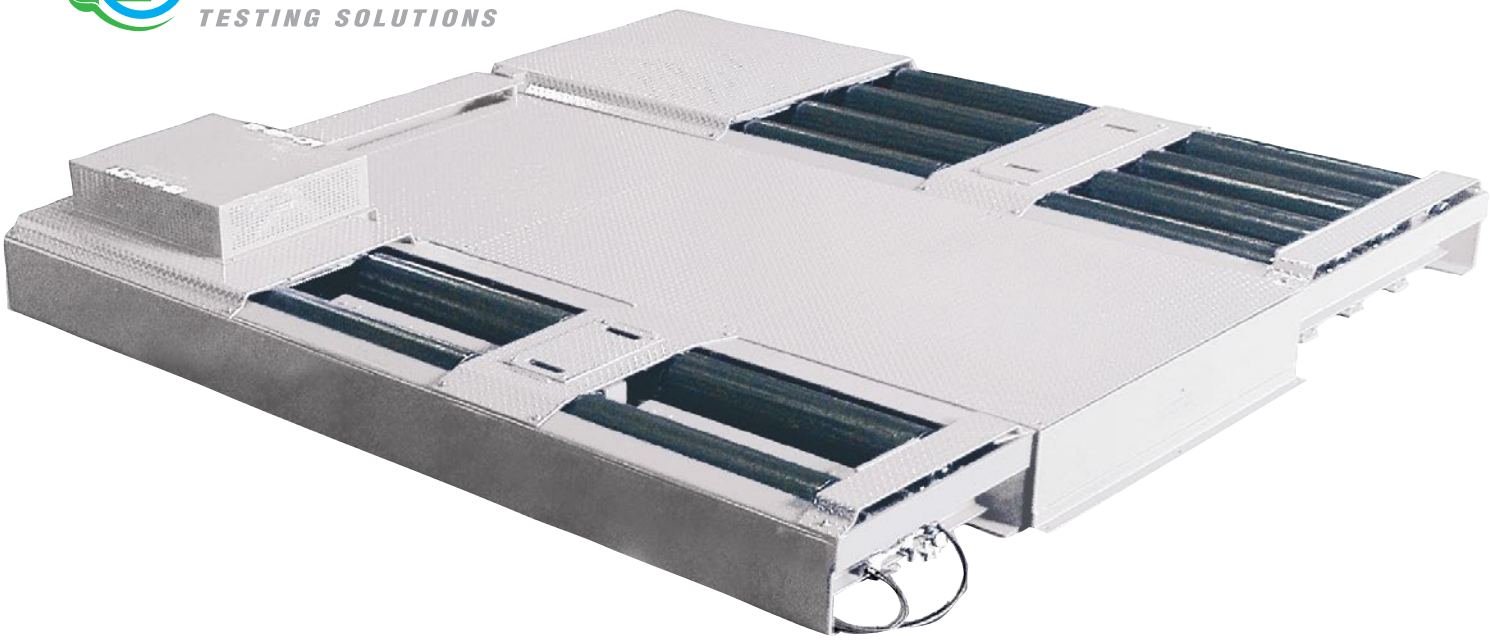
E-Mobility Testing Solutions

MAE-AWD-150-EV Series

The Benefits of a Certification Grade Rolling Road at the Fraction of the Price

MAE MUSTANG ADVANCED ENGINEERING
Fearless Innovation™

MUSTANG E-MOBILITY™ TESTING SOLUTIONS



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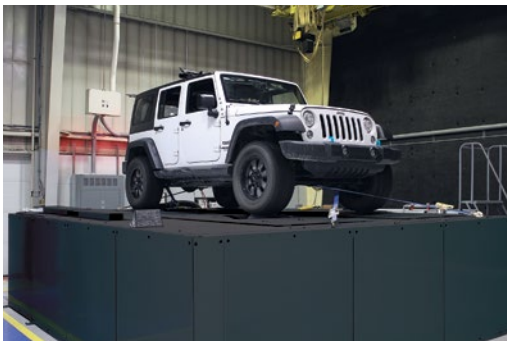
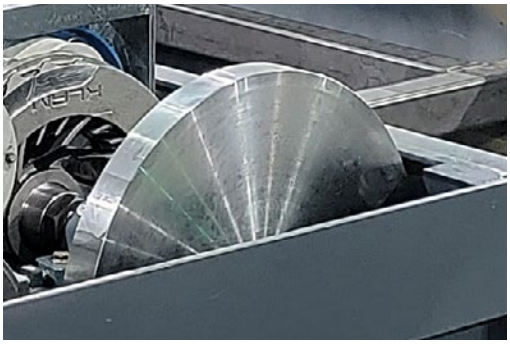
Shown with premium post restraints



