instrumentation. This allows a simplified ordering and build process that will not only meet the customer's data collection needs, but also come with a much quicker delivery time and savings in cost.

## STANDARD INSTRUMENT PACKAGES

99 Channels	Euro NCAP
139 Channels	NCAP Expanded
151 Channels	NHTSA



# ONBOARD DAS INTEGRATION





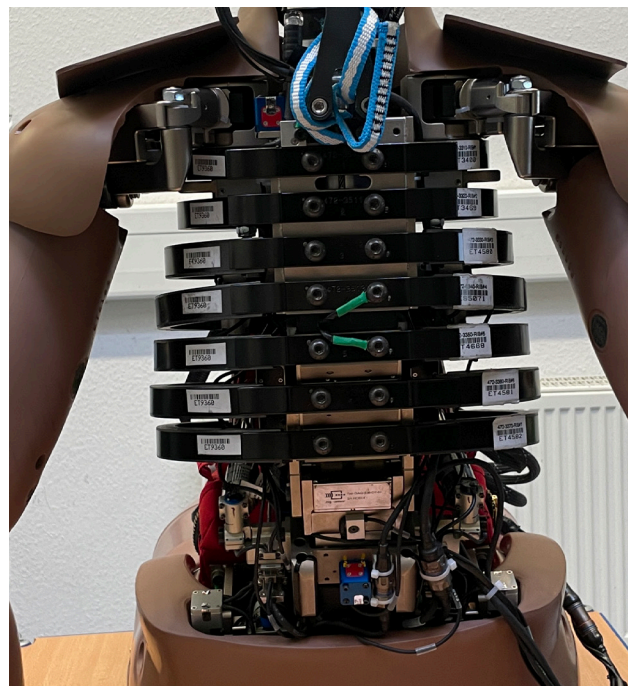
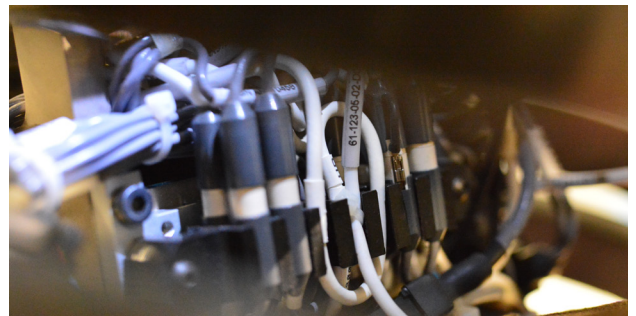
# ONBOARD DAS INTEGRATION OVERVIEW

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The Humanetics legacy of integrating ATDs with onboard Data Acquisition Systems (DAS) spans over twenty years, starting in the mid 1990s with the Intelligent Dummy Data Acquisition System (IDDAS). This first system found itself assimilated into the spine of the Hybrid III 50th ATD with a limited number of channels.

Today, as the world leader in integrations, Humanetics' role in the development of the integrated dummy is well known in the industry and continues to push the boundaries of this technology. A Humanetics iDummy can now exceed 200 channels of available data collection.

The secret to Humanetics' iDummy success has been the ability to integrate all types of dummies using any type of DAS for both automotive and military applications. Being a DAS neutral integrator allows Humanetics to utilize the customer's choice of systems from suppliers like DTS, Kistler, mg Sensor, Messring, and Kyowa. And since the manufacture of dummies and load cells are part of the Humanetics core business, the level of expertise of these integrations provides customers with the assurance that any integrated dummy will seamlessly function and be equal to the non-integrated counterpart in mass, CG, and physical measurements.



# MG-SENSOR-DTI RECORDER OPTIONS

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Hubs connect sensors throughout the dummy by collecting sensor data of specific areas. The collected sensor signals are transferred into a single cable. Hubs help reduce the number of cables routed through the dummy, which ultimately reduces umbilical mass and weight.

