Rigaku

Advanced XRF

ZSX PrimusIII+

X-ray Fluorescence Spectrometer

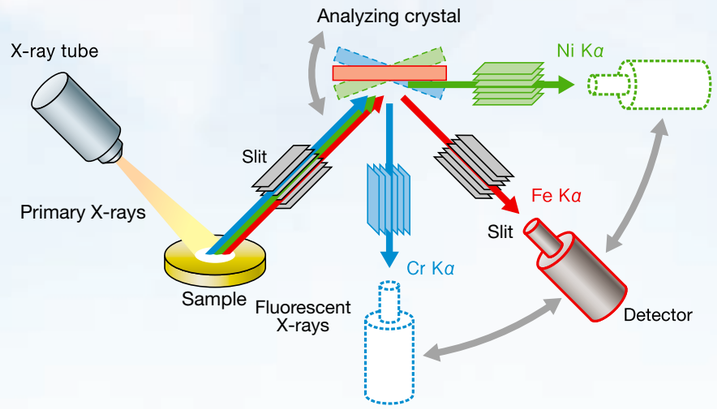
X-ray Fluorescence Spectrometer

Reliable Production Control

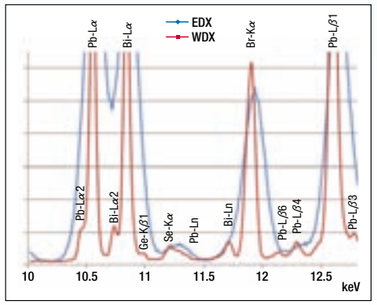
Features

Principle

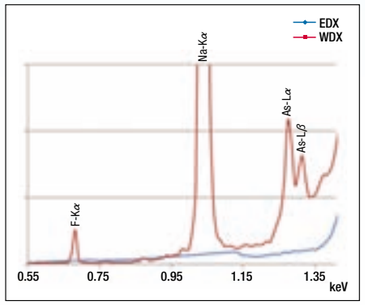
Excellent resolution with Wavelength Dispersive XRF optics



WDX vs. EDX: Spectrum Comparison



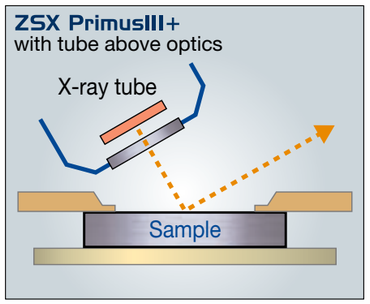
High resolution and high precision



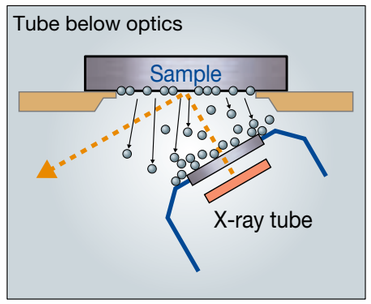
High sensitivity for light elements

Simple & Safe Sample Preparation

Ideal Optics for Powder Analysis



Reduced risk of pressed pellets breaking and damaging spectrometer



Falling particulate matter can contaminate beam path, increased risk of pellets breaking

Applications

Analysis of Iron Ore

Unique Compton Scattering Ratio Method with Theoretical Alpha Corrections

Using the Compton scattering ratio with theoretical alpha corrections significantly improves the accuracy of the calibration curve for analysis of Fe in iron ore. This method is also applicable for other nonferrous metal ore and concentrate analysis.

ASTM C114 Analysis of Powder Portland Cement

ZSX Primus III+ was tested to determine if the instrument meets ASTM C114 qualification using Portland cement standards. The results demonstrate the spectrometer's ability to meet ASTM C114 requirements for the analysis of Portland cements.

