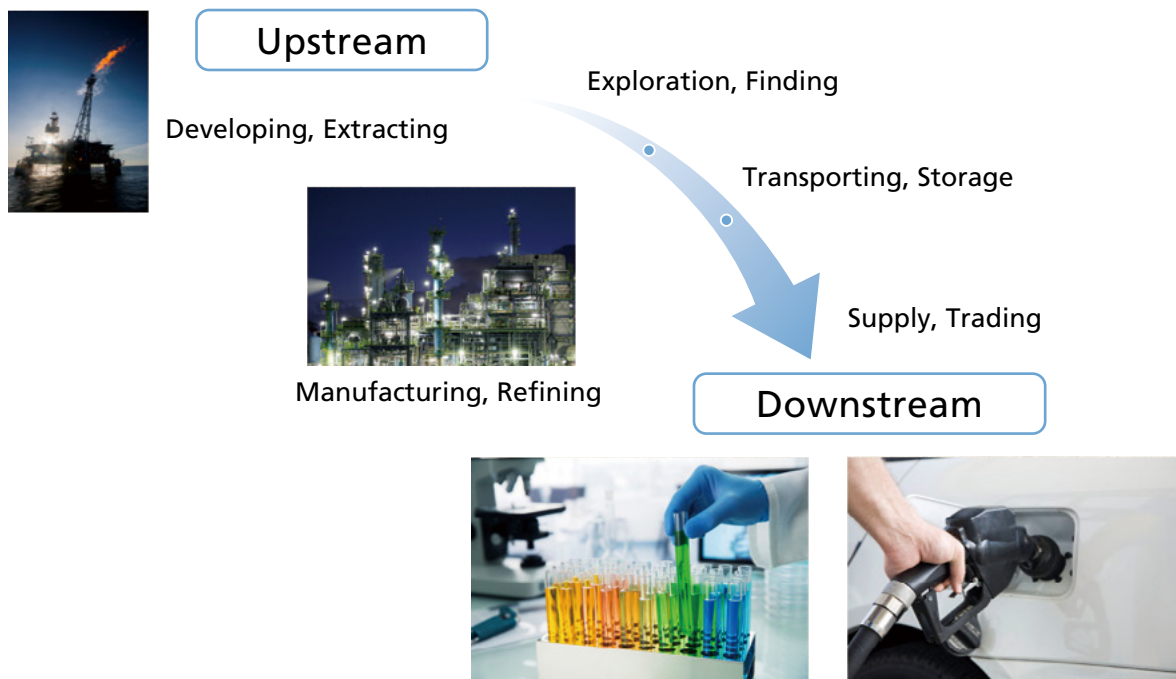# SHIMADZU
Excellence in Science

Shimadzu's Total Solutions for the
Hydrocarbon Processing Industry

Shimadzu's Total Solutions for the Hydrocarbon Processing Industry (Petrochemical, Chemical)

The Hydrocarbon Processing Industry (HPI), encompassing petroleum refining, gas processing, petrochemical and chemical, is a foundational field for all industry. In the HPI market, many kinds of analytical and measuring instruments are used for quality control purposes and process management. With a wide range of products, from GC and Elemental Analyzers to an On-line Water Quality Analyzer, Shimadzu offers total support for laboratories in the HPI market.

From Upstream to Downstream, our rugged, high-quality products are perfectly suited to meet the demands of your laboratory and contribute to your business success.

Upstream

Developing, Extracting

Exploration, Finding

Transporting, Storage

Manufacturing, Refining

Supply, Trading

Downstream

For more information about Shimadzu's solutions for the HPI market, visit our website

Shimadzu Global Network
(Sales, Service, Manufacturing, and R&D Facilities)

Shimadzu Customized GC Systems

Various Applications in the HPI Market

- Support third-party detectors, including a pulsed flame photometric detector (PFPD) and a pulsed discharge helium ionization detector (PDHID).
- Support third-party software for detailed hydrocarbon analysis (DHA) and Chrom Merge.
- Support liquefied petroleum gas (LPG) sampling devices and vaporizers.
- Complete application manual and methods

