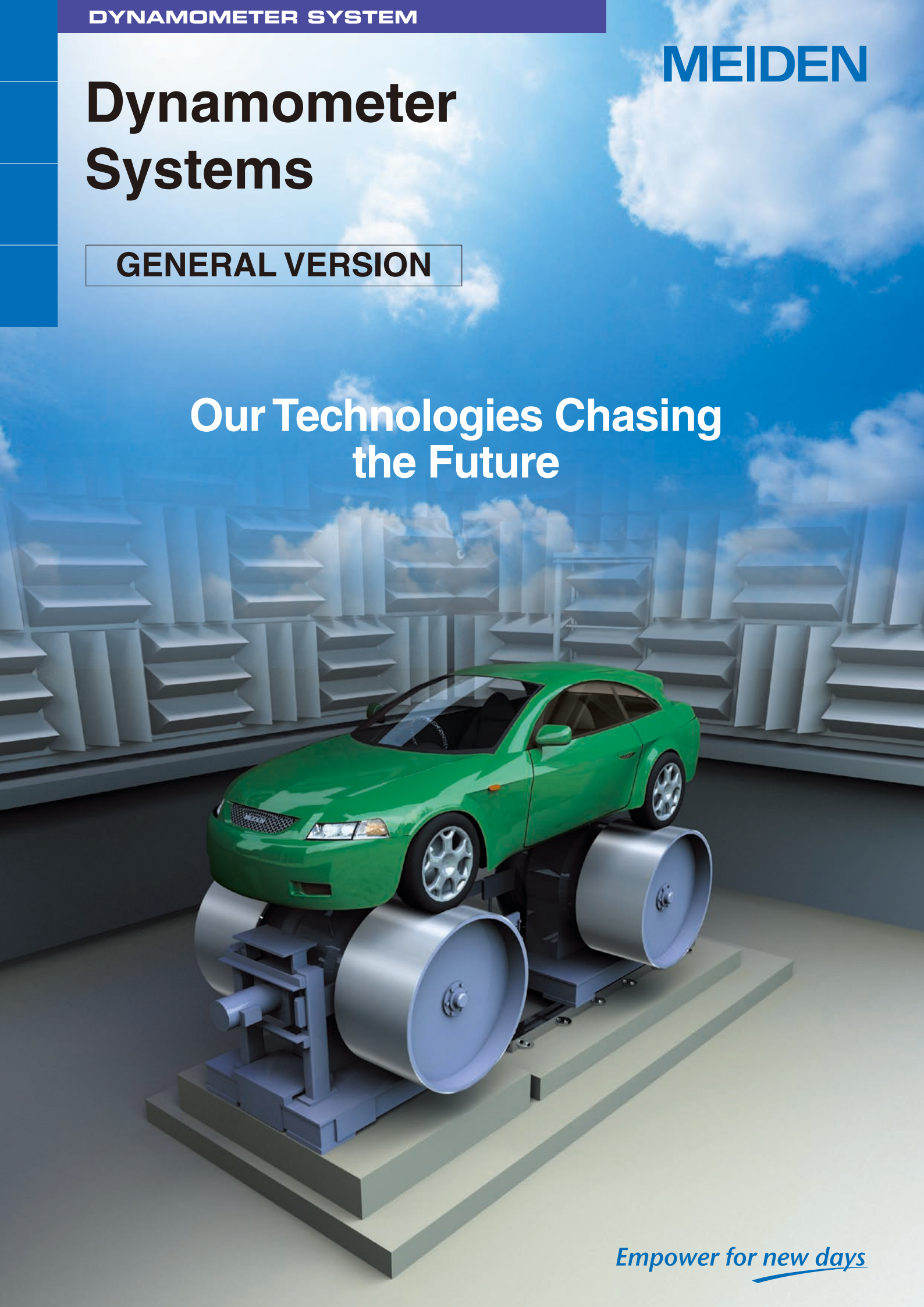
MEIDEN

# Dynamometer Systems

GENERAL VERSION

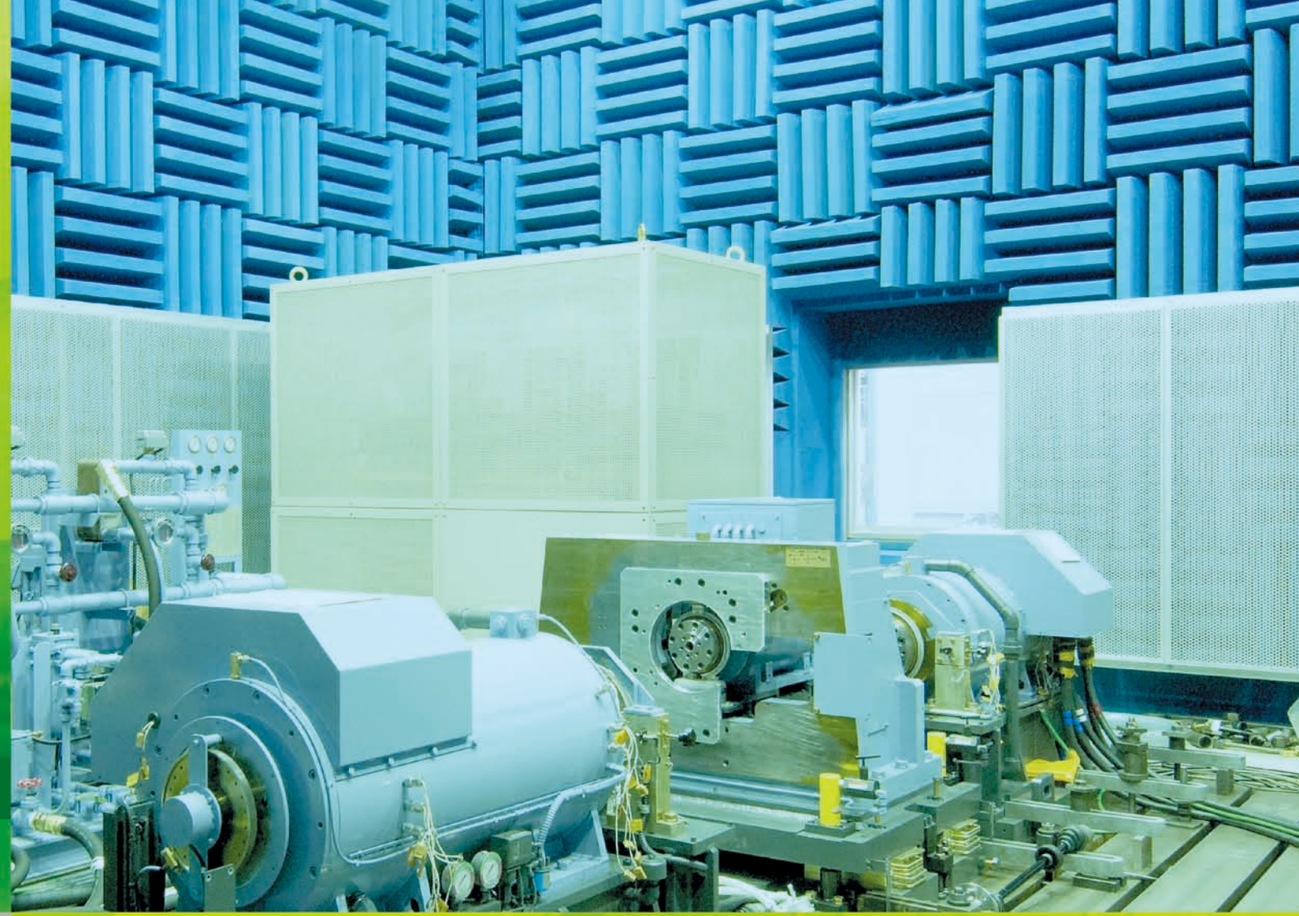
## Our Technologies Chasing the Future



Empower for new days

# High Accuracy and High Reliability of Meiden Dynamometer Systems.

Since the first development and delivery of DC dynamometers in 1920, Meidensha Corporation has developed a variety of record-breaking products. We are known as a leading manufacturer with its accumulated supply records in the world, and is favorably patronized by many customers. Recently, we have supplied not only dynamometer units but also many of testing facility systems, automated operation and data processing systems, and computer systems. In addition, we are engaged in engineering and construction work for the total systems where test rooms, facility equipments, architectures, and others are accommodated.
In the future, the engineering staff will make every effort to promote R&D activities so that the products can meet the requirements of contemporary customers such as automotive and machinery industries. We always intend to deliver advanced and valuable testing facilities to our customers.





## CONTENTS

# Various Dynamometers for any purpose.

## 1 Ultra-low-inertia Dynamometers (PMDY)

Features

(1) This type of dynamometer has the moment of inertia, which is almost the same as that of an automobile engine.Therefore, it can be used in place of an automobile engine when testing the power train system.

**PCDY 330**
330kW 6000/10000min$^{-1}$ 0.12kgm$^2$

(2) This dynamometer uses permanent magnets to achieve high efficiency. This contributes to down-sizing and energy conservation.

(3) Great improvement has been achieved to reduce torque ripples.

(4) The liquid cooling system is used to reduce the operation noise. Such a design concept is effective in reducing noise.

(5) The VT330DY-PM Series adopt IGBT devices, and it performs vector control by the use of permanent magnets.

(6) PMDY Series

| | |
|---|---|
| PCDY | 115 |
| PCDY | 150 |
| PCDY | 220 |
| PCDY | 330 |
| PCDY | 450 |
| PCDY | 600 |
| PMDY | LV220 |
| PMDY | LV500 |
| PMDY | 600 |
| EVDY | 250 |

Notes:
PMDY: Generic name of the dynamometer in which the permanent magnets are used
PCDY: PM dynamometers with extremely low inertia and small diameters, used mainly for driving
LV : Low-speed type
EVDY: Dynamometers for EV motors

PCDY 330 dynamometer /
Low inertia and high response characteristics

PMDY LV 220 /
Low-speed PM dynamometer

EVDY 250 /
Ultra-high-speed dynamometer

FREC Dynamometer
control drive

## 2 FREC Dynamometers

The FREC dynamometer is an AC dynamometer where accumulated manufacturing techniques of various dynamometers and induction motors have been applied for many years.

Features

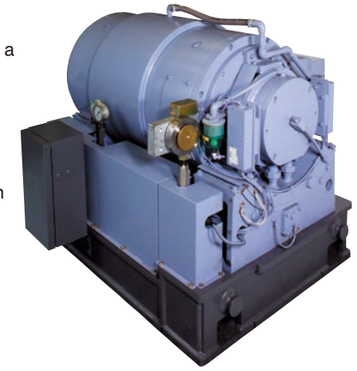