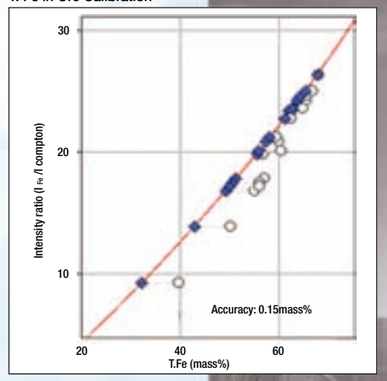
Repeat analysis results (sample: SRM1889a) unit: mass%

Comp.	Certified value	10x repeat measurement		Difference between duplicates		Difference between average of pellets and certified value	
		1st pellet	2nd pellet	C114 criteria	Result	C114 criteria	Result
CaO	65.34	65.407	65.421	0.2	0.01	0.3	0.1
SiO_2	20.66	20.739	20.775	0.16	0.04	0.2	0.1
Al_2O_3	3.89	3.854	3.861	0.2	0.01	0.2	0.03
Fe_2O_3	1.937	1.912	1.91	0.1	0.002	0.1	0.03
SO_3	2.69	2.68	2.69	0.1	0.01	0.1	0.05
MgO	0.814	0.864	0.865	0.16	0.001	0.2	0.05
K_2O	0.605	0.61	0.612	0.03	0.002	0.05	0.01
TiO_2	0.227	0.225	0.223	0.02	0.002	0.03	0.003
Na_2O	0.195	0.201	0.199	0.03	0.002	0.05	0.005
P_2O_5	0.11	0.113	0.112	0.03	0.001	0.03	0.002
Mn_2O_3	0.2588	0.2586	0.2592	0.03	0.001	0.03	0.002
Cl	0.0019	0.003	0.002	0.03	0.001	0.03	0.001
ZnO	0.0048	0.0042	0.004	0.03	0.000	0.03	0.001

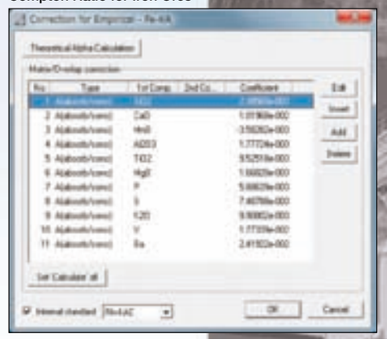
Fusion Bead Rock Analysis

Fusion bead method is an effective sample preparation technique to eliminate errors caused by heterogeneous effects. The low dilution fusion technique enables the analyses of both major and minor elements. Unique fusion bead correction software assures accurate analysis of rocks.

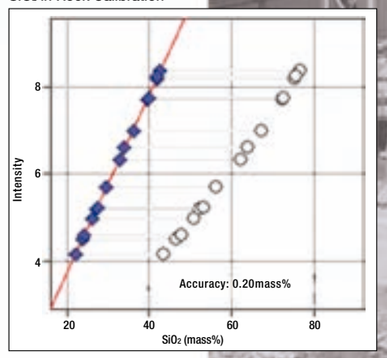
T. Fe in Ore Calibration



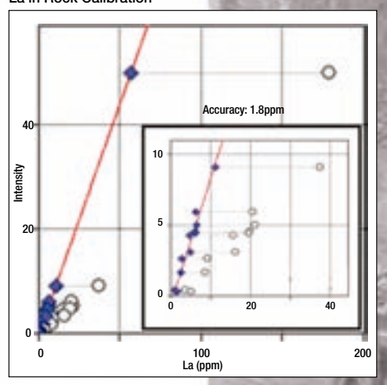
Theoretical Alphas with Compton Ratio for Iron Ores



SiO_2 in Rock Calibration



La in Rock Calibration



Optimized for Powder and Metal Analyses

The tube above optics in ZSX Primus III+ minimize powder scatter in the vacuum chamber and facilitate fast sample preparation by eliminating the need for binders when performing powder sample analysis.
The evacuation and vacuum leak rates can be switched between slow and fast to optimize sample throughput for powder and metal samples.