	Natural Gas Analysis	Refinery Gas Analysis (RGA)	Process and Custom Gas Analysis	TOGA/DGA Analysis	Petrochemicals Analysis
Applicable Methods	ASTM D1945 ASTM D1946 GPA 2261, GPA 2177 GPA 2286, GPA 2186 ISO 6975	ASTM D7833 ASTM D2163 UOP 539	ASTM D1946 ASTM E1746	ASTM D3612C	ASTM D6228
Analysis	C1-C6+ Hydrocarbons, Non Condensable gases O_2, N_2, CO, CO_2 and H_2S Optional Hydrogen Extended NGA C1-C14+ NGL, Dual Oven NGA High Speed NGA	C1-C6+ Hydrocarbons saturates and unsaturates H2S, Non Condensable gases O_2, N_2, CO, CO_2 and H_2 LPG Sampling Vaporizer	O_2, N_2, CO, CO_2 Impurities in Chlorine	TOGA with Head Space H_2, O_2, N_2, CO, CO_2, C1, C2's, C3's	Trace Sulfur
Features	Analysis time 10 min.	Analysis time less than 6 min.	Special Hastelloy Material for Chlorine Analyzer	High Sensitivity Extension up to C4	PFPD for Sulfur

	Simulated Distillation Analysis	DHA Analysis	Oxygenates Analysis	Sulfur Analysis	Aromatics Analysis
Applicable Methods	ASTM D7096 ASTM D7213 ASTM D3710 ASTM D2887 ASTM D6417 ASTM D6352 ASTM D7500 ASTM D5307 ASTM D7169 IP 480 ISO 3924	ASTM D5134 ASTM D6729 ASTM D6730 ASTM D6733 ASTM D8071	ASTM D4815 ASTM D7423 UOP 960	ASTM D6228 ASTM D5504 ASTM D5623 ASTM D7011	ASTM D3606 ASTM D5580
Analysis	Boiling Point Distribution C1-C110 (As per method)	C1-C14 Hydrocarbons PIONA Report	C1-C4 Alcohols	Trace Sulfur Analysis Individual components	Aromatics
Features	Fast Simdist Correlations with D86 and D1160, Integrated Shimadzu Software	Tuned D6730 column Fast DHA Front End PIONA Room Temperature Database VUV PIONA+	Use of N_2 Carrier for D4815	Use of FPD, PFPD or SCD Detectors	Combination model for D3606, D5580. D4815

Product Lineup

Natural Gas Analysis (ASTM D1945/D1946/D3588, GPA 2177/2186/2261/2286, ISO 6975)
Refinery Gas Analysis (ASTM D2163/D7833, UOP 539)
Gasoline/Fuel Analysis (ASTM D3606/D4815/D5580/D7423, UOP 960)
Detailed Hydrocarbon Analysis (ASTM D5134/D6729/D6730/D6733)
**Fuel dilution analysis of engine lubricants** (ASTM D3524/D3525/D7593)

VUV PIONA+ Analysis (ASTM D8071)

This high-speed gasoline PIONA analyzer is compliant with ASTM D8071. It supports simultaneous analysis of PIONA compounds, specific oxygenated compounds, and BTEX in gasoline, and can quickly analyze samples within 30 minutes by classifying compounds based on VUV absorption spectra. The simple system configuration provides broad applicability, including analyzing other petroleum products.

The VUV detector VGA-100 is a product of VUV ANALYTICS, INC.

Product >
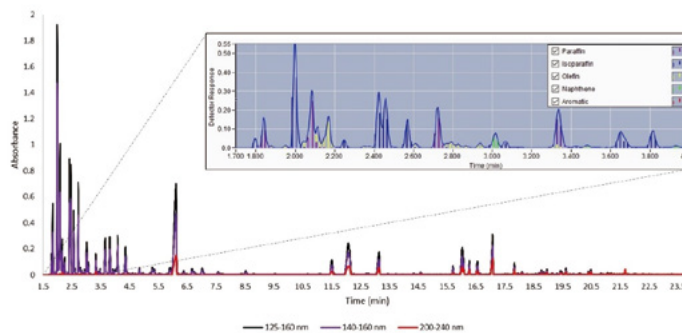
VUV Chromatogram of Gasoline Sample

Transformer Oil Gas Analysis (TOGA) (ASTM D3612)

It is necessary to analyze outgas in transformer insulation oil in power plant facilities. Shimadzu offers a System GC compliant with ASTM D3612 Method B (oil stripper sampling) or ASTM D3612 Method C (headspace sampling). The Nexis GC-2030 TOGAS3 system, equipped with a PDHID, enables the analysis of more trace amounts of permanent gas than conventional systems.

