

SPECIFICATION

 **Rigaku**

No.11718-1907SS4

Rigaku / X-ray Fluorescence Spectrometer

ZSX Primus IV*i*

Specifications



Rigaku Corporation

Contents

1. General	1
2. Configuration.....	4
3. Hardware specifications	7
3.1 X-ray generation unit	7
3.2 Spectrometer unit	8
3.3 X-ray counting system and system controller.....	13
3.4 Data processing system	13
4. Software specifications.....	13
4.1 "ZSX Guidance" software functions	13
4.2 Analysis package by industry (Optional).....	14
4.3 Data capacity	16
5. Accessories	16
6. Installation requirements	18

1. General

Rigaku ZSX Primus IVi is a tube-below sequential wavelength dispersive X-ray fluorescence spectrometer developed for various purposes from production control to research and development.

The newly developed operation software "ZSX Guidance" provides strong supports for operators in generating measurement parameters and creating calibrations. Operators can perform XRF analysis without advanced expertise with this software.

By making counting circuit faster processing and optimizing various mechanical sequences, analysis efficiency is further improved.

"ZSX Primus IVi" has the following features.

<Reliable supports by the operation software ZSX Guidance>

- (1) Automatic application setup function sets up the measuring conditions and various correction coefficients automatically, and even unexperienced users can generate calibration curves.
- (2) Improved functions of "Scan Quant X", a standard-less FP analysis program using the built-in sensitivity libraries, make operation much easier. Operators can obtain accurate analysis results by functions such as removing influence of high-order lines which overlap with element lines of analysis components.
- (3) In the "EZ Analysis" mode, which is a compact operation setting needed for daily routine analysis, sample ID setting operation (copy, move) by unit of sample tray has become easy and efficiency of analysis work can be enhanced by the software system.
- (4) Data search function, recalculation and multiple result view are improved in "Result Display" program.

The filtering function for data display is improved to enable faster data extraction. Recalculation of analysis results can be easily carried out using stored intensity data for cases such as when calibration coefficients are modified.

<Analysis support by optional analysis package for each industry>

- (5) "Precalibration Package" consists of pre-installed calibration curves and the drift correction samples. Quantitative analysis can be started immediately after the installation of the package without using calibration standard samples, such as CRMs.
- (6) "Application Package" consists of samples of certified reference materials, analytical parameters saved in a CD and the installation manual. Calibration curves can be set up easily in the "Application Package".
- (7) "Master Matching Library" of system sensitivities optimized for a specific application can provide better accuracy of standard-less FP analysis results with the SQX program.

<High precision / high sensitivity, high throughput>

- (8) A 4 kW end-window X-ray tube with a 30 micrometer beryllium window provides the highest sensitivities for light and ultra-light elements.

- (9) The standard four crystals consisting of LiF(200), PET, Ge, RX26 cover the elemental range of ${}^8\text{O}$ – ${}_{96}\text{Cm}$. And the high sensitive curved crystals PET and Ge are equipped as standard and can provide 30% higher intensity than conventional flat crystals. Also, RX85, which is a newly developed synthetic multilayer for B (boron), provides 30% higher intensity than the existing synthetic multilayer.
- (10) Evacuation time to reach the target vacuum level in auto pressure control is shortened compared to previous model. Light elements as well as ultra-light elements can be analyzed with higher precision using the auto pressure control.
- (11) The digital multi-channel analyzer (D-MCA) in the X-ray counting system with high speed pulse processing ability provides wide range linearity up to the higher count rate and high analytical precision.
- (12) Sample throughput has been improved by rapid sample transportation (no need to shut down X-Ray tube), rapid goniometer driving, high speed data processing and efficient control of each driving unit. The time of a qualitative analysis can be reduced by maximum 40% of previous model, and a quantitative analysis, by 18% of the same.

<Useful functions>

- (13) Point/micro-mapping analysis can be easily carried out by the combination of measurement positioning selection by using a digital camera image and the r - θ driving sample stage. The superior spectral resolution owing to the wavelength dispersive system of the spectrometer provides accurate results of elemental mapping analysis even for samples with complex sample matrix.
- (14) Accurate quantitative analyses of ores and minerals are possible by applying the scattering FP method, which is a correction method for influences of co-existing elements with the combination of scatter-ratio correction and theoretical alpha correction.
- (15) For liquid sample analysis using sample cell, accuracy of the analysis is improved by correction for the influence caused by difference of sample amount (Geometry effect).
- (16) It is possible to easily transfer application conditions to another system or get the instrument status of the system installed in a remote place, simplifying application information sharing and can be used to enhance support by Rigaku.
- (17) The sample changer can handle up to 60 samples by adding sample trays. SSLS (Smart Sample Loading System with holderless sample changer; option) enables "holderless" analysis, where it is possible to directly place samples on trays of the sample changer. Up to 138 samples can be placed on the sample changer at a time (using the $\phi 35\text{mm}$ sample trays). It is possible to mix holderless analyses for multiple-sized samples and/or samples set in the sample holders. SSLS can be connected to an automation system such as an automatic sample preparation system.
- (18) LIMS Command Receiving Function (option) enables the software to receive sample IDs for analysis from LIMS. This function saves labor and prevents typing errors when setting Sample IDs.