(1) Since the liquid-cooling system is adopted, a substantially low noise level has been attained. In addition, the noise measuring test for the specimen can be easily established.

(2) Both motoring and absorbing operation can be performed.

(3) Absorbed energy is fed back to the power source.

(4) By the brushless structure, minimum maintenance is required.

(5) Can be manufactured in wide range of capacity and speed, and low inertia.



FREC Dynamometer,
Liquid-cooled type

FREC Dynamometer,
air-cooled type

## 3 EDDIC Dynamometers

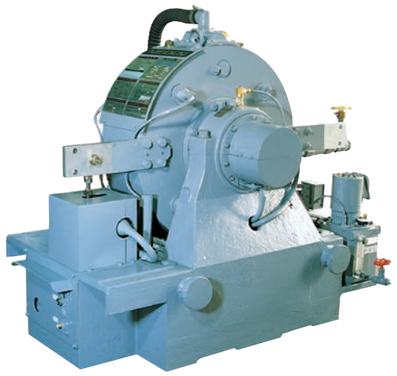
The EDDIC dynamometer is an eddy current type electrical dynamometer developed based on many years of accumulated technologies.

Features

(1) Compact size, light weight low inertia, long life.

(2) Easy inspection and maintenance plus simple handing.

(3) High speed and large capacity unit can be offered.



EDDIC Dynamometer

## Application of various dynamometers

(1) Test for the power performance of various prime movers.

(2) Performance test on power transmission machine units (gears, belts, chains, etc.).

(3) Performance test on engine components and accessories (carburetors, spark plugs, radiators, oil pumps, etc.).

(4) Performance test for main parts of power transmission systems of power vehicles (clutches, transmissions, differential gears, etc.) .

(5) Test of fuels and lubrication oils of vehicle.

(6) Chassis dynamometers.

(7) Performance test for fluid machinery (pumps, blowers, compressors, etc. ).

# Accurate Data Acquisition by Highly-reproducible Test.

## 4 Chassis Dynamometers

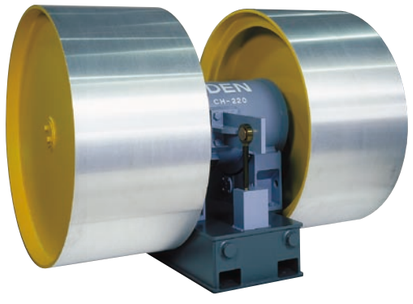
The chassis dynamometer is used for the testing of motorcycles, passenger cars, buses, trucks, specific vehicles, etc. with their driving wheels put on the chassis rollers in place of road surfaces.

Applications

(1) Exhaust gas and Fuel Emmission test.
(2) Durability test.
(3) General performance test.
(4) Ultra-high-precision, low-loss testing.
(5) Line checking.
(6) All-weather type testing.
(7) Noise test (in anechoic rooms) .
(8) Radio wave shield room.
(9) Vibration testing.

### Liquid-cooled chassis dynamometers

This equipment is most suitable for the noise test in a hemi-anechoic room.
Compared with roller/DY separation type, the characteristic for space saving is prominent. Therefore, a great reduction of construction expenses can be expected.



Overhung Type
Chassis Dynamometer
(Liquid-Cooled Type)

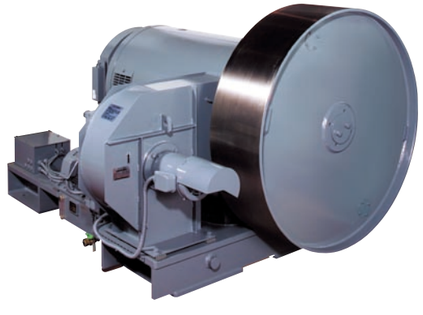
### Air-cooled chassis dynamometers

This equipment comes in an integrated configuration where rollers are overhung on both shaft ends of a FREC dynamometer.
A remarkably high-accuracy torque measuring system has been realized in the environment of space saving.
The inertial mass simulation adopts a total electric inertia compensation system of high-speed response control type.