Product >

Simulated Distillation Analysis (ASTM D2887/D3710/D6352/D7213/D7500/D7169, ISO 3924)

The Shimadzu simulated distillation analysis system, consisting of a Nexis GC-2030 high-performance capillary gas chromatograph and LabSolutions™ simulated distillation GC analysis software, meets all applicable ASTM, ISO, EN, and JIS standards. Permitting accurate and highly reproducible analysis of high-boiling components in crude oil samples, it is the optimal system for product quality control and process management in oil refinery plants.
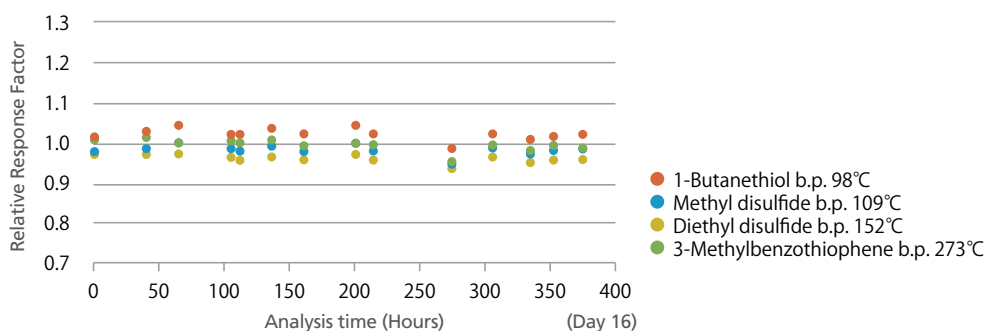
Product >

Trace Sulfur Analysis
—Nexis™ SCD-2030

(ASTM D5504/D5623/D6228/D7011)

Some sulfur compounds are known to be not only hazardous but also catalytic poisons. ppb sulfur analysis is conducted by gas chromatography. The Nexis SCD-2030 is a next-generation sulfur chemiluminescence detection system. The dramatically enhanced sensitivity and reliability, the excellent maintainability, and the automation functions, a first for the industry, will improve laboratory productivity.

Product >

- 1-Butanethiol b.p. 98℃
- Methyl disulfide b.p. 109℃
- Diethyl disulfide b.p. 152℃
- 3-Methylbenzothiophene b.p. 273℃

Excellent Long-Term Stability

Trace Moisture Analysis

Shimadzu's proprietary Barrier Discharge Ionization Detector (BID) with MilliporeSigma's* moisture analysis column "Watercol™" separates and measures the moisture in a formulation of feedstock and provides sensitive and accurate results with measurements made down to a ppm level of moisture detection without any interference.

* MilliporeSigma, the life science business of Merck KGaA

Product >
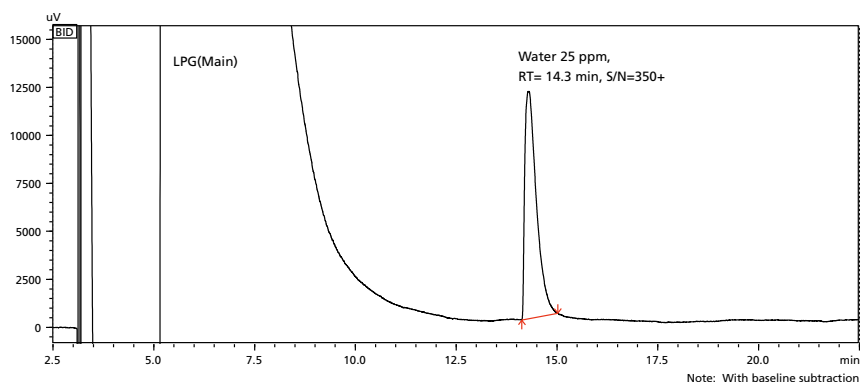
Analysis of Water in LPG

Aromatics Analysis
HPLC

Products >

■ **Features**

- Switching Valve Configuration
- Super Performance and Expandability
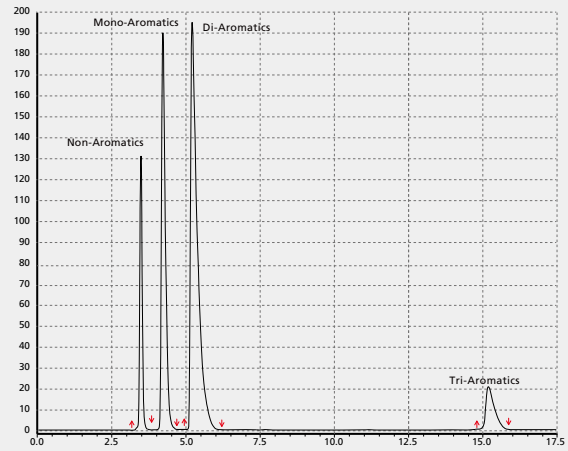- Precise Sample Injection

