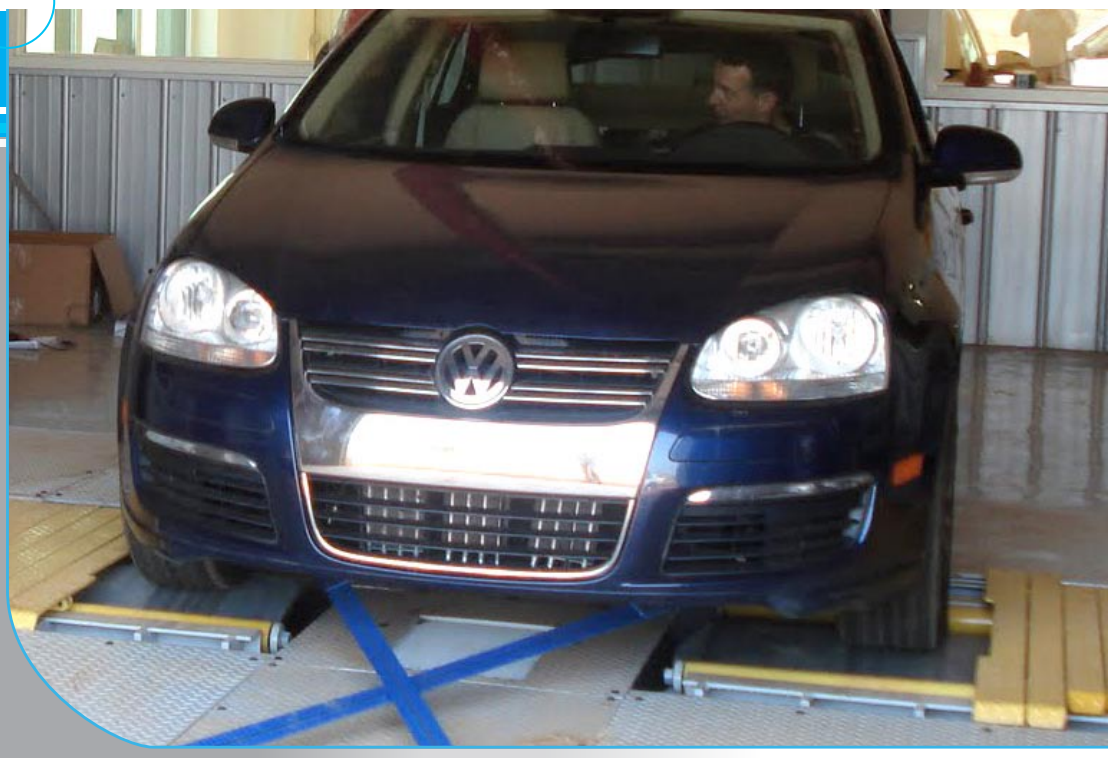
Advanced Engineering

Testing Solutions

48” Chassis Dynamometer Systems



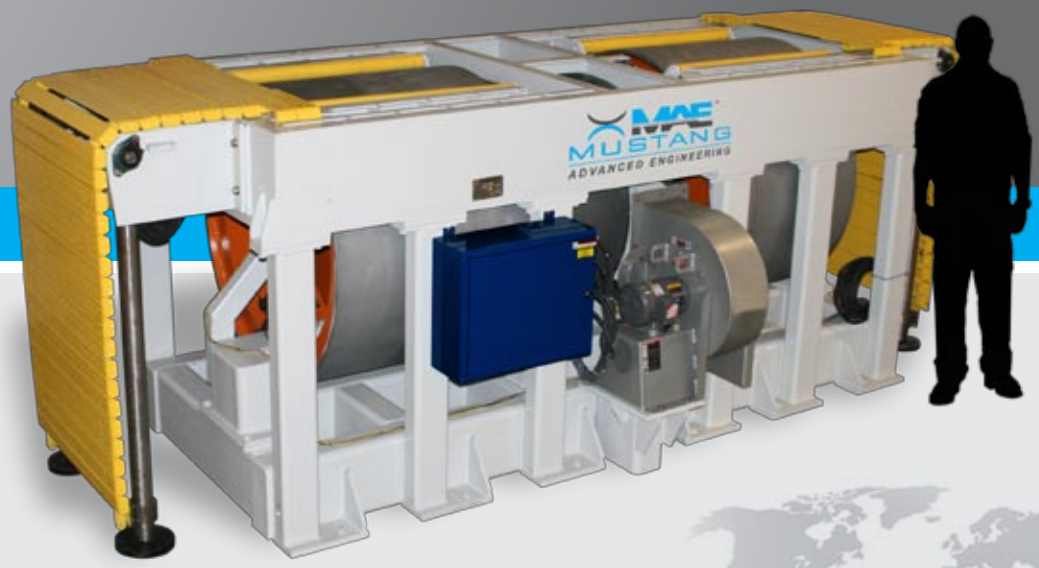
MUSTANG ADVANCED ENGINEERING

48” Chassis Dynamometers for Passenger Cars and MD Vehicles

Today’s advanced vehicle emission testing requires the use of repeatable and highly accurate dynamometers that are capable of testing vehicles under precisely simulated road load conditions in an emissions laboratory. The 48” motor-in-the-middle chassis dynamometer sets the standard in the industry for emissions certification and mileage accumulation applications.

Mustang Advanced Engineering is widely regarded as a leading global provider of chassis dynamometer systems for a wide range of applications that require accurate and repeatable road load simulation, speed control, force control or acceleration control. MAE has developed its 48” MIM Series Chassis Dynamometers to exceed the demanding performance criteria required by the US EPA directive, FTP 75 / SFTP (US06) EUDC standards.
These criteria include:

- Accurate Road Load simulation to ensure the vehicle is tested under operational conditions.
- Fast, critically damped Inertia simulation response to provide realistic loading of the test vehicle powertrain.
- Accurate synchronization of multi-roller systems to provide “on the road” type conditions.
- Effective parasitic loss compensation.



Global Market Leader

MAE offers a wide range of Light to Heavy-Duty AC Motor Chassis Dynamometer systems and designs, from 4x2, 4x4 to a number of multiple axle configurations. MAE has developed and installed some of the largest and most advanced systems for large class 8 trucks, military vehicles and even 8x8 “independent roll” commercial vehicles as well a host of light-duty vehicle systems. MAE has systems installed in virtually every corner of the globe and continuously provides technical support and service to a global install base of thousands of dynamometer systems.

MAE's emissions chassis dynamometers provide an extremely accurate, repeatable and responsive electrical inertia simulation vehicle test system. The chassis dynamometer utilizes an AC motor centrally mounted between the rollers that provides a compact, low maintenance design. The MIM configuration offers the most compact envelope dimension in the 48" roll product class, while the cradle-mounted configuration of the PCU makes possible the use of a highly accurate strain gauge load cell in lieu of an in-line torque flange. Both light duty and medium duty PCU sizes are available. High quality bearings and a robust structural design help to ensure long life and low maintenance of the equipment.

