EDX Series

Shimadzu
Energy Dispersive
X-ray Fluorescence Spectrometer
Market Leader in Energy

Dispersive X-ray Fluorescence Instruments!

EDX-720/800HS
The implementation of new environmental regulations, such as RoHS and ELV in the EU, has resulted in an increased demand for instruments that can perform trace, rapid analysis of a wide range of samples. With an even greater level of sensitivity and expedition, the EDX Series meets this demand, enabling both trace and rapid analysis that goes beyond the limits of screening analysis.

**X-ray Fluorescence Spectrometers**

An EDX fluorescence spectrometer irradiates a sample with X-rays, and then measures the energy of the generated fluorescent X-rays to determine the type and amount of elements comprising the sample. This nondestructive analysis technique allows measurement of a wide variety of sample types (solids, powders, liquids, thin films, etc).

**EDX Series instruments are used in a variety of fields.**

1. **Electrical and Electronic Materials**
   - Assessment of regulated substances used in electrical and electronic parts in accordance with Global environmental regulations
   - Thin-film analysis and defect analysis for semiconductors, disks and liquid crystals

2. **Chemical Industry**
   - Analysis of organic and inorganic materials and products, catalysts, pigments, paints, rubbers and plastics

3. **Petroleum and Petrochemicals**
   - Analysis of nickel (Ni), vanadium (V), and sulfur (S) in heavy oils
   - Analysis of dopants and contaminant elements in lubricating oil

4. **Building and Construction Materials**
   - Analysis of ceramics, cements, glass, bricks and clays

5. **Medical Supplies**
   - Analysis of materials and products and analysis of catalysts during synthesis
   - Analysis of sulfur (S), chlorine (Cl) and bromine (Br)

6. **Agriculture and Food Products**
   - Analysis of soils, fertilizers, foods and food-related products

7. **Iron, Steel and Nonferrous Metals**
   - Analysis of composition and impurities in raw materials, alloys, solders and precious metals

8. **Machinery and Automobiles**
   - Assessment of regulated substances used in automobile parts in accordance with ELV compositional analysis and coating-thickness measurement of machine parts

9. **Environment**
   - Analysis of soil, effluent, ashes and filters

10. **Other Applications**
    - Analysis of archaeological samples and precious stones

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Large Sample Chamber with Automatic Opening/Closing Door

Equipped with an automatic opening/closing door, the large sample chamber can accommodate samples up to 300 mm wide and 150 mm high. Also, operation in combination with the optional sample turrets (for continuous measurement) allows fully automatic measurement at the touch of a button. (Patent granted)


There is no need to set complicated procedures before sample measurement. No specialized knowledge, experience or expertise is required.

Standard-less Quantitative Analysis Software Is Suitable for Various Applications - from Thin Films to Organic Substances

The software includes FP (fundamental parameter) methods for quantitative analysis as standard. These include the Bulk FP method, which allows the analysis of samples such as oxides, metals, and resins, and the Thin-Film FP method, which enables the thickness measurement and compositional analysis of coatings and thin films.

Time-Reduction Function Sets Measurement Time Automatically According to Target Precision Level

Measurement time is determined automatically according to the target precision level set. Measurement stops when measurement precision reaches the set level.

High-Count-Rate Circuit Provides Rapid, High-Precision Measurement

The detector is combined with a high-count-rate circuit that provides high-precision analysis (at least twice higher count rate than previous models). This increase in count rate allows the same precision in previous models to be attained in less time, thereby significantly reducing the overall time required for analysis.

No Time-Consuming Pretreatment! Analysis in Air, Helium, or Vacuums Possible!

Measurement in helium or vacuum atmosphere is possible, allowing analysis of light elements whose X-ray emissions are heavily absorbed by air. Solid samples can be analyzed in vacuum atmosphere, and powders and liquids can be analyzed in helium atmosphere. (Optional function)

Sample Observation Camera (Option)

A CCD camera can be installed in the main unit and used to observe the sample position. This is useful for checking analysis positioning.

Equipped with Five Types of Filters for High-Sensitivity Analysis

This model is equipped with five types of filters for reducing and eliminating background, characteristic lines, and other forms of scattered radiation. These filters greatly improve the detection sensitivity for lead (Pb), mercury (Hg), cadmium (Cd) and others.

