Analytical and Testing Instruments for the HPI Market

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.

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

https://www.shimadzu.com/an/industry/petrochemicalchemical/index.html
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Shimadzu Customized GC Analyzers

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

Product Lineup

<table>
<thead>
<tr>
<th>Natural Gas Analyzers</th>
<th>Refinery Gas Analyzer (RGA)</th>
<th>Process and Custom Gas Analyzers</th>
<th>TOGA/DGA Analyzer</th>
<th>Petrochemicals analyzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM D1945/D1946</td>
<td>UOP S39, ASTM D7833, D 2163</td>
<td>ASTM D1946</td>
<td>TOGA with Head Space</td>
<td>Trace Sulfur</td>
</tr>
<tr>
<td>GPA 2261, GPA 2177</td>
<td></td>
<td>E1746</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPA 2286, GPA 2186</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ISO 6975</td>
<td></td>
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</tr>
</tbody>
</table>

Applicable Methods

- C1-C6+ Hydrocarbons, Non Condensable gases O2, N2, CO, CO2 and H2S
- Optional Hydrogen
- Extended NGA C1-C14+
- NGL, Dual Oven NGA
- High Speed NGA

Analysis

- Analysis time 10 min.
- Analysis time less than 6 min.
- Special Hastelloy Material for Chlorine Analyzer
- High Sensitivity Extension up to C4

Features

- Relative Response Factor
- Excellent Long-Term Stability

Transformer Oil Gas Analyzer (TOGA)

Simulated Distillation Analyzer
Shimadzu’s Total Solutions for the Hydrocarbon Processing Industry

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Analytical and Testing Instruments for the Hi-Market
Aromatics Analysis
HPLC

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

Applicable Methods
- ASTM D 6591, D6379, IP 391, IP 436, IP 548, IP590 Custom Methods

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

Furan Analysis
HPLC

Features
- Fully Integrated System
- Network Connectivity
- High Sensitivity Detector

Applicable Methods
- ASTM D5837
- Custom Methods

Analysis Subjects
- Components in transformer oil
### LC / MS / MS

**Features**

- High Speed and High Sensitivity
- Scan Speed 30000s / Sec
- MRM 555 Ch / Sec

**Applicable Methods**

Custom Methods

**Analysis Subjects**

Additives in polymers

**LCMS-8060**

![MS Chromatograms of Polymer Additives](image)

Analysis of Additives in Plastic

### VOCs Analysis

**GC-MS**

**Features**

- Accessories HS, TD and P&T
- High Sensitivity and Reduced Cost
- High Efficiency Multicomponent Analysis

**GCMS-QP2020 NX**

**Applicable Methods**

- EPA 8270B, TO -14, IP-585
- Custom Methods

**Analysis Subjects**

- Additives in polymers
- Volatile organic compounds
- Arsine phosphine in ethylene
- FAME in jet fuel

**HS-20 Headspace Analysis System**

**TD-30 Thermal Desorption System**

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- Analytical and Testing Instruments for the HPI Market
Inductively Coupled Plasma Mass Spectrometer (ICP-MS)

- Features
  - Easy Method Development
  - Lowest Running Costs
  - High Stability, High Sensitivity and Low Interference

- Applicable Methods
  - Customized

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

ICP Atomic Emission Spectrometer (ICPE)

- Applicable Methods
  - Elemental Analysis ASTM D4951, D5184
    - ASTM D4951, DS5184 UOP 389, UOP 303
    - UOP 714, APHA 3120, IFP 9507

- Analysis Subjects
  - All elements
  - Lubricating oils
  - Petroleum naphtha, gasoline
  - Marine fuel, fuel oil, heavy oils

- Features
  - Easy Method Development
  - Low Argon Consumption
  - All Wavelength Acquisition

In the Arsenic Chromatogram, arsenic species such as AsV, AsIII, DMAs, and AsB are clearly distinguished. The Cr in Naphtha with ISO Mist Kit graph shows the measured intensity (cps/uA) against the standard value (ppm) for chromium, highlighting the instrument's ability to detect trace elements with high sensitivity and high resolution.
Atomic Absorption Spectrophotometer (AAS)

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

- Applicable Methods
  - ASTM D6595, D3237, D3567, D3605, D3635, D3831, D3919, D4628, IFP9312, UOP946, D5863

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

- Graph
  - Abs = 0.011100Conc + 0.0043463
  - r = 0.9989
  - Arsenic in Vacuum Gas Oil (VGO)

Energy Dispersive X-ray Fluorescence Spectrometer (EDX)

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

- Applicable Methods
  - ASTM D5839, ASTM D4294, C114
  - ISO 8754

- Analysis Subjects
  - Sulfur in oil
  - All elements

- Graph
  - Measured Intensity (cps/uA)
  - Standard Value (ppm)
  - Zn in Lubricant Oil