■ **Applicable Methods**
ASTM D6591/D6379
IP 391/436/548/590
Custom Methods

■ **Analysis Subjects**
Aromatics in fuels
Poly-aromatics in diesel
FAME in jet fuel

Application >

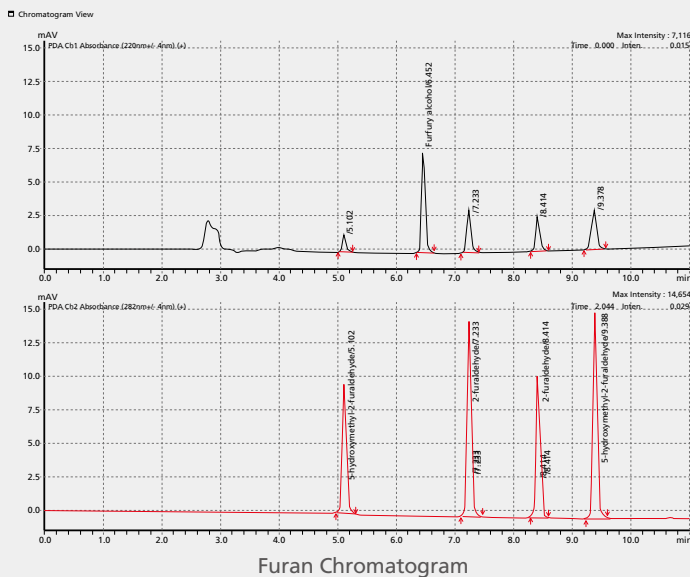Aromatics Ref. Std. ASTMD6591

■ **Applicable Methods**
ASTM D5837
Custom Methods

■ **Analysis Subjects**
Components in transformer oil

Application >

Furan Chromatogram

Furan Analysis
HPLC

Products >

■ **Features**

- Fully Integrated System
- Network Connectivity
- High Sensitivity Detector

LC-MS/MS

- **Applicable Methods**
  Custom Methods
- **Analysis Subjects**
  Additives in polymers

Products >

MS Chromatograms of Polymer Additives

Analysis of Additives in Plastic

- **Features**

High Speed and High Sensitivity

Scan Speed 30000u / sec

MRM 555 Ch / Sec

- **Applicable Methods**
  EPA 8270B, TO-14, IP-585
  Custom Methods
- **Analysis Subjects**
  Volatile organic compounds
  Arsine phosphine in ethylene
  FAME in jet fuel

Application >

VOCs Analysis
GC-MS

Products >

Headspace Analysis System

Thermal Desorption System

Products >

- **Features**

Accessories HS, TD and P&T

High Sensitivity and Reduced Cost

High Efficiency Multicomponent Analysis

Inductively Coupled Plasma Mass Spectrometer (ICP-MS)

- ■ **Applicable Methods**
  Customized

- ■ **Analysis Subjects**
  Trace elements in naphtha
  Determination of toxic arsenic species using LC-ICP-MS

Arsenic Chromatogram

- ■ **Features**

Easy Method Development

Lowest Running Costs

High Stability, High Sensitivity and Low Interference
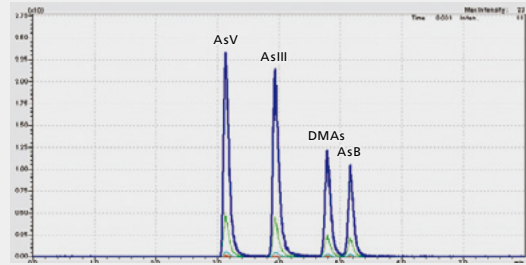
ICP Atomic Emission Spectrometer (ICPE)

