Access to **your** success

SHIMADZU

EDX Series

Shimadzu
Energy dispersive
X-ray Fluorescence Spectrometer

Ray

Market Leader in Energy Dispersive X-Ray Fluorescence Instruments!

EDX-720/800HS/900HS

EDX Series
EDX-720/800HS/900HS

Shimadzu Energy Dispersive
X-ray Fluorescence Spectrometer

Trace analysis and rapid analysis are recently seeing an increased emphasis on compliance with European environmental regulations, such as RoHS and ELV. The EDX Series, meets the needs of our customers by achieving an even greater level of sensitivity and expedition, and enables both trace and rapid analysis that goes beyond the limits of screening analysis.

☐ X-ray Fluorescence Spectrometers

Fluorescent X-rays generates from a sample irradiated by X-rays. The types and amounts of elements contained within the sample can then be identified by detection of these fluorescent X-rays. 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 European 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, glasses, 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

Contents

Features

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)

Large sample chamber allows samples to be analyzed without having to cut up the sample

Standard-less Quantitative Analysis Software can be suitable for various Applications - from Thin Films to Organic Substances

The software includes FP (fundamental parameter) methods for quantitative analysis as standard. These also 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.

Thin-Film FP is provided as a standard feature for measuring coating thickness

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), and cadmium (Cd) and others.
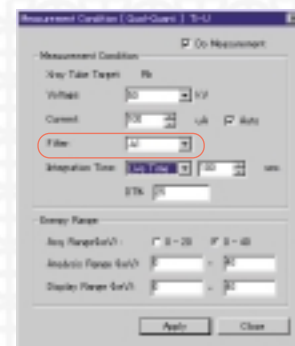
High-sensitivity and standardless analysis is possible using primary filter

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).

Simple Operations Start Fully Automatic Measurement – Even Any Analysts Can Perform Simple, Accurate Measurement

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

Step 1: Select conditions

Step 2: Register sample names

Step 3: Start measurement
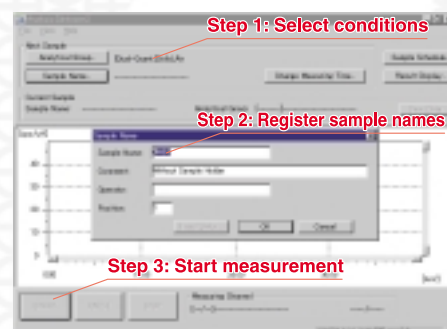
Measurement can start after only 3 steps operations.

Time-Reduction Function Sets Measurement Time Automatioally 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.

When the target precision level is entered, the system determines the required measurement time.

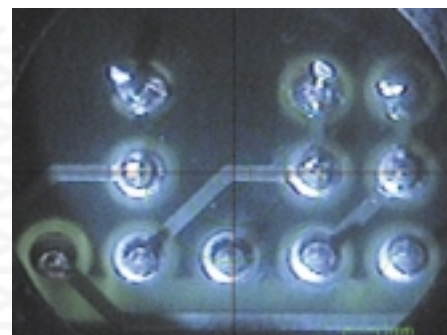## High-Count-Rate Circuit Provides rapid, High-Precision Measurement

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.

Defect analysis is simple using four types of collimators and the sample observation unit

Excellent Performance and High

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. This technique allows nondestructive and rapid analysis. In particular, X-ray fluorescence spectrometers that use semiconductor detectors are called as "energy dispersive", and it is most advantage that this can perform simultaneous measurement for many different elements. It is also advantage that this system can be compact and the distance between the sample and the detector can be small because there is no driving mechanical parts.Using this system, attenuation of fluorecent 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 acceptable to measure.

Sample compartment cover: CLOSE

Atmosphere: Air   Measurement time: 300 sec
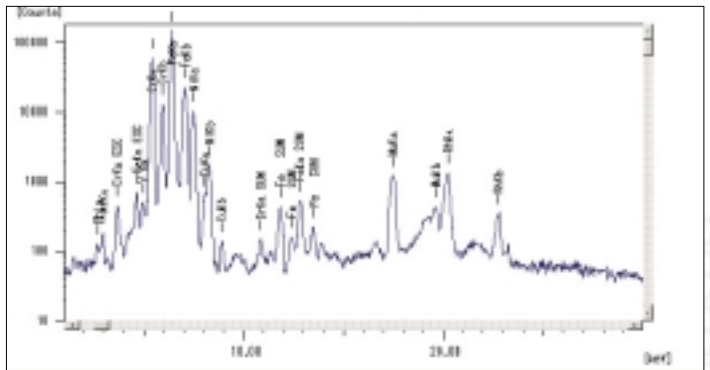Vacuum level: Air   Dead time: 25%

Sample — **Liquid mode: OFF**

Detector

Collimator: 10 mm
Shutter: OPEN
Filter: OUT

Detector temperature: OK
Detector power supply: ON

X-ray: ON   **X-ray tube**
Voltage: 50 kV
Current: 35 μA

* The figures given here are for example purposes only.

* Typical spectrum of EDX (Sample:SUS)

Features of X-ray fluorescence analysis method

1.Non destructive analysis
Measurement without sample destruction.

2.Without pre-treatment process
Without chemical pre-treatment process at all.

3.Measurement in air
Measurement sample under the air atmosphere normally.

4.No need expert engineer
Interpretation is simple and operation is also easy.

