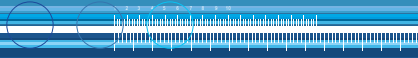


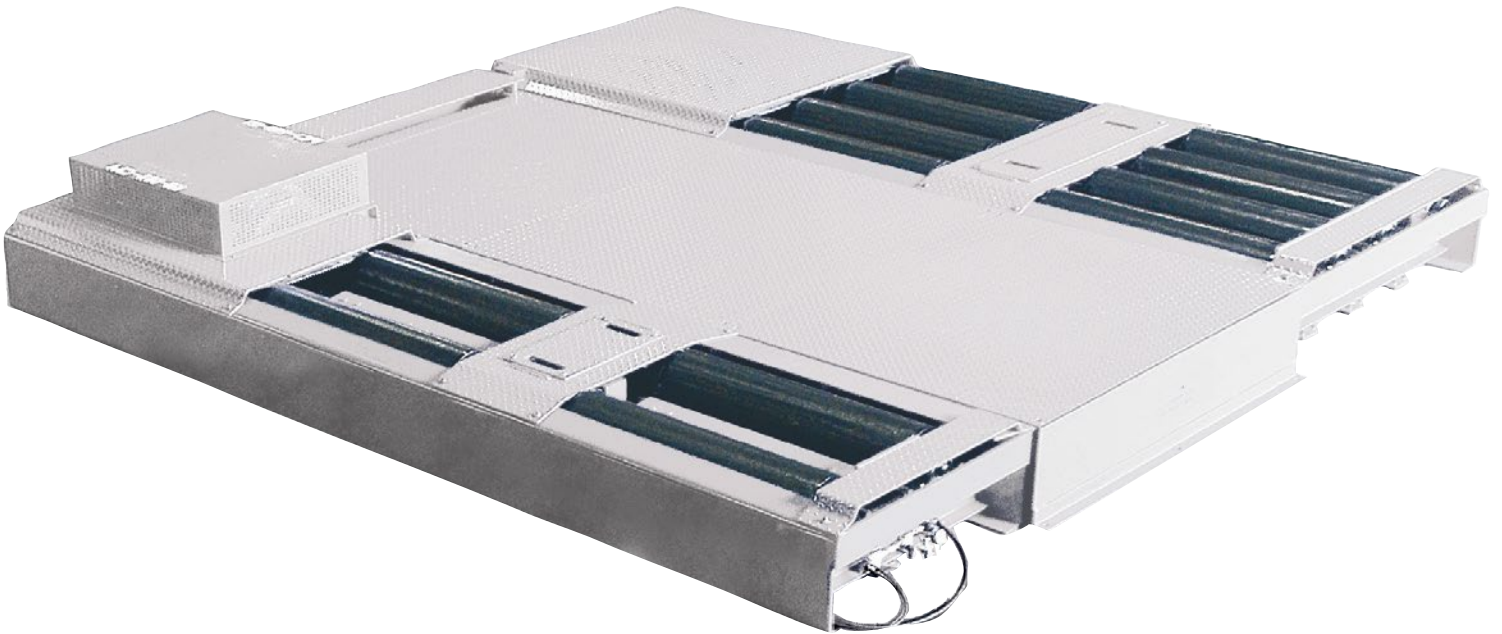
# *E-Mobility Testing Solutions*



## ***MAE-AWD-150-EV Series***

*The Benefits of a Certification Grade Chassis  
Dynamometer at the Fraction of the Price*

*Optional 50HP AC Motor Available*





Shown with premium post restraints



Larger roll design version available



AC Motor, 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 chassis dynamometers 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 model available
- Mechanically-linked AWD Design
- Multiple AC Motor & EC PAU Size Combinations
- Regeneration Testing w/ AC Motor
- Emissions & Hybrid Development
- Calibration & Certification
- Efficiency Energy Loss Evaluation of EVs
- Precision Inertia Simulation
- kWh/mile Evaluation for EVs
- Thermal Imaging & Vibration Analysis
- Battery Power Measurement Available
- SAE J2264 Road Load Derivations Compliant within +/-3-lbs nominal
- Optional robot driver for automatic continuous driving

## **Why Chassis Dynamometers**

The MAE-AWD-150-EV series of chassis dynamometers 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 94.2-inches all the way up to 124-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.

The MAE-AWD-150-EV series incorporates an AC drive motor and a powerful air-cooled eddy current power absorption unit to provide the perfect combination of precision and economy. Systems are available with AC Motors ranging from our standard 50-hp motor up to large motors depending on your application. The system comes with one or two air-cooled eddy current PAUs for extended testing to meet the needs of your application.