- ■ **Applicable Methods**
  ASTM D4951/D5184/D5185
  UOP 389/303/714
  APHA 3120

- ■ **Analysis Subjects**
  All elements
  Lubricating oils
  Petroleum naphtha, gasoline
  Marine fuel, fuel oil, heavy oils
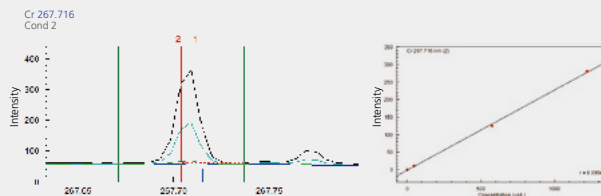
Cr in Naphtha with ISO Mist Kit

- ■ **Features**

Easy Method Development

Low Argon Consumption

All Wavelength Acquisition

Atomic Absorption Spectrophotometer (AAS)

■ **Applicable Methods**
ASTM D6595/D3237/D3567/D3605/D3635/
D3831/D3919/D4628/D5863
IFP 9312, UOP 946

■ **Analysis Subjects**
Additives in polymers
All elements
Lubricating oil
Petroleum oils
Lead in gasoline

Products >

■ **Features**

- Unique 3D Double Beam Optics
- Comprehensive Safety Functions
- Dual Background Correction Functions

$Abs=0.011100Conc+0.0043463 \quad r=0.9989$
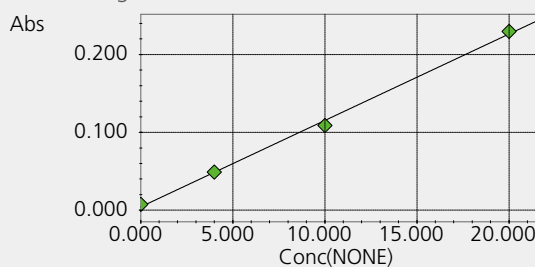
Arsenic in Vacuum Gas Oil (VGO)

Energy Dispersive X-ray Fluorescence Spectrometer (EDX)

■ **Applicable Methods**
ASTM D5839/D4294/C114
ISO 8754

■ **Analysis Subjects**
Sulfur in oil
All elements

Application >
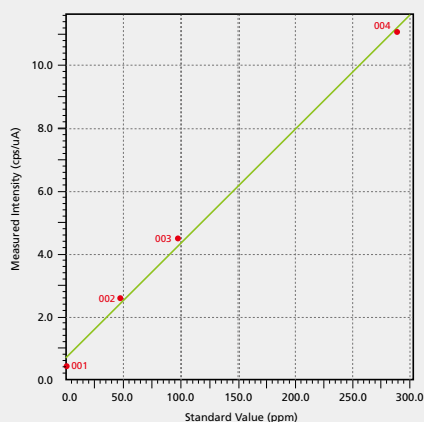
Zn in Lubricant Oil

Products >

■ **Features**

- High Sensitivity, High Speed and High Resolution
- Large Sample Chamber
- Easy-To-Use Operation

Fourier Transform Infrared Spectrophotometer (FTIR)

- **Applicable Methods**
  ASTM D7371/D7575/D7678
  EN 14078
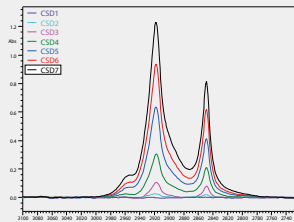- Custom Methods

Analysis Subjects
Fame in biodiesel
Total petroleum hydrocarbons
Additives in polymers
Oil in water

Application >

Products >

- **Features**

Space Efficient with High Expandability

Dedicated IR Pilot Program

High Reliability

Sample	Absorbance	Concentration [ppm]
CSD1	0.0020	0.73
CSD2	0.026	4.54
CSD3	0.096	15.23
CSD4	0.28	40.56
CSD5	0.60	87.57
CSD6	0.87	127.55
CSD7	1.2	168.70

Enlarged View of Peaks Around 2920 cm^{-1}
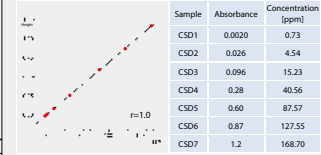
Calibration Curve and Standard Sample Concentrations

Analysis of Oil in Water

UV-VIS Spectrophotometer (UV-Vis)