A function of transmitting analysis results to LIMS is included in the standard software.

- (19) Code Reader System (optionally available only with SSLS) automatically reads Sample ID information by scanning 2D code placed on the back of samples. This function saves labor and prevents typing errors when setting Sample IDs.

<Security and Safety>

- (20) The access level for each operator can be specified to protect the data base from being overwritten or eliminated by operational errors. The selection to display or hide program menus for each access level eliminates troubles by erroneous operations.
- (21) The optional sealed proportional counter for light elements (S-PC LE) makes the installation of the spectrometer easy at the location where it is difficult to obtain counter gas.
- (22) Powder sample attachment is included as standard to prevent dust from entering the vacuum pump.
- (23) The optional partition between the sample chamber and optical chamber for helium flushing mechanism reduces time to change the sample chamber atmosphere to helium. The optional liquid sample recognition function prevents accidental loading of liquid samples into vacuum atmosphere to measure liquid samples with ease. And this partition avoids contamination of the optical chamber as it partitions the optical chamber and the sample chamber.
- (24) When the operating system or analysis software goes down, the function to automatically unload the samples to be measured is included in standard system. This feature minimizes damage to the equipment and measurement samples and reduces the burden on the operator to monitor the condition of the equipment.
- (25) The optional automatic program operation function turns off the power automatically, starts analysis at pre-determined time and interval, and runs energy saver. Moreover, automatic start up/automatic drift correction/automatic analysis can be programmed by the scheduler (for setting time, date, day of week and month to analyze). Drastic labor-saving of preparation works can be realized by programming automatic X-ray on, tube aging, PHA adjustment, drift correction for which an analysis date and time is previously designated.
- (26) ZSX Primus IVi conforms to CE marking requirements.

<Compatibility with automation system>

- (27) By connecting to an automation system with belt-conveyers, online analysis for pressed powder and fused beads can be done using SSLS.

2. Configuration

2.1 X-ray generation unit

2.1.1	X-ray generator	4kW	1 set
2.1.2	X-ray tube	End window type 4kW or 3kW	1 set
2.1.3	Heat exchanger	Internal chiller with ion-exchanging resin	1 set
2.1.4	Filter for primary cooling water (Optional)		__set
2.1.5	Dissolved oxygen absorbent filter (Optional)		__set

2.2 Spectrometer unit

2.2.1 Sample changer

ASC60 (Standard, at least one sample tray for 12 samples should be selected) 1 set

Sample tray

Standard 12 samples/tray (max. 5 sets.) __set

2.2.2 Primary X-ray filter

Al125, Al25, Ni40, Ni400 (Standard) 1 set

Be30 for X-ray tube protection (Optional) __set

2.2.3 Diaphragm

Select one from the configurations of diaphragm sizes shown below.

ϕ 35, 30, 20, 10, 1, 0.5mm (Standard) __set

ϕ 35, 30, 20, 10, 3, 1mm __set

ϕ 35, 30, 20, 10, 3, 0.5mm __set

ϕ 35, 27, 20, 10, 1, 0.5mm __set

ϕ 35, 27, 20, 10, 3, 1mm __set

ϕ 35, 27, 20, 10, 3, 0.5mm __set

2.2.4 Divergence slit

Standard resolution and fine resolution (Standard) 1 set

Choose one option below if necessary.

