

Energy Dispersive X-ray Fluorescence Spectrometer for RoHS/ELV Screening

EDX-LE



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EDX-LE

Light and Easy, destined to be the Leading Expert for screening

Making the Difficult Simple

- The [Screening Analysis] window makes operation easy
- Fully automatic, from determining main components to selecting conditions
- Simple screening setting functions can be easily changed according to the control system on user side

Fully Equipped with Essential Functions

- RoHS/ELV analysis functions are standard
- Large Sample Chamber enables as-is measurement of large samples
- Protection functions restrict changing conditions or data



Comparison of Applicability of EDX-LE for Screening Applications

Regulation	<div>← ELV →</div> <div>← RoHS →</div> <div>← Halogen →</div> <div>← CPSIA →</div> <div>← EN 71 (toys) →</div> <div>← Quality indication of textile products →</div>											
	Element	Cl	Br	Hg	Cr	Pb	Cd	Sb	As	Ba	Se	Ni
EDX-LE	○	◎	◎	◎	◎	◎	◎	○	○*	○*	○*	△*

◎: Standard applicability

○: Optional applicability

△: Applicability depends on analytical conditions

*Additional function kit is required.

Making the Difficult Simple

Easy Screening, Even for First-time Users

Start sample measurement from [Screening Analysis] using simple steps. The selection of measurement conditions, which typically relies on the judgment of the experimenter, is determined automatically. This means that even first-time users can rest assured.

1st Step

Simply set the sample and click [START].



Place the Sample

- After placement, the sample observation camera observes the sample and confirms the sample's analysis position.
- Set the analysis area to 3 mm, 5 mm, or 10 mm diameter.
- Close the sample chamber.

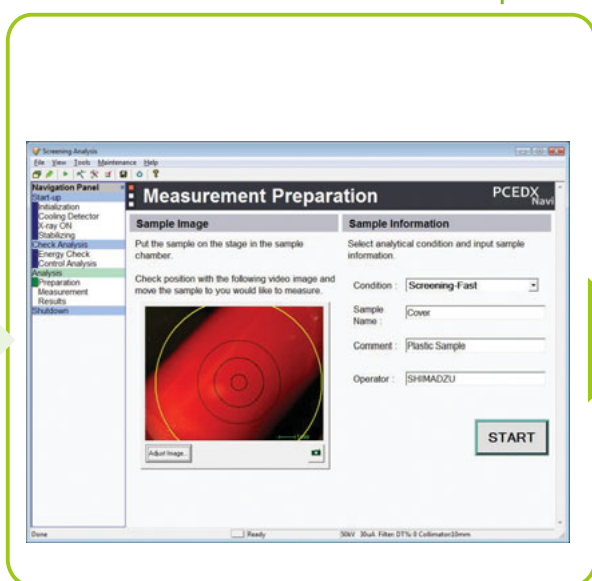


To check the results to date...

Results List: Lists data of completed measurements (with photographs)

Color	Conc.	Unit	OK	NG	Unit	OK	NG	Unit	OK	NG	Unit	OK	NG	Unit	OK	NG	Unit	OK	NG	Unit
Blue	ND	(20.0) ppm	OK	NG	(20.0) ppm	OK	NG	(12.4) ppm	OK	NG	(25.0) ppm	OK	NG	(4.0) ppm	OK	NG	(10.0) ppm	OK	NG	(10.0) ppm
Red	717.0	(100.0) ppm	NG	NG	(10.0) ppm	OK	NG	(11.0) ppm	OK	NG	(2.0) ppm	OK	NG	(2.2) ppm	OK	NG	(2.2) ppm	OK	NG	(2.2) ppm
Yellow	29043.4	(1429.1) ppm	NG	OK	29043.4	(1429.1) ppm	NG	OK	1083.7	(182.0) ppm	NG	OK	1083.7	(182.0) ppm	NG	OK	1083.7	(182.0) ppm	NG	OK