Operability

1. Calibration-Curve Method
Quantitative Analysis with High Accuracy

With this method, standard samples are measured, a calibration curve is created as relationship between the concentration and the X-ray fluorescence intensity of each element. The concentration of unknown sample is quantitated by using this calibration curve. This is well-known as empirical method. This method need to prepare some kinds of standard samples of each different matrix material and create calibration curves for each element, this method, however, provides highly accurate analysis.
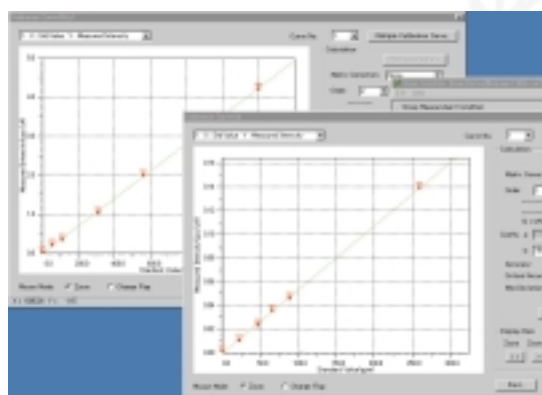
Calibration-Curve Setting Window

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. This model is equipped with Shimadzu's high-performance FP software, which was developed based on many years of our experience with the 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 as standard feature.

FP Method Setting Window

EDX-720

[Toward Further High Sensitivity Keep on Improving tool for Total Solution]
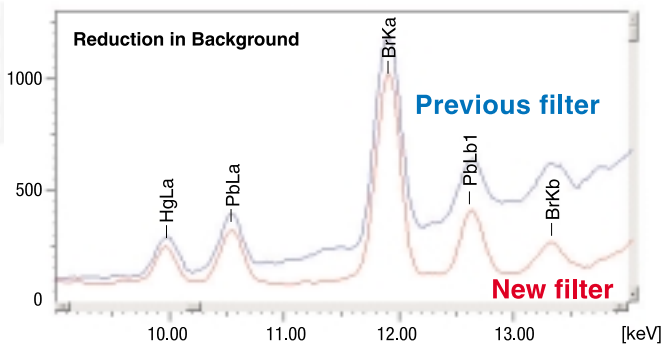
The EDX-720 is the most optimum tool for the rapid analysis of hazardous substances regulated by RoHS and ELV.

New filters and a high-count-rate circuit produce twice the sensitivity of previous models. The time-reduction function and switching
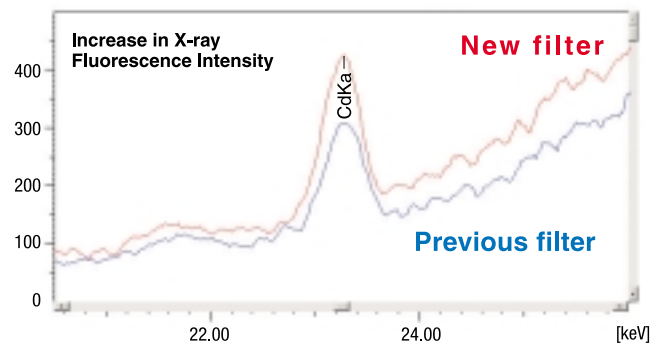
The Sensitivity of hazardous elements such as Lead and Cadmium is twice better by Hardware Improvement!

New Filters Improve hazardous elements Sensitivity

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 measure the trace analysis with high sensitivity by reduction of background which cause worse sensitivity.

Reduction in Background

Previous filter

New filter

BrKa

PbLa

HgLa

PbLb1

BrKb

Comparison for Standard Sample of
PVC Resin Containing 100-ppm Lead

Increase in X-ray
Fluorescence Intensity

New filter

CdKa

Previous filter

Comparison for Standard Sample of
PVC Resin Containing 100-ppm Cadmium

Detector Count Rate Increased by Adopting of High-Count-Rate Circuit

The counting system used in the EDX-720 has been modified to process at even high 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 flourescent X-rays from the main component, it has been difficult to get information about trace elements because almost counted signals is 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 time for analysis significantly because the same level of precision can be attained in half the time required with previous models.

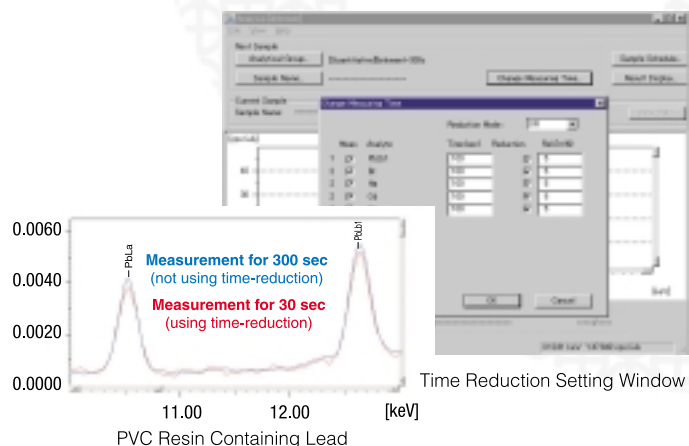EDX-720

Previous model

CdKa
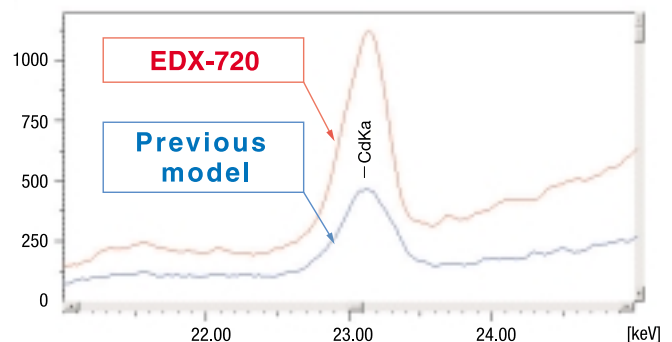
Comparison using Standard PVC Resin Sample
Containing 100-ppm Cadmium

calibration-curve function make this model easy
to use and a more efficient tool for screening
assessment.

