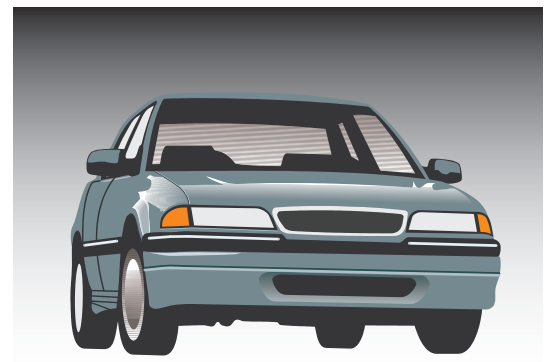


Automobile Evaluation Instruments

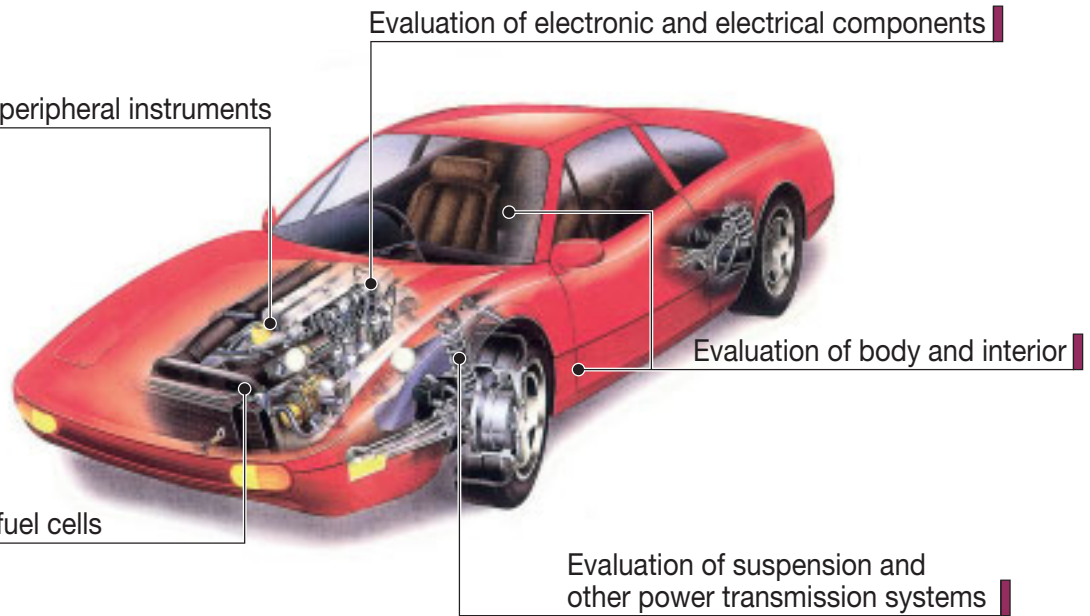
For the development and safety of the next generation of cars



Evaluation Instruments
For Automotive Industry

Evaluation, Inspection, and Testing Instruments for All Development Needs

- As a manufacturer of analytical and testing instruments, Shimadzu offers a range of instruments to aid the development of fuel-cell vehicles (FCV), which are widely tipped to become the next generation of automobile.
- Shimadzu provides overall assistance with the development of these vehicles, including the development of solid polymer fuel cells, seen as the most promising candidate for vehicle applications; development of reformers to minimize the infrastructure required; and the development and evaluation of the new materials needed to create a practical FCV.



Reformer Evaluation Instruments

● High-sensitivity Inorganic Gas Analyzer

GC-14B (PDD)

The GC-14B gas chromatograph permits measurements into the ppm range using pulsed discharge detector (PDD), a sensitivity not possible with conventional TCD. Permits highly sensitive measurements of CO in reformer emissions.



● Portable Continuous Gas Analyzer

CGT-7000

This portable infrared gas analyzer is able to continuously monitor low concentrations of CO in reformer emissions. It also handles continuous measurement of CO₂ and CH₄. Monitors up to two components simultaneously.