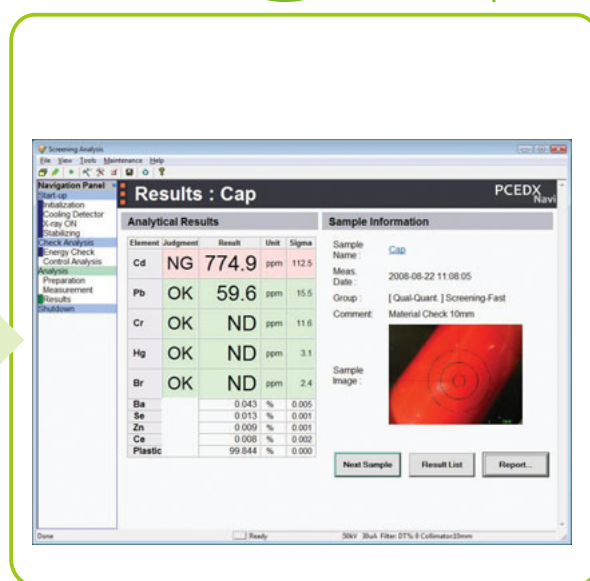
2nd Step



Select Analysis Conditions/ Enter Sample Name

- The [Measurement Preparation] window displays the current sample image. Use this window to select analysis conditions and enter a sample name.
- Start measurement with a single click.

3rd Step



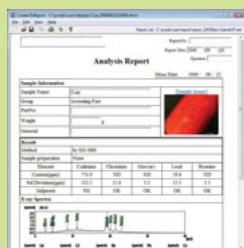
Display of Analysis Results

- After measurements are completed, [Pass/Fail Judgment], [Concentration], and [3σ (Measurement Variance)] are displayed for all 5 elements in an easy-to-understand layout.
- Display the [Result List] and [Individual Report] with a single mouse click.



If you want to create a report...

Individual Report: Displays a report of the current sample

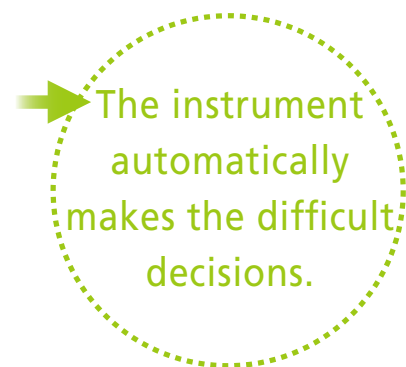


Create reports in Excel or HTML format. Reports can also be created for non-RoHS 5 element data.

*Note that this requires installation of Microsoft Office Excel before use.