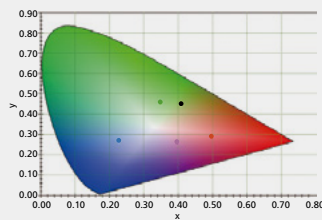- **Applicable Methods**
  ASTM D1840/D2008
  Custom Methods
- **Analysis Subjects**
  Petroleum products
  Turbine fuels
  Mineral oils
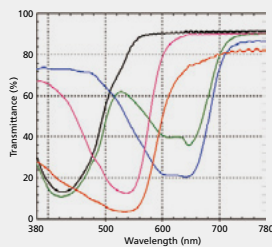
Transmittance Spectra of Colored Cellophane Tape

Chromaticity Diagram of XY Color System

Analysis of Colored Cellophane Tape

Products >

- **Features**

Easy Operation Allows Obtaining Answers Rapidly

Advanced Regulatory Compliance

High Performance to Meet Diverse Needs

Thermal Analyzer

- **Applicable Methods**
  Custom Methods

- **Analysis Subjects**
  Thermal properties of polymers
  DSC, TGA, TG/DTA, TMA

- **Features**

  - High Performance DSC / TGA
  - Diverse Measurements by Simple Operations
  - High Sensitivity

DSC Curves of HDPE, PP, and Blend Sample
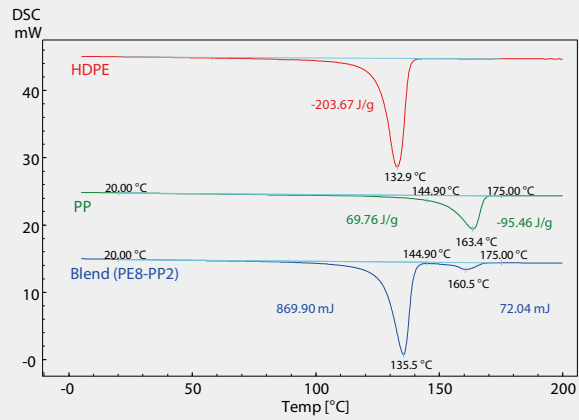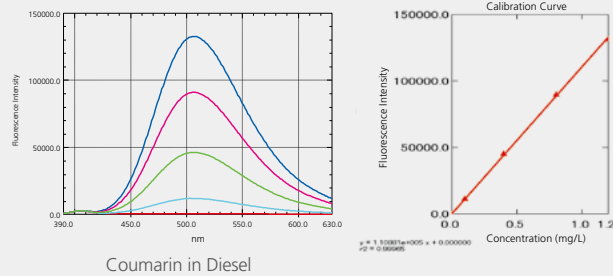
Spectrofluorophotometer

- **Applicable Methods**
  ASTM D5412, JPI-5S-71-2010
  Custom Methods

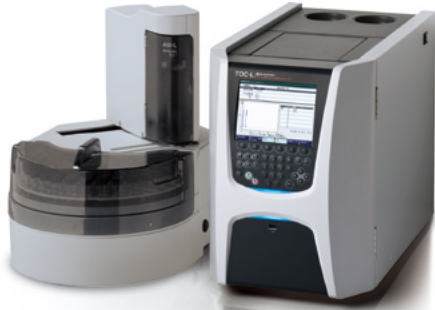- **Analysis Subjects**
  Measuring oil in water
  Coumarin in diesel

Coumarin in Diesel

- **Features**

  - High Sensitivity High Stability and High Speed
  - High Speed 3D Scanning
  - Fluorescence Quantum Yield and Fluorescence Quantum Efficiency Measurement

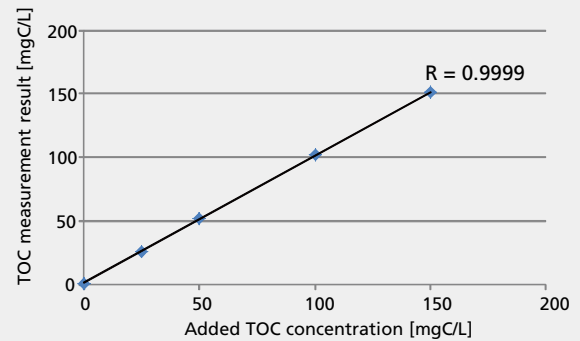# Total Organic Carbon (TOC) Analyzer

■ **Applicable Methods**
ASTM D7573, EN 1484, EPA 415.1
APHA 5310B

■ **Analysis Subjects**
TOC in various types of water,
including high salt content water

