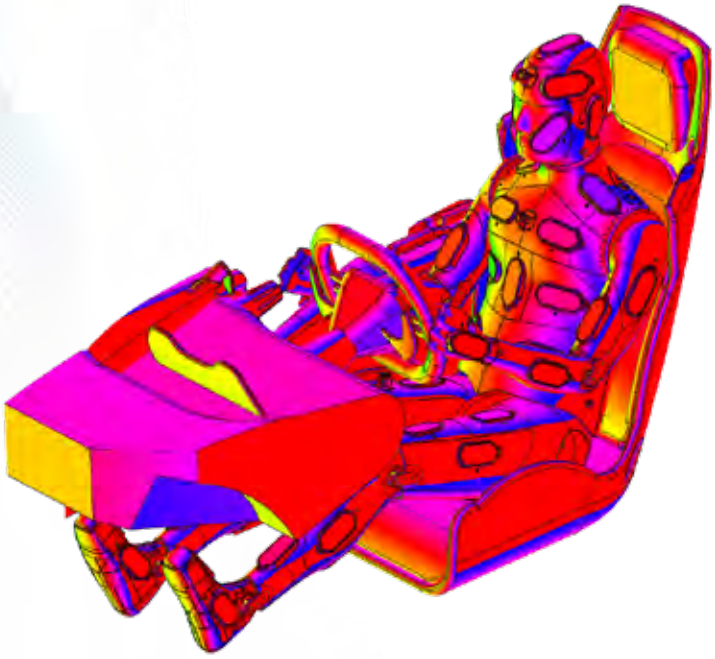
THE WORLD'S MOST ADVANCED SENSOR MANIKIN SYSTEM

ACE - AUTOMOTIVE COMFORT EVALUATION SYSTEM

Vehicle cabin environments are complex and transient, making thermal comfort a moving target. Confidence starts with data. ACE—the Automotive Comfort Evaluation system—offers a repeatable, objective way to measure and optimize comfort under real-world conditions.

ACE's poseable body form, equipped with advanced surface-mounted sensors, captures high-fidelity data across convective, radiative, and conductive boundary conditions. Auxiliary sensors extend measurement beyond the manikin to include vehicle interiors or human subjects.

For virtual designs, ACE data can be used to validate and inform thermal models. Active cabin features such as heated steering wheels, heated/cooled seats, advanced glazing, and radiant panels can be represented more accurately, reducing development time and cost.



Thermetrics

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ACE - AUTOMOTIVE MANIKIN

ACE Feature Highlights & Benefits

- Delivers repeatable, quantitative results—eliminating variability of human testing and converting transient cabin conditions into clear boundary measurements.
  - Validate CFD models with direct sensor correlation
  - Detect hot/cold extremes impacting comfort targets
  - Run precise A/B comparisons of climate or glazing changes
  - Analyze comfort via PMV (ISO 7730), EHT, or UC Berkeley models
- Sets up in minutes with no preheat—prepare, load, and start testing immediately.
- Operates on lab AC or vehicle 12V power for flexible testing anywhere.
- Enables fast, single-person loading and positioning; modular body and friction joints simplify use in tight cabins.
- Streams data your way—raw CAN output plus real-time metrics, logging, and visualization.

Environmental sensor module measures air speed, temperature, dual-spectrum heat flux, and relative humidity.

Base Manikin System Includes:

- Lightweight, jointed nylon manikin shell
- Pre-installed sensors
  - 46 Environmental sensor modules for ambient conditions
  - 8 Conductive sensor modules for seat contact
  - 2 Hands with instrumented palm for steering wheel contact
- External power supply for in-vehicle and in-lab use
- Laptop PC preinstalled with ThermDAC software
- Standard one-year warranty

System Options

- Stand-alone environmental sensor modules for instrumenting vehicle or human subjects
- ManikinPC human physiology + comfort model add-in