Overhung Type
Chassis Dynamometer
(Air-Cooled Type)

### Chassis Dynamometers for Motorcycles

This type of dynamometer comes in an integrated configuration equipped with a roller overhung on a shaft end of the low-inertia FREC dynamometer.
For space saving, the flywheel has been omitted to realize high-accuracy torque measurement.
For inertial mass simulation, the totally electrical inertia compensation system of high-speed response control type is adopted.
It is applicable to any motorcycle, from light to heavy weight types.



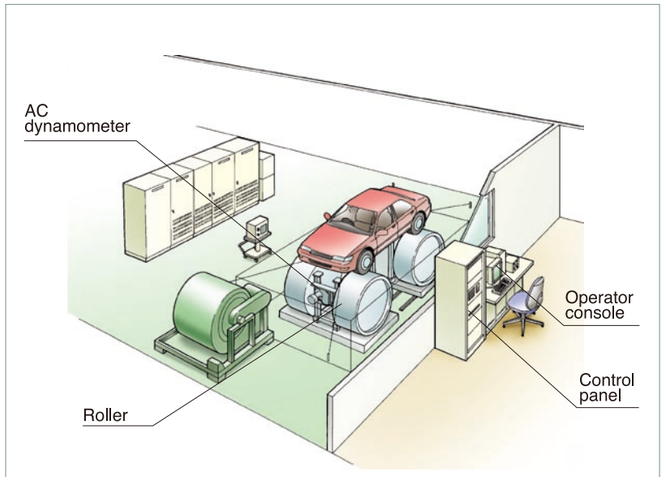
Chassis Dynamometer
for Motorcycles

Optional equipments for chassis dynamometers are available, such as vehicle cooling fans, tire cooling fans, vehicle restraint device, and others.

### Vehicle restraint device

The vehicle restraint device comes in the following three types:

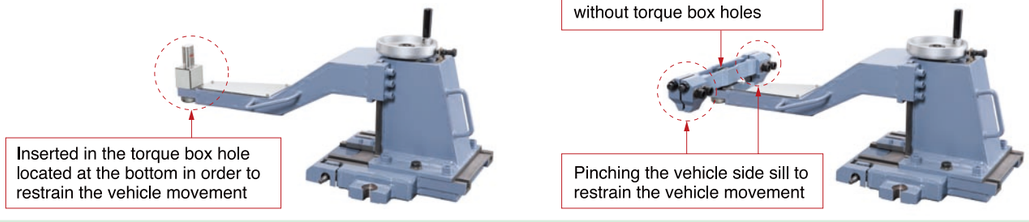
- The tire restraint device is used for 2WD vehicles such as FWD or RWD.
- The 4-point pole type vehicle restraint system is used for 4WD vehicles.
- The torque box system is newly available.
  A hook is inserted in vehicle's torque box hole to restrain the vehicle movement. Where no torque box hole is provided, an appropriate attachment is used to restrain the vehicle movement.




Tire restraint device ( for 2WD )

4-point pole pulling system ( for 4WD )

Torque box system ( for 2WD and 4WD )



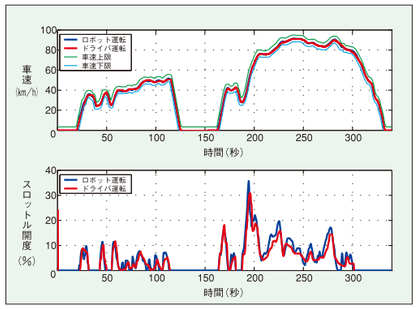
# Accurate Data Acquisition by Highly-reproducible Test.

## 5 Drive Robots

Drive simulator can operate accelerator, clutch, shift lever, brake of a vehicle or a vehicle engine by means of a robot (electric actuators plus automatic driving equipment) reproducing normal driving conditions.
Test can be made with an engine alone or with a complete vehicle on the chassis dynamometer.

Applications

(1) Exhaust gas analysis mode driving.
(2) Exhaust gas analysis durability test driving.
(3) Durability performance test
(4) Test of lubricating oil and additive.
(5) Road Load simulation test.
(6) Various tests of power train components.




Example of Operation Data Waveforms

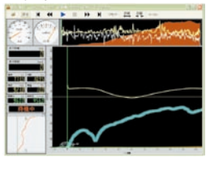
## 6 Driver's Aid

The Driver's Aid is a device to let the driver know the vehicle speed pattern and transmission position on the chassis dynamometer for emission test cycle such as 10-15 mode cycle.

Driver's Aid with distance-based program controller, **3D-DAD**

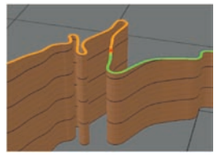
It is used from emission test cycle to road load reproduction.
Vehicle speed pattern is displayed and scrolled in distance base with visualized slope pattern. It is possible to display not only vehicle speed pattern but also environmental data pattern from environment test chamber.

Example of 2D display screen



Example of 3D contour display screen

Example of 3D skeleton display screen

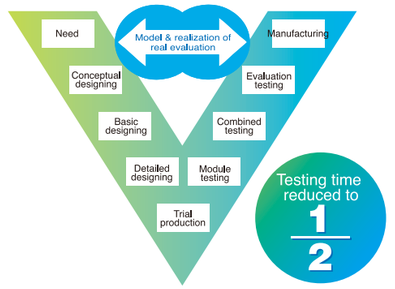


Road load data reproduction flow

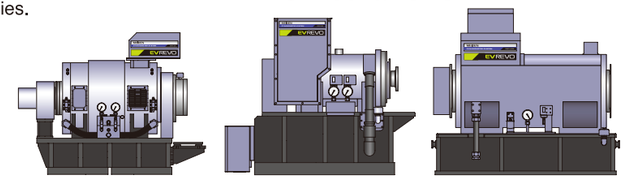
Road load data collection → Editing (speed・inclination・position) → Geographic data link → 3D data registration → Test on chassis dynamometer

## 7 EV・HEV Evaluation System (EVREVO)

For the revolution of electric vehicle testing, we offer you a testing system combined with the most advanced technologies.




EVREVO Mechanisms



| Ultra-low-speed to ultra-high-speed revolutions | | Low inertia and high response characteristics | Low inertia and high capacity |
|---|---|---|---|
| **EVDY 150** | **EVDY 250** | **PCDY 330** | **PMDY LV500** |
| 150kW | 250kW | 330kW | 500kW |
| 20,000r/m | 16,000r/m | 6,000—10,000r/m | 1,200—3,000r/m |

## EVREVO Variations / All testing factors are duly covered.

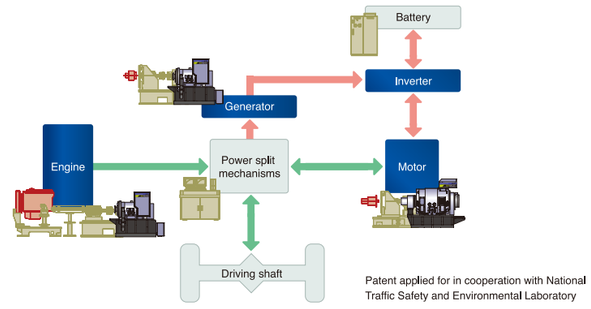
Mechanical driving force → Electric power → Real machines

### Power balance evaluation system

Optimization of EV/HEV has been achieved with the power-split mechanical model.
By virtue of power split mechanisms and battery modeling, optimal HEV vehicle evaluation can be simulated without any real mechanisms.