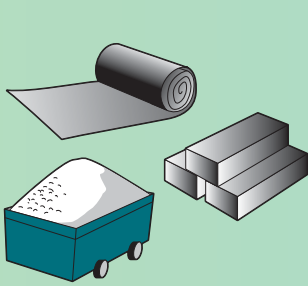
● Multi-component Continuous Gas Analyzer

IRA-208 with CFP-8000

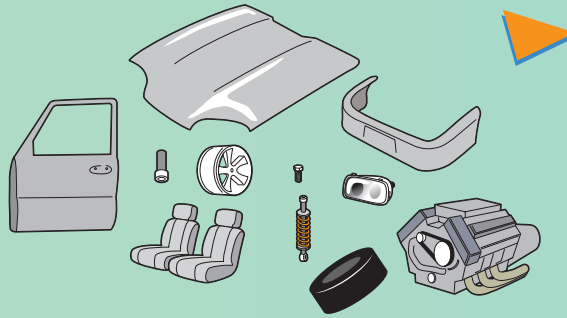
This analyzer continuously monitors three components in reformer emissions: CO, CO₂, and CH₄. It is able to monitor emission gas fluctuations during reformer start up and shut down.



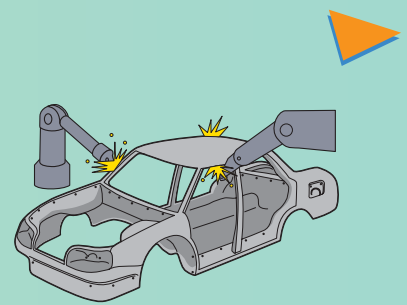
Raw material



Parts forming



Body forming



Material Strength Evaluation Instruments

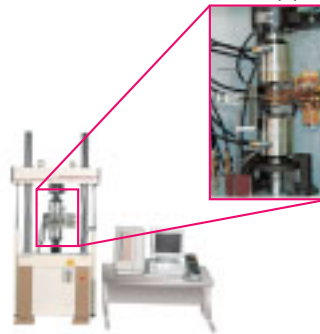
High-speed Impact Tester

This tester gathers data on the impact characteristics of bumpers, instrument panels, and structural materials. It permits measurements in a thermostatic chamber.



Thermal Fatigue Testing System

Conduct thermal fatigue testing on parts such as mufflers, exhaust manifolds, and exhaust pipes.



Electronic and Electrical Component Tester

EZ-Test Series (Static testing machine)

This series is suitable for the evaluation of soldering and small parts, such as connectors. It is the ideal instrument for technicians with concerns about the accuracy of manual methods using a push-pull gauge, for example. Available in six models from 5 N to 500 N.



Torsional Fatigue Tester

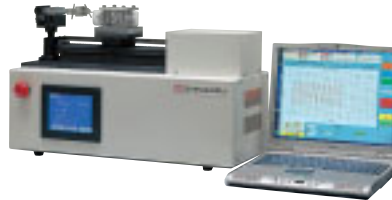
Used to conduct torsional fatigue endurance testing of power-transmission components, such as clutch and torque converters, and steering system components. A high-temperature chamber can be mounted to evaluate dynamic characteristics.



Electronic and Electrical Component Tester

ENT Series Connector Durability Tester

This instrument effectively evaluates connector durability through repeated insertion and withdrawal of the connectors for electronic components used in automobiles.



Force Simulator

This simulator is used for the durability testing of chassis, suspension, and other important safety parts. Systems can be configured with actuators for forces from 5 kN to 50 kN.



Thermal Analysis Instruments

● Differential Scanning Calorimeter

DSC-60

This instrument can be used for the characterization of materials by measuring the melting temperature, heat of fusion, and glass transition temperature for rubbers, plastics, or paints. This is an extremely sensitive DSC with noise not exceeding 1 μ W. Incorporates a liquid-nitrogen cooling chamber for easy measurements of the cooling process.