Larger roll design version available



Eddy Current and Inertia Fly-wheel design

Robotic pedal-throttle actuators for automatic driving

MAE-AWD-150-EV

With the growing market of electric vehicle (EV, BEV, HEV, PHEV, FCEV) , Mustang Advanced Engineering has developed a series of rolling roads to provide highly accurate and sophisticated EV R&D and production test stands that are both cost-effective and loaded with advanced testing and inertia simulation capabilities.

- All wheel drive & 2WD compatible
- Mechanically-linked
- Regeneration testing inertia
- Emissions & hybrid development
- Calibration & certification
- Efficiency energy loss evaluation of EVs
- Inertia simulation
- kWh/mile evaluation for EVs
- Battery power measurement available
- Optional robot driver for automatic continuous driving

Why Rolling Roads

The MAE-AWD-150-EV series of rolling roads were designed for pre-certification development and testing of both 2WD and AWD hybrid and electric vehicles. AWD models with a mechanically-linked roll system are available to accommodate wheelbase ranges from as short as 89-inches all the way up to 127-inches without needing to adjust the rollers.

A mechanically-linked AWD roller system synchronizes the front and back roller speeds to simulate a flat, dry road condition. Synchronization, or linkage, insures that the front and rear rollers are always spinning at precisely the same road speed when in AWD Mode, thereby eliminating the possibility of activating a vehicle's traction control system and insuring that a vehicle's torque management system is operating under the assumption that the vehicle is not skidding, turning or slipping.

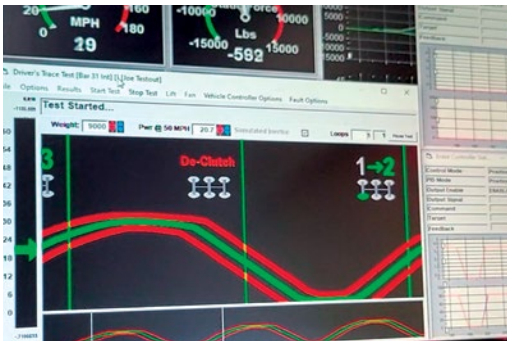
Battery Power Measurement (Optional)

MAE's Battery Power Measurement Module is designed to accurately measure a vehicle's battery power while being operated on the rolling road. The option provides continuous measurement of the voltage and current of the batteries, which can be displayed on the operator interface display and collected by the data acquisition system for graphing and analysis. The option includes a robust clamp-on current transducer, industrial battery clamps/cables, and isolation/signal conditioning modules integrated with the rolling road control system package.

EV R&D, Calibration, Pre-Certification

For vehicle development, calibration and certification applications, the MAE-AWD-150-EV Series provides a cost-effective design and enables quick development cycles for performing initial hybrid and electric vehicle calibrations, traction system motoring and ABS/ESC testing with skid simulation, regenerative braking and limited traction condition simulations using road load and federal drive cycles, electrical power systems analysis, HEV/PHEV/EV controller development, efficiency testing, fuel consumption testing, repair & maintenance and other complete vehicle or sub systems evaluations. In addition to our industry standard PowerDyne PC Software, MAE offers a number of flexible lab-grade software and data acquisition packages for Hardware-in-the-loop and R&D environments.

- Cost effective road load simulation, including Davis Dam Test simulation
- Regenerative braking testing
- Customizable software, data acquisition package to meet any need



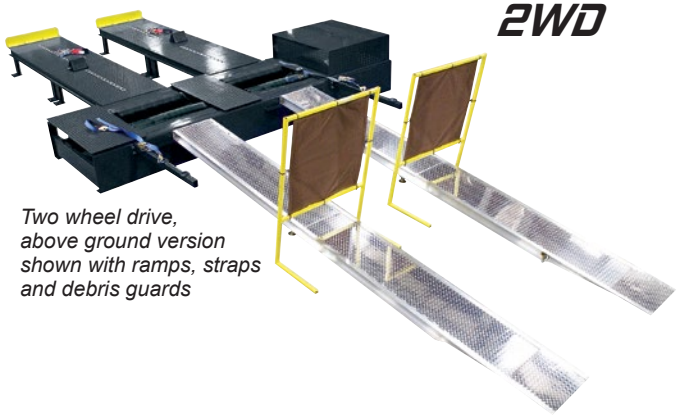
Customizable drive cycles include speeds and grades