Switching Calibration Curve Function Recognizes Sample Type Differences and Selects Appropriate Calibration Curves Automatically

The optimum calibration curve for the sample is selected automatically from pre-registered calibration curves.

For example, the calibration curve with polymer resin samples is automatically selected, according to whether the samples are judged to contain chlorine (Cl).
Excellent Performance and High Operability

**Principle and Features**

With X-ray fluorescence spectrometry, a sample is irradiated with X-rays emitted by an X-ray tube and the resulting characteristic X-rays generated in the sample (fluorescent X-rays) are detected.

In particular, X-ray fluorescence spectrometers that use semiconductor detectors are called "energy dispersive". Advantages of these spectrometers include the ability to perform simultaneous measurement of many different elements, a compact design, and the distance between the sample and the detector can be small because there are no driving mechanical parts. In addition, using this system, attenuation of fluorescent X-rays is small and measurement is possible even in air. Furthermore, this system does not require time-consuming pretreatment and a wide variety of samples can be measured.

**Benefits of X-ray fluorescence analysis method**

1. **Nondestructive analysis**
   Measurement without sample destruction.

2. **No chemical pre-treatment necessary**

3. **Measurement in air**
   No special atmosphere required.

4. **Simple interpretation and operation**

**Various Methods Enable Powerful, Flexible Quantitative Analysis**

1. **Calibration-Curve Method**
   **Quantitative Analysis with High Accuracy**

   With this method, standard samples are measured, and a calibration curve is created as a relationship between the concentration and the X-ray fluorescence intensity of each element.

   The concentration of the unknown sample is quantitated by using this calibration curve. This is well-known as empirical method.

   With this method, it is necessary to prepare standard samples of each different matrix material and create calibration curves for each element; however, this method provides highly accurate analysis.

2. **FP Method**
   **Perform Bulk Analysis and Analyze Thin Films, Organic Materials and etc. without Standard Samples!**

   With the FP method, the X-ray intensity is obtained and quantitative analysis is performed using theoretical calculation. This method is very effective for quantitative analysis of unknown samples for which standard samples are not provided. Shimadzu EDX Series is equipped with Shimadzu's high-performance FP software, which was developed based on our many years of experience with wavelength-dispersive spectrometers. This software includes the Bulk FP method, which can be used to analyze samples such as oxides, metals, and resins, and the Thin-Film FP method, which can be used for film-thickness and compositional analysis of coatings and thin films without standard samples.
Wide Variety of Samples Support

**Trace Analysis with Automatic Change among 5 Filters**

In trace-element analysis, a scattered X-ray, such as the continuous X-ray from the X-ray tube, causes a large background, and it is difficult to detect target peaks. In the case of chlorine (Cl), a characteristic X-ray from the X-ray tube interferes and overlaps with a target peak. In such a case, a primary X-ray filter that cuts the unnecessary X-ray is an effective tool to reduce the background, eliminate interference peaks, and consequently improve the detection sensitivity. Normally, four or five types of filters are required to cover the entire element range.

<table>
<thead>
<tr>
<th>Filter</th>
<th>Representative measurement elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Cl</td>
<td></td>
</tr>
<tr>
<td>#2 Cr</td>
<td></td>
</tr>
<tr>
<td>#3*1 Hg, Pb, Br, Bi&lt;br&gt;*2 Hg, Pb, Br, Bi (high sensitivity type)</td>
<td></td>
</tr>
<tr>
<td>#4*1 Rh-Cd&lt;br&gt;*2 Cd (high sensitivity type)</td>
<td></td>
</tr>
<tr>
<td>#5 Cd</td>
<td></td>
</tr>
</tbody>
</table>

*1: EDX-800HS/900HS<br>*2: EDX-720

**With filter**

**Without filter**

**Nonstandard Quantitative Analysis**

Shimadzu's original FP software can calculate the quantitation without standard samples even when the filter is used because this software considers X-ray absorption by the filter theoretically. With instruments that don't have such a function, it is necessary, when using a filter, to measure standard samples and recreate the calibration curve.