● Thermomechanical Analyzer

TMA-60/60H

The TMA is applicable to the thermal expansion measurement and mechanical characteristic evaluation of various materials. The unique high-precision displacement sensor measures a wide range of sample length changes at high sensitivity. The special accessories and load program functions can handle a range of sample shapes (films, fibers, etc.) and test types.



● Simultaneous DTA-TG

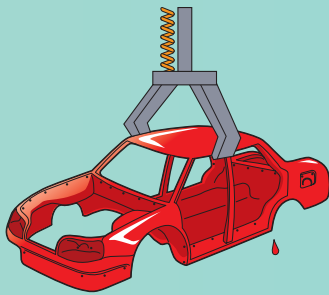
DTG-60/60H

This instrument is suitable for the measurement of the heat resistance of engineering plastics and the quantitation of carbon black in rubber.

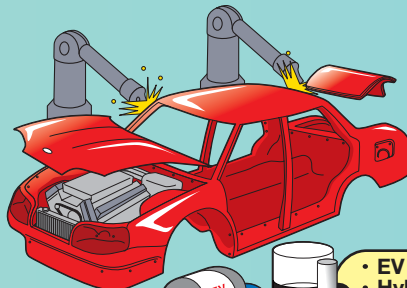
Incorporates a highly sensitive and accurate balance suitable for thermogravimetric analysis. The unique top-loading construction achieves the stable baseline demanded for TG/DTA.



Painting

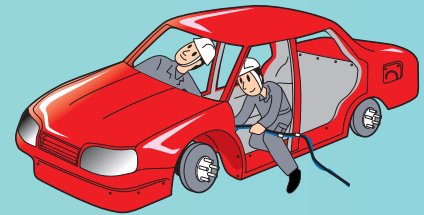


Engine



- EV engine
- Hybrid
- Fuel cell

Electrical installation



● Universal Testing Machine

Autograph AG-I Series

This instrument tests the strength of all types of part and material. It handles the tensile and bending testing of plastic materials according to ISO standards and measures the tensile strength and Young's modulus of metal materials. This is a compact and rigid testing system that is easy to use thanks to functions such as load auto-calibration and fully automatic load range switching. Versions are available from 10 kN to 250 kN.

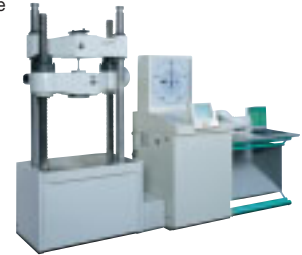


● Universal Testing Machine

UH-I Series

This is a computer-controlled, servo-hydraulic universal testing machine. The test rate can be set using the easy-to-use automatic load controller.

This is the optimal testing machine for the tensile, compression, and bending testing of strong parts and materials. Versions are available from 500 kN to 2,000 kN.



EHF-U Series Servopulser

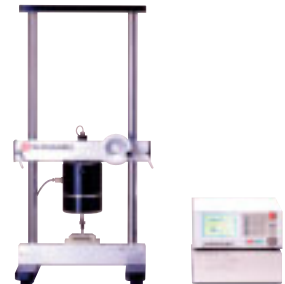
This multi-function fatigue tester is suitable for the fatigue testing of ball joints and other parts. The upper-actuator design expands the test space, permitting testing in controlled atmospheres, such as a corrosive-gas chamber or constant-temperature chamber.



Electronic and Electrical Component Tester

MMT Series (Dynamic testing machine)

These magnetic micro testing systems apply small test forces that cannot be generated using hydraulic systems. Suitable for the evaluation of new materials and electronic parts such as printed circuit boards and connectors. Available in three models: 10 N, 100 N, and 250 N.



