

# CMX-3135

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## Coal Mining XRF



EPCC / PRODUCTS / APPLICATION / SOFTWARE / ACCESSORIES / CONSUMABLES / SERVICES

**Analytical Technologies Limited**

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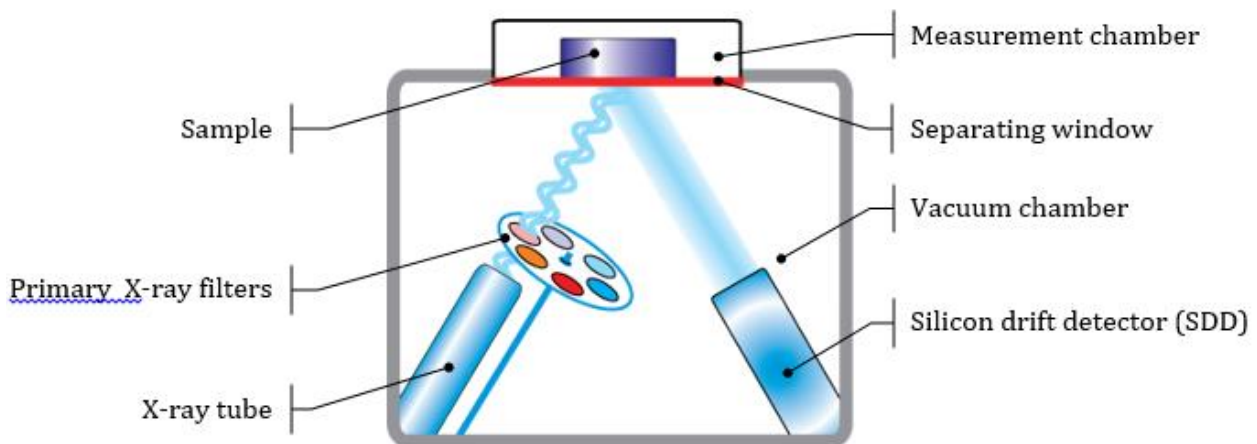
## ►► INTRODUCTION

- This Technical and Commercial Offer concerns supply of Universal X-Ray Fluorescence Analyzer. The CMX-3135 intended for the qualitative and quantitative determination of chemical elements in range from <sup>9</sup>F to <sup>92</sup>U of liquid, powder and solid samples.

The XRF is certified as a measuring instrument and is freed from the radiation monitoring and accounting. The CMX-3135 is manufacturing in accordance with the requirements of the quality management system

## ►► Principle of operation

The operation of analyzer is based on exciting the fluorescence radiation of the samples atoms by the X-ray tube radiation. Determination of elements concentration occurs based on the quantity of registered by high performance SDD detector photons with various energies.