**Functions for Handling a Variety of Sample Forms**

**Setting of Analysis Region Using Collimator and Setting of Measurement Atmosphere (Option)**

When a sample is small, a collimator can improve the S/N ratio by irradiating the sample only, and therefore eliminating unnecessary X-rays. The irradiation diameter can be switched between 1, 3, 5, and 10mm. Furthermore, the FP method can be used at any collimator diameter, as the FP method sensitivity coefficient is converted automatically according to the irradiation diameter. Combination with a CCD camera is recommended (see below). Additionally, measurement in a helium or vacuum atmosphere is possible in order to analyze analysis the light elements whose sensitivity is lower when measured in air atmosphere. (Option)

**Setting Measurement Position Using Sample Observation Kit (Option)**

A CCD camera makes it easy to find and set the analysis positions in measurements of foreign matter or samples made up of multiple parts.
Since the energy of fluorescent X-rays generated from light elements is weak, energy is absorbed if air is present between the sample and detector, which may worsen detection sensitivity. Setting the measurement chamber to a vacuum atmosphere is effective in increasing sensitivity when measuring light elements. He purging is useful in the analysis of light elements contained in samples that, for example, generate liquids or gases and that cannot be set to a vacuum atmospheric state.

Vacuum Unit (Option) / He Purge Unit (Option)
Changing the Measurement Atmosphere Enables High-Sensitivity Measurement of Light Elements

Continuous Measurement Results in Improved Throughput
Range of Turrets (Option)
Adding on a turret enables automatic continuous measurement. This is particularly effective in improving throughput when measuring in a vacuum or He atmosphere. Continuous measurement using a combination of different analysis conditions is also possible. Furthermore, X-ray emission can be automatically set to OFF or to a standby state after continuous measurement is finished.

In addition to two types of 16-sample turrets (for solids and for liquids), which are ideal for measuring samples in sample containers, two other types are available – an 8-sample turret that accommodates large samples up to 52 mm in diameter and an 8-sample turret with spinner that is useful for analyzing non-uniform samples.
**Analysis of Foreign Matter**

Fluorescent X-ray analysis is effective in the analysis of foreign matter adhering to or contained in food, drugs, and other products since it allows elements to be analyzed non-destructively. Micro-contaminants can also be easily analyzed by using a CCD camera and collimator.

We analyzed foreign matter on a tablet. Since the sample was smaller than the instrument's minimum irradiation diameter (1 mm), a location that contained the foreign matter and one that did not (i.e. blank) were measured, and the two profiles were overlapped and subjected to subtraction processing to assess the sample.

**Matching Function**

"Matching" is a function for comparing the analysis results of a certain sample with existing data from a library and displaying the result in order starting with the highest degree of match.

There are two types of libraries, one for content data and the other intensity data. Samples can be registered using existing data from each of these libraries. Values can be entered manually for content data.
Range of Fields

**Thin-Film Measurement**

**Measurement of Film Thickness of Electroless Ni-P Plating and Its Composition Ratio**
The thickness and composition of not only single-layer but also multilayer films can be obtained by the thin-film FP method. The amount of deposition can also be measured.
This method demonstrates its effectiveness also in the measurement, for example, of Pb in plating.

**Measurement of Au Vapor-Deposited Film**
This is an example of measurement of a glass sample vapor-deposited with thin Au film.
Heavy element thin films can be measured from the sub-nanometer (several Å) order.

**Example of Thickness Measurement of Organic Film Using Scattered X-Rays**
The thickness of even organic films that do not contain inorganic compounds can be measured using scattered X-rays. The figure on the right shows overlapping of the scattered X-ray profiles of polyester films of different thicknesses.