Advanced XRF

ZSX PrimusIII+

X-ray Fluorescence Spectrometer

X-ray Tube

X-ray Tube

The standard 3kW, Rh target, end-window tube efficiently generates fluorescent X-rays from samples for both heavy elements (Rh-K lines) and light elements (Rh-L lines).

Primary Beam Filter

Eliminates scattering peaks from the X-ray tube target (Thomson and Compton scattering).
Reduces background, improving peak:background ratio.

Filter	Function and analyzing elements
Ni 400	Eliminates the scattering peaks from Rh target; Rh, Ru, Cd, Ag…
Ni 40	Reduces background; Pb, As, Mo, Zr, Nb…
Al 125	Reduces background; Ti, Co, Fe, Ce, Pr, Nd…
Al 25	Reduces background and reduces scattering from the Rh-target (L lines); Cl, Cd (L), Ag (L) …

Analyzing Crystal

10 position crystal changer

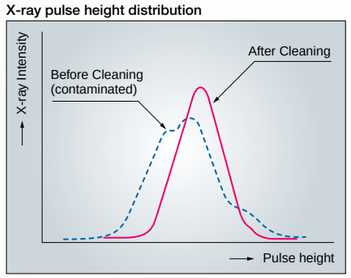
The three standard analyzing crystals in the Primus III+ are capable of analyzing elements from O. The 10-position crystal changer makes it easy to put together the optimum combination from a wide range of optional analyzing crystals, creating a custom solution tailored to meet the needs of your specific applications.

	Element	4	5	6	7	8	9	11	12	13	14	15	16	17	19	-	23	24	-	92	Characterstics
	Crystal	Be	B	C	N	O	F	Na	Mg	Al	Si	P	S	Cl	K	-	V	Cr	-	U	
Standard	RX25					■	■	■	■												
Standard	PET									■	■	■	■	■							
Standard	LiF(200)														■	■	■	■	■	■	
Optional	RX40				■	■															
Optional	RX61		■	■																	
Optional	Ge											■	■	■							High sensitivity
Optional	LiF(220)																	■	■	■	High resolution
Optional	RX35					■	■	■	■												High sensitivity
Optional	RX45				■																
Optional	RX75		■																		
Optional	RX80	■																			

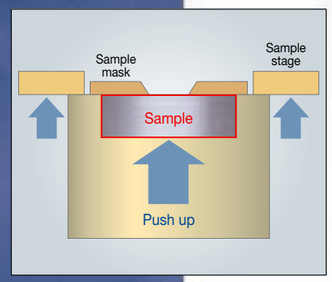
Detectors

The system includes a scintillation counter (SC) for heavy element analysis and gas flow proportional counter (F-PC) with very thin polymer window for light element analysis are equipped. Automatic center wire cleaning keeps the F-PC's performance in peak condition with minimum maintenance.

X-ray pulse height distribution

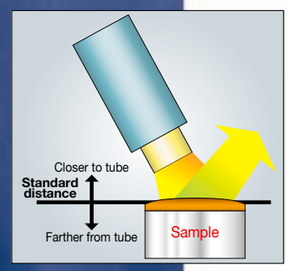


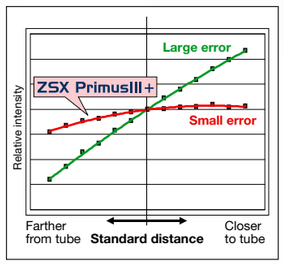
Sample Stage



High Precision Sample Positioning

The high precision positioning of the sample ensures that the distance between the sample surface and X-ray tube is kept constant. This is important for applications that require high precision, such as the analysis of alloys.





Special Optics Reduce Errors Caused by Curved Sample Surfaces

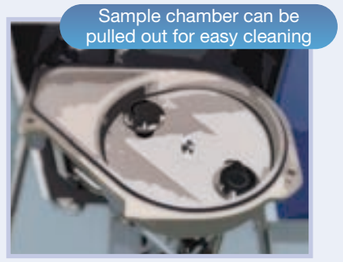
Perform high-precision analysis using a unique optical configuration designed to minimize errors caused by non-flat surfaces in samples such as fused beads and pressed pellets.