The standard MIM configuration utilizes manually operated vehicle alignment and restraint systems, while automated side-to-side and fore-to-aft alignment mechanisms are available as optional features.

For climatic chamber applications MAE offers extreme temperature chamber packages which insure proper dynamometer operation at even the most extreme hot/cold testing conditions. For applications that require the testing of AWD vehicles, the MIM Series is available in an AWD configuration. In most cases the 2WD MIM class dynamometer can be upgraded in the future to the AWD-MIM chassis dynamometer. MAE's standard wheelbase range accommodates vehicles with wheelbases ranging from 80 to 150 inches. Optionally, systems can be designed to accommodate vehicles with a wheelbase of up to 185 inches.

MAE's proprietary control system includes several automated routines to test and validate all the main performance criteria. Emission chassis dynamometer solutions are also available for truck and motorcycle applications.

Applications Include:

- Exhaust Emission Testing
- Fuel Consumption
- Milage Accumulation Testing
- Climatic & Environmental Testing
- Road-load Simulation Testing
- Driveability Testing
- Performance Testing

AWD 48" Chassis Dynamometer in Thermal, Climatic & Solar Wind Tunnel

48” Chassis Dynamometers for Mileage Accumulation

Mileage accumulation tests are long-running tests that can last several days to several weeks. For most long-running mileage accumulation testing applications, programmable robot drivers, automatic refueling systems and extra safety protective measures are required to provide a safe, reliable and efficient laboratory testing environment. The engineers at MAE have taken into account all of these special requirements and have developed integrated systems to address these special needs and concerns.

Safety Features

A pair of vehicle centering guards aid in positioning the wheels on the rollers and can also raise the vehicle to allow for free coast down of the system. An automatic roll cover system provides added protection for test operators against possible hazards from the moving rollers during testing. While closed, the roll covers are designed to support the full axle load of a vehicle, allowing vehicles to cross over the dyne safely. Several styles of vehicle restraint systems are also available.