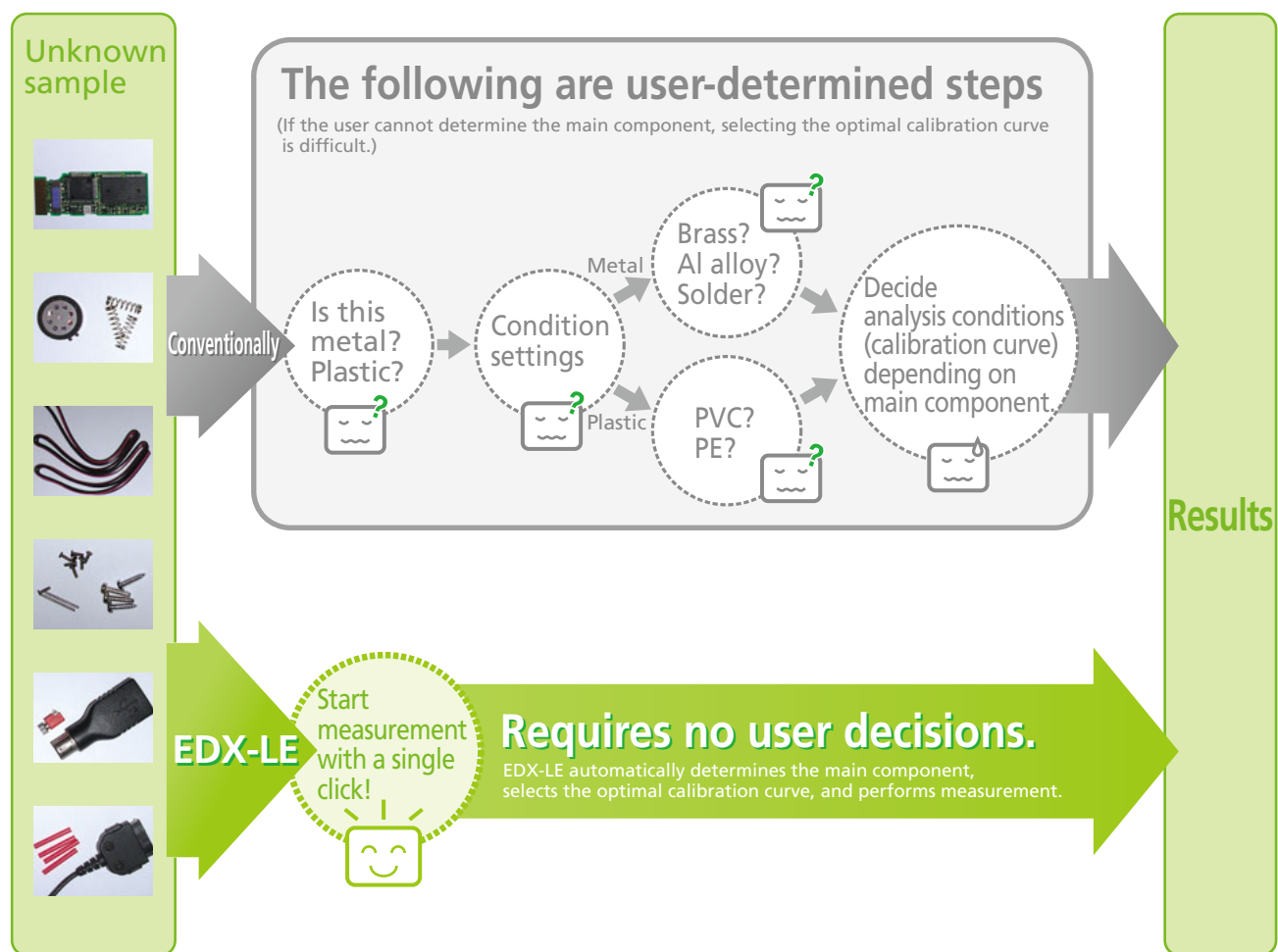
Screening Software Features

A single click in the [Screening Analysis] window automatically performs everything from measurement to the display of results, in accordance with your pre-registered analysis conditions.



All steps, from judgment of the main components to the selection of conditions, are automated

Automatic Calibration Curve Selection Function



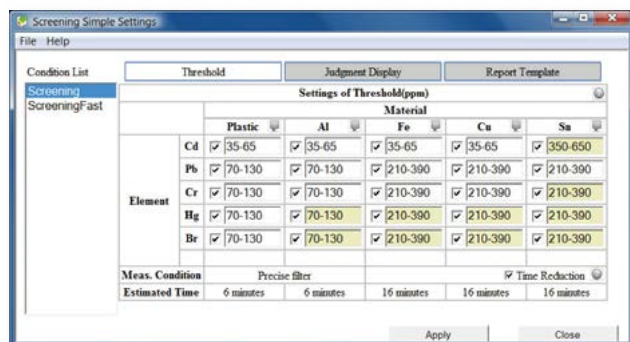
Variety of functions makes screening easier

Simple Screening Setup

Screening conditions can be customized easily according to the control system.

Changing Threshold Values

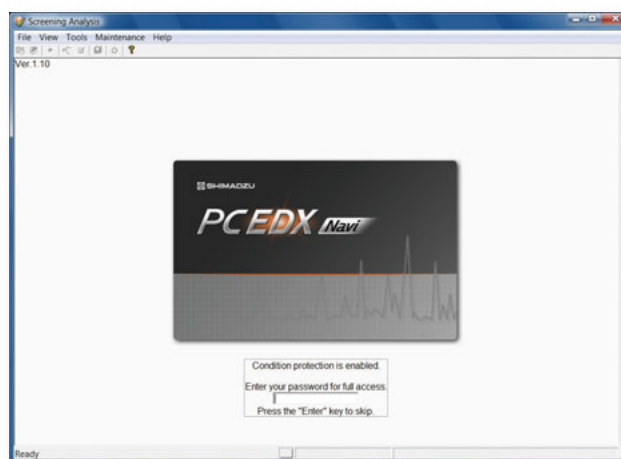
Threshold values can be set for each material or element. The screening judgment method can also be changed in accordance with the input method used for threshold values. Furthermore, lower limits for threshold values can be referenced for each material, which helps to set threshold values.