**Examples of Measurement of Various Film Thicknesses**
A variety of other film thicknesses can be measured.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Film (Lamination) Makeup</th>
<th>Quantitative Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plated Steel Plate</td>
<td>Amount of deposited film (\text{mg/m}^2) Film composition Cr 100 %</td>
<td>Cr layer 75.4 mg/m²</td>
</tr>
<tr>
<td></td>
<td>Amount of deposited film (\text{g/m}^2) Film composition Zn 100 %</td>
<td>Zn layer 31.6 g/m²</td>
</tr>
<tr>
<td></td>
<td>Substrate composition Fe 100 %</td>
<td></td>
</tr>
<tr>
<td>Film Formation on Silicon Wafer</td>
<td>Film thickness (\text{nm}) Film composition Fe %, Ni ? % Substrate composition Si 100 %</td>
<td>Film thickness 111 nm Fe 18.8 %, Ni 81.2 % (C.V 0.2 %, 0.05 %)</td>
</tr>
<tr>
<td>Anti-Static Film on Resin Film Peel Coating Film</td>
<td>Amount of deposited film (\mu g/cm²) Film composition Si compound* Resin film composition C_6H_10O_5 (PET) 100 %</td>
<td>Si compound 5.5 µg/cm² (C.V 0.8 %) *Set the actual chemical formula since there are a variety of compounds.</td>
</tr>
<tr>
<td>Paper Composition</td>
<td>Film weight 10.5 mg/cm² Component?:composition?</td>
<td>SiO_2 1.16 %, MgO 0.54 % Other: C_6H_10O_5 97.65 % (balance)</td>
</tr>
</tbody>
</table>
Powerful Tools for RoHS/ELV Scre

Analysis of RoHS and ELV-regulated Hazardous Elements

Measurement of Polymer Resin Samples
Analysis of Hazardous Substances in Resin Materials Used in Power-Supply Adapter Casings, Wire-Coating Materials, and Electronic-Device Casings

Measurement of Metal Samples

Measurement of Lead-Free Solder Samples

Report Generator Function

Analysis Report

XXX Company

[Analysis Examples for Lead and Cadmium in Brass]

[Analysis Example for Lead in Lead-Free Solder Sample]
The EDX can be used for judging metal scrap and for checking product types. Also, it can be made good use of in control analysis of samples subjected to pretreatment such as grinding.

The table below summarizes example analysis values for elements contained in cast iron. The table shows that although carbon cannot be detected, the coefficient of variation of other elements is about several percent and that the values demonstrate sufficient performance for product management and acceptance inspections at secondary user sites.

Leaves of black tea made in India (4 types), Ceylon (5 types), and China (3 types) were crushed in a mortar, poured into a sample container coated with polypropylene film, and analyzed by the calibration curve method.

Differences, in particular, in the content of phosphor (P), manganese (Mn), zinc (Zn), iron (Fe), and rubidium (Rb) appeared according to the country of origin. It can be seen that the EDX is also useful in discerning the country of origin of agricultural products.

### Control Analysis of Metal Materials

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>Si</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Cu</th>
<th>Ni</th>
<th>Cr</th>
<th>Mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>4300India-assam</td>
<td>0.023</td>
<td>0.019</td>
<td>0.0048</td>
<td>0.0046</td>
<td>0.0048</td>
<td>0.0075</td>
<td>0.0051</td>
<td>0.0060</td>
</tr>
<tr>
<td>4303India-assam</td>
<td>2.53</td>
<td>0.40</td>
<td>0.050</td>
<td>0.086</td>
<td>0.086</td>
<td>0.069</td>
<td>0.051</td>
<td>0.093</td>
</tr>
<tr>
<td>4304India-assam</td>
<td>0.02</td>
<td>0.010</td>
<td>0.007</td>
<td>0.002</td>
<td>0.004</td>
<td>0.005</td>
<td>0.004</td>
<td>0.002</td>
</tr>
<tr>
<td>4305India-assam</td>
<td>0.78</td>
<td>2.4</td>
<td>14</td>
<td>2.2</td>
<td>4.5</td>
<td>7.3</td>
<td>8.1</td>
<td>2.3</td>
</tr>
</tbody>
</table>

### Quantitative Analysis of Elements Contained in Black Tea Leaves

Leaves of black tea made in India (4 types), Ceylon (5 types), and China (3 types) were crushed in a mortar, poured into a sample container coated with polypropylene film, and analyzed by the calibration curve method.

Differences, in particular, in the content of phosphor (P), manganese (Mn), zinc (Zn), iron (Fe), and rubidium (Rb) appeared according to the country of origin. It can be seen that the EDX is also useful in discerning the country of origin of agricultural products.