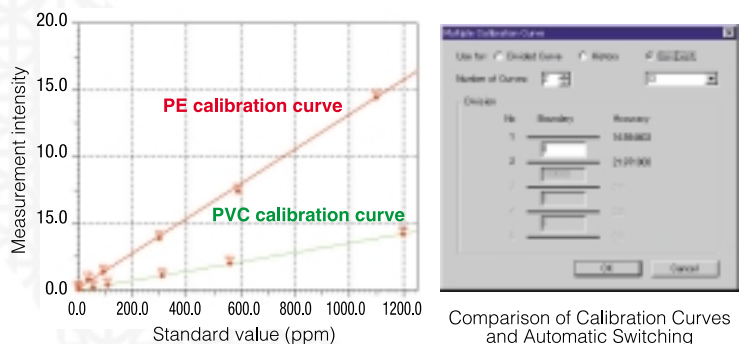## New Measurement and Analysis Functions Provide Greater Analysis Precision

Time-Reduction Function Calculates Measurement Precision from X-ray Fluorescence Intensity and Automatically Determines Minimum Required Measurement Time

When analyzing unknown samples, the measurement time
setting must be based on experience since the content of
target element is unknown. This function calculates the
precision theoretically from the X-ray fluorescence
intensity and stops measurement when measurement
precision reaches to the set target level. This helps
improve the reliability of analysis results and facilitates a
more efficient analysis time. When the time-reduction
function is used in the sample measurement example
shown on the right, the target precision level is reached in
just 30 sec, after which the measurement is terminated
then the measurement is stopped and the next
measurement is started.

Time Reduction Setting Window

Measurement for 300 sec
(not using time-reduction)

Measurement for 30 sec
(using time-reduction)

0.0060
0.0040
0.0020
0.0000

11.00   12.00   [keV]

PVC Resin Containing Lead

Automatic Switching Calibration-Curve Function Identifies Sample Types and Selects Optimum Calibration Curves

In the analysis of plastic samples, the absorption
effect of chlorine contained in PVC (polyvinyl
chloride) resin gives rise to differences in X-ray
fluorescence intensities of PVC samples and PE
(polyethylene) samples and, as a result, the
calibration curves for each differ greatly. This function
switches most suitable calibration curve
automatically in one condition file which include
some calibration curves for PVC, PE and etc.
according to whether the chlorine is contained or not.
This makes it unnecessary for the analyst to spend
time selecting calibration curves before
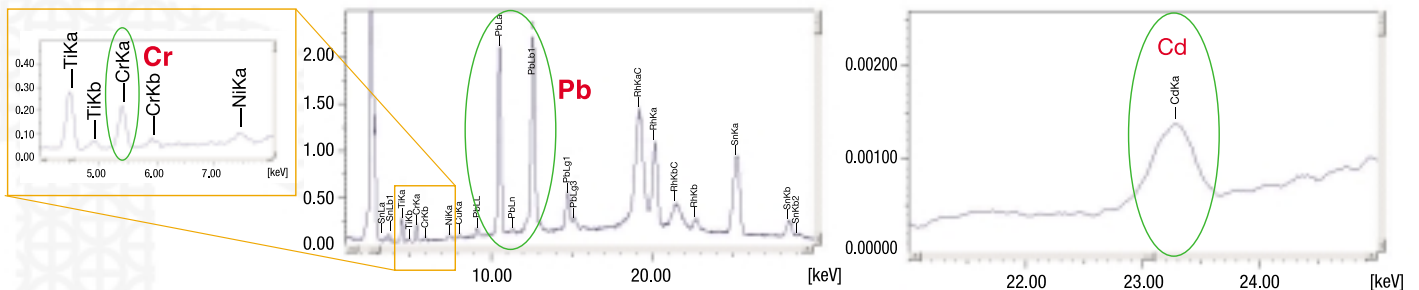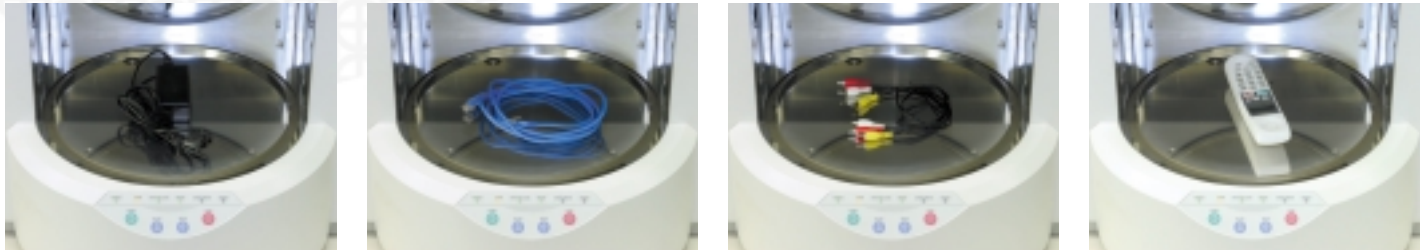measurement.