EDX-LE Offers Improved Security for Software Operations

Condition Protection Function

Restrictions can be specified for screening conditions and various other settings.



Changing Judgment Character Strings

The character strings displayed for judgments in analysis results, used to indicate whether they are below the threshold value, in the gray zone, or above the threshold value, can be specified.

Changing the Report Template

The style used for reports can be changed. The standard templates provided can be selected.

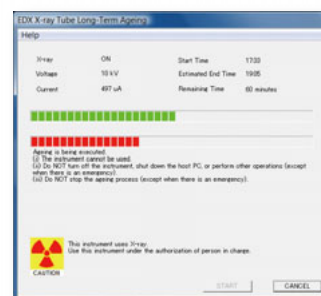
Variety of functions minimizes instrument maintenance requirements

Automatic X-ray Tube Ageing Function

If the instrument has not been used for a long time, the X-ray tube must be aged when it is restarted. To prevent malfunction, this process has been automated.

Detector Does Not Require Liquid Nitrogen

The EDX-LE is equipped with a detector that does not need to be cooled with liquid nitrogen, providing significantly reduced operating costs.



Fully Equipped with Essential Functions

All-in-One Design Includes All Functions Required for RoHS/ELV Screening

Overall RoHS/ELV analysis performance is tied to the smooth coordination of a variety of analytical systems, creating a synergistic effect.

For this reason, EDX-LE standard equipment includes all the functions required for RoHS/ELV analysis, providing users with the optimal RoHS/ELV screening System.

Obtaining highly reliable analytical results

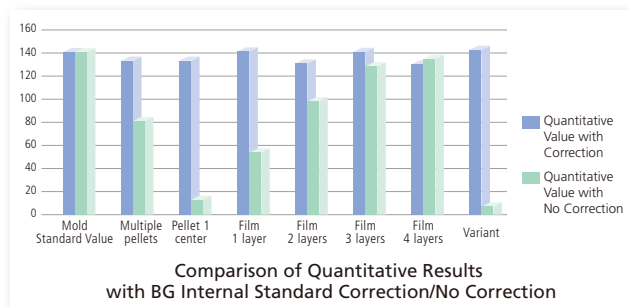
Calibration Curve Method and FP Method

To improve the reliability of analysis results for elements specified by the RoHS/ELV directive, the elements are analyzed using the calibration curve method and standard sample (check sample) provided with the instrument. (The Fundamental Parameter (FP) method is used to analyze some RoHS elements in metal samples.) Any other elements detected are analyzed using the FP method, which uses theoretical calculations to provide additional information.

Compensates for the influence of differences in shape of actual samples on analysis results

Shape Correction Function

X-ray intensity differs with the shape and thickness of samples, even if they contain the same material, and will have an impact on quantitative values. EDX-LE utilizes a BG internal standard method* to eliminate the effect of shape and thickness in order to provide highly precise results.



* BG internal standards method:
Fluorescent X-ray intensity of each element is standardized using scattered X-ray intensity.

Large Sample Chamber

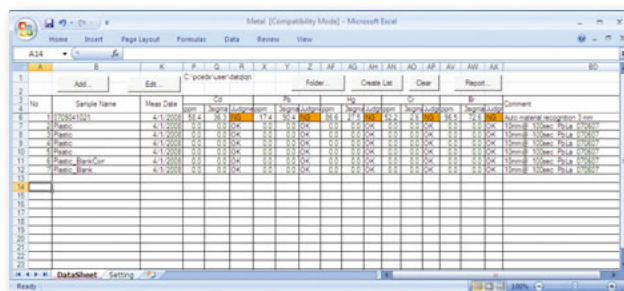
Despite its compact body, the EDX can accommodate samples up to W370 mm × D320 mm × H155 mm.



Organize measurement results in a list

List Creation Function

List data stored in Excel format.

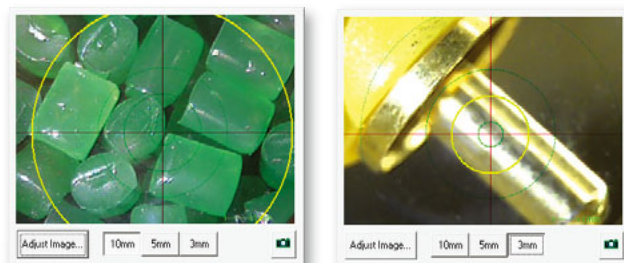


Note that this requires installation of Microsoft Office Excel before use.