● Micro Hardness Tester

HMV-2AD

This tester is widely used for the hardness evaluation of quenched parts and the hardness testing of welded joints. It measures hardness by automatically reading the length of the indentation diagonal at a high accuracy of 0.125 μm resolution (using 40x lens). Load: 98.07 mN to 19.61 N

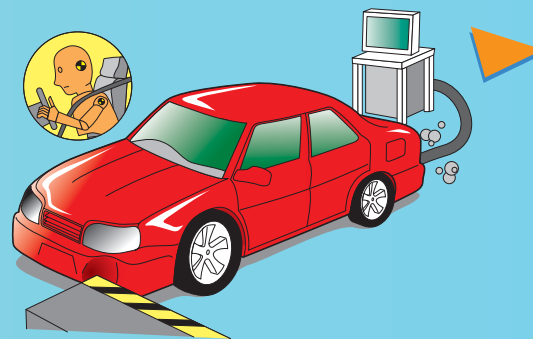
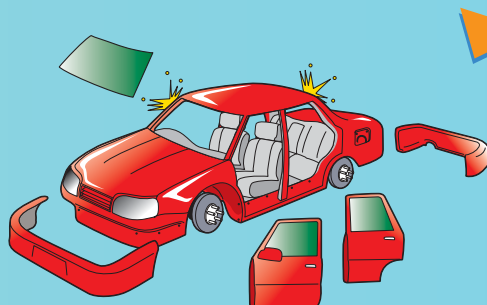


● Digital Rockwell Type Hardness Tester

DXT Series

This tester is widely used for the hardness evaluation of quenched parts and the hardness testing of welded joints. Data can be directly read into Excel, permitting data processing by PC without the need for special software.





Materials Evaluation Instruments (Surface Observation, Composition, Structure, Film Thickness)

● Scanning Electron Microscope

SSX-550

The SSX-550 Analytical Scanning Electron Microscope is the latest SEM-EDS combined system that offers a comfortable operation environment for micro-scale observations of surface topography and element analysis. The design emphasizes low-acceleration-voltage imaging, which allows easy observation of non-conducting samples without pretreatment. The low vacuum observation function permits non-deposition EDS analysis.



● Multi-Channel X-ray Fluorescence Spectrometer

MXF-2400

With its ability to analyze 36 elements simultaneously, this easy-to-operate system achieves rapid, accurate, non-destructive analyses for process management, R&D, and system automation.

This system can analyze elements in diverse samples, from trace levels to high concentrations, permitting analysis for management and R&D in raw materials, new materials, and components.



● Scanning Probe Microscope

SPM-9500 J3

This new microscope offers simple, high-magnification imaging of sample surface in atmospheric air and accurate sample height measurements. Permits the observation of metals and semiconductors as well as non-conductors such as ceramics, organic matter, and polymers without the need for coating or other pretreatment.

This microscope offers other features, including analysis of the material properties of the sample at the probe tip. It can be upgraded for SPM observations in a controlled atmosphere.



● Environmental controlled SPM

WET-9400

This SPM conducts imaging at several 10,000x magnification to observe changes in the surface topography under controlled conditions of temperature and humidity.



● Energy Dispersive X-ray Fluorescence Spectrometer

EDX-700/800/900

The EDX systems offer one-touch, accurate, simultaneous analysis of elements from light elements to heavy elements using operations so simple that a novice can do it! The large sample chamber opens and closes automatically and accommodates liquid, powder, or solid samples up to 300 mm diameter. Also provides imaging of the sample surface.

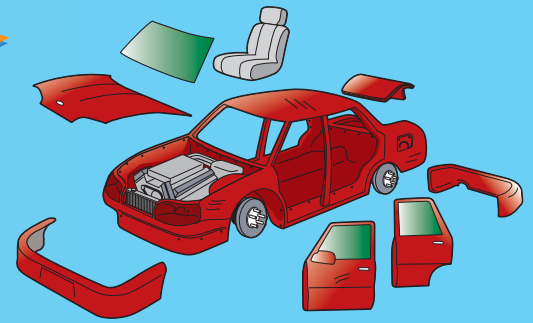


● Energy Dispersive Micro X-ray Fluorescence Spectrometer

μEDX Series

The MicroEDX series, that cooperate with polycapillary X-ray lens, achieve high sensitivity and high resolution analysis in a small point of 50micrometer diameter. Pinpoint target is realized by dual CCD camera system and precisely controlled motorized sample stage. Powerful software suit like Standardless FP quantitation, Auto mapping that are embedded as standard feature supports diverse analysis. Transmission X-ray images can be observed with optional kit.