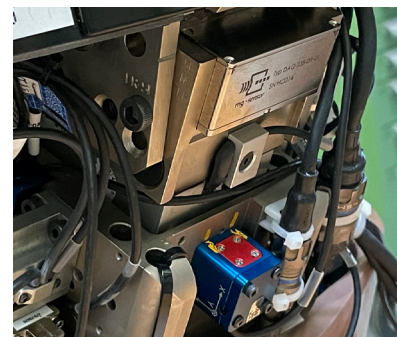
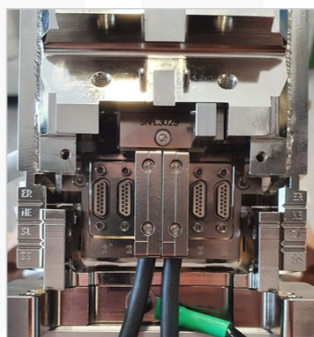
Data recorders are used to collect measurement data in a central erasable memory. For the DTI integrated THOR-50M version, Humanetics offers a data recorder by mg-sensor, called DAQ-238-DY. The recorder features 17 DTI ports and a system LED port, as well as a 64 GB Flash Memory for data storage

To ensure an optimal distribution of the sensor data, hubs by Humanetics are always customized to the certain needs within the area they are used, for example, the amount of input connector slots or the number of data channels that need to be connected to the hub.

Due to the user-friendly design and installation, the recorder can easily be accessed from the front as well as the back of the spine. The recorder is working with all DTI compatible DIMODs and ADMs and has been tested with various software packages with DTI support, to ensure frictionless operation and making it a valuable component of the integrated dummy. Additionally, the integrated power supply supports user efficiency by avoiding unnecessary downtime.

This new recorder can cover a maximum amount of 238 channels and is featuring 10/100/1000 Mbit Ethernet for extremely fast data download, simplifying and speeding up the daily work with the dummy. With an embedded web interface, it can be operated within the web browser.

The DAQ-238-DY is fully compliant with SAE J211 and ISO6487 and accepted by Euro NCAP.



# LOCATIONS

---

A THOR-50M can have modules and hubs built into different parts of the dummy to service those areas where data channels are concentrated.

An example of locations can be seen below.

Head Module

Upper Arm Module

Thorax Module

Tilt Module

Pelvis Module

Upper Leg Module

# PRODUCT + CUSTOMER SUPPORT



There is no company of engineers more experienced in designing, installing, and maintaining sophisticated passive and active safety testing equipment than Humanetics.

Our experts in each of our global facilities spend much of their time on-site with customers training them to use the latest technologies. Humanetics offers an extensive global service model. We train automaker and test facility engineers in a range of capabilities: calibration of sensors, set-up of complete test facilities, and management of CAE and FE modeling.

We also provide fully outsourced on-site dummy management through our own test engineers.

Let us know how you would like us to support you - **we are here to help you succeed.**



# SPARE PART AVAILABILITY

Having a variety of THOR-50M spare parts on hand for quick replacement during an ATD certification or a crash test series is an affordable and efficient way to help manage unexpected needs and regular maintenance requirements.

To help with your inventory planning, we've put together lists of the most common and consumable components to have readily available for regular and emergency use. Visit our website to download the latest recommended spare parts for the THOR-50M.

- Neck Rubbers
- Abdomen
- Rib Set
- Lumbar Rubbers
- Shoulder Pad
- Knee Slider Assemblies
- 3D IR-TRACC Assemblies
- Misc Hardware and Washers

## RECOMMENDED SPARE PARTS & CONSUMABLES THOR-50M

Having a variety of THOR-50M spare parts on hand for quick replacement during an ATD certification or a crash test series is an affordable and efficient way to help manage unexpected needs and regular maintenance requirements.

**Importance of ATD Spare Part Inventory**

Accidents happen. And within vehicle safety test facilities, they happen on purpose! So there's nothing more frustrating than lacking a critical replacement part for a test dummy that's scheduled for a required re-certification or needed immediately for a crucial test series.

Some of the components that bear the brunt of physical impact and abuse are critical items to have on-hand for quick replacement when damaged or worn-out. Many test dummy spares have delivery lead times that could delay your testing if you don't have them available in your local inventory.

To help with your inventory planning, we've put together a list of the most common and consumable components to have readily available for regular and emergency use.