Ultra-light element slit (Optional) __set

Ultra-high resolution slit (Optional) __set

2.2.5 Receiving slit For SC and PC 1 set

2.2.6 Analyzing crystals

(Standard four crystals) LiF(200), GeH, PETH, RX26 __set

or

(Optional four crystals) LiF(200), Ge, PET, RX26 __set

(Optional) _____, _____, _____, _____,

	Total	__sets
2.2.7	Detector	
	(1) Scintillation counter	1 set
	(2) Gas flow proportional counter: Select (a) or (b) below	
	(a) Gas flow proportional counter (F-PC)	__set
	Equipped with the center wire cleaning system and gas density stabilizer.	
	(b) Gas sealed proportional counter (S-PC LE) for light elements	__set
2.2.8	Mapping mechanism (with sample observation system) (Optional)	__set
2.2.9	Filter for powder sample	1 set
2.2.10	Crystal chamber contamination prevention mechanism (Partition)	__set
	(Optional) Not to be chosen when the automatic Helium purge system is chosen; for the same partition is included in it.	
2.2.11	Temperature stabilizer	1 set
2.2.12	Automatic helium purge system with partition (Optional)	__set
2.2.13	Liquid sample holder detection function (Optional)	__set
2.2.14	SSLS [Smart Sample Loading System, holderless system] (Optional)	__set
2.2.15	Code Reader System (Optional)	__set
2.2.16	Inlet Port Lid for Manual Loading (Optional)	__set
2.3	X-ray counting system and system controller	
2.3.1	Pulse Height Analyzer (Digital multi-channel analyzer)	1 set
2.4	Data processing system	
2.4.1	Personal computer	1 set
2.4.2	Printer (Optional)	__set
2.4.3	PC rack or PC desk (Optional)	__set
2.5	Software	
2.5.1	Standard software	1 set
2.5.2	High speed qualitative analysis	1 set
2.5.3	PAS (Automatic pulse height adjusting system)	1 set
2.5.4	ACC (Automatic center wire cleaning system)	1 set
2.5.5	SQX software (Optional)	__set
	2.5.5.1 Matching Library (for SQX) (Optional)	__set
	2.5.5.2 Material Identification Function (for SQX) (Optional)	__set
	2.5.5.3 SQX Scattering FP Method program (Optional)	__set
	(Note) 2.5.5.1 ~ 2.5.5.3 and 2.5.13 are available when the SQX (2.5.5) is selected.	

- 2.5.6 Quantitative FP Theoretical Overlap Correction (Optional) __set
- 2.5.7 Fusion Bead Correction (for LOI/GOI, Dilution ratio, etc.) (Optional) __set
- 2.5.8 Quantitative Scattering FP Method program (Optional) __set
- 2.5.9 Automatic Program Operation (Optional) __set
(Auto power off, predetermined time/interval analysis, energy saving operation)
- 2.5.10 Charge Correction Program (Optional) __set
- 2.5.11 Precalibration Package (Optional) __set
- 2.5.12 Application Package (Optional) __set
- 2.5.13 Master Matching Library (Optional) __set

- 2.6 Standard accessories 1 set

- 2.7 Instruction manuals 1 set

- 2.8 Attachment and goods

No.	Item	Remarks	Qty

3. Hardware specifications

3.1 X-ray generation unit

3.1.1 X-ray generator

- (1) Rating 60 kV, 150mA
(The maximum current is limited depending on the type of an X-ray tube)
- (2) Continuous maximum rating 4 kW
- (3) Interlock
 - (a) HF power source abnormality detection system
Abnormal voltage of HV generation circuit
Abnormal temperature of circuit elements
Short circuit detection
 - (b) Abnormal load detection system
Filament disconnection detection
 - (c) Abnormal control detection system
Abnormal tube voltage and tube current control
 - (d) Micro discharge detection system
Arc discharge detection
 - (e) Interlock abnormality detection system
Interlock signal from the equipment input system
- (4) Tube voltage/current setting
 - Tube voltage 20 – 60 kV (variable by 1 kV steps)
 - Tube current 2 – 150 mA (variable by 1 mA steps)
- (5) Maximum load setting 3kW/4kW automatic switch-over system
- (6) Alarm indication
 - Abnormal HF power source
 - Filament disconnection
 - Abnormal control
 - HV surgical discharge in X-ray tube
 - Abnormal interlock
 - Detection of abnormal indication lamp
- (7) Automatic aging Standard function

- 3.1.2 X-ray tube End window type
Rh target 4kW (Thin beryllium window) (3kW, optionally available)

3.1.3 Heat exchanger

- (1) Pure water circulation type : Specific resistance of pure water is secured by ion exchanges resin.
(Alarm indication: Abnormality of water pressure, water flow, water level, water temperature, water quality)
- (2) Air cooled heat exchanger : (Optional)

3.1.4 Primary cooling water filter : (Optional)

When industrial water is used for the primary cooling, this filter is essential.

3.1.5 Dissolved oxygen absorbent filter : (Optional)

This filter is used to eliminate dissolved oxygen in the secondary cooling water to prolong life of the X-ray tube anode.

3.2 Spectrometer unit

3.2.1 Automatic sample changer

X-Y transfer mechanism interlocked with cover door switch

Selected from 12, 24, 36, 48, and 60 sample configuration

Note) For SSLS (holderless system), refer to 3.2.17.

Note) In case of a malfunction of the sample changer, it is possible to directly place sample holder on the inlet port (manual loading) by using Inlet Port Lid for Manual Loading (Optional) on the top of the inlet port to cover and then execute measurement for a single sample.