Robot Drivers

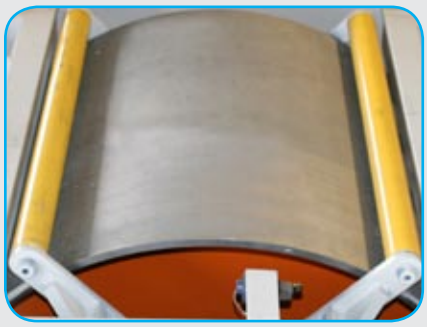
MAE robot driver systems allow for fully automated test sequences to be performed without the use of a human driver, thus resulting in increased test repeatability. Robot drivers can be easily programmed to play back cycles previously recorded on the road or track or can be programmed to perform virtually any test sequence desired for any given length of mileage accumulation testing.

Fuel Conditioning, Measurement and Delivery Systems

MAE offers a number of modular designs of Fuel Management Solutions. Systems are available to continuously condition, measure and deliver fuel to a test vehicle to allow for uninterrupted testing and increase test repeatability.

AWD 48” Chassis Dynamometer in thermal climatic and wind test chamber showing wind tunnel nosal and dyne control room windows.

AWD 48” Chassis Dynamometer showing an optional vehicle restraint system and exhaust removal system.



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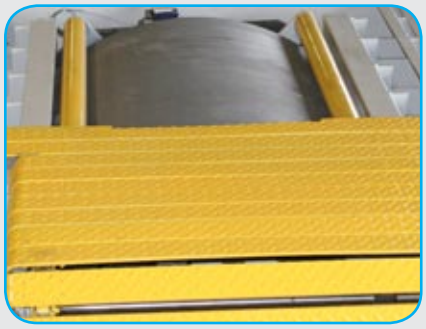

Automatic roll cover system.

MAE Fuel Management System.

The latest 48” systems developed by MAE utilize AC Motors and provide significant benefits including:

- Compliant with EPA 75, EPA SFTP(US06), ECE + EUDC, Japanese 10-15 Mode, EURO III, IV and V legislative emissions test requirements
- High accuracy and repeatability with fast respose electrical inertia simulation
- Automated dynamometer performance testing routines
- Floor level calibration
- Bearing heaters
- Bi-directional bearing race rotation
- Non-vertical loading restraint system
- Brake & throttle actuators available in base systems
- 4x2 and 4x4 configurations, upgradable
- 4x4 independent systems for Hybrid Vehicle testing
- Robust design for long & trouble-free operational life
- Low maintenance and lifecycle costs

MAE offers 48” Chassis Dynamometers in both 4x2 and 4x4 configurations. 4x2 systems can be designed to allow an upgrade path to 4x4 system in the future per customer request.

Additional Options and Services

- Auto-center system
- Tire blow-out detection
- Fully integrated certified emissions bench
- Particulate matter measurement and analysis
- Enhanced data acquisition
- Scrolling driver’s trace aids
- Vehicle cooling
- Tire cooling
- Unique roller surfaces (flame spray, chrome)
- Fuel delivery and consumption monitoring
- Throttle actuator or robot driver
- Complete facilities planning & installation services
- Vibration analysis