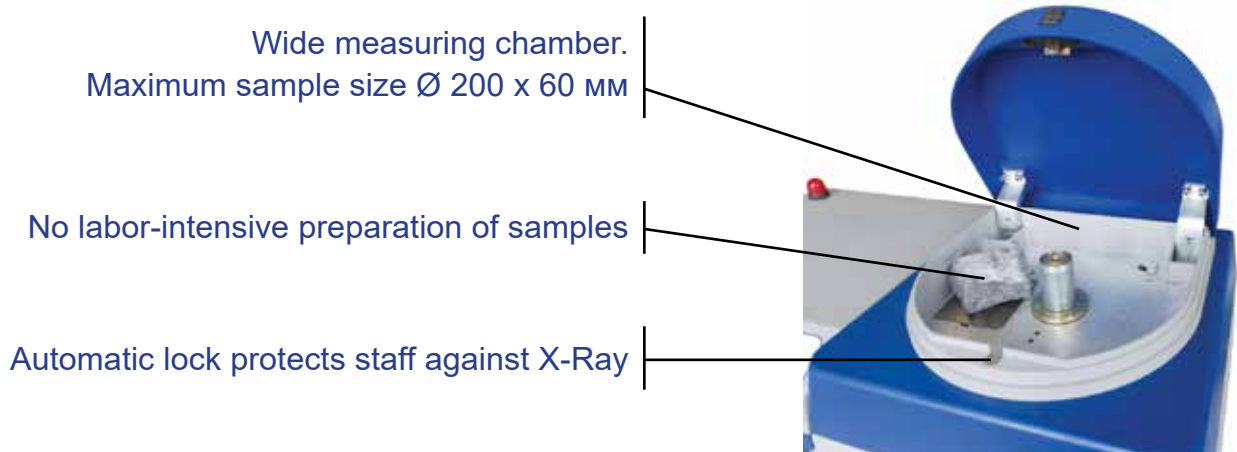
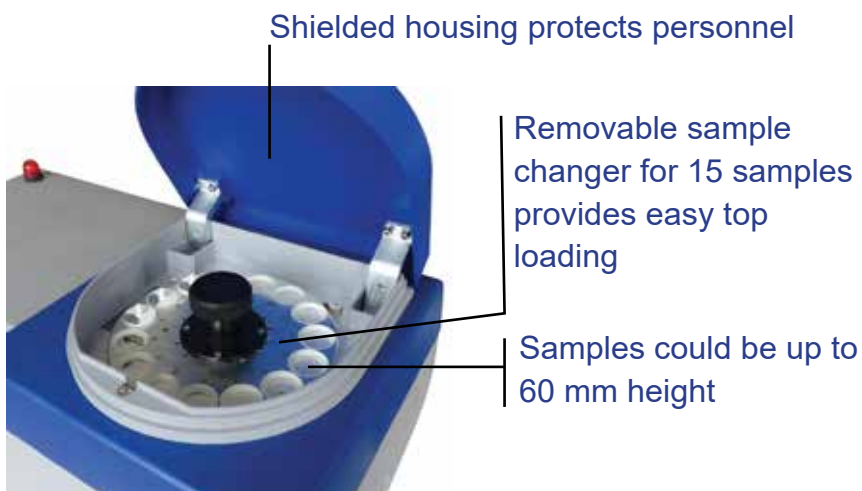


The analyzer control, data collecting and processing, determination of concentration are carried out by software package, which is pre installed on built-in industrial computer.

## ►► Features

- **Low limit of detection** due to high aperture and optimally chosen primary X-Ray filters;
- **Vacuum measurement chamber** provides high analytical characteristics in range of light elements from <sup>9</sup>F to <sup>17</sup>Cl;

- **Similar technology of measurements** for solid, powder and liquid samples. Samples are tested out of the vacuum, while the X-ray optical path passes in vacuum;
- No need of Helium flushing;
- Compressed air, water, gas, helium does not required;
- Analyze of **large samples** and **samples with irregular shape**;
- 15 samples analyzed automatically step by step;
- No need to press powdered samples and no special requirements to quality of the surface.



## ►► Specification

Parameter	Value
Determining elements	From <sup>9</sup> F to <sup>92</sup> U
Positions of sample changer	15
Limit of determination without preconcentration, %	
- light elements from Na to Mg;	10 <sup>-2</sup>
- middle group elements from Al to Cl;	2*10 <sup>-3</sup>
- heavy elements from K to U.	5*10 <sup>-4</sup>

Limit of detection at preconcentration of sample, %	$1.5 \cdot 10^{-5}$
Limit of determination of middle group elements in liquids, %	$n \cdot 10^{-5}$
Average time of analysis per one sample, sec	100
Energy resolution of detector on MnKa line at pulses count rate up to $10^4 \text{ sec}^{-1}$ , , less than, eV	145
Limit of relative measurement error of count rate, %	$\pm 0,2$
Maximum X-ray tube voltage, kV	50
Maximum X-ray tube power, W	10
X-ray tube cooling	air
Primary X-ray filters	Cd, Sr, Zn, Al, Ti
Maximum size of non-type sample, mm	$\text{Ø}200 \times 60$
Connection to Ethernet network	available
Remote control and data acquisition	available
Working temperature	10 - 35° C
Overall dimensions (LxWxH), mm	700x360x400
Weight, kg	65
Power supply	220 $\pm$ 22 V, 50 $\pm$ 1 Hz
Power consumption	500 V A

## ►► Measurement process

Device is verified and calibrated.