20.0
15.0
10.0
15.0
0.0

Measurement intensity

PE calibration curve

PVC calibration curve

0.0   200.0   400.0   600.0   800.0   1000.0   1200.0
Standard value (ppm)

Comparison of Calibration Curves
and Automatic Switching
Calibration-Curve Setting Window

# Powerful Tools for RoHS/ELV Screening

Analysis of RoHS and ELV-regulated Hazardous Elements
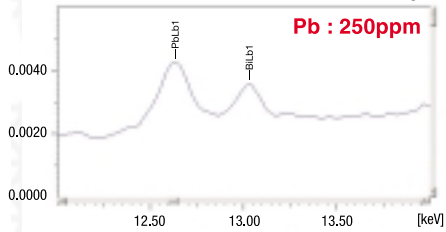
Measurement of Polymer Resin Samples

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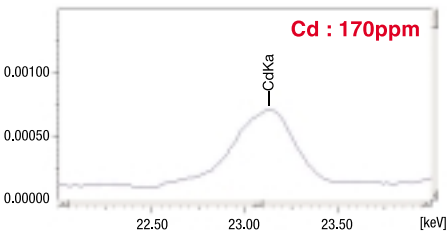

Measurement of Metal Samples

Pb : 1200ppm

Cd : 170ppm

[Analysis Examples for Lead and Cadmium in Brass]
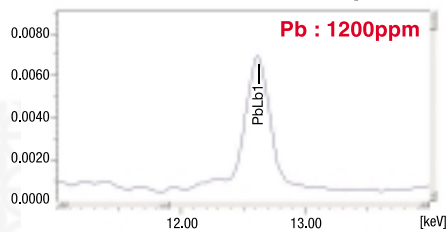
Measurement of Lead-Free Solder Samples

Pb : 250ppm

[Analysis Example for Lead in Lead-Free Solder Sample]

Report generator Function

XXX Company.

Analysis Report

		Report No.:	Cable Covering Material
		Report Date:	2005/7/1
		Operator :	SHIMADZU
		Meas.Date :	2005/7/1

Sample Information

Sample Name	Cable Covering Material	[Sample Image]
Group	WR-10mm-300sec	
PartNo.	T-001	
Weight	10.0g	
Material	Plastic	

Result

| Method	by ED-XRF				
Sample preparation	None				
Element	Cadmium	Lead	Mercury	Chromium	Bromine
Content(ppm)	103	16.8	0.5	12.9	5.3
Std.Deviation(ppm)	1.3	1.0	1.4	3.6	0.5
Judgment	NG	OK	OK	OK	OK

X-ray Spectra
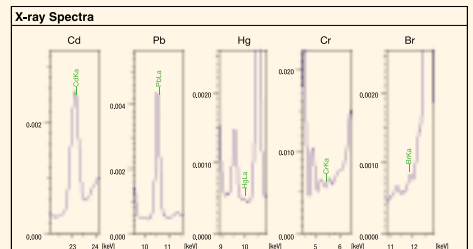
[Note]

Thickness and Form Correction Enables High-Precision Analysis of Non-formed Samples

Since X-ray intensity will vary by sample form and thickness, the quantitative result could be different in spite of the same content samples. EDX-series models have a variety of quantitative correction methods as standard features.
In particular, the background internal standard correction method enables to get highly precise results by performing quantitative correction calculations that eliminate the influence of sample form and thickness.

Background Internal Standard Correction Method

Internal standard correction is a method used to correct fluctuations in the X-ray intensity due to variations in the density, form, and size of the sample. This method is corrected way by calculating the ratio to the intensity of the scattered X-rays from the X-ray tube (background), the characteristic lines of the target materials, and the Compton scattered X-rays.
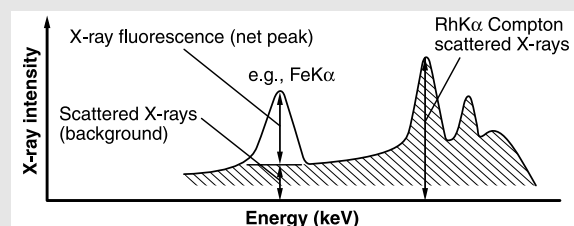
Standard sample: (PE (polyethylene) standard sample : Evaluation sample 5 different forms of BCR-680

Molded sample	Multiple pellets	Single pellet	Film	Deformed sample

Comparison of Quantitative Results Obtained with/without Background Internal Standard Correction

| Sample: BCR-680		Cd				Pb			
		With correction		Without correction		With correction		Without correction	
		Quantitative value	Ratio to standard value	Quantitative value	Ratio to standard value	Quantitative value	Ratio to standard value	Quantitative value	Ratio to standard value
Molded sample: standard value		140.8	1.00	140.8	1.00	107.6	1.00	107.6	1.00
Pellet	Multiple	137.2	0.97	85.5	0.61	105.0	0.98	74.1	0.69
	1 at center	151.9	1.08	15.5	0.11	111.9	1.04	17.3	0.16
	1 at front	174.5	1.24	26.6	0.19	109.9	1.02	(- 8.5)	——
	1 at back	194.4	1.38	6.8	0.05	65.0	0.60	(- 8.3)	——
	1 at side	224.7	1.60	6.7	0.05	90.6	0.84	(- 8.2)	——
Film	1 sheet	143.4	1.02	57.5	0.41	104.7	0.97	57.9	0.54
	2 sheets	135.1	0.96	99.1	0.70	103.3	0.96	90.6	0.84
	3 sheets	140.7	1.00	132.5	0.94	101.1	0.94	109.5	1.02
	4 sheets	134.5	0.96	138.6	0.98	104.8	0.97	114.5	1.06
Deformed sample		146.8	1.04	11.4	0.08	97.0	0.90	15.4	0.14

Units: ppm

Broad Range of Applications in

## Trace Analysis with Automatic change among 5 Filters

In trace-element analysis, the 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 case of chlorine (Cl), characteristic X-ray from the X-ray tube interfere and overlap with a target peak. In such cases, primary X-ray filter that cuts unnecessary X-ray is effective tool to reduce the background, eliminate interference peaks, and consequently improve the detection sensitivity. Normally, four or five types of filter are required to cover the entire element range.