### Result of Repeated Measurement of Cast Iron Sample

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>P</th>
<th>S</th>
<th>K</th>
<th>Ca</th>
<th>Mn</th>
<th>Fe</th>
<th>Cu</th>
<th>Zn</th>
<th>Rb</th>
<th>Sr</th>
</tr>
</thead>
<tbody>
<tr>
<td>4300India-assam</td>
<td>2799.0</td>
<td>2350.1</td>
<td>19092.2</td>
<td>4503.8</td>
<td>540.8</td>
<td>60.4</td>
<td>12.4</td>
<td>27.1</td>
<td>863.9</td>
<td>13.7</td>
</tr>
<tr>
<td>4303India-assam</td>
<td>2434.4</td>
<td>2203.7</td>
<td>19635.4</td>
<td>5440.8</td>
<td>634.0</td>
<td>222.5</td>
<td>8.0</td>
<td>21.1</td>
<td>657.0</td>
<td>10.8</td>
</tr>
<tr>
<td>4304India-assam</td>
<td>3128.7</td>
<td>2383.6</td>
<td>19348.2</td>
<td>5591.7</td>
<td>899.6</td>
<td>100.3</td>
<td>9.0</td>
<td>21.4</td>
<td>827.0</td>
<td>11.3</td>
</tr>
<tr>
<td>4305India-assam</td>
<td>1911.5</td>
<td>2207.4</td>
<td>19397.8</td>
<td>5547.4</td>
<td>428.9</td>
<td>111.3</td>
<td>10.1</td>
<td>20.3</td>
<td>680.7</td>
<td>13.4</td>
</tr>
<tr>
<td>4501Ceylon-dimbula</td>
<td>1853.2</td>
<td>2156.9</td>
<td>18337.0</td>
<td>5286.2</td>
<td>325.1</td>
<td>41.5</td>
<td>12.5</td>
<td>22.9</td>
<td>605.0</td>
<td>15.0</td>
</tr>
<tr>
<td>4502Ceylon-dimbula</td>
<td>1975.3</td>
<td>1807.4</td>
<td>16173.0</td>
<td>5542.1</td>
<td>263.9</td>
<td>68.1</td>
<td>13.7</td>
<td>26.6</td>
<td>150.2</td>
<td>12.9</td>
</tr>
<tr>
<td>4520Ceylon-ruhuna</td>
<td>2027.7</td>
<td>2099.5</td>
<td>17872.7</td>
<td>4999.0</td>
<td>529.8</td>
<td>77.1</td>
<td>11.8</td>
<td>21.6</td>
<td>473.6</td>
<td>20.0</td>
</tr>
<tr>
<td>4530Ceylon-kandy</td>
<td>2576.7</td>
<td>2326.3</td>
<td>18135.7</td>
<td>5129.2</td>
<td>397.5</td>
<td>101.2</td>
<td>12.2</td>
<td>31.5</td>
<td>489.3</td>
<td>18.8</td>
</tr>
<tr>
<td>4540Ceylon-ruhuna</td>
<td>2699.2</td>
<td>2427.0</td>
<td>18327.5</td>
<td>3827.7</td>
<td>384.8</td>
<td>86.5</td>
<td>12.0</td>
<td>19.9</td>
<td>856.9</td>
<td>9.5</td>
</tr>
<tr>
<td>4701China-anhui</td>
<td>3802.5</td>
<td>2555.6</td>
<td>17849.0</td>
<td>4240.6</td>
<td>818.5</td>
<td>223.4</td>
<td>16.7</td>
<td>41.4</td>
<td>977.7</td>
<td>14.0</td>
</tr>
<tr>
<td>4702China-anhui</td>
<td>3693.5</td>
<td>2511.6</td>
<td>18023.0</td>
<td>4413.2</td>
<td>1009.7</td>
<td>257.3</td>
<td>12.6</td>
<td>36.2</td>
<td>749.7</td>
<td>16.8</td>
</tr>
<tr>
<td>4750China-yunnan</td>
<td>3041.6</td>
<td>2427.0</td>
<td>19761.1</td>
<td>5765.7</td>
<td>723.7</td>
<td>362.6</td>
<td>10.1</td>
<td>32.3</td>
<td>1295.5</td>
<td>19.2</td>
</tr>
</tbody>
</table>