Modeling: power split mechanisms & battery

EV・HEV motor evaluation | HEV engine evaluation | Generator evaluation



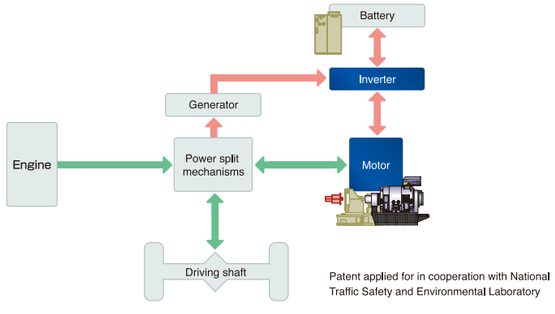

Patent applied for in cooperation with National Traffic Safety and Environmental Laboratory

### Motor evaluation system

Motor evaluation has been achieved with the HEV model.
Driving simulation has been realized for the HEV・EV motors through the modeling of HEV engines, EV vehicles, batteries, and so on.

Modeling: HEV engine・EV vehicle・batteries

EV・HEV motor evaluation



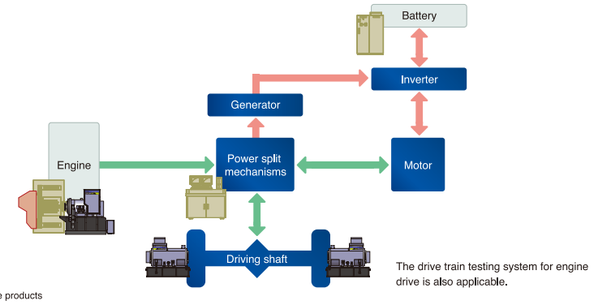

Patent applied for in cooperation with National Traffic Safety and Environmental Laboratory

### Driving system evaluation system

Drive train evaluation has been achieved with the HEV model.
Driving simulation has been realized for the HEV・EV drive trains through the modeling of HEV engines, EV vehicles, batteries, and so on.

Modeling: HEV engine EV vehicle batteries

INV & battery evaluation | Drive train evaluation




The drive train testing system for engine drive is also applicable.

・The various evaluation systems [EVREVO] for the EV・HEV (electric vehicles and hybrid vehicles) are the joint-venture products developed between Meidensha Corporation and Ono Sokki, Inc.
・The [EVREVO] utilizes the techniques of hybrid bench tester developed by National Traffic Safety and Environmental Laboratory.
・The [EVREVO] is the registered trademark of Meidensha Corporation.

# Experience in Computer Systems

## 8 Computer Systems

Computer systems have sufficient power for acquisition of various test date, arithmetic operation, reporting, drawings and data filing. Also computer systems are extensively used for the exhaust gas analysis which is closely related with vehicle driving. The system also plays an important roller for automatic driving with data processing in order to improve testing efficiency and to enhance testing accuracy. Following are the major systems that are available.

Operation, Data Acquisition and Control System (MEIDACS-DY6200)

### Automobile engine performance testing system

(1) Automatic driving and measurement system for general performance test of engine.
(2) Diesel engine performance and exhaust gas automatic measuring system.
(3) Measurement, data logging and curve plotting of diesel engine cylinder pressure.
(4) General performance test system for electric automobile.
(5) Data measuring system for aero engines.
(6) Date measuring and monitoring system.
(7) Data measuring, logging, CRT display and curve plotting system.
(8) Date logging system.

### Exhaust gas Emission testing system

(1) Gasoline engine exhaust gas analyzing mode, automatic driving, measuring system.
(2) Diesel engine exhaust gas analyzing mode, automatic driving, measuring system.
(3) Common exhaust gas testing system for gasoline and diesel engines.
(4) Multi-benches automatic driving system for exhaust gas durability test system.

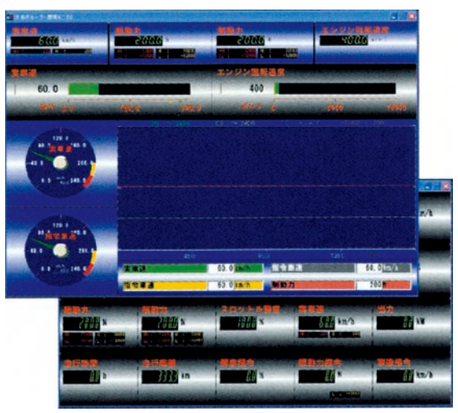
### Various components and parts test system

(1) Brake dynamometer, on-line data acquisition and operating system.
(2) Brake dynamometer automatic control and measuring system.
(3) Torque converter performance test system.
(4) Clutch performance test system.

### Line inspection system

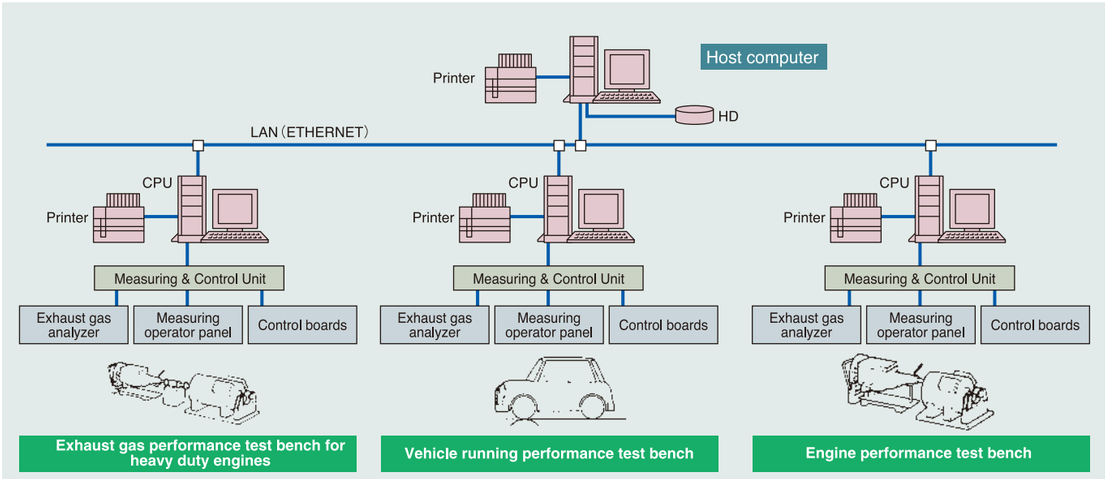
(1) Automatic control measurement and judgment system for engine inspection.
(2) Data management host computer system for engine inspection.
(3) Automatic control measurement and judgment system for transmission inspection.
(4) Automatic control measurement and judgment system for valve body inspection.
(5) Automatic control measurement and judgment system for torque converter inspection.

Road Load Setup Screen



Monitor Screen





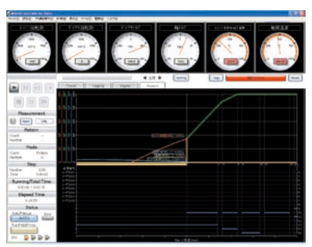

## 9 Personal Computer Systems (MDOD)

This is a automatic driving and measuring system for engine bench dynamometers applying a personal computer available. It is widely applicable to many fields, such as engine durability and power train testing facilities.