MAE has been the E-mobility testing supplier for Tesla, Rimac, Rivian, GM and many others, even developed the first EV test stand rolling road with General Motors in the late 90's (EV1 Project)

MAE-AWD-150-EV Series

Roll Diameter:	8.575" (217.81 mm) *Larger roll versions are available*
Roller Surface:	Knurled (Standard)
Rotation:	Bi-Directional
Roll Face Length:	35" (889 mm)
Roll Inner Track Width:	18" (457 mm)
Roll Outer Track Width:	88" (2235 mm)
Maximum Roller Speed:	130 MPH (209 KPH); *Higher speeds optional*
HP Measurement:	1,000HP (745.7 Kw) *Traction limited*
Peak PAU Absorption:	400-HP (298.28 Kw) nominal
PAU Torque Measurement:	S-beam load cell; accuracy 0.10% nominal
Speed Measurement:	Encoder - accuracy <0.01% F.S.
System Response Time:	100 ms nominal
Front & Rear Roll Synchronization:	Mechanically-Linked / Coupled
Wheelbase range and Inertia Values	
Standard AWD	89" to 127" ; 4,500 lbs of inertia, nominal 2,261 mm to 3,226 mm ; 2041 kg of inertia *Custom wheelbases and inertias are optional*
Maximum Axle Weight:	6,000 lbs. (2,722 kg) per axle *Custom heavier axle weights available*

Note: Inertia is expressed in equivalent vehicle weight term

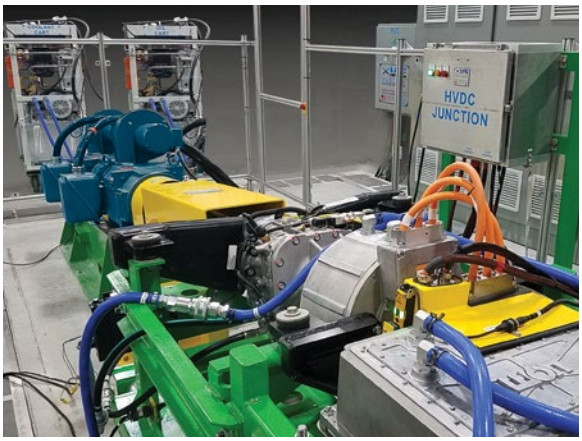


Two wheel drive, above ground version shown with ramps, straps and debris guards

MUSTANG E-MOBILITY™ TESTING SOLUTIONS

Mustang Advanced Engineering

EV Powertrain Test Cell



EV e-Axle Test Stand

Global Leaders in EV Testing

MAE is a test cell system integrator capable of supplying turnkey, fully functional, integrated test cell solutions. MAE draws on more than 35 years of equipment production and test cell integration experience to provide customers the perfect test cell for their requirements. MAE leverages our vast test cell experience and our safety minded engineers to develop test cells that are safe and meet local and national safety requirements. Safety is achieved through physical barriers, electrically lockable access barriers monitored until conditions are safe to unlock, guards, dual hand touch pads, light curtains, electrical lockable doors/covers, pressure pads, lights, lamps and sound. Safety is also designed into the high-power electrical systems with lock-out/tag-out requirements, arch flash analysis and facility interface design.

Additional EV Test Articles

MAE is poised to serve the Electric Vehicle markets (EV, BEV, HEV, PHEV, FCEV) and its current and future testing needs. Additional test stands MAE has designed and created include:

- Electric Powertrain
- Electric Motors
- Electric Motor Control Units
- Electric DC/DC Converters
- Battery Simulators
- Components and accessories
- Climate controller interfaces
- Inverters
- Fuel Cells
- Gearboxes
- Batteries
- Coolant conditioning systems
- Hydrogen fuel supply systems
- Test article interfaces

About MAE

Mustang Advanced Engineering is a leading supplier of advanced, custom engineered testing and measurement systems. Located in Twinsburg, Ohio since 1986, MAE delivers world-class testing solutions, custom design support, technical assistance, backed by a dedicated factory service team, making them a trusted source of expertise for the global industrial market. Visit MustangAE.com for more information. Follow them on Facebook, Twitter, LinkedIn, and Instagram

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