Since the lid of the inlet port of SSLS moves independently from the sample changer, Inlet Port Lid for Manual Loading is not required for manual loading in the case of SSLS.

3.2.2 Sample chamber

Sample loading	Air-lock type
Internal turret	2 position, with a sample sensor
Sample size	52 mm O.D., 40 mmH, at a maximum
Sample posture	Horizontal, lower surface irradiation
Sample spins	30 rpm
Partition (Optional)	Mounted between the optical and sample chambers Available for only 30mm dia. or 27mm dia. (Depending on selection in 2.2.3)

3.2.3 Primary X-ray beam filter (automatic)

Material	Remarks
Al125	For analysis of Ti, Cr, Co, Fe, Zn
Al25	For removal of Rh-L α For measurement of Cd-L α
Ni40	For measurement of Pb-L α , As-K α
Ni400	For removal of Rh-K α For measurement of Cd-K α
Be30	For protection of X-ray tube (Optional)

3.2.4 Diaphragm

Automatic diaphragm changer with six positions

Attenuator (Attenuation ratio 1/10) Only for 30mm dia. or 27mm dia. diaphragms
(depending on the selection of 2.2.3.)

3.2.5 Slit system

Divergence Soller slit, automatic changer: (One optional slit can be chosen if necessary.)

Standard slit (Standard)

Fine slit (Standard)

Ultra-light element slit (Optional)

Ultra-high resolution slit (Optional)

Receiving Soller slit, fixed:

For the scintillation counter

For the proportional counter.

3.2.6 Goniometer

Driving mechanism Pulse motor (θ - 2θ independent driving system)

Scanning range Scintillation counter: 5° to 118° (2θ)

Proportional counter: 13° to 148° (2θ)

Scanning speed $2400^\circ / \text{min}$ (2θ) at a maximum

Step scanning Increment angle :

0.002° , 0.01° , 0.02° , 0.05° , 0.1°

Continuous scanning $0.1^\circ - 600^\circ / \text{min}$

3.2.7 Crystal changer

10 position changer, automatic, bidirectional driving

3.2.8 Analyzing Crystals

Select either basic four crystal set with high sensitive curved crystals or optional four crystals. In addition, up to six additional crystals can also be selected from the options.

	Crystal	Elements covered	Notes
Standard 4-crystal set, including high sensitive curved crystals	LiF(200) GeH (*1) PETH (*2) RX26	$^{19}\text{K} - ^{96}\text{Cm}$ $^{15}\text{P} - ^{21}\text{Sc}$ $^{13}\text{Al} - ^{21}\text{Sc}$ $^8\text{O} - ^{12}\text{Mg}$	30% higher than Ge 30% higher than PET
Optional 4-crystal set	LiF(200) Ge PET RX26	$^{19}\text{K} - ^{96}\text{Cm}$ $^{15}\text{P} - ^{21}\text{Sc}$ $^{13}\text{Al} - ^{21}\text{Sc}$ $^8\text{O} - ^{12}\text{Mg}$	
Optional	LiF(220) LiF(420) RX40 RX61 RX61F RX4 RX9 RX35 RX45 RX75 RX85	$^{24}\text{Cr} - ^{96}\text{Cm}$ $^{30}\text{Zn} - ^{96}\text{Cm}$ $^7\text{N}, ^8\text{O}$ $^5\text{B}, ^6\text{C}$ ^6C ^{14}Si $^{15}\text{P} - ^{17}\text{Cl}$ $^8\text{O} - ^{12}\text{Mg}$ ^7N $^4\text{Be}, ^5\text{B}$ $^4\text{Be}, ^5\text{B}$	Higher res. than LiF(200) Higher res. than LiF(220) Twice as high as PET 3 times as high as Ge 3 times as high as RX26 3 times as high as RX40 30% higher than RX75

*1: Curved crystal of Ge,

*2: Curved crystal of PET

3.2.9 Detector

- (1) Scintillation counter (SC) $^{22}\text{Ti} - ^{96}\text{Cm}$
- (2) Proportional counter (PC) Choose either (a) or (b) below
- (a) Gas flow proportional counter (F-PC) $^4\text{Be} - ^{28}\text{Ni}$
With center wire cleaning system and gas density stabilizer
(For stabilization of the gas density from variation of
temperature and atmospheric pressure).
- (b) Gas sealed proportional counter for light elements (S-PC LE) $^5\text{B} - ^{28}\text{Ni}$

3.2.10 Sample stage

r- θ stage driving

3.2.11 Sample observation mechanism (Optional)

Precise mapping analysis is available with the combination of positioning with a camera image and the r- θ sample stage.

