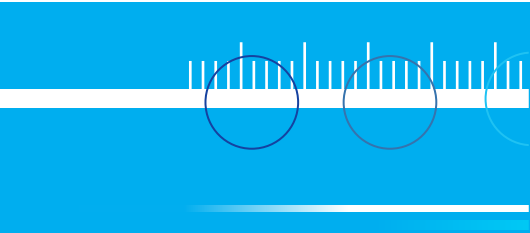


MAE AC 4000

Universal AWD AC Automotive Test Stand



The engineers at MAE developed the MAE-AC-4000 Series Test Stand for R&D, Calibration, Certification, End-Of-Line, and Repair/Maintenance testing applications. This new universal automotive test stand was

designed to rigorously and efficiently test the next generation of electric and hybrid vehicles as they are developed, calibrated, certified and then roll off your production lines.

One Universal Test Stand designed to do it all - Smarter by Design.

- Universal Automotive Test Stand
- 2WD & AWD Vehicles
- Adjustable Wheelbase (90-140")
- Independent AC Motor per Roll Set
- Electric Hybrid Systems Development
- Calibration & Certification
- EOL Production Testing
- Regeneration Testing
- Inertia Simulation
- ABS Braking/ESC Skid Simulation
- Thermal Imaging & Vibration Analysis

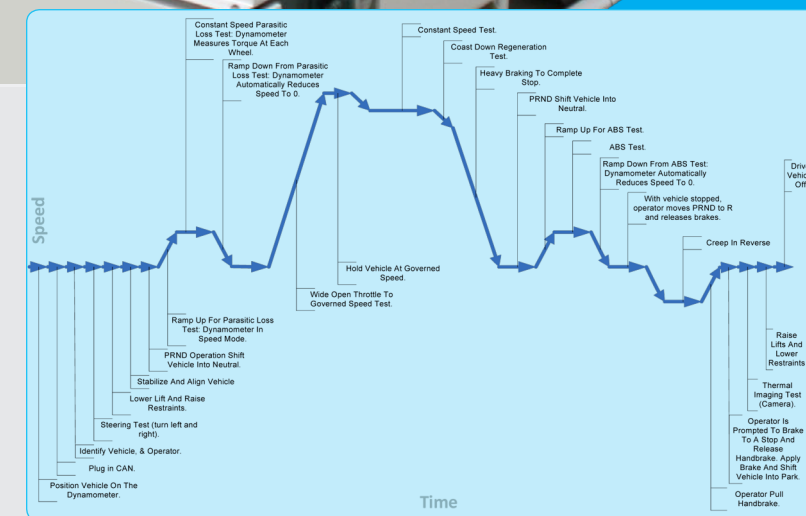
MAE's latest product for the development, calibration, certification, End-of-line and repair & maintenance testing of electric and hybrid vehicles is the MAE-AC-4000 Series Universal Automotive Test Stand. This new universal tester is an advanced independent-wheel-control AC motor dynamometer and ABS/ESC tester that is capable of reproducing an unlimited array of testing and simulation conditions for full product life cycle testing of electric and hybrid vehicles and vehicle sub-systems.

The AC-4000 utilizes four independent AC motors, one coupled to each set of rollers, to control the load to each wheel independently. A moveable wheelbase system allows the AC-4000 to accommodate both 2WD and AWD vehicles with wheelbases ranging from 90-140". An automatic vehicle restraint and safety system greatly reduces the test cycle time and ensures that vehicles remain safely in position on the tester.



End-Of-Line Production Testing

As a EOL test stand, the MAE-AC-4000 Series offers a flexible solution for test control, data acquisition and operator interface, stepping test operators through each step of an automated EOL test sequence in a simple and user-friendly format, while collecting, analyzing and reporting on vehicle systems status and performance data. MAE's AC-4000 test stand communicates with each vehicle via CAN communication to determine pass/fail results and to establish certain vehicle systems statuses as required during the test procedure. The flexibility of MAE's systems allows us to easily adapt to meet unlimited test procedures and simulation requirements.



HEV R&D, Calibration, Certification

For vehicle development, calibration and certification applications, the AC-4000 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. MAE offers a number of lab-grade software and data acquisition packages for Hardware-in-the-loop and R&D environments.