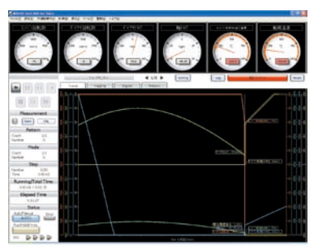
### Features

(1) Functions of telemetry and control have been integrated with the use of a personal computer where Windows is installed.
(2) Through the adoption of remote I/O, transmission of telemetry data has been digitized.
(3) Various control performance has been realized with the aid of MATLAB/SIMULINK.

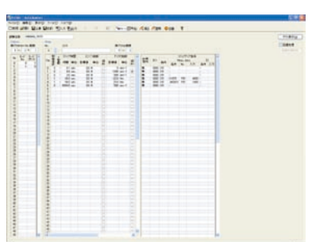


Test Schedule Monitor Screen

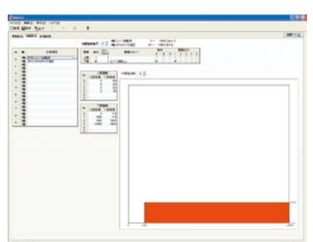
Digital Display Screen



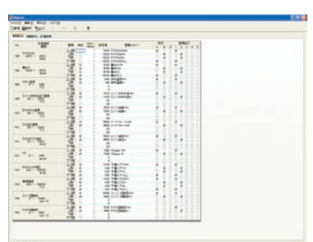
Trend Monitor Screen



Test Schedule Setting Screen



Correlation monitoring Setting Screen



Alarm Setting Screen

# Complex Systems on Full Turn-key Basis.

## 10 Environmental Testing Facilities

The facility is to test vehicle or engine and other related equipment under the varivous environmental condition to analyze the performance. Representative systems are described below. Meidensha can provide a full range of services from dynamometer supply to a full turn key system.

### All weather test room

Test condition, i.e. ambient temperature, relative humidity, atmospheric pressure, infrared intensity, road surface radiation, rain and snow, can artificially be created at will in the testing room.

### Anechoic room

This is a facility to test noise level of the engine or vehicle during acceleration and normal driving. Latest technology in anechoic facility design enables optimum results in low level noise measurement.

### Evaporation test facility

A sealed room which can detect and measure vaporized polluted gas generated from motor vehicle. The facility is comprised of purging floor, panel heater, sampling equipment, etc..

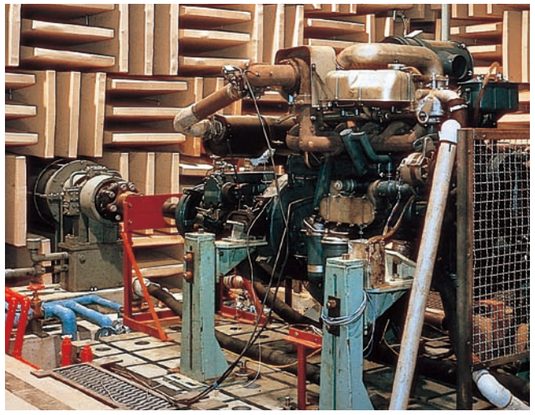
### Radio wave shield room

Provides a protected environment for testing electronic components or complete vehicle systems. The radio wave shield room will exclude external signals and undesirable frequencies. The room also can be used for measurement of the static waves generated from the vehicle.

### High altitude (low pressure) test facility

This facility is for simulating condition from high altitude to ground level. By using this system, it is possible to do many kind of performance test and emission test under low pressure condition. There are both engine bench and chassis dynamometer in this one.


Chassis Dynamometer in a Large-Scale Anechoic Room

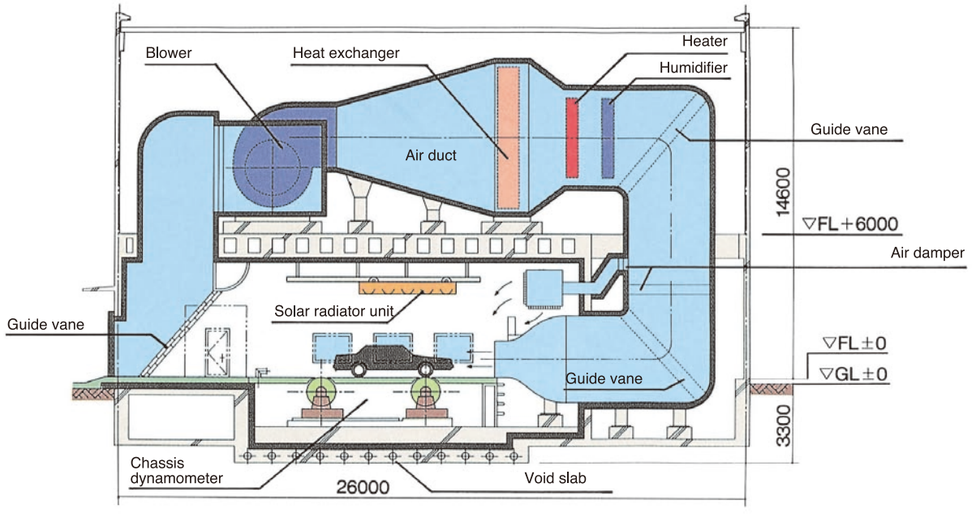


Engine Anechoic Room

High/Low Temperature Anechoic Room

All-Weather Chassis Dynamometer

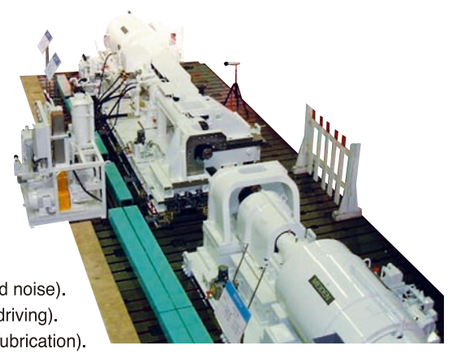
### All-Weather Test Room



# Reliable Testing System for Automobile Parts.

## 11 Power Train Tester

This unit tests various components comprising drive power train of an automobile, i.e. clutch, power transmission, propeller shaft, differential gear, etc., 2 types of tester are available, one for driving the component by vehicle's own engine, another by electric motor.
In particular, a transient dynamometer is an absolutely new and advanced driving system that makes it possible to obtain a low inertia equivalent to that of an engine and also to accomplish sudden acceleration and decoleration.
In addition, it makes possible to simulate engine characteristics.


Power Train Tester

### Features

(1) Various tests for clutch (performance, durability and vibration).
(2) Various tests of transmission gear (performance, durability, strength, vibration and noise).
(3) Various tests of propeller shaft (performance durability, strength and high speed driving).
(4) Various tests of differential gear (performance, durability, strength, vibration and lubrication).
(5) Test of the power train system.
The test procedures provides actual vehicle conditions from the engine through axle including differential gear etc. and determine performance, durability, noise and lubrication efficiency.
(6) Various tests of torque converter.
(7) Various tests of automatic transmission equipment.

## 12 Brake Dynamometers

Brake dynamometer is used for testing performance, durability, strength and creak for vehicle brake and industrial brakes and has the following types.