Resolution : 5,000,000 pixels
Back light : LED
Magnification : Approx. 20
View size : Approx. 30mm diameter

3.2.12 P-10 gas system

Gas flow 7 mL/min

3.2.13 Vacuum system High speed evacuation system

Single vacuum pump

Direct drive oil rotary pump (with oil back-flow prevention mechanism)

Vacuum gauge : Two Pirani gauges for main and sub vacuum system

3.2.14 Filter for powder sample

3.2.15 Temperature stabilizer (independent from X-Ray source)

Control temperature 36.5°C

3.2.16 Automatic Helium purge system (Optional)

Note: Available only when the partition (Optional) is used.

3.2.17 Sample Holders

- (1) Standard sample holder, 30mm fixed type (mask not needed)
- (2) Sample holder without mask.

Available sample holder masks: ϕ 38, 30, 27, 20, 10, 5 mm.

3.2.18 SSLS [Smart Sample Loading System, holderless system] (Optional)

Number of samples Up to 138 samples can be placed at a time.
(when the ϕ 35mm sample trays are used)

Sample type Fused beads, pressed powder briquettes (disks), plated steel sheet; the back surface of samples must be flat so that the samples can be suctioned by the vacuum chuck.

Sample weight	100 grams or lower
Sample height	10 mm or shorter
Sample diameter	35 mm or 40 mm of outer diameter
ASC tray	Sample tray for 35 mm-dia. samples : 32 samples
	Sample tray for 40 mm-dia. samples : 24 samples
	Holder tray (for sample holder) : 12 samples
Number of ASC trays	Up to 5 trays can be used at a time

ASC trays are placed from the front side of the sample changer. Since the sample holders to be used in the internal turret for holderless measurement are placed on the Holder tray at the end, the Holder tray has to be placed at the end.

- One or more Holder trays and one or more Sample trays (when "holderless" measurement (sample loading using the vacuum sucker is used) :
 - One Holder tray has to be placed at the end. On the front side, either Sample tray(s) or Holder tray(s) can be placed in any order.
 - For example, in the case of One Sample tray and One Holder tray, Sample tray is placed in the first row and Holder tray is placed in the second row.
- Only sample tray(s) for sample holder:
 - All the trays are set as Holder tray. Holderless measurement is not available.
 - With only one Holder tray, the Holder tray is placed in the first row.

For holderless measurement, Sample trays for 35 mm-dia. and 40 mm-dia. are available. If sample trays for the other sample sizes are required, actual samples to be analyzed are to be sent to Rigaku factory and Rigaku will manufacture Sample trays fit to the actual samples as custom order.

3.2.19 Code reader system (Optional)

Available code	2D: QR Code [®] or DataMatrix [®] (ECC200) Note) "QR Code" is a registered trademark of DENSO WAVE INCORPORATED. "DataMatrix" is a registered trademark of International Data Matrix, Inc. (USA).
Code reading	When a sample is transferred to the inlet port
Code information	Sample ID (sample type, sample name, etc.)
Laser	Class 1 (IEC60825-1, FDA 21CFR Part 1040.10(CDRH))

When this option is selected, SLS also has to be selected.

3.2.19 Liquid sample holder detection function (Optional)

Detection Distinguish liquid sample by the difference of the shapes of dedicated liquid sample holder (for liquid samples) and standard sample holder (for solid samples).

Function When the sample chamber is under vacuum, the system does not allow the dedicated liquid sample holder to transfer to the sample chamber.

When SSSL is selected, this option cannot be selected.

3.3 X-ray counting system and system controller

3.3.1 Pulse height analyzer Digital multi-channel analyzer (D-MCA)

3.3.2 Detector high voltage power

(1) For SC 300 – 1000V

(2) For F-PC/S-PC 1000 – 2500V

3.3.3 X-ray counting unit

(1) Maximum counting rate (Linearity : 1%)

Scintillation counter 1,800 kcps

Gas flow proportional counter 3,000 kcps

Gas sealed proportional counter 3,000 kcps

(2) Calculation process

Counting-loss correction (Automatic)

Pulse height shift correction (Automatic)

Two-theta pulse height linking

(3) Maximum counting capacity $2^{64} - 1$ counts

(4) Integration Time 1 – 999 sec. (for quantitative analysis)

0.1 – 9.9 sec. (for step scan)

3.3.4 Sequence controller For goniometer, sample chamber and etc.

3.4 Data processing system

3.4.1 PC system

PC OS/Windows®

Monitor 17 inch square type LCD, 19 inch square type LCD or 23 inch wide type LCD

Printer (Option) A4 color printer (Color) or A4 laser printer (Monochrome)

4. Software specifications

4.1 "ZSX Guidance" software functions

The functions and specifications included in the "ZSX Guidance" software are as follows.

4.1.1 EZ Analysis

Analysis screen using graphics makes operation of daily analysis easier. Besides EZ Scan

(Optional), qualitative analysis and quantitative analysis can be carried out.