Filter	Representative measurement elements
#1	Cl
#2	Cr
#3	*1:Hg, Pb, Br, Bi *2:Hg, Pb, Br, Bi (high sensitivity type)
#4	*1:Rh-Cd/*2:Cd (high sensitivity type)
#5	Cd

*1: EDX-800HS/900HS
*2: EDX-720
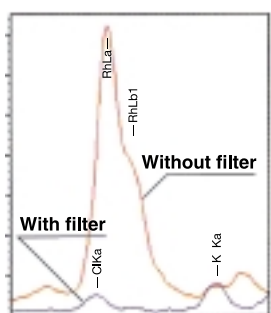
Trace element: Chlorine
(removal of characteristic lines)
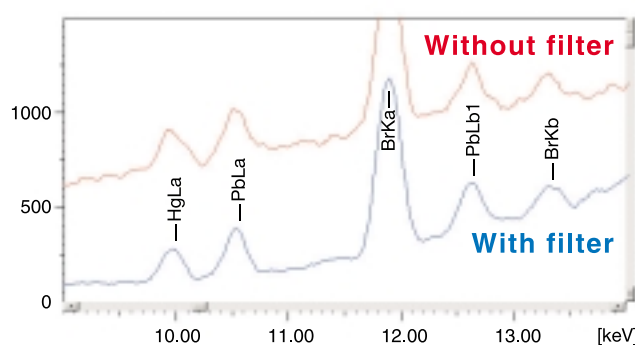
Trace element: Lead (reduces background)

Nonstandard Quantitative Analysis

With EDX Series models, using Shimadzu 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 which doesn't have such above 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 sample is small, collimator can improve the S/N ratio by irradiating the sample only, and therefore eliminating unnecessary X-ray from others. 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 CCD camera is recommended (see below) . Additionally, measurement in helium or vacuum atmosphere is possible to analysis the light elements whose sensitivity is lower when measured in air atmosphere. (Option)

Setting Measurement Position Using Sample Observation Kit (Option)

CCD camera makes it easy to find and set the analysis positions in measurements of foreign matter or samples made up multiple parts.
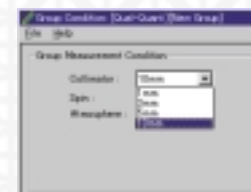
Condition Setting Window



CCD Camera Image of
Electronic Part

Various Fields

Other Applications

Film-Thickness Analysis of Thin-Film Samples

This application is for thin-film analysis by using either X-ray fluorescence intensity or scattered X-ray intensity. EDX Series has the function of the Thin-Film FP method as a standard feature. This method can be used for the amount of deposition and compositional analysis, including film-thickness analysis.
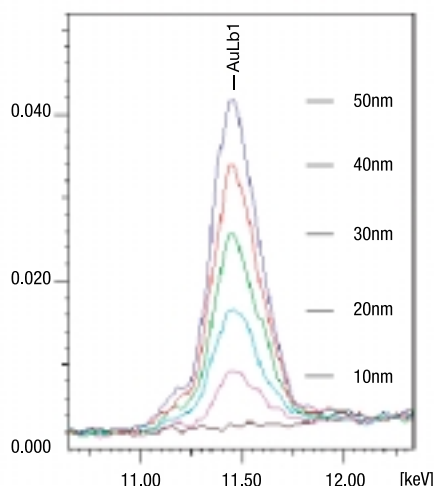
Example of Film-Thickness Analysis of Gold plate
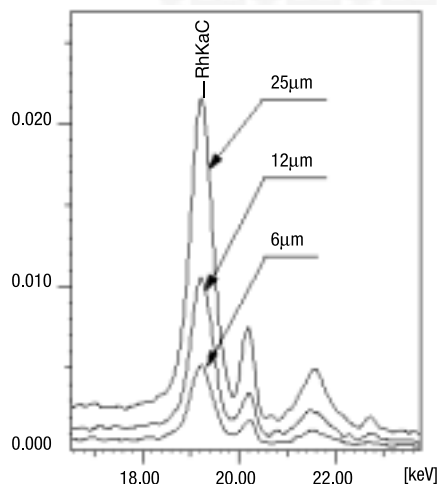
Example of Film-Thickness Analysis of Organic Film Using Scattered X-ray

[Other Applications]

- Amount of deposition analysis of copper plating
- Film-thickness and compositional analysis of films deposited on silicon wafers
- Amount of deposition analysis of resin films, such as anti-reflective films

Matching function-Identification of unknown materials

This function can compare actual measurement data with library data registered by the user for various steel types, and immediately identify the corresponding type. In addition to the spectral matching method using fluorescent X-ray spectral patterns, this function has also the content matching method as a standard feature without standard samples.


Library Data
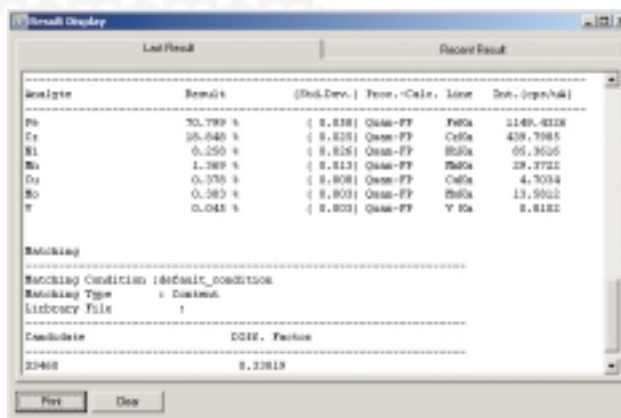
Matching Result

Product Lineup

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 behave itself 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 get high-sensitivity analysis of elements lighter than sodium.