Toll Free: 1-888-468-7826

48” Chassis Dynamometers Specifications

	LDV Series GVW 0 - 7,500 Lb.	MDPV Series GVW 0 - 10,000 Lb.	MD Series GVW 0 - 14,000 Lb.
Technical Specifications - 2WD Dynamometers			
MAE Model Number	**MAE-AC-150.48-MIM-2WD-LDV**	**MAE-AC-200.48-MIM-2WD-MDPV**	**MAE-AC-250.48-MIM-2WD-MDV**
Test Vehicle Range	Automobile, Light Truck	Automobile, Light Truck, Medium Duty Passenger Vehicles	Automobile, Light Truck, Medium Duty Passenger Vehicles & Trucks
Inertia Simulation Range: (with 8.4 mph/sec, US06)	1000 – 7,500 Lb. (455 – 3,409 Kg.)	1000 – 10,000 Lb. (455 – 4,545 Kg.)	1000 – 14,000 Lb. (455 – 6,364 Kg.)
Inertia Simulation Range: (with 3.5 mph/sec, FTP-75)	1000 – 14,000 Lb. (455 – 6,363 Kg.)	1000 – 14,000 Lb. (455 – 6,363 Kg.)	1000 – 14,000 Lb. (455 – 6,363 Kg.)
Mechanical Base Inertia	3,000 Lb. (1,364 Kg)	4,410 Lb. (2,000 Kg)	4,410 Lb. (2,000 Kg)
Electrical Inertia Increment	1 Lb. (0.45 Kg)	1 Lb. (0.45 Kg)	1 Lb. (0.45 Kg)
Motor Power (Continuous)1	150 HP @ 57 mph (112 kW @ 92 km/hr)	200 HP @ 57 mph (150 kW @ 92 km/hr)	250 HP @ 57 mph (187 kW @ 92 km/hr)
Motor Power (1-min) 150% OL	225 HP @ 57 mph (168 kW @ 92 km/hr)	300 HP @ 57 mph (225 kW @ 92 km/hr)	375 HP @ 57 mph (280 kW @ 92 km/hr)
Motor Power (10-sec) Peak	300 HP @ 57 mph (225 kW @ 92 km/hr)	400 HP @ 57 mph (300 kW @ 92 km/hr)	583 HP @ 57 mph (435 kW @ 92 km/hr)
Axle Weight Capacity	8,500 Lb. (3,860 Kg)	10,000 Lb. (4,545 Kg)	10,000 Lb. (4,545 Kg)
Standard Operating Speed Range2	0 – 100 mph (0 -160 km/hr)	0 – 100 mph (0 -160 km/hr)	0 – 100 mph (0 -160 km/hr)
Wheel Force (Continuous) below 57 mph (92 km/hr)	985 Lb. (4,382 N)	1,313 Lb. (5,840 N)	1,641 Lb. (7,300 N)
Wheel Force (Peak) below 57 mph (92 km/hr)	2,000 Lb. (8,900 N)	2,593 Lb. (11,534 N)	3,816 Lb. (16,975 N)
Dyne Motor & Drive Response	< 5 ms	< 5 ms	< 5 ms
Closed Loop Response Time (90% of Step Command)	< 10 ms	< 10 ms	< 10 ms
System Response Time from a Change in Acceleration Rate to 90% of Command	< 43 ms (min) Adjustable to < 100 ms	< 43 ms (min) Adjustable to < 100 ms	< 43 ms (min) Adjustable to < 100 ms
Speed Accuracy	+/- 0.001 mph (+/- 0.0016 km/hr)	+/- 0.001 mph (+/- 0.0016 km/hr)	+/- 0.001 mph (+/- 0.0016 km/hr)
Acceleration Accuracy (digitally)	+/- 0.002 mph/sec (+/- 0.0032 km/hr-sec)	+/- 0.002 mph/sec (+/- 0.0032 km/hr-sec)	+/- 0.002 mph/sec (+/- 0.0032 km/hr-sec)

1 High Performance MIM Systems are Available: 300 Hp (225 kW), 400 Hp (300 kW), 500 Hp (375 kW), 650 Hp (485 kW)
2 Extended speed ranges are available: 120 mph (200 km/h), 150 mph (240 km/hr), 200 mph (320 km/hr)
Contact Mustang Advanced Engineering for Inertia Simulation Tables, Graphs and Technical Data about each dynamometer
All specifications meet or exceed those required for EPA and ECE Emission Testing
Specifications are subject to change due to Mustang Advanced Engineering’s continuous improvement and product refinement initiative.