● Sequential Plasma Emission Spectrometer ICP Series

These instruments offer highly sensitive and accurate component analysis of all materials used in automobile parts. The comprehensive range extends from a tabletop design with low running costs to a high-resolution, high-speed system using twin monochromators.



● X-ray Diffractometer XRD-7000

This X-ray diffractometer offers an extra large type horizontal goniometer that accommodates large samples up to 350 mm diameter (model L). The extremely stable Windows NT/2000 platform makes the instrument remarkably easy to use. Extensive options (polycapillary, large $R-\theta$ sample stage) support many applications.



Powder Evaluation Instruments

● Laser Diffraction Particle Size Analyzer SALD-2101

This analyzer measures particle size distributions in powders and coatings, such as hydrogen absorbing alloys, electrode materials, and ceramics.

This model offers rapid, high-sensitivity, and high-resolution measurements across a range from 0.03 to 1000 μm . Other models in the line-up include the SALD-7001 for ultra-fine particles (0.015 to 500 μm measuring range) and the SALD-3101 for coarse and high-density particles (0.05 to 3000 μm measuring range).



● Inductively Coupled Plasma Mass Spectrometer ICPM-8500

This is a quadrupole mass spectrometer using an ICP ion source. It achieves multi-element simultaneous analysis at ppt-level sensitivity. The diagonal lens (patent pending) used reduces contamination.



● X-ray Diffractometer XRD-6000

X-ray diffractometers are used in diverse fields to measure many materials, including new materials, ceramics, metals, semiconductors, and polymers. The XRD-6000 is a general-purpose instrument using a vertical goniometer and data-processing software for ease-of-use and multifunctionality. Shimadzu's new X-ray optical system ensures highly sensitive and accurate X-ray diffraction measurements of curved or extremely irregular samples.



● Optical Emission Spectrometer OES-5500II

This spectrometer is used for the quality control of pig iron and cast-aluminum automobile parts. It employs a unique horizontal lighting stand and time-resolution PDA software to enhance sensitivity in the trace region.



● Sequential X-ray Fluorescence Spectrometer XRF-1800

The XRF-1800 can conduct qualitative analysis and quantitative analysis on a wide range of samples, including solids, powders, liquids, and thin films. It is a state-of-the-art instrument employing the world's first 250 μm mapping and higher-order X-ray for more accurate qualitative and quantitative functions and greater ease-of-use.



Shimadzu Balances

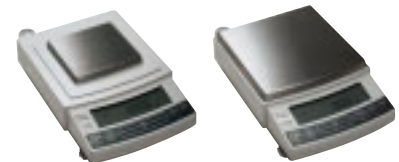
The new line of Shimadzu balances sets a higher standard for attractive ergonomic design and operational efficiency. Product line up in wide range, a host of accessories and peripherals offer the choice of the most suitable balance to meet specific application requirements.

ANALYTICAL BALANCES (AW/AX/AY)



Four decimal sensitivity and integral draft shield define the basic balance. The new line of Shimadzu analytical balances goes beyond this definition with beautiful design and powerful features.

TOPLOADING BALANCES (BW/BX)



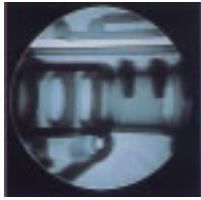
Covering a wide range of readability and capacities up to 6200g, Shimadzu's new line of full-featured toploading balances offer excellent in design and function in a compact package.