4.1.2 Analysis

Analysis is automatically carried out following the analysis schedule table set for each sample. Displaying of "Analysis result" and "Status of operation" are also available.

4.1.3 Data processing

Saved data of qualitative and quantitative analyses can be re-processed by means of dialog. "Qual data handling (Qualitative analysis)", "SQX calculation (Standard-less FP analysis, Optional)", "Result Display" and "Quant simulation" can be performed.

4.1.4 Qualitative application

It is possible to edit measurement conditions to be used in qualitative analysis with analysis program and data analysis conditions, and create files for each analysis purpose. "Select element range", "Parameters", "Check measuring condition" and "Output information" are included in it.

4.1.5 Quantitative application

It is possible to edit measurement conditions to be used in quantitative analysis with an analysis program and quantification calculation conditions, and create files for each analysis purpose. Setting of "Application information", "Standard sample", "Analysis condition", "Measuring condition determination", "Regression calculation (Calculation curve creation)", "Analysis control information" and etc., and the measurement program are included in it. Automatic Quantitative Application Setup Function (for various sample type: metal, powder, polymer, ceramics) is included.

4.1.6 Utility

It is possible to set items related with the whole program. "Atomic symbols", "Compound table", "Sample ID tables", "Universal standard samples", "Sensitivity library (Optional)", "Material judgment standards (Optional)", "System management" and etc. are included in it.

"User management" in "System management" is used to authorize users to access a specific group of the software.

4.1.7 Maintenance

This is a function to support maintenance work of the system. "Maintenance spectrometer", "Maintenance records" and "Test measurement" are included in it.

4.1.8 Start-up and shut-off

Besides the display of "Instrument conditions", X-ray ON/OFF, atmosphere changeover and etc. can be performed. "Spectrometer status", "Startup", "Tube / Atmosphere change" and "Shutdown" are included in it.

4.1.9 Micro-Mapping (Optional)

Using a digital camera image and the sample stage, a qualitative analysis or quantitative analysis can be carried out to obtain an elemental mapping at any position or area of sample.

4.2 Analysis package by industry (Optional)

4.2.1 Precalibration Package

Precalibration Package includes pre-installed calibration coefficients and drift correction samples.

It is possible to start analysis without using calibration standard samples immediately after the installation of the package.

- (1) Calibrations before shipment
- (2) Drift correction sample(s)
- (3) Optional applications available : Select applications from the options below.
 - a. OXIDE-FB-PAK (Package for fusion bead method for oxide samples with wide range concentrations)

The optional program Fusion Bead Correction and sample preparation by a fusion bead machine is required.

Applicable to ores, minerals, cement, cement raw materials, slags, etc.
 - b. GEO-TRACE-PAK (Package for rock, mineral and ores by the pressed powder method)

The analyzing crystal LiF(220), Be30 primary beam filter for tube protection, and sample preparation using a press machine are required.
 - c. OIL-MULTI-PACK (Package for additive elements in lubricating oil)

Helium flush system, Be30 primary beam filter for tube protection, analyzing crystal RX35, and the optional program Quantitative FP Theoretical Overlap Correction are required.

Multi-element analysis is applicable.
 - d. Alloy Analysis (for Fe, Ni and Co-based alloys)

The analyzing crystal LiF(220), the optional program Quantitative FP Theoretical Overlap Correction and ϕ 20mm holder masks are required.

Applicable to iron, nickel, and cobalt-based alloys

4.2.2 Application Package (Option)

Application Packages include certified reference material samples, analysis conditions in a CD and an installation manual; therefore, calibration curves can be made easily immediately after the equipment installation.

- (1) Drift correction samples
- (2) Analysis conditions in CD
- (3) Certified reference material samples

Select applications from the options below. (more than one can be selected.)

- a. Low alloy and Stainless steel : A belt grinder (polisher) is required separately.
- b. Refractory : A fusion machine is required separately.

Select applications below. (more than one can be selected.)

Clay, Silica, Magnesite, Chrome-magnesite and Zircon-zirconia

4.2.3 Master Matching Library (Optional, specialized for SQX)

The standardless FP analysis by SQX software (Optional) can be more accurate with the Master Matching Library, which includes equipment sensitivities optimized for the specific applications.

- (1) To be installed before shipment
- (2) Application

Select applications from the options below. (more than one can be selected.)

