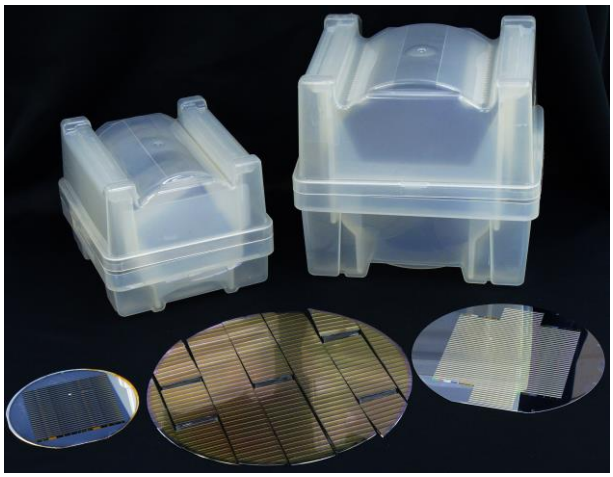
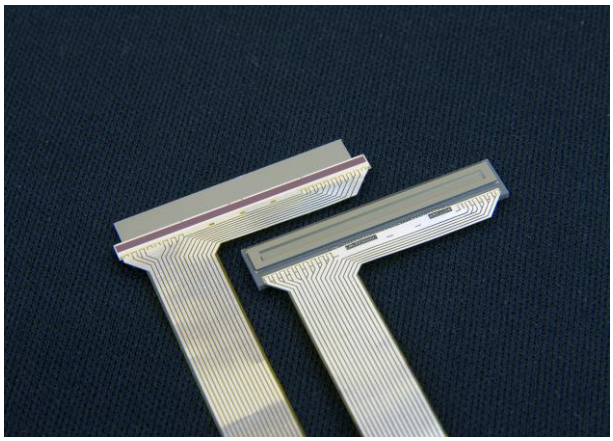
About us

The VMK-Optoelektronika company focuses on the development of high-tech equipment for direct atomic emission spectral analysis of powders, metals and alloys.

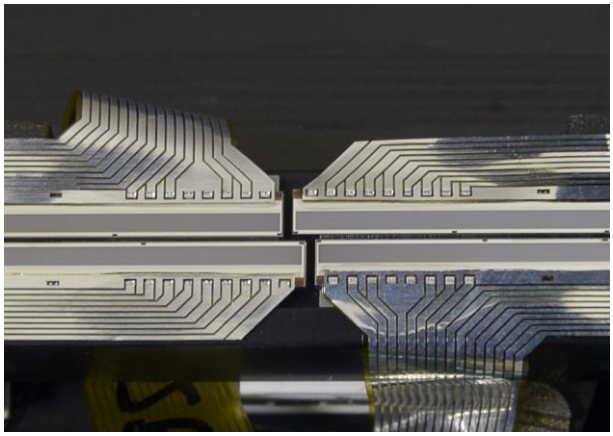


VMK-Optoelektronika is developing, manufacturing, upgrading and servicing spectroanalytical equipment. The company has been operating on the market since 1991.

The company applies a quality management system for development, production and maintenance of equipment which has been developed in accordance with the requirements of the GOST ISO 9001-2011 certification.



The company produces:
• silicon multi-element optical radiation detectors;
• multichannel optical spectrum analyzers;
• expert systems for atomic emission analysis;
• multichannel optical spectrometers for atomic emission analysis of powders, metals and alloys;
• arc and spark spectroanalytical generators;
• spectroanalytical stands;
• compact spectrum excitation sources with powder sample introduction by the spill-injection method;
• software for atomic emission analysis.



The products are high-tech and their quality and uniqueness are based on the latest achievements and original author's developments. The developments underlying the manufactured devices are protected by patents of the Russian Federation.

The originality of the designs, the reliability of electronics, and software user friendliness have made the company's products a popular choice in many industries in Russia and abroad.