**Recommended THOR-50M Spare Parts**

ITEM #	PART NUMBER	DESCRIPTION	QTY	ITEM #	PART NUMBER	DESCRIPTION	QTY
1	472-1320	HEAD SKIN THOR-M	1	14	472-3330	ELLIPTICAL RIB ASSEMBLY 3, UNTESTED	1
2	472-1401	CONFOR FOAM FACE	4	15	472-3340	ELLIPTICAL RIB ASSEMBLY 4, UNTESTED	1
3	472-1310	CAP SKIN THOR-M	1	16	472-3350	ELLIPTICAL RIB ASSEMBLY 5, UNTESTED	1
4	472-2015	CABLE SEAT COVER, NECK	2	17	472-3360	ELLIPTICAL RIB ASSEMBLY 6, UNTESTED	1
5	472-2018	SCREW, OCCIPITAL CONDYLE	1	18	472-3370	ELLIPTICAL RIB ASSEMBLY 7, UNTESTED	1
6	472-2018	NEOPRENE SPRACR, NECK	1	19	472-3400	THORAX RIB ASSEMBLY	1
7	472-2100-B-KIT	MOLDED NECK, TIC, SBL B KIT	1	20	472-3510	ELLIPTICAL RIB ASSEMBLY 1, UNTESTED	1
8	472-2230	DC STOP ASSEMBLY	1	21	472-3511	THORAX ELLIPTICAL RIB STIFFENER 1	1
9	472-2900	NECK SKIN/FOAM ASSEMBLY	1	22	472-3512	THORAX ELLIPTICAL RIB STIFFENER 2	1
10	472-2901	NECK SKIN ASSEMBLY	1	23	472-3513	THORAX ELLIPTICAL RIB STIFFENER 3	1
11	472-2101	FRONT STOP, NECK	1				
12	472-3310	ELLIPTICAL RIB ASSEMBLY 1, UNTESTED	1				
13	472-3320	ELLIPTICAL RIB ASSEMBLY 2, UNTESTED	1				

humaneticsatd.com HUMANETICS



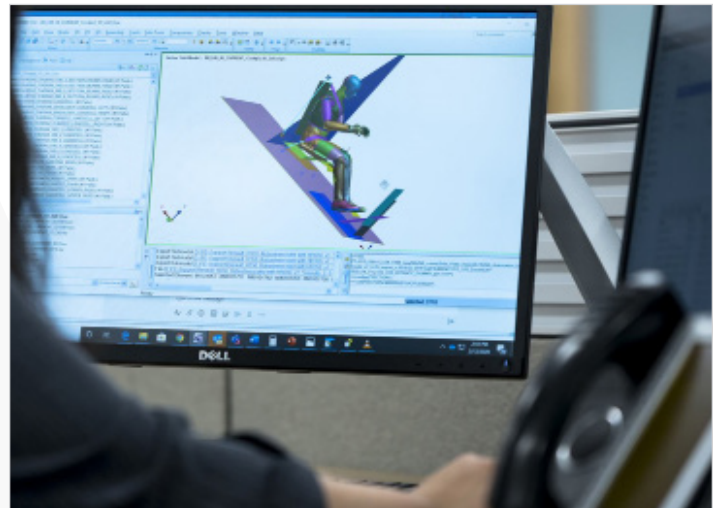
# CERTIFICATION AND CALIBRATION

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Humanetics provides a full range of services to install, maintain, calibrate, and certify our ATD's. Our aim is to keep your test operations running to the highest certified standards by providing you with our expertise, products, and partnership when you need it.

Humanetics offers calibration and certification services for the entire range of THOR-50M dummy components and sensors. ATD certification includes initial overall inspection of the dummy and dynamic testing certified to the latest approved industry standards. Our worldwide laboratories makes sure regional support is always available for your ATD.

Humanetics offices also stock the most commonly replaced certified parts for all dummy types. This allows Humanetics to offer the fastest possible turn-around times to meet your testing schedules.