Application >

Products >

■ **Features**

- 680 DegC Combustion Method
- High Salt Kit
- Standalone System

R = 0.9999

TOC measurement result [mgC/L] vs Added TOC concentration [mgC/L]

TOC Measurement Result of the Seawater Sample

On-line TOC Analyzer

■ **Applicable Methods**
Custom Methods

■ **Analysis Subjects**
TOC in various types of water

NPOC in mg/l vs Number of Measurements
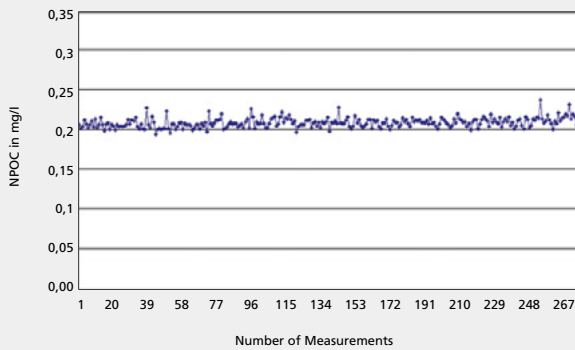
TOC Analysis in Condensate Sample
Mean Value 0.208mg/L, SD 0.006mg/L, DL 0.05mg/L

Products >

■ **Features**

- Superior Sampling Units
- Low Operation Costs
- Low Maintenance Costs

Testing Machine

- **Applicable Methods**
  ISO 6892/527, ASTM D638
- **Analysis Subjects**
  Tensile properties of metals
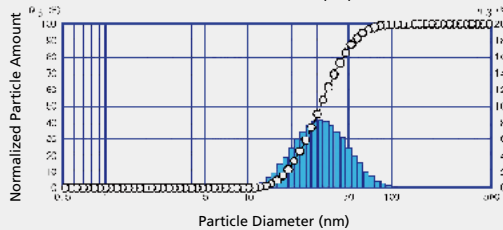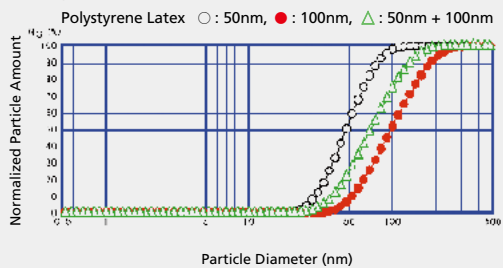 Tensile properties of plastics

Application >

Products >

- **Features**

Short Test Cycle Time

Ultrafast Sampling Rate

Eight Fold High Resolution
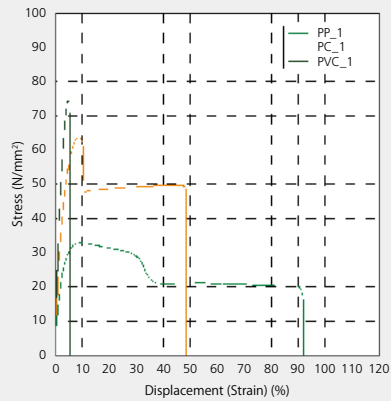
Tensile Test of PP, PC, PVC

Particle Size Analyzer

- **Applicable Methods**
  Custom Methods
- **Analysis Subjects**
  Various petrochemicals streams