- | | |
|--|---|
| a. Ecology sample 1 | For botanical sample, soil and coal ash |
| b. Tool steel and high-speed steel | |
| c. Low alloy steel and stainless steel | |
| d. Rock sample (pressed powder method) | For igneous rocks |

4.3 Data capacity

4.3.1 Qualitative analysis

- | | |
|-------------------------|--------------------------------------|
| (1) Measuring condition | 100 measuring conditions/application |
| (2) Applications | Number of applications : Unlimited |
| (3) Result files | Unlimited |

4.3.2 Quantitative analysis

- | | |
|---------------------------------|---|
| (1) Measuring condition | 150 measuring conditions / application |
| (2) Process parameter equation | 40 coefficients, 256 characters / equation |
| (3) Calibration curve | 3 curves / component |
| (4) Matrix correction | 102 correction terms / component |
| (5) Application | 150 components* ¹ / application |
| | Number of applications : Unlimited (Analysis) |
| | Number of applications : Unlimited (Simulation) |
| (6) Drift correction sample | Unlimited |
| (7) Component standard judgment | 150 components* ¹ / standard |
| | Number of standard conditions: Unlimited |
| (8) Check sample | 150 components* ¹ / sample |
| | Number of samples: Unlimited |
| (9) Calibration standard sample | 100 components / sample |
| | 2000 samples / application |
| (10) Regression calculation | Maximum 2000 samples, Regression calculation of maximum 102 constants |
| (11) Analytical result file | Unlimited |

*1: Including components of process parameters as well as analysis components.

5. Accessories

5.1 Standard accessories

- | | | |
|--|--------------------|-----------|
| (1) Intensity check samples Cu, Ti and Al | | 1 pc each |
| (2) Equipment calibration sample | | |
| (Standard) | Glass monitor disk | 1 pc. |
| (When analyzing crystal for Boron or Nitrogen is included) | | |
| | Boron nitride disk | 1 pc. |
| (When analyzing crystal for Carbon is included) | | |
| | Graphite disk | 1 pc. |

- | | |
|--------------------|-------|
| (3) Tools | 1 set |
| (4) Fuses | 1 set |
| (5) Oil and grease | 1 set |

5.2 Optional

- | | |
|---|--|
| (1) Printer paper A4 500 sheets (Monochrome laser printer, Color printer) | |
| (2) Ink cartridge (Spare) | Color 1 pc. (For color printer) |
| | Black 1 pc. (For color printer) |
| Toner cartridge (Spare) | Black 1 pc. (For monochrome laser printer) |

6. Installation requirements

6.1 Dimensions and weight

Main Unit (including the temperature stabilizer.)

Component	Dimension (mm)			Mass (kg)
	Width	Depth	Height	
(Including built-in heat exchanger and X-ray generator)	840	980	1,250	500

*Height : X-ray warning light tower is excluded.

*The vacuum pump (1 set) is placed outside the cabinet.

Vacuum pump

Component	Dimension (mm)			Mass (kg)
	Width	Depth	Height	
Vacuum pump	488	170	306	29

Note : Refer to the agent in case of local supply.

Personal computer (PC) system, PC rack

Component	Dimension (mm)			Mass (kg)
	Width	Depth	Height	
Rack for a PC	650	700	1,400	20
PC	338	379	100	7
Monitor	377	206	387	4
Printer	451	368	128	7

Note : The above numbers are typical ones.

Refer to the agent in case of local supply.

6.2 Electric power

Instrument	Phase	Voltage/Frequency	Current	Grounding
Spectrometer main unit (including standard heat exchanger and accessories)	3 ¹⁾	200VAC, 50/60 Hz	40 A	30 Ω or less (Independent)
	1 ²⁾	200 – 240VAC, 50/60 Hz	40A	30 Ω or less (Independent)
Personal computer, Monitor and Printer	1	100 – 240VAC, 50/60 Hz	10A	Grounded to a wall outlet

* Power for spectrometer main unit can be either three-phase or single-phase.

Choose 1) or 2) above whichever convenient for users.

* Including power for the temperature stabilizer, heat exchanger and vacuum pump.