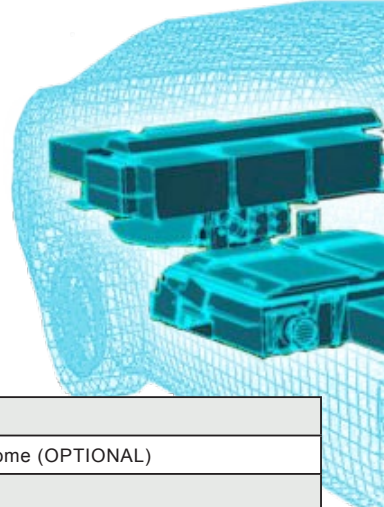
MAE's experience and expertise with sophisticated End-of-Line systems stems from having supplied a host of fully-integrated, automated testing solutions for a wide range of EOL testing applications. MAE offers completely customized end of line testing solutions for your specific end of line testing applications.

A sample EOL test procedure is illustrated in the figure on the right. MAE can easily customize an automated EOL test sequence to meet your EOL testing requirements.



Thermal Imaging and vibration analysis are commonly integrated into EOL test stands. Thermal images on key under hood points before and after cycle testing allows QA engineers to establish pass/fail criteria based on areas-of-interest and temperature limits.

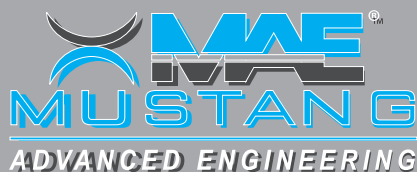




MAE AC 4000

Roll Diameter:	8.575" (217.805 mm)
Roller Surface:	Knurled (STANDARD), Chrome (OPTIONAL)
Rolls and Inertia Weight Balance Specification:	ISO DR1940 G3.0
Rotation:	Bi-Directional
Operating Speed Range:	0-80 mph
Roll Speed Accuracy:	> 0.1 mph
Power Conversion Unit (PCU) Type:	AC Inverter Duty Motor/Generator
PCU Size:	Continuous Duty: 75-hp @1150 - 3200 rpm (x4) Intermittent Duty: 150% of continuous duty for 1 out of 5 minutes
PCU Cooling:	Forced air fan cooled
PCU Speed Sensor:	The PCU shall have an independent speed sensor dedicated for the control of the PCU. This speed sensor shall have a minimum 1,024 pulses/rev.
PCU Thermal Overload:	Thermal switch wired normally closed
Inverter Online Power Regeneration (standard):	Power Module to regenerate power back onto supply power lines instead of into the Power Dissipation Coil.
Line Reactance:	The Inverter/Controller has a small amount of line reactance built in. This reactance helps balance and reduces noise injected back into the supply circuits. Additional external line reactance can be installed as an option.
Inertia Selection Increment:	1 lb. for simulation
PCU Force Measuring Accuracy:	In-line Torque Meter \pm 833 lb.ft Accuracy Class: \pm 0.1% of rated output at all values \pm 10-100% of rated output.
Inverter/Controller:	Self contained controller specifically designed to operate the PCU and the Power Regeneration System (Inverter Power Dissipation Coils). This is the heart of the power control section of the system. The controller has many built in features to observe the environment around it, such as: PCU Over Current, PCU Over Temperature, PCU Power Dissipation Coils over Temperature (if Used), Supply Power Phase Loss, PCU Short Circuit Protection, PCU Supply Voltage, PCU Over Speed, PCU Supply Current.
Road Load Increments:	0.1 hp @ 50 mph or to the precision of the vehicle loading coefficients.
Vehicle Loading (Trans):	$TRLHP@Obmph = \{Av * Obmph\} + \{Bv * Obmph^2\} + \{Cv * Obmph^3\}$ Where: TRLHP = Track Road Load Horse Power Obmph = Observed mph Av , Bv , Cv = Road Load Coefficients
Wheelbase Movement:	Gearmotor
Wheelbase Range:	90 - 140 Inches (2286 - 3556 mm)
Vehicle Restraint System:	Automatic pop-up roller restraints
Ambient Temperature Range:	68 to 86° F, 10-95% relative humidity (non-condensing). The system is intended for use in a climate controlled laboratory environment with adequate air ventilation and exhaust removal systems (optional by MAE).
Machine Shipping Weight:	16,000 lbs. (7257 kg)

Smarter By
Design



U.S. Corporate Headquarters
Mustang Advanced Engineering
 2300 Pinnacle Parkway
 Twinsburg, OH 44087
 Phone: (330) 963-5400
 Fax: (330) 425-3310
 Email: sales@mustangae.com

www.mustangae.com