Shimadzu's Total Solutions for the Hydrocarbon Processing Industry
Fourier Transform Infrared Spectrophotometer (FTIR)

**Features**
- Space Efficient with High Expandability
- Dedicated IR Pilot Program
- High Reliability

**Applicable Methods**
- D7371, EN 14078, D7575, D7678
- Custom Methods

**Analysis Subjects**
- FAME in biodiesel
- Total petroleum hydrocarbons
- Additives in polymers
- Oil in water

**Transmittance Spectra of Colored Cellophane Tape**

**Calibration Curve and Standard Sample Concentrations**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Absorbance [ppm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSD1</td>
<td>0.0020</td>
</tr>
<tr>
<td>CSD2</td>
<td>0.026</td>
</tr>
<tr>
<td>CSD3</td>
<td>0.096</td>
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<tr>
<td>CSD4</td>
<td>0.28</td>
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<tr>
<td>CSD5</td>
<td>0.60</td>
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<tr>
<td>CSD6</td>
<td>0.87</td>
</tr>
<tr>
<td>CSD7</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**Analysis of Oil in Water**

**Features**
- Easy Operation Allows Obtaining Answers Rapidly
- Advanced Regulatory Compliance
- High Performance to Meet Diverse Needs

UV-VIS Spectrophotometer (UV-Vis)

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

**Analysis of Colored Cellophane Tape**

**UV-1900**

**Applicable Methods**
- ASTM D1840, D2008
- Custom Methods

**Analysis Subjects**
- Petroleum products
- Turbine fuels
- Mineral oils

**Chromaticity Diagram of XY Color System**

**Transmittance (%)**

<table>
<thead>
<tr>
<th>Wavelength (nm)</th>
<th>390 450 500 550 600 630</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration (mg/L)</td>
<td></td>
</tr>
</tbody>
</table>

**UV-VIS Spectrophotometer (UV-Vis)**

- Features
- Easy Operation Allows Obtaining Answers Rapidly
- Advanced Regulatory Compliance
- High Performance to Meet Diverse Needs

**Analysis of Colored Cellophane Tape**

**UV-1900**
Shimadzu's Total Solutions for the Hydrocarbon Processing Industry

Thermal Analyzers

- **Features**
  - High Performance
  - Diverse Measurements by Simple Operations
  - High Sensitivity

- **Applicable Methods**
  - ASTM D3417, D3418, D4419, D4591, D5483,
  - ASTM D3850, D6370, D6375,
  - Custom Methods

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

Spectrofluorophotometer

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

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

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

DSC Curves of HDPE, PP, and Blend Sample

RF-6000

Coularin in Diesel
**Total Organic Carbon (TOC) Analyzer**

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

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

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

**On-line TOC Analyzer**

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

**Applicable Methods**
- Custom Methods

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

**TOC Analysis in Condensate Sample**
- Mean Value: 0.208mg/L, SD: 0.006mg/L, DL: 0.05mg/L

**TOC in Brine Solution**

**Number of Measurements**

- TOC Analysis in Condensate Sample
- Mean Value: 0.208mg/L, SD: 0.006mg/L, DL: 0.05mg/L
**Testing Machines**

**AG-Xplus Series**

- **Features**
  - Short Test Cycle Time
  - Ultrafast Sampling Rate
  - Eight Fold High Resolution

**Applicable Methods**
- ISO 6892, ISO 527, ASTM D638

**Analysis Subjects**
- Tensile properties of metals
- Tensile properties of plastics

**Particle Size Analyzer**

**SALD-2300**

- **Features**
  - Wide Range 17nm-2500um
  - Wide Range of Accessories
  - High Sensitivity / High Concentration

**Applicable Methods**
- Custom Methods

**Analysis Subjects**
- Various petrochemicals streams

**Samples with Broad Distribution**

**Normalized Particle Amount**
- Particle Diameter (nm)

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Analytical and Testing Instruments for the HPI Market
The Nexis SCD-2030 is a next-generation sulfur chemiluminescence detection system. It has been developed to fulfill the unmet needs of laboratories the world over. The dramatically enhanced sensitivity and reliability, the excellent maintainability, and the automation functions, a first for the industry, will improve laboratory productivity.

**LabSolutions CS**

Controlling other vendor’s GC and HPLC using LabSolutions DB/CS

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**Simple User Interface**

- Agilent LC method editing
- Agilent GC method editing
- Agilent LC batch editing
- Agilent GC batch editing
- Agilent LC analysis monitoring
- Agilent GC analysis monitoring
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- The New Standard in Reliability
- Dramatically Improved Productivity
- Best-in-Class Sensitivity