### Quantitative Analysis Results of Black Tea Leaves

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>P</th>
<th>Mn</th>
<th>Fe</th>
<th>Zn</th>
<th>Rb</th>
</tr>
</thead>
<tbody>
<tr>
<td>India Average Value</td>
<td>2638.4</td>
<td>625.9</td>
<td>123.6</td>
<td>22.5</td>
<td>757.2</td>
</tr>
<tr>
<td>Ceylon Average Value</td>
<td>2226.4</td>
<td>380.3</td>
<td>74.9</td>
<td>24.5</td>
<td>515.0</td>
</tr>
<tr>
<td>China Average Value</td>
<td>3046.9</td>
<td>792.2</td>
<td>267.4</td>
<td>34.6</td>
<td>915.8</td>
</tr>
<tr>
<td>Overall Average Value</td>
<td>2741.9</td>
<td>563.7</td>
<td>149.9</td>
<td>27.3</td>
<td>721.0</td>
</tr>
</tbody>
</table>

Average Values of Elements Having a Large Difference by Country of Origin
EDX-720

[ More Refined for Higher Sensitivity and Improved Performance ]

The EDX-720 is the most optimum tool for the rapid analysis of hazardous substances regulated by RoHS and ELV. New filters and a high-count-rate circuit produce twice the sensitivity of previous models. The time-reduction function and switching calibration-curve function make this model easy to use and a more efficient tool for screening assessment.

Improved Hardware Enables Twice the Sensitivity in Analysis of Hazardous Elements such as Lead and Cadmium

New Filters Improve Sensitivity in Analysis of Hazardous Elements

The S/N ratio is improved by adopting two types of new filters that efficiently cut the continuous X-rays component from the X-ray tube. It is possible to perform the trace analysis with high sensitivity by reducing the background.

Detector Count Rate Increased through Adoption of High-Count-Rate Circuit

The counting system used in the EDX-720 has been modified to process at an even higher count region than previous system to measure with higher precision. Particularly in the analysis of resin samples, which generate large numbers of scattered X-rays, and in metal samples, which generate a large amount of fluorescent X-rays from the main component, it has been difficult to get information about trace elements because almost all counted signals are for scattered or fluorescent X-rays from the base material. The count rate attained with the EDX-720 is more than twice that of previous models and detection sensitivity is significantly higher. It is possible to reduce the analysis time significantly because the same level of precision can be attained in half the time required with previous models.

Maximizing Detectability of Light Elements Provides High-Sensitivity Analysis

EDX-800HS

Features

Special Detector Window Material Reduces Absorption of Light Elements and Provides High-Sensitivity Measurement

Analysis of light elements must be measured in helium or vacuum atmospheres. However, even in these kinds of atmospheres, particularly with organic component elements such as oxygen (O) and fluorine (F), the detector window itself can act like an absorbing material and adversely affect the detection efficiency. With the EDX-800HS, an ultrathin film consisting of a special material is used for the detector window to perform high-sensitivity analysis of elements lighter than sodium.
Specifications

Main Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement principle</td>
<td>X-ray fluorescence spectrometry</td>
</tr>
<tr>
<td>Measurement method</td>
<td>Energy dispersive</td>
</tr>
<tr>
<td>Applicable sample type</td>
<td>Solid, liquid, or powder</td>
</tr>
<tr>
<td>Measurement range</td>
<td>nM to s/s (EDX-720)</td>
</tr>
<tr>
<td>Sample size</td>
<td>300 mm (dia.) x 150 mm (H) max.</td>
</tr>
</tbody>
</table>

**Footprint**

![Footprint Diagram]

**Sample Pretreatment for X-ray Fluorescence Spectrometry**

<table>
<thead>
<tr>
<th>Sample format</th>
<th>Pretreatment</th>
<th>Pretreatment equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powder sample</td>
<td>No pretreatment (put in sample cell)</td>
<td>Vibration mill, briquette machine</td>
</tr>
<tr>
<td>Liquid sample</td>
<td>No pretreatment (put in sample cell)</td>
<td>Automatic bead fusion furnace</td>
</tr>
<tr>
<td>Solid sample</td>
<td>No pretreatment (flat part put on stage)</td>
<td>Sample polisher, lathe</td>
</tr>
<tr>
<td>Food or biological sample</td>
<td>No pretreatment (put in sample cell)</td>
<td>Blender mill</td>
</tr>
</tbody>
</table>