### Features

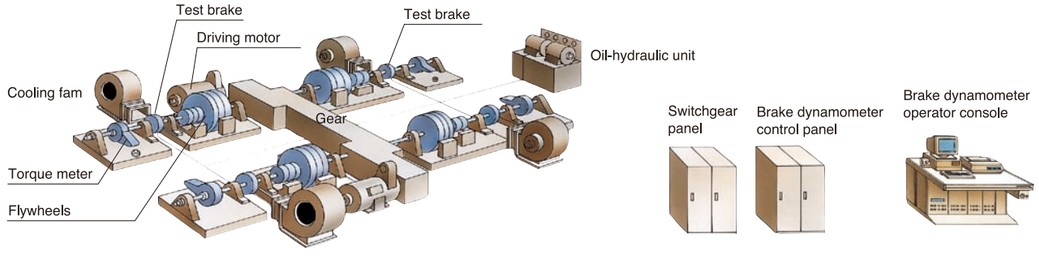
(1) Constant input control (hydraulic and/or air pressure) and constant output control (torque or deceleration rate) can be applied to both hydraulic and air brakes.
(2) Easy adjustment of brake control for different brake characteristics.
(3) Monitoring system is provided to enable a convenient setting of operating conditions (hydraulic pressure, torque, speed, temperature, etc.) and warning value (hydraulic pressure, torque, temperature, etc.).
(4) Calibration of torque is simple.
(5) Standard specification test for all types of brakes on a worldwide basis can be carried out automatically by the scheduler.

### Types

(1) Single brake dynamometer.
(2) Dual brake dynamometer.
(3) Quadruple brake dynamometer.
(4) Chassis brake dynamometer.

### Applications

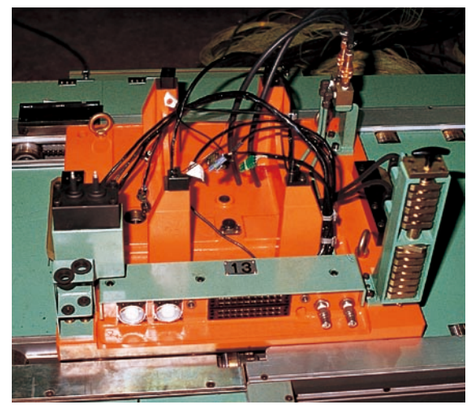
(1) General performance test for vehicle brake.
(2) Durability test for the vehecle brake.
(3) Strength test for the vehicle brake.
(4) Creaking test for vehicle brake.
(5) Brake lining material test.
(6) Relative test of vehicle brake between operation on road.
(7) Various brake system test equipped on the vehicle.






## 13 Production Line Engine Test System (meiline LETS)

This facility is intended to test engine that have been set up on the assembly line.


Pallet

### Features

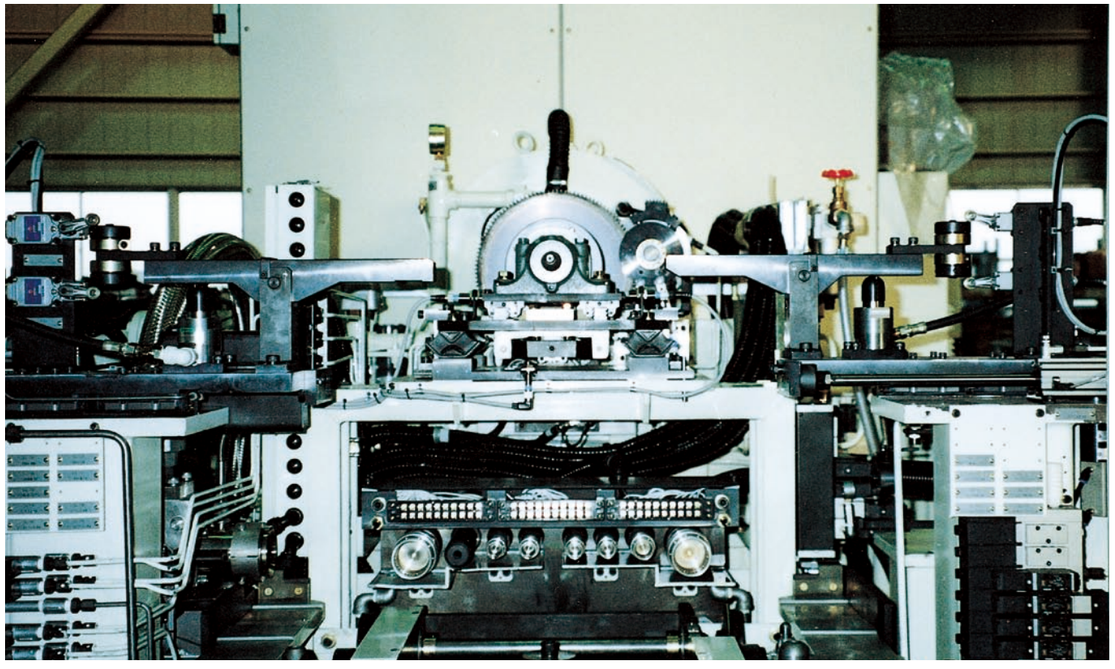
(1) Automatic transportation of engines.
(2) Automatic coupling of test stand and engine.
(3) Automatic testing and adjustments.
(4) Short test cycle.
(5) High test accuracy.
(6) Heavy duty.
(7) Flexible layout.

### Configuration

(1) Leak check stand.
(2) Lubricant fill-in stand.
(3) Cold test stand (ignition timing adjustment, fuel bleeding).
(4) Hot (tiring) test stand.
(5) Repair stand.
(6) Conveyor.
(7) Pallet.
(8) Host Computer system.

### Applicable engines

(1) Gasoline, diesel and LPG engines.
(2) From motorcycle to large trucks and marine engines.


Engine Test System for production lines

# High Quality Assurance Testing.

## 14 Production Lines A/T and Torque Converter Testing System (meiline A/T, T/C)

This facility is intended to test auto-transmissions and torque converters that have been set up on the assembly line.

### meilineA/T

**Features**

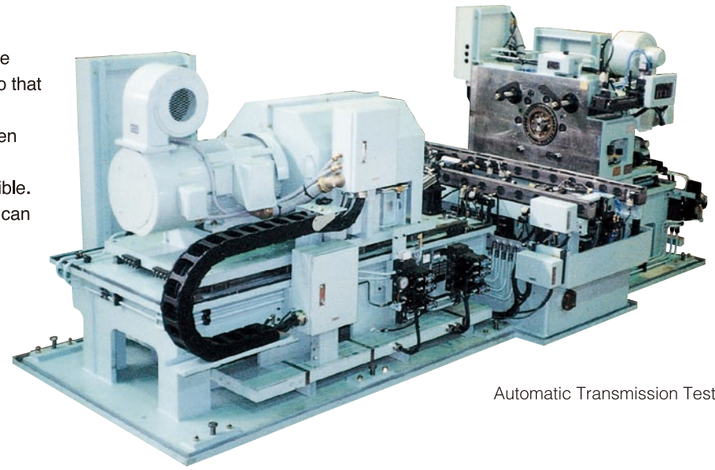
(1) An input shaft with a low inertia is used. The amount of this inertia is almost equivalent to that of an actual car.
(2) High accuracy measurement is possible even with shifting shocks.
(3) High-speed real-time measurement is possible.
(4) Since the noise level is low, unusual sound can be measured.