You can set  $\text{Ø}34$  mm samples into the sample changer with 15 (fifteen) sockets and  $\text{Ø}34$ , 36,40,44 mm samples into the sample changer with 11 (eleven) sockets. It is possible to place large samples or samples with irregular shape directly over measurement chamber.

### Software proposes to choose necessary analysis technique:

- Qualitative analysis – for qualitative definition of substance composition on the presence of peaks specific to concrete elements into spectrum, i.e. presence of one or another element;
- Quantitative analysis – for quantitative definition of elements concentration based on collected spectrum processing by means of special program of calibration (quantitative instrument calibration);
- Fundamental parameters method – for quantitative definition of elements concentration without standard calibration sample usage (for definition of alloy composition).

In order to collect spectrum of each sample it takes from 10 till 200 seconds (depending on required accuracy of final result). If available several samples into the sample changer, analyzable sample switches automatically and it speeds up routine analysis for large number of measurements. After spectrum received operator has to mark characteristic lines of elements by means of special utility.

As to quantitative analysis execution by multiple regression method caliber program must be prepared through the use of standard samples with precisely known elemental composition (State Standard Samples). For plotting of calibration curves it is necessary to have 5-7 samples with known content of analysis element at all measurable range.

In using of fundamental parameters method **application of State Standard Samples is not needed**. Quantitative definition of elements concentration is formed based upon existing calibrations of different elements into software. Method is applicable only to analysis of steels and alloys.

## ►► Software

Spectrometer is equipped with a software package, which is already installed on built-in industrial computer.

Software package has following functions:

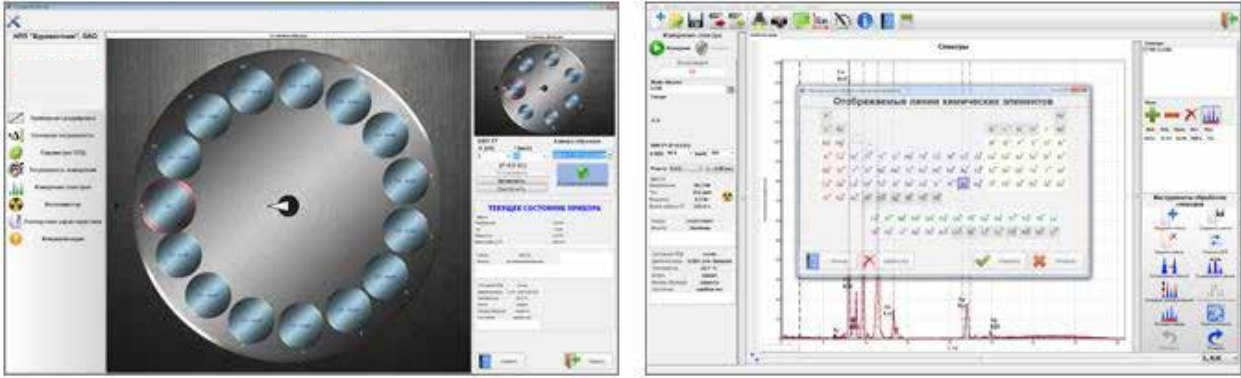
- Device control;
- Qualitative analysis of the sample composition;
- Quantitative benchmark analysis of sample composition;
- Quantitative non-benchmark analysis of sample composition (fundamental parameters method);
- Output and storage of analysis results.

Modern software offers exciting possibilities for immediate information about chemical composition of test material.

Registered spectra can be:

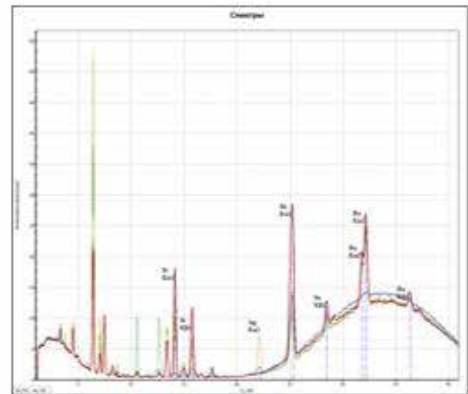
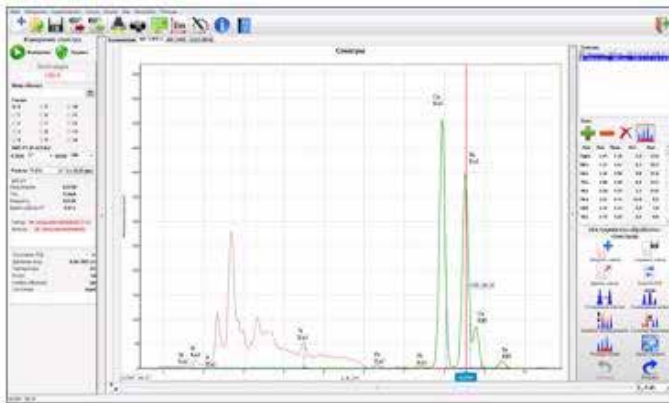
- saved in easy structured archive;
- extracted for re-analysis based on new calibration curve;
- processed on demand of user: addition, subtraction, KLM-marks;
- zoomed.

Secondary utilities make work easier and minimize mistakes during analysis. For example, semi-automatic marker of lines identifies spectral lines of different elements correctly.



## Software Interface

The test results are conveniently archived and retrieved for further analyses, if necessary.



## Results of qualitative analysis

Software (which realizes fundamental parameters method) allows to carry out semi-quantitative and quantitative determination of chemical elements composition within the range from Mg (12) до Pb (82) into one-piece samples of steels and alloys with contents from 0,1% till 100%.

Realization of fundamental parameters method by software package.

The software package operates under Windows 10 and has data access security.

### ►► Scope of supply

Analytic Unit;

VGA monitor LCD ”;

Keyboard USB;

Optical mouse USB;

Vacuum Pump System;

Set of spare parts, tools and accessories accordingly with List of Spare Parts;

Set of calibration samples;

Software package (on USB-drive).

According to the separate order the Customer can additionally purchase:

- printer;
- measuring cells set Chemplex 2135 – 50 pcs;
- X-ray tube 0.01 BH12-Rh or 0.01 BH12-Pd;
- vacuum oil for vacuum pump;
- vacuum grease Dow Corning high vacuum grease (50g tube);
- film for XRF 3 or 6 µm.

## ►► Oil analysis

For measuring purposes of trace elements **Al, Ba, Ca, Cu, Fe, Mn, V, Ni, Pb, Zn, P** into oil and petrochemicals **corresponding methodology** was developed and certified.

Analytic complex consisting of CMX-3135 and measuring methodology is capable of carrying out quantitative element analysis of petrochemicals in order to define metal trace elements and can be used to analyse exhausted motor oils of aircraft, machines, special motor vehicle in order to identify deterioration rate of engines and define applicability of technical service for it. Methodology is purchased additionally.

These test methods cover the measurement of sulfur, Barium, Calcium, Magnesium, Phosphorus, Zinc & Chlorine in hydrocarbons, such as lubricating used oil, diesel, naphtha, kerosene, residuals, lubricating base oils, hydraulic oils, grease, jet fuels, crude oils, gasoline (all unleaded), and other distillates. Additionally, sulfur in other products, such as M-85 and M-100, may be analyzed using this technique.

### Detection limits of CMX-3135 according to certified methodology (ppm):

P	Al	Mn	Ba	Pb	V	Cu	Ni	Fe	Zn	Ca
50	100	5	50	5	5	5	5	5	5	50

## ►► Cement materials analysis

For measuring purposes of mass fraction of **Na<sub>2</sub>O, MgO, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, P<sub>2</sub>O<sub>5</sub>, SO<sub>3</sub>, Cl, K<sub>2</sub>O, CaO, TiO<sub>2</sub>, Cr<sub>2</sub>O<sub>3</sub>, MnO, Fe<sub>2</sub>O<sub>3</sub>, ZnO, SrO** into cements and cement production materials (clinkers, raw mixes) corresponding methodology was developed and certified.

Analytic complex consisting of CMX-3135 and measuring methodology allows to solve the problem of controlling the chemical composition of cement products with satisfactory accuracy and for an acceptable time.