**Installation Requirements**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>10°C to 30°C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>40% to 70%</td>
</tr>
</tbody>
</table>

**EDX-720/800HS (AC100V)**

Power requirements: AC100V10%, 15A, 50/60Hz
Dimensions of the main body: 580(W) x 650(D) x 420(H)mm
(23(W) x 26(D) x 17(H) inches)
Main body weight: Approx. 80kg

**EDX-720/800HS/900HS CE type (AC230V)**

Power requirements: AC220V, 230V, 240A10%, 1000VA, 50/60Hz
Dimensions of the main body: 580(W) x 750(D) x 420(H)mm
(23(W) x 30(D) x 17(H) inches)
Main body weight: Approx. 100kg

**Software**

- **Main unit**
  - IBM PC/AT compatible
- **Memory**
  - More than 256 MB
- **HDD**
  - More than 20 GB
- **FDD**
  - 3.5-inch x 1
- **Printer**
  - Color inkjet printer
- **CD**
  - CD-ROM drive
- **OS**
  - Windows® XP

**Utilities**

- Automatic correction functions (energy correction, FWHM (full-width half-maximum) correction)

- **Measurement/analysis software**
  - Calibration-curve method, matrix correction, FP method, Thin-Film FP method, Background FP method.

- **Matching software**
  - (intensity/content)

**System-status monitoring function**

**Analysis-result tabulation function**

*(Items with * mark are optional.)*
**Options**

**A Wide Variety of Optional Access**

**Precision Stage** P/N 212-22925
This stage is to set a region of interest on the sample to the irradiation area automatically, when collimator and CCD options are equipped. This is useful especially for smaller area like 1 mm. A large knob and XY slide mechanism move the sample smoothly and make sample positioning easy. The sample holder can be replaced, and the stage has a central opening of up to 70 x 70 mm.

Stroke : 10 mm  
Feed : 1 mm per revolution  
Inner diameter of standard holder : 31 mm (can be used with the attached sample cell)

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16-Sample Turret (for Solid Samples) P/N 212-22665-91
This turret is used for the sequential analysis of solid samples with diameters less than 32 mm. It is particularly effective for analysis in helium or vacuum atmospheres.

16-Sample Turret (for Liquid Samples) P/N 212-22665-92
This turret is used for the sequential analysis of up to 16 liquid or powder samples contained in sample cells.

8-Sample Turret P/N 212-22665-93
This turret is used for the sequential analysis of larger samples less than 52 mm dia.

8-Sample Turret with Spinner P/N 212-22345
A turret with spinner used to acquire averaged information of heterogeneous samples like minerals, foods, soil by spinning samples. To be used with solid or small sample holders.

* A turret drive unit is required with each of the above turrets.

**Small-Sample Cover** P/N 212-23860-91
This cover helps shorten the evacuation time when analyzing a small sample sequentially. (Patent granted)  
Sample size: 62 mm (dia.) x 120 mm (H) max.

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**Sample Cells**

3571 31mm Open-End X-Cell  
P/N 219-85000-55 (100 pcs/set)  
(Outer diameter: 31.6 mm; Volume: 10 mL)  
This polyethylene sample cell is used for liquid and powder samples. It is used with Mylar or polypropylene film.

3529 31mm X-Cell  
P/N 219-85000-52 (100 pcs/set)  
(Outer diameter: 32 mm; Volume: 8 mL)

3577 Micro X-Cell  
P/N 219-85000-54 (100 pcs/set)  
(Outer diameter: 31.6 mm; Volume: 0.5 mL)  
The cell is used for trace samples. In order to reduce the scattered radiation emitted from the sample cell, it is recommended that a collimator is used with this cell.