Accommodates a Variety of Samples

Sample Observation Function

When measuring foreign substances and samples with multiple parts, the sample observation camera allows the analysis position to be easily specified by checking the camera image. If the sample is small or if specific locations on the sample are being measured, the collimator can be used to change the X-ray exposure region.

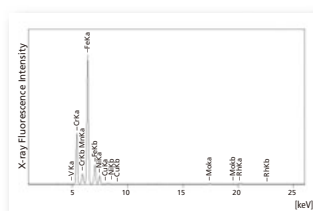


10 mm dia. image (plastic)

3 mm dia. image (metal)

Qualitative-Quantitative Analysis *Additional function kit is required.

The EDX-LE can perform qualitative analysis and non-standard quantitative analysis based on the FP method. This means it can be used to analyze foreign substances or differentiate between different materials.



Qualitative Profile of Stainless Steel

Analyte	Result	[Original]	Proc. Calc.	Line
Fe	71.448	%	[0.241] Quant.-FP	FeK α
Cr	18.810	%	[0.109] Quant.-FP	CrK α
Ni	7.462	%	[0.109] Quant.-FP	NiK α
Mn	1.446	%	[0.054] Quant.-FP	MnK α
Si	0.239	%	[0.032] Quant.-FP	SiK α
P	0.242	%	[0.009] Quant.-FP	P K α
S	0.053	%	[0.014] Quant.-FP	S K α

Quantitative Analysis Results for Stainless Steel (FP Method)

Matching (Steel Type Identification, Product Identification) *Additional function kit is required.

Comparing measurement data to a data library of steel types allows automatic identification for everything from materials closest to the sample, to the 10th position on the library list. In addition to matching by intensity, matching by content is also available if the user creates and registers libraries of concentrations and elements.

Candidate	DW. Factor
SUS_304N2	0.82107
SUS_304L	0.82523
SUS_304	0.66544
SUS_321	0.67971
SUS_304LN	0.74885
SUS_347	0.82780
SUS_305	0.85301
SUS_303	0.93634
SUS_303Se	0.95500
SUS_302	1.07375

Intensity Matching Results

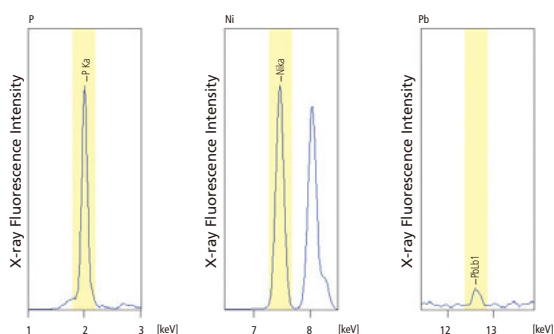
View	Element	Content (%)	Element	Content (%)
1	Fe	71.448	19	0.000
2	Cr	18.810	20	0.000
3	Ni	7.462	21	0.000
4	Mn	1.446	22	0.000
5	Si	0.239	23	0.000
6	P	0.242	24	0.000
7	S	0.053	25	0.000
8	Cu	0.000	26	0.000
9	V	0.000	27	0.000
10	Al	0.000	28	0.000

Element and Content Registration Window

Thin-Film Analysis *Additional function kit is required.

The Film FP method obtains not only single layer, but multilayer film thickness, composition, and deposit volume. It is also well-suited to the measurement of Pb contained in plating. (Information on the layer order (including base) and the constituent elements is necessary.)