## **Battery Power Measurement**

MAE's Battery Power Measurement Module is designed to accurately measure a vehicle's battery power while being operated on the dynamometer. 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 dynamometer 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

## MAE-AWD-150-EV Series

|                                    |   |
|------------------------------------|---|
| Roll Diameter:                     | 8.575" (217.81 mm) <i>Larger roll versions are available</i>  |
| Roller Surface:                    | Knurled (Standard), Optional: Chrome, Carbonite   |
| Rotation:                          | Uni-Directional   |
| Roll Face Length:                  | 35" (889 mm)  |
| Roll Inner Track Width:            | 18" (457 mm)  |
| Roll Outer Track Width:            | 88" (2235 mm)   |
| Maximum Roller Speed:              | 100 MPH (161 KPH); <i>Higher speeds optional</i>  |
| HP Measurement:                    | 1,000HP (745.7 Kw) <i>Traction limited</i>  |
| Optional AC Motor Rating:          | 50-HP @ 65-100 MPH; <i>Larger motors are available</i>  |
| Peak PAU Absorption:               | 400-HP ( 298.28 Kw) nominal   |
| Motor Torque Measurement:          | Calculated from VFD, Option   |
| 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                       | Mechanically-Linked / Coupled   |
| Roll Synchronization:              |   |
| Wheelbase range and Inertia Values |   |
| Standard AWD                       | 94.2" to 124" ; 4,100 lbs of inertia, nominal<br>2,392 mm to 3,152 mm ; 1,860 kg of inertia<br><i>Custom wheelbases and inertias are optional</i> |
| Maximum Axle Weight:               | 6,000 lbs. (2,722 kg) per axle<br><i>Custom heavier axle weights available</i>  |
| SAE J2264 Road Load Derivations:   | +/-3-lbs nominal  |

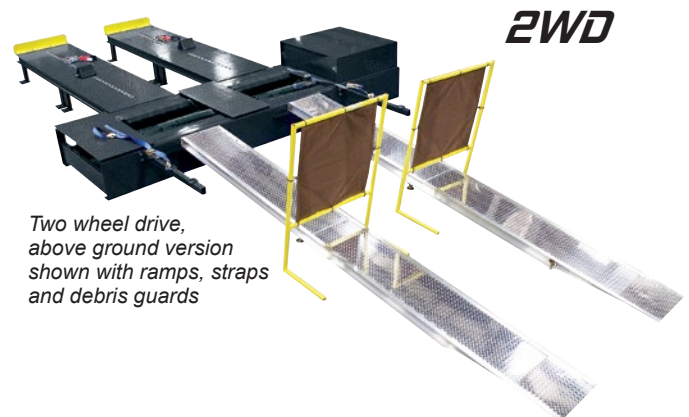
*Note: Inertia is expressed in equivalent vehicle weight term*



Customizable drive cycles include speeds and grades



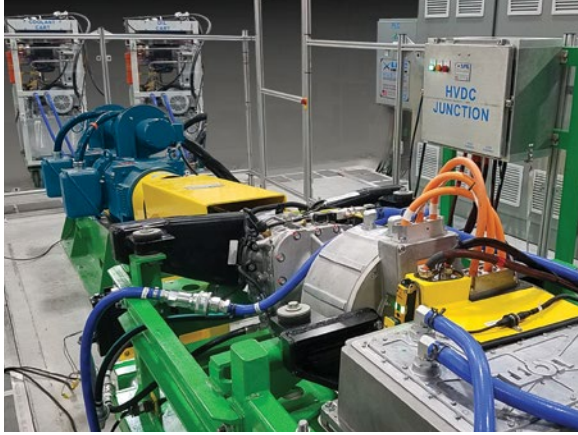
MAE has been the E-mobility dyno supplier for Tesla, Rimac, Lordstown Motors, GM and many others, even developed the first EV test stand dynamometer with General Motors in the late 90's (EV1 Project)



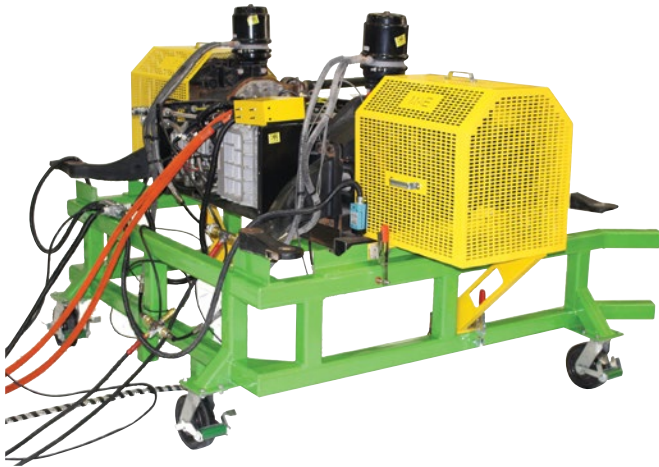
Two wheel drive, above ground version shown with ramps, straps and debris guards

# 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



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## 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](http://MustangAE.com) for more information. Follow them on Facebook, Twitter, LinkedIn, and Instagram