Support System

Easy to Clean Sample Chamber

In the event that powder particles contaminate the sample chamber, cleanup is easy. Powders in the evacuation system can be caught in the powder trap.

Sample chamber can be pulled out for easy cleaning



Auto Sample Changer

Standard system uses one tray (12 samples). Possible to set up to 48 samples when using four trays.

Easy to set samples using drawer

Intuitive and Easy Operation

Routine Analysis

Analysis Package

The spectrometer can be supplied with two types of analysis packages. The pre-calibration package (optional) calibrates the spectrometer prior to shipment. With the pre-calibration package, the spectrometer will be ready to perform analyses using the drift correction samples after on-site installation. The application package (optional) contains both standard and drift correction samples, as well as analytical parameters and an installation manual, making instrument setup quick and painless for non-experts.

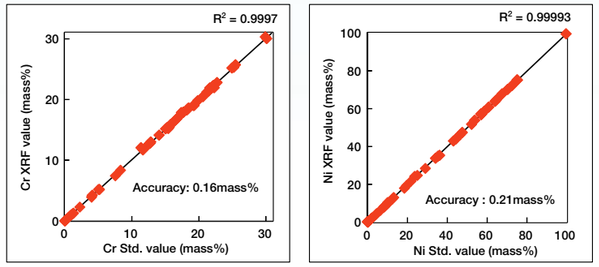
Pre-Calibration Package

FeCoNi Alloys

Analyzed Elements and Concentration Range

Element	Range mass %	Element	Range mass %
Al	0.006 – 3.07	Ni	0.006 – 99.6
Si	0.007 – 4.06	Cu	0.007 – 32.09
P	0.002 – 0.03	Se	- 0.19
S	0.001 – 0.03	Zr	0.002 – 0.058
Ti	0.002 – 0.03	Nb	0.001 – 5.19
V	0.001 – 0.03	Mo	0.001 – 15.45
Cr	0.002 – 0.03	Sn	0.0007 – 0.014
Mn	0.0015 – 0.03	Ta	0.002 – 0.75
Fe	0.02 – 0.03	W	0.007 – 17.98
Co	0.0014 – 49.4	—	—

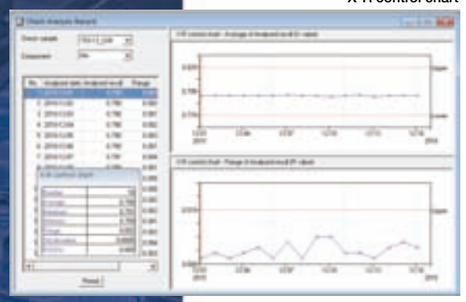
Relationship between Analyzed and Certified Values



Application Package

Sample Type	Analysis Mode	Sample Prep.	Analyzing Elements
Low Alloy Steel, Stainless Steel	Calibration Method		Si,Mn,P,S,Ni,Cr.Mo, etc.
Special Steel, Nickel Alloy	FP Method	Surface Polishing	Mn,Si,Cr,Ni,Co,Mo,W,Fe, etc.
Brass. Lead Free-Cutting Brass	Calibration Method		Cu,Fe,pb,Sn,Zn
Clay		Fusion Method	SiO_2,Al_2O_3,Fe_2O_3,TiO_2,MnO_2, etc.
Silica Sand			
High Alumina			SiO_2,Al_2O_3,Fe_2O_3,CaO,MgO,etc.
Magnesia			SiO_2,Al_2O_3,Fe_2O_3,MgO,Cr_2O_3, etc.
Chrome • Magnesia			SiO_2,Al_2O_3,Fe_2O_3,MgO,ZrO_2, etc.
Zircon • Zirconia			
Polyethylene		Hot press	F,Na,Mg,Al,Si,P,S,Cl,Ca,Ti,Cr,Fe,Zn