Result of Qualitative Analysis

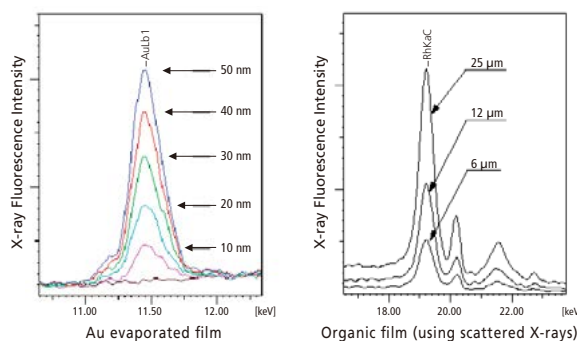


* Trace amounts of lead as a stabilizer detected

Result of Quantitative Analysis

Layer Info	Analyte	Result	(Std. Dev.)	Proc.-Calc.	Line
1 Layer1					
1 Layer Layer1		5.632	um	(-----) Total	-----
1 Elem. Ni		30.533	%	(0.052) Quan-FP	NiK α
1 Elem. Pb		296.655	ppm	(34.303) Quan-FP	PbLb1
1 Elem. P		8.371	%	(0.037) Quan-FP	P K α
B Base					
B Elem. Cu		100.000	%	(-----) Fix	-----

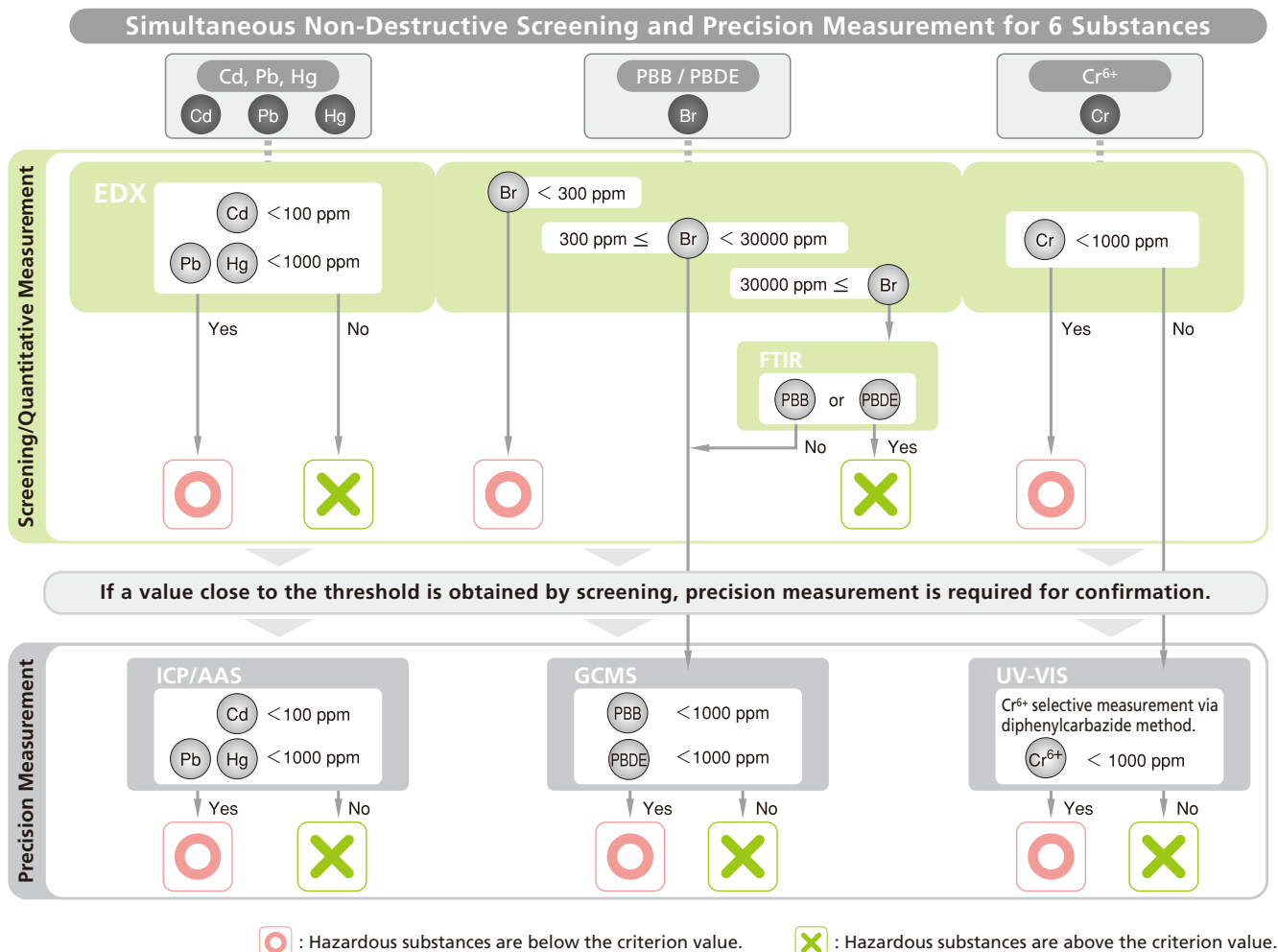
Example of Measurement of Electroless Ni-P Plating