ACE Specifications

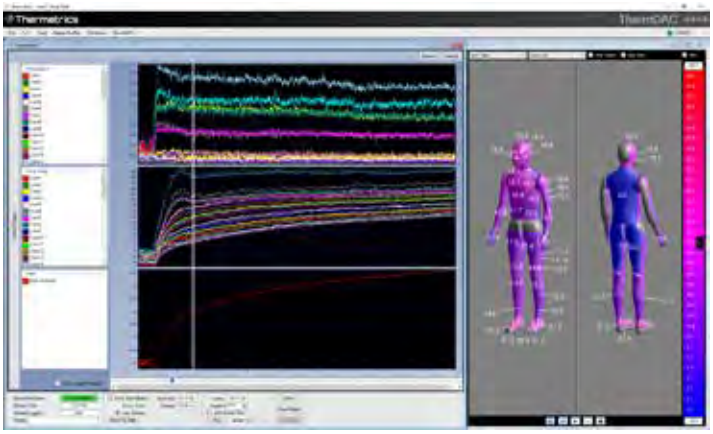
- Lightweight, jointed nylon manikin shell, modeled after 50th percentile male 5 ft, 10 in / 179 cm standing height
- Articulated joints:
  - Neck: 30° range of motion
  - Shoulders: ball joint 360° rotation, +/- 20° lateral motion
  - Hips: ball joint 120° rotation, +/- 20° lateral motion
  - Elbows, knees: ball joint 90° rotation +/- 8° lateral motion
  - Ankles: ball joint +/- 45° rotation +/- 8° lateral motion
  - Wrists: ball joint 180° rotation +/-20° lateral motion
- Manikin handling weight: 50 lbs / 23 kg
- 46 Environmental Sensor Modules:
  - Air Temperature, -25°C to +70°C +/-0.5°C
  - Windspeed, 0.1 to 5 m/sec +/- 3% of full scale
  - Mean Radiant Temperature, -40°C to 90°C +/-1.0°C
  - Solar Heat Flux, 0-2000, 0W/m2 +/- 3% of full scale
- 4 Relative Humidity sensors, 0-95% RH noncondensing +/- 3%
- 8 Conductive Modules on back (4) and buttocks (4)
  - Contact Temperature, -25°C to 70°C +/-0.5°C
  - Contact Heat Flux, -1000 W/m2 to +1000 W/m2 +/- 3% of full scale
- 2 Integrated Sensors, one on each hand palm for:
  - Contact Temperature
  - Contact Heat Flux
- Operating Environment: -25°C to +70°C, 0 to 95% R.H. non-condensing
- Power: 85-235 VAC, 50/60 Hz, or 12VDC 120W typical
- Manikin Data Communications
  - Ethernet
  - WiFi 802.11g
  - CAN

ACE - AUTOMOTIVE MANIKIN

ThermDAC Control Software

ThermDAC is an engineered user interface for thermal manikin systems providing real-time device control, automated testing, and flexible display and logging capabilities, including:

- Color-coded manikin pictorial displays, selectable for any manikin variable
- Zoomable time-history graph of multiple device and ambient variables
- Real-time statistical analysis over any user-selected time range
- ManikinPC integration to simulate human response



Manikin Sensor Measurements:
T, V, Twall, Solar HF, RH

Physiology Parameters
- Clothing Rc, Re
- Berkeley Setpoints

ManikinPC Software

Metabolic Rate (Real-time User Input)

Physiology Outputs:
- Qm (Metabolic heat
- Sh (Shivering heat)
- Qrsp (Respiration heat)
- Tsk (Mean Skin T)
- Thy (Brain T)
- Tblp (Blood pool T)
- Swa (Active sweat)
- Swb (Basal sweat)
- CO (Cardiac output)
- SBF (Skin blood flow)

Comfort Outputs:
- PMV/PPD
- EHT
- Fiala DTS
- Berkeley Sensation
- Berkeley Comfort

4D PHYSIOLOGY & COMFORT MODEL INTEGRATION

Bring your manikin to life with the next dimension in testing; ManikinPC

- Real-time data
- Reduce dependence on human testing
- Shorten design cycles
- Design based on comfort metrics

522 - Thermal Manikin - Automotive - ACE	Item #	Description	Product Name
Standard Base Product	**19-52201**	**ACE Manikin, 46Z, Standard**	**522-XXX_46.M**
Standard Options	—	Stand-Alone Sensor Base Station	—
	—	Stand-Alone Conductive Contact Sensor	—
	—	Stand-Alone Environmental Sensor	—
	11-01407	Software, ManikinPC License (Permanent) - US	—
	11-03396	Software, ManikinPC License (Permanent) - OUS	—

Don't see what you need above? Contact Thermetrics to customize your perfect system.

*Keep your ACE system in tip-top shape. Discuss service plan options and point-of-sale discounts with us at **sales@thermetrics.com**.*