**Configuration**

(1) Flashing stand.
(2) Conveyor.
(3) Test stand.
(4) Oil temperature. adjusting filter unit.
(5) Host Computer.

**Object**

Auto-transmission (FR, FF, CVT).



Automatic Transmission Tester

### meilineT/C

**Features**

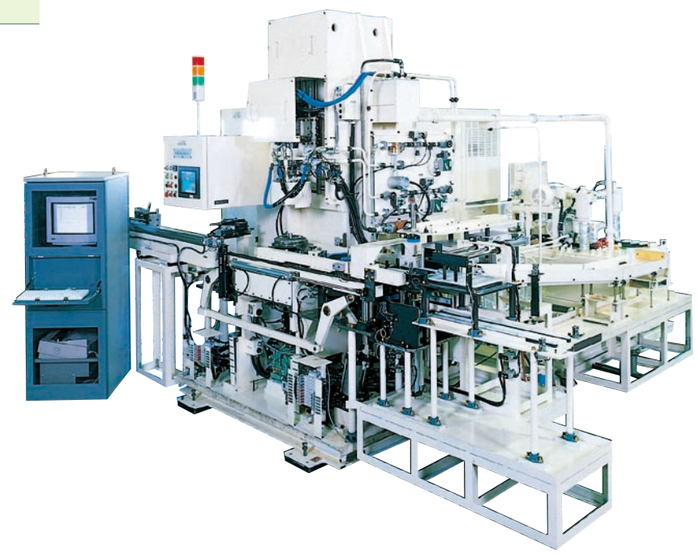
(1) Fully automatic conveyor testing in vertical configuration.
(2) High-speed oil-hydraulic control.
(3) Short cycle time.
(4) Applicable to multiple models.

**Configuration**

(1) Conveyor.
(2) Test stand.
(3) Marking unit.
(4) Oil sampling unit.
(5) Data storage CPU.

**Object**

Torque converter.



Torque converters Tester



# High Quality Measurement and Control Units.

## 15 Electronic Instruments and Control Units

Meidensha manufactures a variety of measuring instruments and control units as shown below for dynamometer test systems.

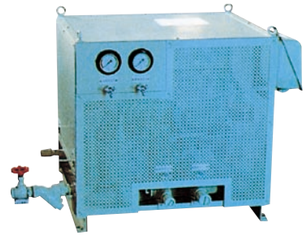
●Engine speed meter

●Ignition pulse detector

●Pressure Transducer

●Measurement data display unit (VM-9300)

●Multi-step programmer (CMP-92)



●Engine lubricant temperature control unit

●Rord-lond setter (DRL62)


●Strain Amplifier

●AC throttle actuator

●Engine cooling water temperature control unit

# Long and Abundant Experience

## History of Meiden Dynamometer and its Applied System Development (1920 ～ 2009)

| Year | Achievement | Remarks |
|---|---|---|
| 1920 | The first 10HP DC dynamometer delivered to a Tokyo Institute of Technology. | Beginning of dynamometer age in Japan. |
| 1927 | Chassis dynamometers\(35kW×2) developed and delivered to an automobile school of the army. | The first chassis dynamometers in Japan. |
| 1930 | Windage loss error compensating device developed for DC dynamometers. | A great contribution to improvement of accuracy and compactness. |
| 1932 | 75HP 4000$m^{-1}$(for Navy Aircraft Div.) and 150HP 2000$m^{-1}$(for Mitsubishi Internal Combustion Mfg.Co.,Ltd.) DC dynamometer completed. | —— |
| 1935 | 300HP DC dynamometer,a combination of three 100HP units, completed for Tokyo Gas Denki Industries. | —— |
| 1936 | 600kW 1500$m^{-1}$ DC dynamometer completed for the Institute of Electrical Technology. | —— |
| 1955 | Improved DC dynamometer completed. | Adoption of new techniques for autobalance,ventilation,lubrication,etc. |
| 1956 | 30HP 10,000$min^{-1}$ DC dynamometer completed. | The first 10,000$min^{-1}$ DC dynamometer in the world. |
| 1958 | EDDIC dynamometer series developed and put into operation. | The first eddycurrent type in Japan dynamometer series. |
| 1960 | Oil floated cradle bearing type DC dynamometers developed. | The first high precision (0.1%) in Japan dynamometer. |
| | Motor operated trunnion type DC dynamometer developed. | The first type with 0.2% accuracy in Japan. |
| 1963 | 1600kW 7750～15,500$min^{-1}$ DC dynamometers delivered to National Aerospace Laboratory. | The largest capacity, geared high speed DC dynamometer in the world. |
| 1966 | Automobile engine driving simulator developed. | The first equipment in the world. |
| | 3300kW EDDIC dynamometer delivered to Ishikawajima-Harima Heavy Industries Co.,Ltd. | The largest capacity in Japan, the first adoption of oil floated type in the world for EDDIC dynamometer. |
| | Torque converter tester developed. | The first semi-automatic testing system in Japan. |
| 1967 | Automatically operated automobile gear shifting system developed. | The first achievement in Japan. |
| | All-weather chassis dynamometer developed. | −40℃～+50℃, making rainfall test possible. |
| 1968 | 3700kW EDDIC dynamometer completed for Japan Defense Agency. | The largest capacity in Japan. |
| 1969 | Quadruple brake dynamometer.The first drive robot for manual transmission (MT) vehicle developed. | The first achievement in Japan. |
| 1971 | Computer system for automatic engine control and data acquisition system. | The first achievement in Japan. |
| 1972 | Chassis dynamometer with engine exhaust gas analyzing computer system. | The first achievement in Japan. |
| | Brake dynamometer computer system. | The first achievement in Japan. |
| 1973 | Multi-bench drive simulator system by computer was developed. | —— |
| | Palletize type automatic air-pump tester was completed. | —— |
| | Chassis simulator was developed for motorcycles. | —— |
| | Purple Ribbon Medal was awarded for many years of achievements in regard to dynamometer-applied systems. | —— |
| 1974 | Frame floating DC dynamometer developed. | The first achievement in Japan. |
| 1976 | A complete full-turn-key completion of anechoic rooms for large and small chassis dynamometers and engine noise and pollution tests for Japan Automobile Research Institute. | —— |
| | Disk type EDDIC dynamometer developed. | —— |
| 1977 | Flat belt type chassis dynamometer developed. | —— |
| | Ultra-precision type chassis dynamometer developed. | The first ultra-high-precision product in the world. |
| 1978 | Honored by the Ichimura Prize for the development of a driving simulator capable of conducting mileage accumulation tests. | —— |
| | High-precision tire rolling friction measuring equipment developed. | —— |
| | Large-capacity ultra-high-speed DC dynamometer developed. | 671kW 63,000$min^{-1}$ —— |
| 1979 | Large-capacity ultra-high-speed EDDIC dynamometer developed. Large brake dynamometer developed. | 880kW 63,000$min^{-1}$ 250kgm·$sec^2$ |
| | FREC dynamometer developed. | —— |
| 1981 | Line engine test system (LETS) completed. | —— |
| 1982 | Larger-capacity FREC dynamometer developed. | 1100kW 1500～2000$min^{-1}$ |
| | Completion of electric wave shield room. | —— |
| | Completion of production of engine carrier line-use large type automatic engine operation system. | —— |
| 1983 | Automatic tire assembly system (LATAS) completed. | —— |
| 1984 | Development of heavy duty E/G test system. | —— |
| 1985 | Development of roller dynmometer. | —— |
| 1986 | Completion of chassis dynamometer applying hydraulic motor for electric wave shield room. | —— |
| 1987 | Development of data acquisition system, the meislab Ⅲ. | —— |
| | Development of high-speed large-capacity EDDIC dynamometers (the R Series). | 800kW 13,000$min^{-1}$ |
| | Development of high-performance transistor type control equipment (VT87DY) for FREC dynamometers. | —— |