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MAES multichannel analyzer of atomic emission spectra

The MAES analyzer is a modern instrument for measuring spectral line intensities and subsequent calculations of analyte element concentrations. The MAES analyzer is registered under No. 21013-11 in the State Register of Measuring Instruments of the Russian Federation and is approved for use.

Specifications (TU 25-7401-11855928-01)	
Detector	photodiode array
Spectral range, nm	160–1100
Number of measuring channels	2580–72000
Photodiode size, μm	12.5×1000
Output signal dynamic range	10^4
Exposure time, ms	10–10000
Digital exposure time	unlimited
Percentage of faulty photocells, %, no more than 0.2	0.2
Standard deviation of output signal at an exposure time of 250 ms,%, no more than 0.03	0.03
Output signal drift at an exposure time of 250 ms for 1 hour,%, no more than 0.5	0.5
Range of measured spectral line intensity for single spectrum recording, rel. units (%)	0.03–100
Relative standard deviation of spectral line intensity at an exposure time of 250 ms for a line intensity of more than 1%, %, no more than	3
Standard deviation of spectral line intensity at an exposure time of 250 ms for a line intensity of less than 1%,% no more than	0.03
Control	computer
Power consumption without computer (220 V, 50 Hz), W	100

Main advantages of MAES analyzers	
over photographic plates:	over photomultipliers:
high quantum efficiency	
direct photoelectric conversion of the spectrum	simultaneous recording of the working spectral range
wide spectral sensitivity range	
real-time analysis results	no constraint on analytical lines
no manual processing errors	reliability, service life
wide dynamic range	background correction option
multipurpose	automatic temperature shift correction by reference lines

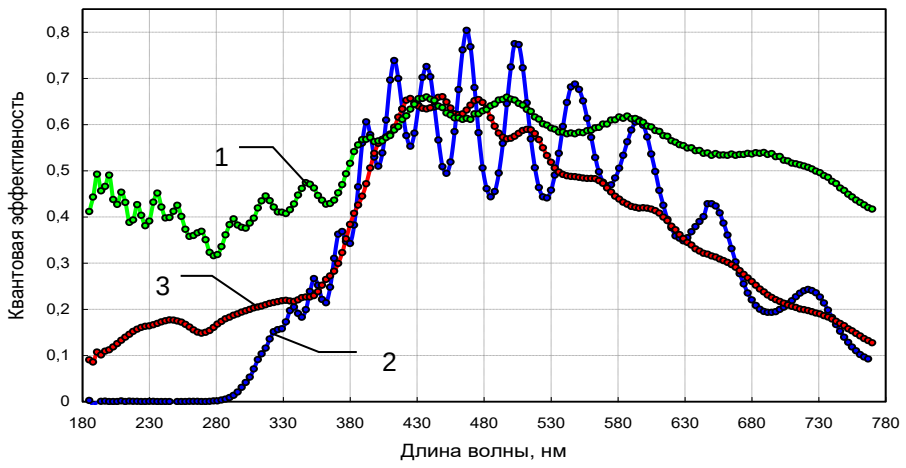
The analyzer is mounted in place of photocassettes on spectrographs and in place of photomultipliers on quantometers of domestic and foreign production.

Spectral devices and their parameters

Optical system of spectral device	Name of spectral device	Inverse linear dispersion, nm/mm	Spectral range, nm
Prismatic	ISP -28, ISP -30	0.4–30	210–600
Czerny-Turner (plane diffraction grating)	DFS-8 DFS -13 PGS-2 Kolibri-2	0.3; 0.6 0.1; 0.2; 0.4 0.74 30.9; 24; 14.4; 5.3; 4.3	190–1000 190–1000 190–1000 190–1100; 190–940; 390–860; 440–600; 470–590
Paschen-Runge (concave diffraction grating)	MFS -4,6,7,8 MFS -3,5 DFS-10M DFS-36 DFS-41 DFS-51 DFS-458S DFS-44 Grand Grand-Ekspert Ekspress Aspekt SpectroLab Polyvac Atomcomp/ICAP Baird HA12	0.55 0.83 0.41 0.26 0.55 0.41 0.52 0.27; 0.36 0.4 0.4 0.55 0.8 0.35 0.5 0.55 0.6	190–410 190–500 200–700 200–500 175–380 170–340 230–350 (190–370)* 200–350;340–550 190–350; 385–470 169–700 190–367; 390–545 190–445 170–500 175–450 175–450 210–450
With crossed dispersion	STE-1	0.38; 0.47; 0.64	220–270 (208–272)* 252–337 (272–355)* 336–450 (380–445)*