	LDV Series GVW 0 - 7,500 Lb.	MDPV Series GVW 0 - 10,000 Lb.	MD Series GVW 0 - 14,000 Lb.
Physical Dimensions			
Test Vehicle Range	Automobile, LT Truck	Automobile, Light Truck, Medium Duty Passenger Vehicles	Automobile, Light Truck, Medium Duty Passenger Vehicles & Trucks
Roll Diameter	48 in +/-0.005 in (1219.2 mm, +/- 0.127 mm)	48 in +/-0.005 in (1219.2 mm, +/- 0.127 mm)	48 in +/-0.005 in (1219.2 mm, +/- 0.127 mm)
Roll Run Out (across face)	< +/-0.010 in (<+/- 0.254 mm)	< +/-0.010 in (<+/- 0.254 mm)	< +/-0.010 in (<+/- 0.254 mm)
Roll Surface [1]	Chrome Plated	Chrome Plated	Chrome Plated
Roll Surface Finish [2]	Ra 200 +/-100 micro-inch	Ra 200 +/-100 micro-inch	Ra 200 +/-100 micro-inch
Roll Width	29 in (736 mm)	36 in (914 mm)	36 in (914 mm)
Roll Inside Track Width	36 in (914 mm)	36 in (914 mm)	36 in (914 mm)
Roll Outside Track Width	94 in (2,387 mm)	108 in (2,743 mm)	108 in (2,743 mm)
Base Dyne Dimension (Width x Length x Depth)	118 x 72 x 63 in (2,997 x 1,829 x 1,600 mm)	132 x 72 x 63 in (3,353 x 1,829 x 1,600 mm)	132 x 72 x 63 in (3,353 x 1,829 x 1,600 mm)
Base Dyne Weight	22,000 Lb. 10,000 Kg	24,500 Lb. 11,150 Kg	24,500 Lb. 11,150 Kg
Pit Dimension (WxLxD) (min)	154 x 130 x 63 in (3,910 x 3,300 x 1,600 mm)	168 x 130 x 63 in (4,267 x 3,300 x 1,600 mm)	168 x 130 x 63 in (4,267 x 3,300 x 1,600 mm)
Electrical / Controls			
Physical Encoder Pulse Per Revolution	18,000 ppr (72,000 ppr after Quadrature)	18,000 ppr (72,000 ppr after Quadrature)	18,000 ppr (72,000 ppr after Quadrature)
Encoder Accuracy	1.25 arcsec	1.25 arcsec	1.25 arcsec
Load Cell Operating Range (As a function of wheel force)	+/- 2,000 lb. +/- 8,900 N	+/- 3,000 lb. +/- 13,345 N	+/- 4,000 lb. +/- 17,800 N
Load Cell Accuracy (With heated enclosure)	+/- 0.05%	+/- 0.05%	+/- 0.05%
Dyne Drive Type	IGBT Based with Direct Torque Control	IGBT Based with Direct Torque Control	IGBT Based with Direct Torque Control
Dyne Drive Enclosure Size (L x W x H)	23.6 x 23.6 x 83.8 in. (600 x 600 x 2,129 mm)	47.9 x 27.5 x 91.3 in. (1,2000 x 697 x 2,318 mm)	47.9 x 27.5 x 91.3 in. (1,200 x 697 x 2,318 mm)
Power Supply Fuse Sizing1	400 amp	450 amp	800 amp
Dyne Controller2	PowerDyne™ Gen-4	PowerDyne™ Gen-4	PowerDyne™ Gen-4
Wheelbase Sensor Accuracy	+/- 0.1 in. (+/- 4 mm)	+/- 0.1 in. (+/- 4 mm)	+/- 0.1 in. (+/- 4 mm)
Energy Absorption Techniques • Regen to Power Lines • Resistor Loading	 Yes Yes	 Yes Yes	 Yes Yes (Not Advised)
Isolation Transformer	Power Supply Dependent	Power Supply Dependent	Power Supply Dependent

[1] Drive Ratings are subject to change based on temperature 104F (40C) and altitude 3,300 ft (1,000m). If circuit breakers are used instead of fuses lower ratings will apply.
[2] The 4th Generation PowerDyne™ Controller is based on a Coldfire 32-bit processor. Ultra Accurate A/D and Precision Timing Circuitry.

MUSTANG ADVANCED ENGINEERING

Smarter By Design

About MAE

Mustang Advanced Engineering is a unique company whose expertise in the design and construction of custom test benches rivals just about any other company in the world. While custom chassis dynamometer systems have always been a large part of its core business, MAE has added a wide variety of products and has gained industry-leading expertise in nearly all types of dynamometer test benches including AC and eddy current engine dynamometer systems, transmission test benches, tow dynamometers and custom test benches of all types and sizes. The current MAE product range includes engine test cells, transmission test cells, custom chassis dynamometers, production and in-process test systems, containerized test cells and complete powertrain test cells up to and including truly colossal 8 x 8 chassis dynamometer systems.

MAE is fortunate to possess very sophisticated engineering capabilities and talents that have developed over many years of doing business in the automotive, industrial and aerospace industries. While some of the engineering MAE does for clients is done on a consulting basis, what MAE truly does best is the design and construction of custom, turn-key testing systems. As a result, MAE has positioned itself as the supplier of choice when it comes to most types of custom dynamometers and test benches.

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