| Year | Achievement | Remarks |
|---|---|---|
| 1988 | Development of transient dynamometers. Completion of 2WD flat chassis dynamometer. | —— |
| | Attainment of high performance for microcomputer-applied products (the MDC-86 Series). | With automatic load road setter (86RL),sheduler (86/PR), measurement data display unit (286/VM). |
| 1989 | Development of data acquisition system for dynamometer meisiab Ⅳ. | —— |
| 1990 | Completion of 4WD flat chassis dynamometer (With steering simulation). | The first product in the world. |
| | Development of roller dynamometer type chassis dynamometer. | —— |
| 1991 | Development of AC transient dynamometers. | —— |
| | Development of all digital transistor type controller for FREC dynamometers. | —— |
| | Completion of production of power train tester system for Ford Livonia Lab. (16 cells,28 dynamometers) | —— |
| 1992 | Development of chassis dynamometer for EPA emission test. | —— |
| | Development of AC servo type drive robot. | —— |
| | Completion of six wheels large brake dynamometer. | The first achievement in Japan 520～1045kg·m·$sec^2$ |
| 1993 | Development of transient dynamometer (AC type). | First equipment in the world. |
| | Development of seat-mounting type drive robot. | —— |
| | Construction of electric-wave anechoic room where both electric-wave testing and noise measurement can be carried out. | First achievement in Japan. |
| 1994 | Development of operation and data measurement system,the MEIDACS-DY3000 Series. (Use of VME bus for measurement and control) | —— |
| 1995 | Development of personal computer system MEIPC for data measurement and control. | —— |
| | Development of the inverter series VT310DY equipped with IGBTs. | —— |
| | Delivery of a large-size high-speed brake tester for Shinkansen. | —— |
| 1996 | Development of permanent-magnet type ultra-low inertia dynamometer (PMDY). | First equipment in the world. |
| | Development of low-speed FREC dynamometer intended to function as an absorber for power train tester. | —— |
| 1997 | Delivery of an 8-wheel chassis dynamometer to be used for specific vehicles. | —— |
| | Development of a drive robot system for two-wheel vehicles,to which the AC servo-motor and the MEIDACS-DY3200P are applied. | —— |
| | Manufacturing of an IGBT-inverter-controlled large-capacity FREC dynamometer. | 830kW 140/280$min^{-1}$ 2-winding parallel. |
| 1998 | System structuring for dynamic load testers. | —— |
| | Ultra-low-inertia PM type dynamometers that realize gearless features. | 300kW 5000/7000$min^{-1}$ 573Nm J=0.35kgm$^2$ |
| | Battery simulators that support EV motors. | —— |
| | 8-wheel vehicles chassis dynamometers for specific vehicle rough road running simulation. | —— |
| | Extension of exhaust gas chassis dynamometer series for medium-size vehicles. | 220kW 200km/h (Overload 350kW for 1 minute) |
| | Chassis dynamometer for motorcycles, that realizes unit compactness. | 55～75kW Max.250km/h |
| 2000 | Low-inertia wide-range FCDY applicable to wide speed range. | —— |
| | High-speed FCDY for EV motor testing. | 220kW 5500/8000$min^{-1}$ |
| | Transmission axle testing drive motor that realizes the use of gearless transmission test units. | 1100kW |
| | Engine simulation system for power train test. | —— |
| | Virtual engine system for NVH test. | Five axis test system with spin torsional unit. |
| | Radio wave CHDY for radio-wave environmental adaptability test. | μvariable high-function chassis dynamometer with real vehile. |
| | Test system for EV.HV performance evaluation. | —— |
| 2003 | Hyper dynamometer: PCDY-Ⅱ 300. | 330kW (overload 150%) 8500$min^{-1}$ |
| | Low-speed PM dynamometer: PMDY-LV220. | 220kW 1000/3000$min^{-1}$ |
| | PM dynamometer type overhung chassis dynamometer. | First equipment in the world. |
| | Structuring of environment coordination type diesel systems. | —— |
| | Measurement and control system: MEIDACS-DY6000P. | —— |
| | New control system for electric inertia simulation (Shaft torque system). | —— |
| | New-generation FREC dynamometer control unit: THYFREC-VT330DY. | —— |
| 2006 | Meiden Technical Center North America, LLC (MTCNA) commencing its operation. | Supporting the development of products for North America and accepting entrusted testing. |
| 2009 | Large-capacity, low-inertia dynamometer: PCDY 600 | 600kW 5000/8000$min^{-1}$ 1145Nm J=0.23kgm$^2$ |
| | Large-capacity, low-inertia, wide-range dynamometer: PMDY 600 | 600kW 1150/8000$min^{-1}$ 4982Nm J=2.0kgm$^2$ |
| | Low-inertia, high-response dynamometer: PCDY 330 | 330kW 6000/10000$min^{-1}$ 525Nm J=0.12kgm$^2$ |
| | Ultra-high-speed revolution dynamometer: EVDY 250 | 250kW max16000$min^{-1}$ 422Nm J=0.3kgm$^2$ |
| | Development of EV·HEV evaluation system (EVREVO) | Patent applied for in cooperation with National Traffic Safety and Environmental Laboratory; joint-venture products developed between Meidensha Corporation and Ono Sokki, Inc. |

# R&D Laboratory

| Your complaints | | Turned into pleasures! |
|---|---|---|
| We have to test in a hurry, but we don't have available facilities. | ⇨ | Shortening of test time |
| We don't have enough budget to install equipments. | ⇨ | No need for new facility investment |
| We want to confirm operationability and performance before equipments installation. | ⇨ | Operationability can be experienced. |
| We are looking for a manufacturer with enough facilities and technical capabilities to promote joint venture developments. | ⇨ | Shortening of development time |

It is available to use facilities for all kinds of testing, research, and development on engines and vehicle components based on a completed car.

The most advanced technologies are concentrated in our Meiden Dynamometer System R&D Laboratory.

The R&D Laboratory was completed on November 25, 2004. This laboratory is intended to reinforce the performance verification and evaluation facilities for the dynamometer system products so that various kinds of testing facilities can be promptly put into production to meet the contemporary requirements offered by our customers.
The laboratory accommodates the engine benches, package type engine benches, chassis dynamometer laboratory, and acoustic laboratory. These facilities are used for the joint development activities with our customers. They can also be leased to the parties concerned.

Acoustic laboratory

## Test Items Available at the R&D Laboratory:

- Testing on engine performance, functions, and durability (Gasoline and diesel)
- Drive-train durability and performance evaluation
- Exhaust gas testing
- EV/HEV motor performance evaluation
- Noise test



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**CE73-2378Ⓚ** As of July, 2013
2013-7ME (2.65V) 0.5L