X-R control chart



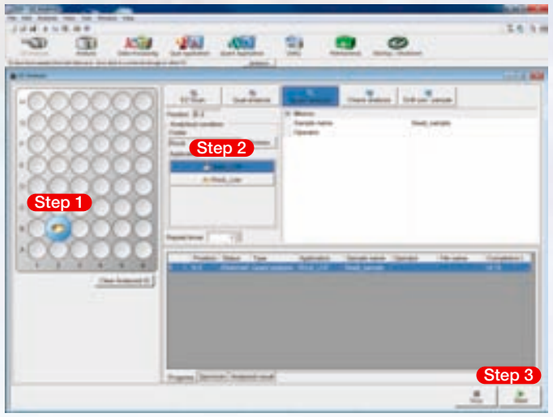
Tools for Statistical Process Control

The ZSX software has a wide array of functionality including statistical process control required for routine operation in production environments. Type standardization using the bias correction function makes it possible to analyze a range of alloys using standard-based calibration. Drift correction can be pre-programmed to run at preset intervals using the periodic analysis function. Statistical process control via X-R and other control charts are available to facilitate production and analysis control. Trend line graphs displaying drift correction coefficients simplify analysis control.

Intuitive Analysis Window

EZ Analysis

All routine operations are integrated in a new “EZ Analysis” menu. The intuitive user interface makes it easy to run daily operations from a single window.

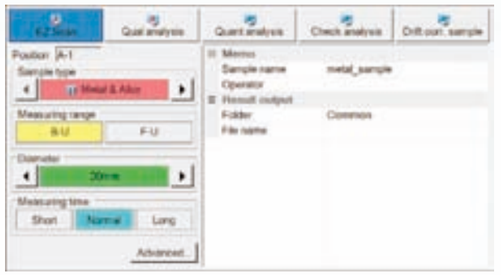


Just 3 Steps

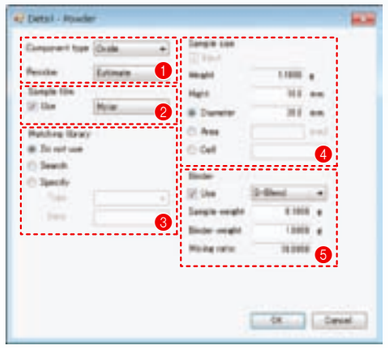
Step 1 Choose sample position
Step 2 Choose application
Step 3 Click “Start”

Advanced EZ Scan

- EZ Scan analysis (standardless, option) with no-fuss settings
- Accurate results with sample information



- Example set-up for powder samples:



1. Component type and balance
2. Sample film used
3. Matching library
4. Sample size (for correct thickness)
5. Binder information

SQX Analysis

The optional “SQX” program is the best available tool for analyses under the FP (fundamental parameter) method. The scan-based, standardless analysis software utilizes a unique fixed angle measurement feature and provides accurate analysis results using the power of the full FP method, including matching library functionality and automatic overlap correction.

SQX Analysis Results

Sample: CCRMP Syenite SY-3

Major components unit: mass %

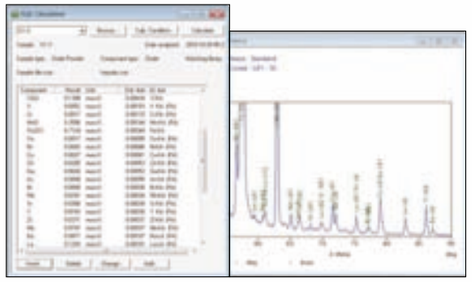
Component	SiO2	Al2O3	Fe2O3	MnO	MgO	CaO	Na2O	K2O	TiO2	P2O5
SQX values	59.23	11.72	6.20	0.31	2.74	8.25	4.16	4.16	0.16	0.57
Std. value	59.68	11.76	6.49	0.32	2.67	8.25	4.12	4.23	0.15	0.54