Comparison for Glass Sample

Comparison for Teflon Sample
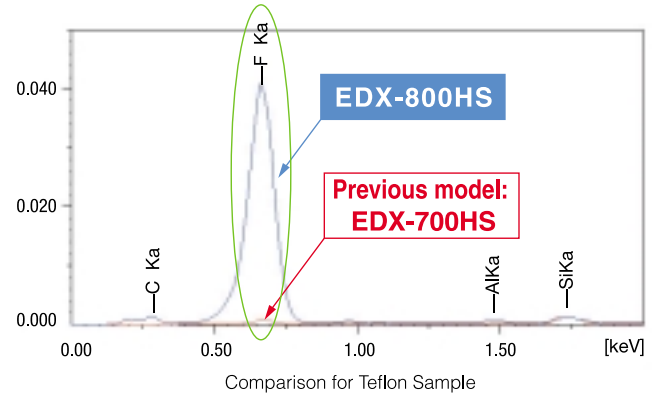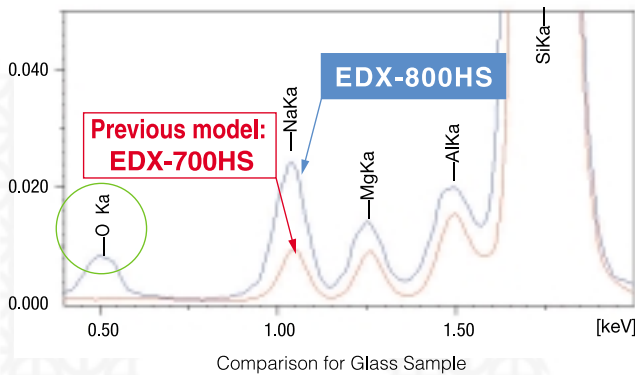
Liquid Nitrogen is No Longer Required for Detector – One Step Closer to Maintenance-Free Operation

EDX-900HS

Features

Thermoelectric cooling Detector achieves High Count rate System

This detector uses a thermoelectric cooling method which can work with only a fan to cool. This means that liquid nitrogen is no longer required and this system requires little maintenance. The detection range is from sodium (Na) to uranium (U) and adopts a high-count-rate circuit for higher sensitivity.
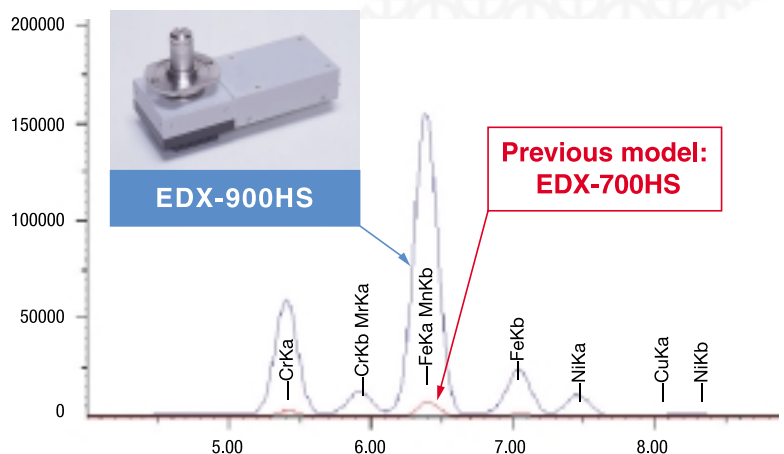
The flow for the test procedure of RoHS/ELV regulated elements

Cd, Pb, Hg, PBB, PBDE, Cr^{6+}

*PBB, PBDE and Cr^{6+} provide information as the total Br and total Cr.

Screening Test
EDX

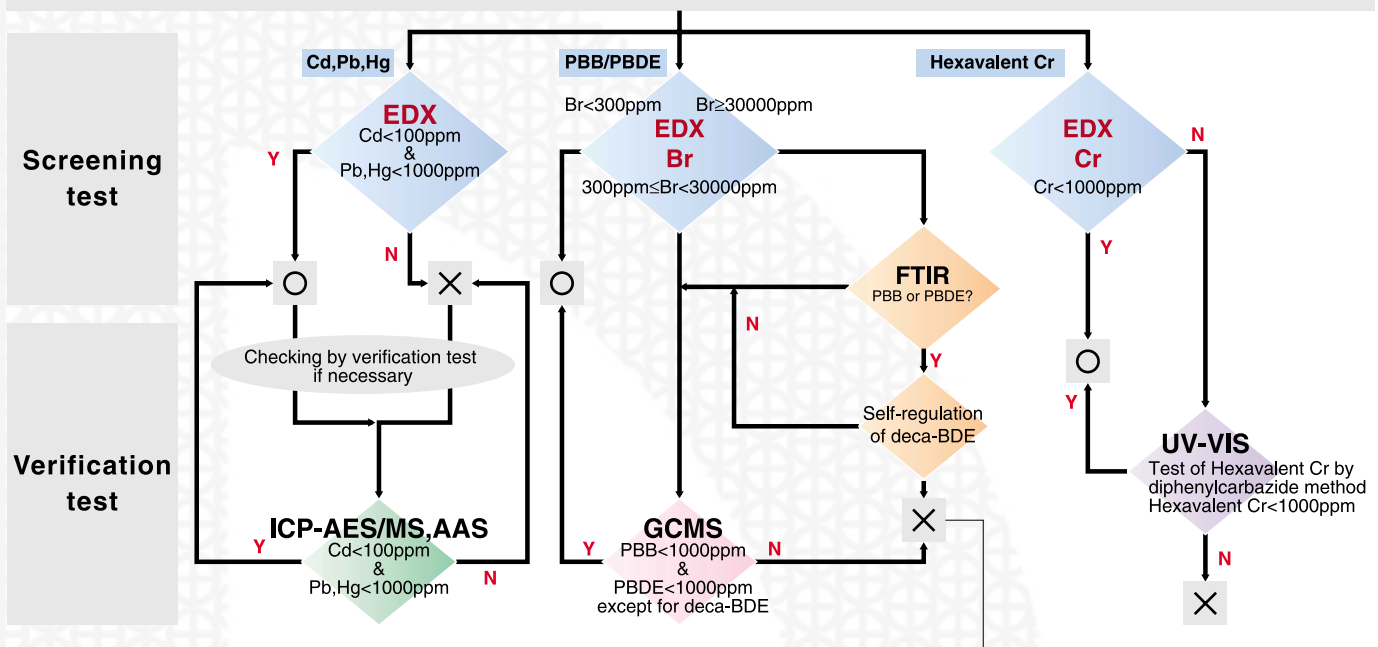| Cd, Pb, Hg	PBB, PBDE	PBB, PBDE	Cr^{6+}
Verification Test ICP-AES/MS AAS	**Verification Test** GCMS	**Screening Test** FTIR	**Verification Test** UV-VIS