Non-destructive Testing Instruments

● Microfocus X-ray CT System

SMX-225CT

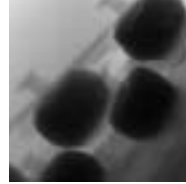
Depending on system configuration and image processing, this system can take images at over 260x magnification and easily take computer tomography (CT) and 3D images. This is a useful quality-control tool for automobile electronic parts. It is also the optimal instrument for the quality control of important diecast safety parts.



● Microfocus X-ray TV System

SMX-160LT

Incorporates a newly developed 0.4-micron microfocus X-ray tube to take high-resolution fluoroscopic images. This instrument is a powerful tool for the quality control of high-density automobile electronic components.



● Aluminum Die-casting X-ray TV System

SMX-31

Incorporates a microfocus X-ray tube that permits the analysis and evaluation of bubbles and hair cracks in aluminum die-castings. It also the optimal instrument to conduct micro testing for the



Evaluation Instruments for Solid Polymer Fuel Cells

● Fourier Transform Infrared Spectrophotometer

IRPrestige-21 / AIM-8800

Thanks to increased sensitivity and ease of operation of microscope systems, FTIR, which is widely used as a method of polymer analysis, is becoming increasingly applied to polymer defect analysis. IRPrestige-21 is PC controlled Fourier transform infrared spectrophotometer operating with IRsolution software. The IRsolution software provides outstanding ease of use including high level of processing functions. The IRPrestige-21 is a research grade FTIR with expandable measure range from Near IR to Far IR and 0.5cm⁻¹ resolution.

With the infrared Microscope System using AIM-8800R Automatic Infrared Microscope, as small as 10 μm samples can be measured with high sensitivity.



● Electron Probe Microanalyzer

EPMA-1600/EPMA-1610

The EPMA-1600/EPMA-1610 Electron Probe Microanalyzers are leading-edge instruments that can be used for the development and evaluation of many automobile materials, including fuel cells, catalysts, and structural components. The EPMA-1610 Electron Probe Microanalyzer incorporates a CeBix cathode that permits genuine sub-micron analysis, making the instrument perfect for the development of new technologies.



Other Instruments for Fuel Cell Evaluation

● Dynamic Ultra Micro Hardness Tester

DUH-W201

Handles the evaluation of modified surface areas and film strength, including measurements of the strength and Young's modulus of electrolyte films, film penetration strength testing before and after film processing, and hardness testing of plating layers.

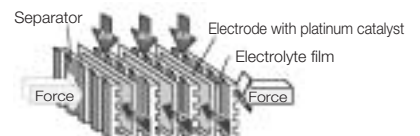


● Universal Testing Machine

Autograph AG-I / AGS-J Series

Used for evaluating the change in generation efficiency due to the stack clamping force. Applicable to the tensile, compressive, and bending testing of small parts, such as electrolyte film, separators, and MEA (film-electrode connection).

A temperature/humidity chamber can be attached to permit measurements in a controlled atmosphere.



Dynamic Balancing Instruments

- Machine for Testing and Correcting the Dynamic Balance of Motors

DBM-AE

Automatically measures and corrects the rotary balance of rotors for fuel injection pump motors, starter motors, power window motors, wiper motors, and power seat motors. Sister model can conduct dynamic balancing of other parts, including cranks, air-conditioner fans, clutches, and torque converters.



Others

Foam Rubber Compression Tester

This tester conducts compression testing on the foam rubber used in car seats according to JIS standards. It is a special attachment for the Universal Testing Machine.



- Helium Leak Detector

MSE Series

This leak detector uses helium that easily passes through pinholes to detect leaks from fuel cells or evaluate the performance of polymer films. It is resistant to background effects.



Shimadzu Overseas Customer Support

To support customers engaged in the development and production in automotive industry, Shimadzu has established a global service network incorporating customer support, training and service centers in the USA, Germany, China and Singapore, as well as in Japan. Shimadzu provides comprehensive support services including instrument maintenance, training workshops and the provision of relevant information to meet customer needs regarding both software and hardware.



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