3561 31mm Universal X-Cell  
P/N 219-85000-53 (100 pcs/set)  
(Outer diameter: 31.6 mm; Volume: 8 mL)

3561 31mm Universal X-Cell  
P/N 219-85000-53 (100 pcs/set)  
(Outer diameter: 31.6 mm; Volume: 8 mL)

**Mylar Film for Sample Cell**  
P/N 202-86501-56 (500 sheets/set)

**Polypropylene Film for Sample Cell**  
P/N 219-82019-05 (73-mm wide, 92-m long)  
This film is effective for the trace analysis of light elements in vacuum and helium atmospheres.
Sample Observation Camera**
P/N 212-22750-95
The camera displays an image of the sample to check the analysis position. Images can be stored in files.

Vacuum Unit
with RP : P/N 212-22460
without RP : P/N 212-22460-01
(RP : oil rotary vacuum pump)
This unit is used for the high-sensitivity analysis of light elements. Samples must not contain water or oil, and powder samples must be pressed before analysis. When analyzing a large number of samples, this unit should be used together with a sample turret.

Hand-Operated Press  P/N 044-33101-01
The Hand-operated Press is used to press powder samples into a molding ring using hydraulic pressure. The pressure value can be read directly from the meter. This press is used together with disc-shaped compression plates for holding the sample.

| Press size | 200 x 150 mm |
| Stroke | 150mm |
| Weight capacity of plate | 0 to 15 tonnes |
| Compression plates | Upper and lower compression plates (P/N 210-15024) |
| Molding ring | Polyvinyl chloride (P/N 212-21654-05, 100 pcs/set) |
| | 22 (I.D.) x 3.5 (height) mm |
| | Aluminum (P/N 202-82397-05) |
| | 24 (I.D.) x 5 (height) mm |

Automatic Collimator**
P/N 212-22320
Collimator with aperture exchange mechanism in 4 steps of either 1, 3, 5, or 10mm dia. The energy dispersive type features less attenuation of sensitivity for a small area than the wavelength dispersive type.

Helium Purge Unit
without He gas Cylinder : P/N 212-22495-01
Used in direct analysis of a liquid sample. By replacing air with a He atmosphere, X-ray absorption is reduced and sensitivity for light elements is improved. In addition, it is effective for eliminating Ar peaks.

<table>
<thead>
<tr>
<th>P/N</th>
<th>Product name</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>212-22685-91</td>
<td>Turret Drive Unit**</td>
<td>Drives 8/16-sample turrets. Used together with a turret.</td>
</tr>
<tr>
<td>212-22354</td>
<td>Solid Sample Holder for Spinner</td>
<td>A sample holder for the analysis of a sample less than 52mm dia.</td>
</tr>
<tr>
<td>212-22357</td>
<td>Small Sample Holder for Spinner</td>
<td>A sample holder for the analysis of a sample less than 11mm dia.</td>
</tr>
<tr>
<td>212-22656-01</td>
<td>Sample Fixing Jig, 40-mm dia. (for 8-sample turret)</td>
<td>Use to fix position displacement during turret rotation.</td>
</tr>
<tr>
<td>212-22656-02</td>
<td>Sample Fixing Jig, 30-mm dia. (for 8-sample turret)</td>
<td></td>
</tr>
<tr>
<td>212-22656-03</td>
<td>Sample Fixing Jig, 20-mm dia. (for 8-sample turret)</td>
<td></td>
</tr>
<tr>
<td>212-22656-04</td>
<td>Sample Fixing Jig, 20-mm dia. (for 16-sample turret)</td>
<td></td>
</tr>
<tr>
<td>212-22454</td>
<td>X-ray Pilot Lamp</td>
<td>Indicates X-ray exposure.</td>
</tr>
</tbody>
</table>

Note : Items with** mark are options to be installed at Shimadzu. (Factory option)
To support customers, Shimadzu has established a global network and provides comprehensive support through the network.

Founded in 1875, Shimadzu Corporation, a leader in the development of advanced technologies, has a distinguished history of innovation built on the foundation of contributing to society through science and technology. We maintain a global network of sales, service, technical support and applications centers on six continents, and have established long-term relationships with a host of highly trained distributors located in over 100 countries. For information about Shimadzu, and to contact your local office, please visit our Web site at www.shimadzu.com