The flow for the test procedure of RoHS/ELV Screening test by EDX and Verification test by other method

Screening test

Cd,Pb,Hg

EDX Cd<100ppm & Pb,Hg<1000ppm — Y / N

PBB/PBDE

Br<300ppm   Br≥30000ppm
EDX Br
300ppm≤Br<30000ppm

Hexavalent Cr

EDX Cr Cr<1000ppm — N / Y

FTIR PBB or PBDE? — N / Y

Self-regulation of deca-BDE

Checking by verification test if necessary

Verification test

ICP-AES/MS,AAS Cd<100ppm & Pb,Hg<1000ppm — Y / N

GCMS PBB<1000ppm & PBDE<1000ppm except for deca-BDE — Y / N

UV-VIS Test of Hexavalent Cr by diphenylcarbazide method Hexavalent Cr<1000ppm — Y / N

Note1:
Threshold value shall be ELV/RoHS regulated value.
In case the threshold value uses for the acceptance inspection or
delivery inspection, the threshold should be tighten based on the situation.
There are some exemption of Pb in Iron, Aluminum alloy and Brass.

Note2:
Exemption of deca-BDE was adopted in 15th Nov.,2005.
However, it is highly possible that a few % of PBB or mono to nona-BDE as
contaminant is contained in deca-BDE. It is not still safety material,
nevertheless deca-BDE is exempt.

* This test flow is proposed by Shimadzu. This is not for international or industrial standard.

Specifications

Main Specifications

Measurement principle	X-ray fluorescence spectrometry
Measurement method	Energy dispersive
Applicable sample type	Solid, liquid, or powder
Measurement range	$_{11}$Na to $_{92}$U (EDX-720/900HS) $_{6}$C to $_{92}$U (EDX-800HS)
Sample size	300 mm (dia.) x 150 mm (H) max.

X-ray Generator		Detector		
			(EDX-720/800HS)	(EDX-900HS)
X-ray tube	Rh target			
Tube voltage	5 to 50 kV	Type	Si (Li) semiconductor detector	Silicon drift chamber semiconductor detector
Tube current	1 to 1,000 μA			
Cooling method	Air cooling (with fan)	LN$_2$ supply	Only during measurement	Not required (thermo-electronic cooling method)
Exposure area	10 mm dia. (standard)(Automatic switching between 4 settings: 1, 3, 5, and 10 mm dia.)*	LN$_2$ Dewar capacity	3 L	————
Primary filter	Automatic switching between 5 types	LN$_2$ consumption	Approx. 1 L/day	————

Sample Chamber		Vacuum Unit* (for high-sensitivity analysis of light elements) It is necessary unit in case of the measurement for lighter than S (Sulfur)	
Atmosphere	Air, vacuum*, helium*	Evacuation	Oil rotary vacuum pump, directly connected
Sample exchange*	8/16-sample turret 8-sample turret with spinner Precision stage	Vacuum monitor	Pirani gauge
		Atmospheric-pressure monitor	With pressure sensor
Sample observation*	CCD camera		

Data Processing Unit (To be procured separatelly)		Software	
Main unit	IBM PC/AT compatible	Qualitative analysis	Measurement/analysis software
Memory	More than 256 MB	Quantitative analysis	Calibration-curve method, matrix correction, FP method, Thin-Film FP method, Background FP method.
HDD	More than 20 GB		
FDD	3.5-inch x 1	Matching software (intensity/content)	
Printer	Color inkjet printer		
CD	CD-ROM drive	Utilities	Automatic correction functions (energy correction, FWHM (full-width half-maximum) correction)
OS	Windows® XP		

System-status monitoring function
Analysis-result tabulation function
(Items with * mark are optional.)