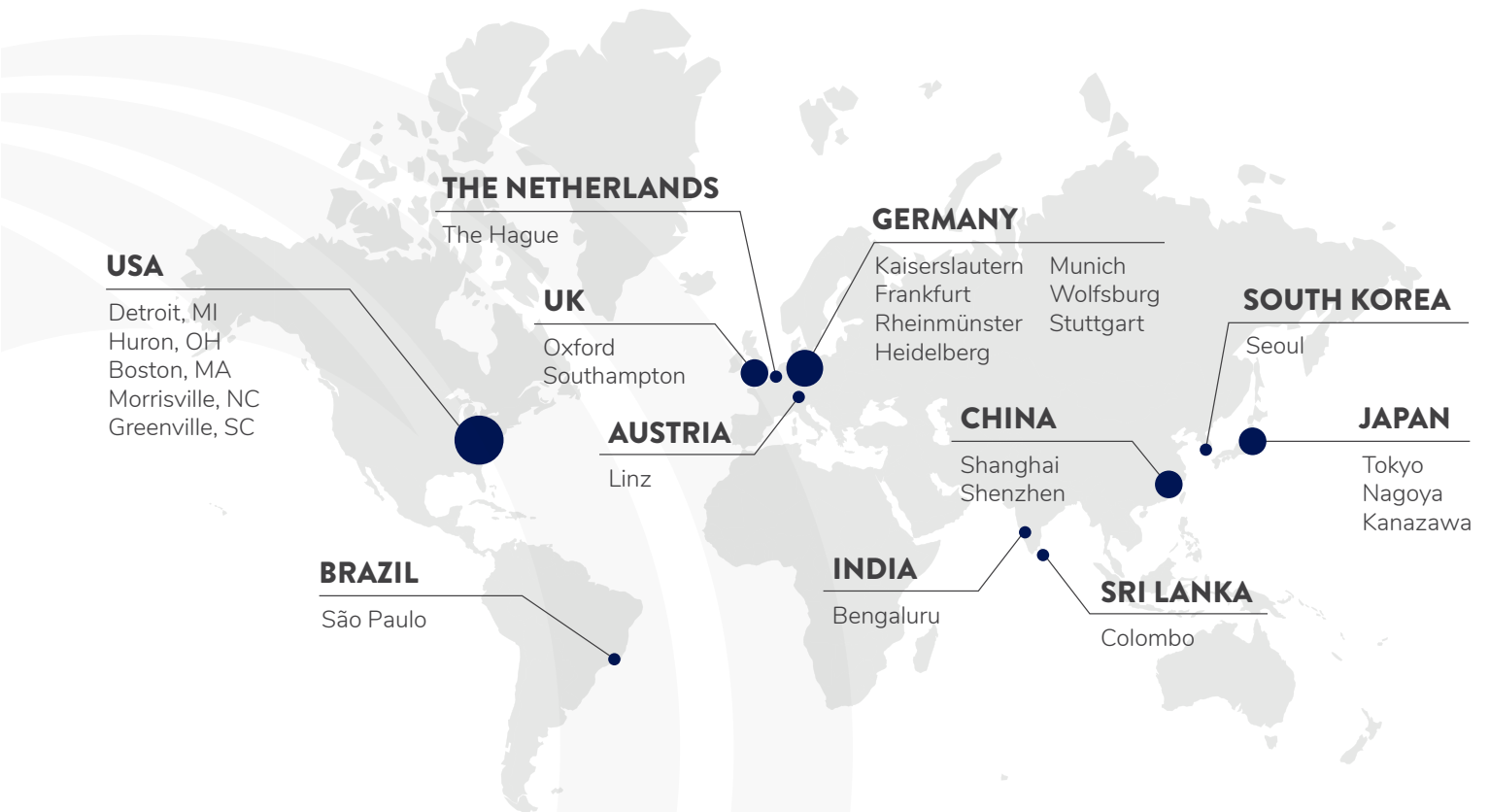
# HUMANETICS

## GLOBAL NETWORK

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Humanetics has a strategic presence in major automotive and industrial markets to fully support the advanced THOR ATDs with 24 locations worldwide including 12 sales & customer and design & service centers.

Our management team are some of the world's leading experts on vehicle safety and biomechanical engineering. They have a passion to lead their teams to develop the best devices, service the needs of our incredible customers worldwide and ensure that people are safe every time they get into a car.



# SALES, MAINTENANCE, AND TRAINING

---

Humanetics provides a full range of services to install, maintain, calibrate, and certify our ATD's. Our aim is to keep your test operations running to the highest certified standards by providing you with our expertise, products, and partnership when you need it.

- A complete plug and play management service to give some of our clients a turnkey solution building and resourcing new facilities around the world, and others, a scalable set of resources during peak testing.
- Leased ATDs, and engineers to install them, for specific tests or longer periods of time and we can provide regular maintenance and training for in-house teams, or schedule times to deliver one-off programs tailored to your needs.
- A full training program to develop the next generation of engineers in your labs, or a fully outsourced solution with our engineers embedded in your teams on a short term or long-term basis.

## KEEP YOUR TESTING PROGRAM ON TRACK



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## CONTACT US

Having offices across Europe, the U.S. and Asia, we have a number of experts in each region who can help you with inquiries. Feel free to reach out to our team in case you have questions or are interested in more detailed information at any time.

Detailed contact information for each region as well as the latest product information including user manuals and technical service bulletins is located on our homepage.

# WEBINARS AND TECHNICAL SUPPORT

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Stay Safe, Stay Informed. Please enjoy our on-demand webinar series on exciting topics that we and our community are passionate about.

Our on-line seminars are presented to enable our experts to engage in discussions with the safety community and share the latest industry knowledge on the tools we use daily and ones soon available in the near future. When in-person meetings are not practical because of distance, schedules, or even health reasons, our webinars are a great source of information delivered effortlessly right to your computer.

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