Minor elements unit: mass %

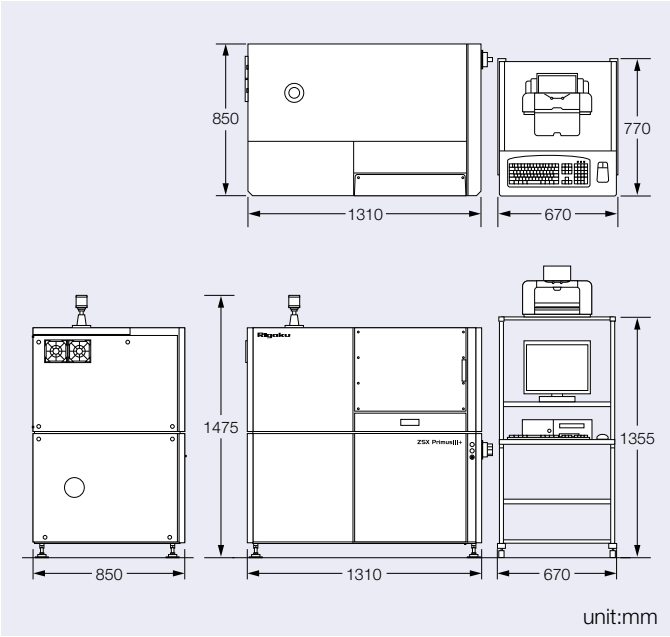
Element	As	Ba	Ce	Co	Cr	Cu	Er	Ga	Gd	La
SQX value	0.0027	0.043	0.193	0.0027	0.0005	0.0026	0.0061	0.0026	0.0094	0.112
Std. value	0.0019	0.045	0.223	0.0009	0.0011	0.0017	0.0068	0.0027	0.0105	0.134
Element	Nb	Nd	Ni	Pb	Pr	Rb	S	Sm	Sr	Th
SQX value	0.0163	0.063	0.004	0.0151	0.0162	0.0188	0.037	0.0091	0.0287	0.0999
Std. value	0.0148	0.067	0.001	0.0133	0.0223	0.0206	0.051	0.0109	0.0302	0.1003
Element	U	V	Y	Yb	Zn	Zr				
SQX value	0.061	0.0016	0.0655	0.0051	0.0236	0.027				
Std. value	0.065	0.005	0.0718	0.0062	0.0244	0.032				

Matching library : CCRMP Syenite SY-2

Results screen of SQX



Dimensions



Installation Requirements

Power	3Phase 200/208V 40A 50/60Hz Single phase 100-240V 50/60Hz (PC)
Earth Grounding	Grounding resistance less than 30Ω, Independent
Cooling water	Quality: tap water or equivalent Temperature: 30°C or less Flow: 5L/min or more
Room temperature	15-28°C (daily variation less than ±2°C within the range)
Humidity	75% RH or less
Vibration	2m/s^2 or less (Lower than human sensitivity level)
Counter gas	P-10 gas (Ar 90% Methane 10% mixture) Gas Pressure 0.15MPa

Specification

		ZSX Primus III+
X-ray Source	X-ray tube	End window type Rh Target 3kW
	High Voltage Generator	High Frequency Inverter type Maximum rating: 3kW, 60kV-100mA
Optics	Maximum Sample Size	ø51mm X 30mm (H)
	Primary Beam Filter	4 Filters
	Diaphragm	4 positions (ø35, 30, 20, 10mm)
	Crystal	10 crystal changer Standard: LiF (200), PET, RX25
Counting	Detector	Heavy Element: SC Light Element: F-PC

- The numeric values of performance indicated in this brochure are based on the test results at Rigaku. Rigaku does not warrant that the identical values can always be obtained regardless of different operational environments.
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Specifications subject to change without notice.

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