Example of Thickness Measurement for Thin-Film Sample

Screening Process for RoHS/ELV Judgment

This flowchart shows the procedures recommended by Shimadzu, not those recommended by the IEC.



* The criteria above are the definitive values adopted in RoHS and ELV. If this procedure is used in the manufacturing process for acceptance/shipping inspections for raw materials, parts and materials or products, stricter criteria may have to be adopted in accordance with the client's acceptance standards. Caution is also required regarding the many exempted applications.

* Relationship between Br concentration (assuming Br: 80), and maximum permitted content of polybrominated biphenyl (PBB) and polybrominated diphenyl ethers (PBDE)

- Br concentration in 1000 ppm mono-BB: $1000 \times 80 / 233 = 343$ ppm
- Br concentration in 1000 ppm mono-BDE: $1000 \times 80 / 249 = 321$ ppm

If the quantity of Br in resin is known to be less than 320 ppm, whatever the bromine substitution, the concentration of a PBB or PBDE will be less than 1000 ppm. On the other hand, even if the Br concentration is 650 ppm, which is below 1000 ppm, we cannot say that this is a conforming result, because if all the Br originates from mono-BDE, then the PBB/PBDE concentration will in fact be 2000 ppm or more.



Instrument Specifications

Primary Specifications

Measurement Principle	X-ray fluorescence spectrometry
Measurement Method	Energy dispersive
Measurement Sample Type	Solids, liquids, or powder
Elements to be Detected	¹³ Al to ⁹² U
Sample Chamber Size	Max. W 370 mm × D 320 mm × H 155 mm

X-Ray Generator

X-Ray Tube	Rh target
Tube Voltage	5 kV to 50 kV
Tube Current	1 μA to 1,000 μA
Cooling Method	Air cooling (with fan)
Exposure Area	Automatic switching between 3, 5, and 10 mm dia. areas (1 mmø is an option)
Primary Filter	Automatic switching between: 5 types + OPEN

Detector

Type	Si-PIN semiconductor detector
LN ₂ Supply	Not required
Counting Method	Digital filter counting

Sample Chamber

Measurement Atmosphere	Air
Sample Observation	CCD camera

Data Processing Unit

Main Unit	IBM PC/AT compatible equipment
Memory	1 GB min.
HDD	80 GB min.
Resolution	1024 × 768 pixels min.
Printer	Color inkjet printer
CD	CD-ROM drive
OS	Windows 7

Software

Screening Analysis	Simple operation software
Qualitative Analysis	Measurement/analysis software
Quantitative Analysis	Calibration curve method
	FP method
	Thin-film FP method (Option)
	BG-FP method (Option)
Matching Software	Option
Utilities	Automatic calibration functions (energy calibration, full-width half-maximum calibration)
Other Functions	System-status Monitoring Function
	Analysis-results Tabulation Function
	Analysis-results Report Creation Function

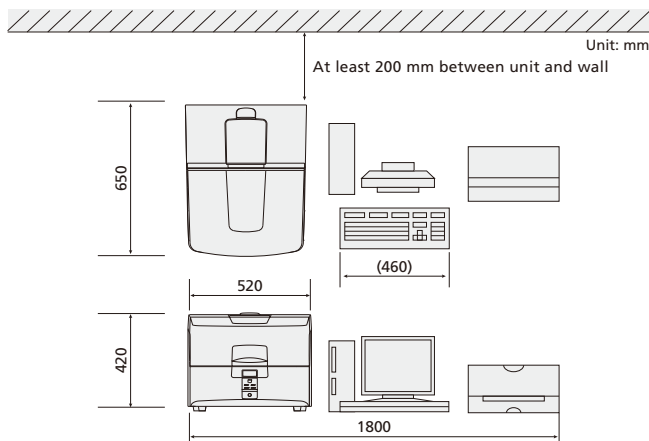
Installation Requirements

	Guaranteed Performance	Guaranteed Operation
Temperature	10°C to 30°C (fluctuations should be 2°C/hour max.)	5°C to 35°C
Humidity	40% to 70% (No condensation)	40% to 70% (No condensation)
Power Source	AC 100 V to 240 V ±10% 50/60 Hz, 150 VA grounded outlet Power for peripheral devices (printer, PC, display monitor, etc.) must be provided separately.	