6.3 Cooling water

Quality Equivalent to drinking water

Temperature Lower than 30 °C

Pressure 0.29 – 0.49 MPa

Drain Gravity drain

Flow More than 5L/min

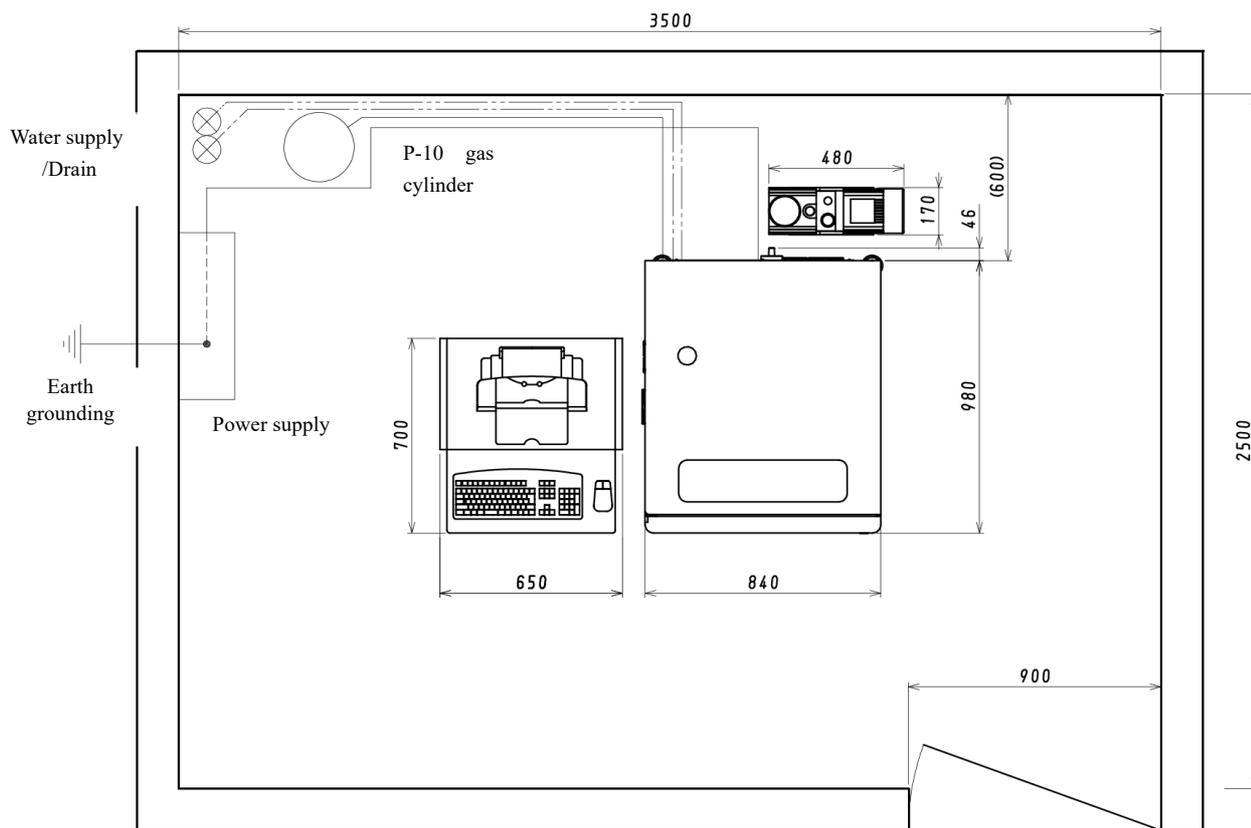
6.4 Room Temperature 15 –30 °C with daily variation of ± 2 °C

6.5 Humidity 10 –75 RH%

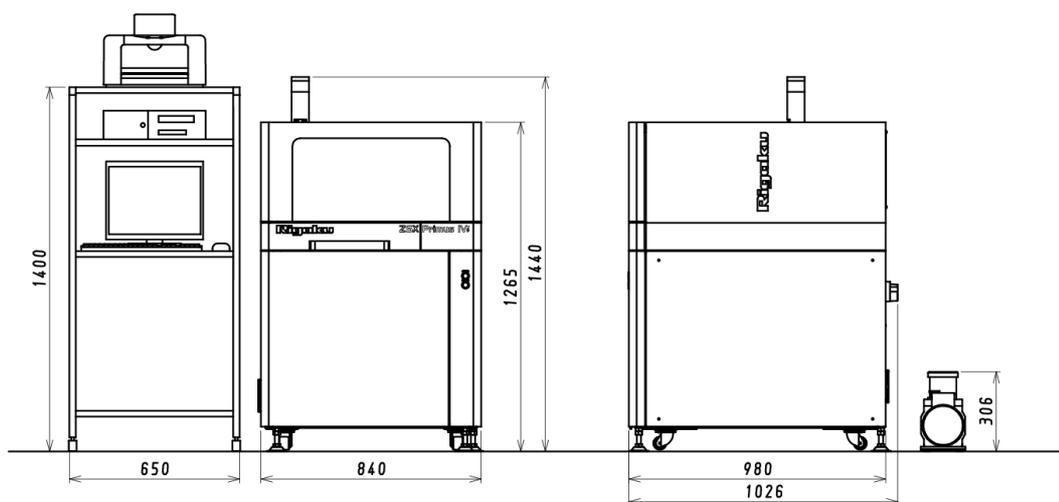
6.6 Vibration Not detectable by a human

6.7 Others Environmental requirements for dust, corrosive gas, etc. are equivalent to ordinary electronic devices.

6.8 Typical layout



Outside dimensions



Note: The standard is that the PC rack (or table) is located on the left side of the equipment, facing forward.