Installation Requirements

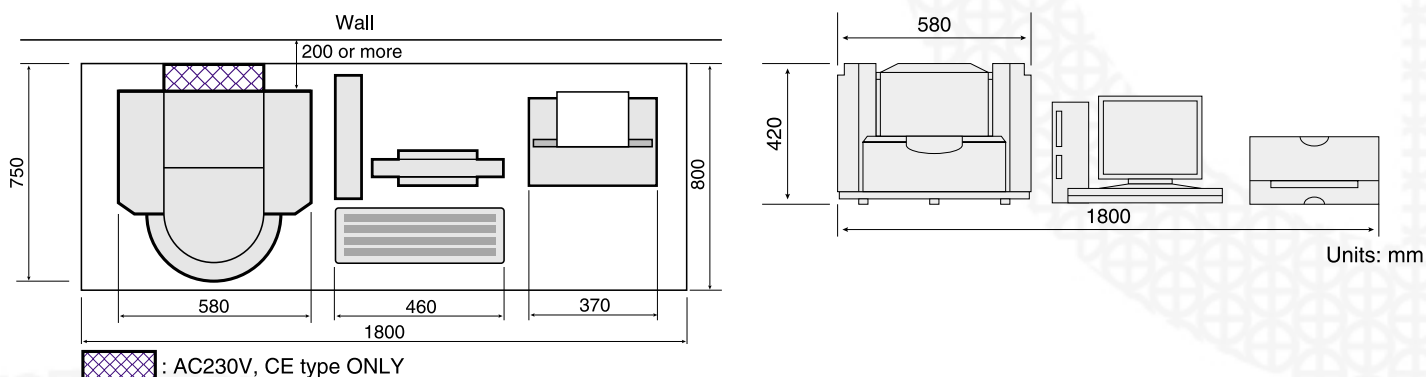| Temperature	10°C to 30°C
Relative humidity	40% to 70%

EDX-720/800HS/900HS (AC100V)

Power requirements : AC100V±10%, 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. 85kg

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

Power requirements : AC220V, 230V, 240A±10%, 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

Footprint

Wall
200 or more
750
580
460
370
1800
800

: AC230V, CE type ONLY

580
420
1800

Units: mm

Sample Pretreatment for X-ray Fluorescence Spectrometry

Sample format	Pretreatment	Pretreatment equipment
Powder sample	No pretreatment (put in sample cell)	————
	Pressing	Vibration mill, briquette machine
	Melting; making glass bead sample	Automatic bead fusion furnace
Liquid sample	No pretreatment (put in sample cell)	————
	Dropping on paper filter and drying	————
Solid sample	No pretreatment (flat part put on stage)	————
	Surface polishing, cutting	Sample polisher, lathe
Food or biological sample	No pretreatment (put in sample cell)	————
	Mashed into paste using blender mill (put in sample cell)	Blender mill

# A Wide Variety of Optional Accessories

Precision Stage P/N 212-22925

This stage is to set a region of interest of sample to the irradiation area preusely, when collimator and CCD options are equipped. This is useful especially for smaller area like 1mm. Large knob and XY slide mechanism move 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 70mm.

Stroke : 10 mm
Feed :   1 mm per revolution
Inner diameter of standard holder : 31 mm (can be used with the attached sample cell)
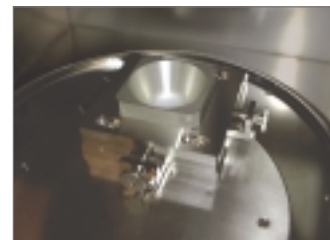
16-Sample Turret (for Solid Samples) P/N 212-22665-91

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.

8-Sample Turret P/N 212-22665-93

This turret is used for the sequential analysis of large sample less than 52 mm dia.

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 with Spinner P/N 212-22345

A turret with spinner to acquire averaged infomation of heterogeneous samples like minerals, foods, soil by spinning samples.
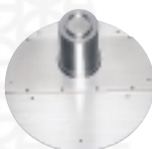To be used with solid or small sample holders.

* 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.

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.

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.

3529 31mm X-Cell

P/N 219-85000-52 (100 pcs/set)
(Outer diameter: 32 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 (EDX-720/800HS)
P/N 212-22750-98 (EDX-900HS)

The camera displays an image of the sample to check the analysis position. Images can be stored in files.

Automatic Collimator**

P/N 212-22320

This is collimator with aperture exchange mechanism in 4 steps of either 1, 3, 5, and 10mm dia.
The energy dispersive type features less attenuation of sensitivity for a small area than the wavelength dispersive type.

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.

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 atomosphere, X-ray absorption is reduced and sensitivity for light elements is improved. Besides, it is effective for eliminating Ar peaks.

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 212-21654-06, 500 pcs/set) 22 (I.D.) x 3.5 (height) mm Aluminum (P/N 202-82397-05) 24 (I.D.) x 5 (height) mm

Compression-plate heads

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

Note : Items with** mark are options to be installed at Shimadzu. (Factory option)

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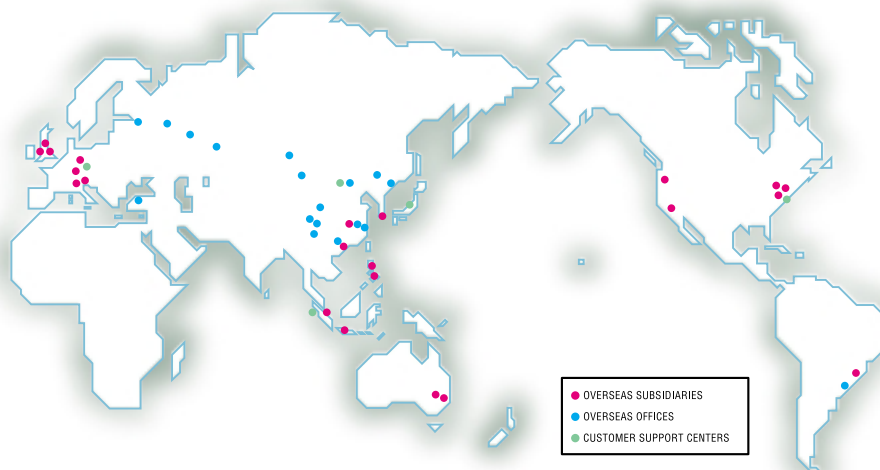
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