The certified test method includes fusion of samples with borate flux at a temperature of 1125 °C in platinum crucibles for 6-9 minutes to create a homogeneous fused bead. The general calibration consists of synthetic fused beads and fused beads which are created from technological samples of cement, clinker and raw mix.

The table shows the main characteristics of the certified methodology:

### Expanded measurement uncertainty $U$ ( $k = 2$ ) and repeatability limit $r$

No	Component	Measurement range of mass fraction of component in terms of the calcined sample <sup>1)</sup> , %	$U$ ( $k=2$ ), %	$r$ , %
1	Na <sub>2</sub> O	0,25 - 1,20 inc.	0,25	0,25
2	MgO	0,30 - 6,50 inc.	0,30	0,20
3	Al <sub>2</sub> O <sub>3</sub>	2,50 - 9,00 inc.	0,30	0,20
4	SiO <sub>2</sub>	14,0 - 30,0 inc.	1,0	0,2
5	P <sub>2</sub> O <sub>5</sub>	0,15 - 0,40 inc.	0,15	0,06
6	SO <sub>3</sub>	0,25 - 4,60 inc.	0,25	0,07
7	Cl	0,060 - 0,200 inc.	0,058	0,033
8	K <sub>2</sub> O	0,10 - 1,50 inc.	0,06	0,03
9	CaO	54,0 - 75,0 inc.	1,4	0,5
10	TiO <sub>2</sub>	0,11 - 0,60 inc.	0,06	0,05
11	Cr <sub>2</sub> O <sub>3</sub>	0,013 - 0,300 inc.	0,013	0,014
12	MnO	0,016 - 0,300 inc.	0,016	0,014
13	Fe <sub>2</sub> O <sub>3</sub>	0,25 - 5,00 inc.	0,25	0,08
14	ZnO	0,006 - 0,200 inc.	0,006	0,003
15	SrO	0,024 - 0,300 inc.	0,024	0,015

The test result is the arithmetic mean of the two observed value whose modulus of difference does not exceed  $r$ .



## HPLC Servicing, Validation, Trainings and Preventive Maintenance :

**HPLC Servicing** :HPLC Servicing : We have team of service engineers who can attend to any make of HPLC promptly @the most affordable cost.

**Trainings** :We also take up preventive Maintenance to reduce downtime of HPLC's Trainings.

**AMC's/CMC** :AMC's/CMC :We offer user training both in-House and at customer sites on HPLC principles, operations, trouble-shooting.

**Validations** :Validations :We have protocols for carrying out periodic Validations as per GLP/GMP/USFDA norms.

**Instruments** :Instruments :We offer instruments/Renting Services Modules like pumps,detector etc. on Rent.



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Analytical Technologies is synonymous for offering technologies for doing analysis and is the Fastest Growing Global Brand having presence in at least 96 countries across the global. Analytical Technologies Limited is an ISO:9001 Certified Company engaged in Designing, Manufacturing, Marketing & providing Services for the Analytical, Chromatography, Spectroscopy, Bio Technology, Bio Medical, Clinical Diagnostics, Material Science & General Laboratory Instrumentation. Analytical Technologies, India has across the Country operations with at least 4 Regional Offices, 6 Branch Offices & Service Centers. Distributors & Channel partners worldwide.

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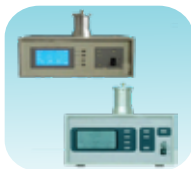
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Ion Chromatograph



Water purification  
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## Regulatory compliances



## Corporate Social Responsibility

Analytical Foundation is a nonprofit organization (NGO) found for the purpose of:



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1. Research & Innovation Scientist's awards/QC Professional Award : Quality life is possible by innovation only and the innovation is possible by research only, hence ANALYTICAL FOUNDATION is committed to identify such personalities for their contributions across various field of Science and Technology and awarding them yearly. To participate for award, send us your details of research / testing / publication at [Info@analyticalfoundation.org](mailto:Info@analyticalfoundation.org)

2. Improving quality of life by offering YOGA Training courses, Work shops/Seminars etc.

3. ANALYTICAL FOUNDATION aims to DETOXYFY human minds,souls and body by means of yoga, Meditation, Ayurveda, Health Care, Awards, Media, Events, Camps etc.

## Reach us @



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