* Windows and Windows 7 are registered trademarks of Microsoft Corporation (USA) in the United States and other countries.

Installation Example

Dimensions of the Main Unit	W 520 mm × D 650 mm × H 420 mm
Main Unit Weight	Approx. 60 kg



Options

Halogen Screening Analysis Kit

P/N 212-24908-91

This kit includes an instruction manual for Halogen analysis and a check sample required for measurement of 6 elements (Cd, Pb, Hg, Cr, Br, and Cl) specified by the RoHS directive and Halogen regulation.

Small Spot Solder Analysis Kit

P/N 212-24850-41

This kit includes an instruction manual for small spot solder analysis and a small spot collimator plate required for measurement of a print circuit board.

RoHS, Halogen, and Antimony Screening Analysis Kit

P/N 212-24922

This kit includes an instruction manual and a check sample required for measurement of 7 elements including those specified by the RoHS directive, Halogen regulation, and Antimony (Cd, Pb, Hg, Cr, Br, Cl, and Sb).

Additional Function Kit for EDX-LE

P/N 212-24922-91

Adds a general-analysis function to the EDX-LE. For details, please contact your Shimadzu representative.

Sample Cells

3571 General Open-End X-Cell (no lid)

P/N 219-85000-55 (100 pcs/set)

(Outer diameter: 31.6 mm, volume 10 mL)

Polyethylene sample cell used for liquid and powder samples. Used with Mylar or polypropylene films.



3529 General X-Cell (with lid)

P/N 219-85000-52 (100 pcs/set)

(Outer diameter: 32 mm, volume 8 mL)

Used for liquid samples. Equipped with relief hole and liquid retainer in case of liquid expansion.



3577 Micro X-Cell

P/N 219-85000-54 (100 pcs/set)

(Outer diameter 31.6 mm, volume 0.5 mL)

For trace samples. Use with a collimator is recommended to reduce scattered radiation emitted by sample cell.



3561 Universal X-Cell

P/N 219-85000-53 (100 pcs/set)

(Outer diameter 31.6 mm, volume 8 mL)

For liquid and thin-film samples. Equipped with a relief hole and liquid retainer in case of liquid expansion. Equipped with a ring for tightly holding thin-film samples with film.



Polypropylene Film

P/N 219-82019-05 (73 mm W × 92 m roll)

Sample-holding film. (For light element analysis)

Mylar Film

P/N 202-86501-56 (500 sheets/set)

Sample-holding film. (For heavy element analysis)

EDX-LE

Energy Dispersive X-ray Fluorescence Spectrometer

X-ray Fluorescence Spectrometer Product Line

Sequential X-ray Fluorescence Spectrometer XRF-1800



- World's first 250- μm mapping capability achieved with wavelength-dispersive instrument (patented)
- Accurate qualitative-quantitative analysis using higher-order X-ray profiles (patented)
- Background FP method enables measuring thickness and inorganic components in thin polymer films (patented)
- Greater stability achieved by incorporating hardware with proven track record
- Template and matching functions incorporate Shimadzu's accumulated know-how

Energy Dispersive X-ray Fluorescence Spectrometer EDX-7000/8000



- **High Sensitivity, High Speed, and High Resolution**
The high performance SDD detector and optimized hardware achieve a previously unattainable high level of analysis performance.
- **Large Sample Chamber Accommodates Various Sample Sizes**
Despite its compact body, it can accept large sample sizes. In addition, the sample observation camera and collimator enable trace and small sample analysis.
- **Easy-To-Use Operation**
PCEDX-Navi software allows easy operation from the start. Display reports with a single mouse click.



This unit is designated
as an X-ray device.



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