Polystyrene Latex ○ : 50nm, ● : 100nm, △ : 50nm + 100nm

Samples with Broad Distribution
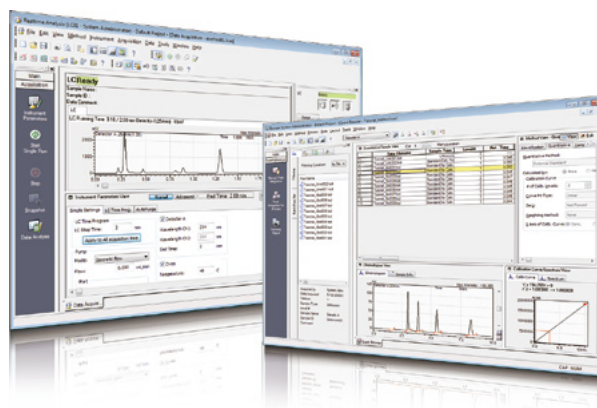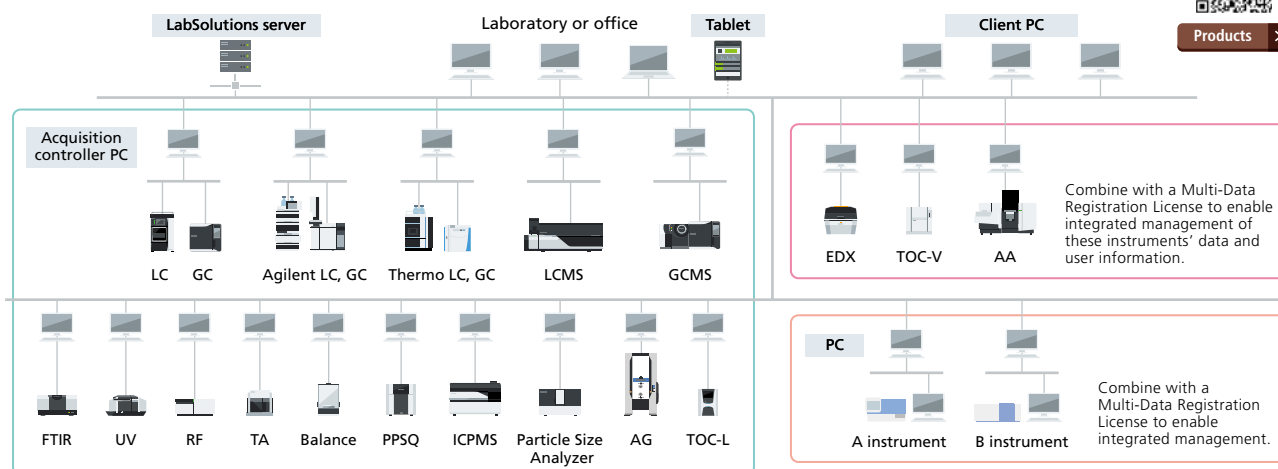

Products >

- **Features**

Wide Range 17nm-2500um

Wide Range of Accessories

High Sensitivity / High Concentration

Analytical Network Data System

LabSolutions

LabSolutions features an innovative operating environment and provides complete data management to ensure secure information in networked laboratories.

The LabSolutions series of integrated workstation software controls a wide variety of analytical instruments and performs data management. Software is sometimes complex, but the LabSolutions series offers superior ease of use and a highly reliable system environment with solutions for a variety of issues encountered in the analytical laboratory.

Products >

LabSolutions server   Laboratory or office   Tablet   Client PC

Acquisition controller PC

LC   GC   Agilent LC, GC   Thermo LC, GC   LCMS   GCMS

Combine with a Multi-Data Registration License to enable integrated management of these instruments' data and user information.

EDX   TOC-V   AA

FTIR   UV   RF   TA   Balance   PPSQ   ICPMS   Particle Size Analyzer   AG   TOC-L

PC

A instrument   B instrument

Combine with a Multi-Data Registration License to enable integrated management.

LabSolutions Series Support Operations in a Variety of Laboratory Environments

LabSolutions LC/GC is a file-based standalone system for simultaneous instrument control and data analysis of up to four HPLC and GC units from a single PC. LabSolutions LC/GC offers integrated control over data acquisition, analysis, and reporting, providing an intuitive operating environment that is easy to master. LabSolutions Direct facilitates the control and monitoring of HPLC and GC units from personal smartphones and tablet PCs, allowing you to check the status of instruments during ongoing analysis while out of the laboratory.

LabSolutions DB and CS integrate a data management function with LabSolutions LC/GC and are compliant with ER/ES Regulations. LabSolutions DB and CS ensure data integrity with features that prohibit data tampering and offer enhanced support for regulatory compliance.

   LabSolutions DB offers these regulatory compliance features in a standalone system for even a single instrument. This setup is ideal for customers with only a small number of instruments who intend to manage all their data from a single PC.

   LabSolutions CS is a networked system for the centralized management of analytical data in a server-based database. LabSolutions CS facilitates the remote control of HPLC, GC, and MS units and the analysis of data obtained by various types of instruments from any client PC. LabSolutions CS also directly controls HPLC and GC units made by Agilent Technologies and Thermo Fisher Scientific and imports data from other companies' instruments.

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SHIMADZU

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