* – working spectral range with a MAES analyzer

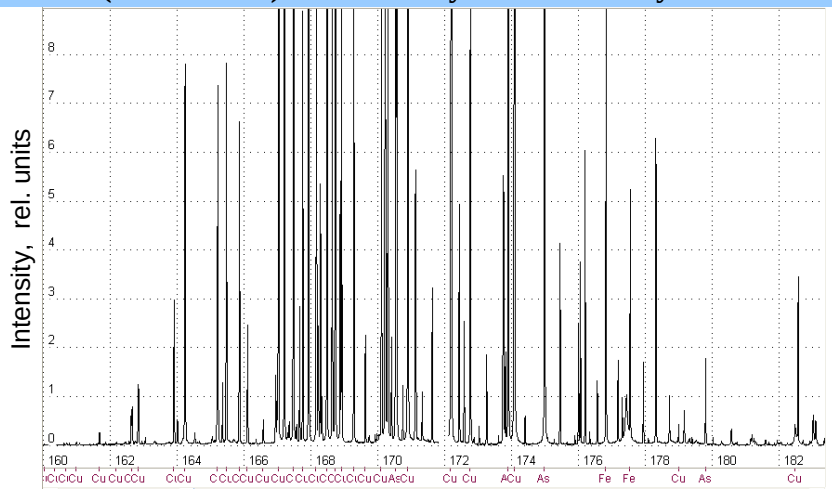
Quantum efficiency of photodiodes



1- Photodiode arrays of MAES analyzers
2- As-built Sony ILX-526A CCD arrays
3- Phosphor-coated Sony ILX-526A CCD arrays

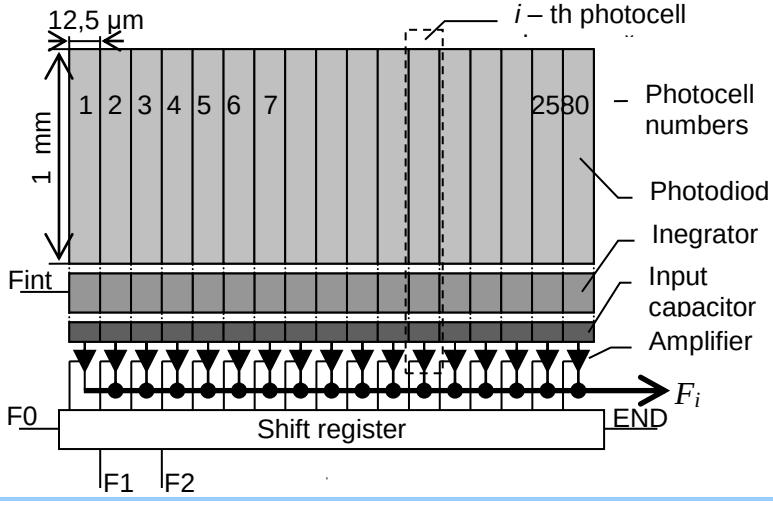
The MAES uses photodiode-based photocells which provide high sensitivity in the UV up to 160 nm without using phosphors.

Fragment of an atomic emission spectrum of copper (160-183 nm) measured by a MAES analyzer



The use of photodiode arrays offers a number of significant advantages: photocells simultaneously start and finish signal acquisition and there is no signal distortion in photocells located near bright spectral lines (no blooming).

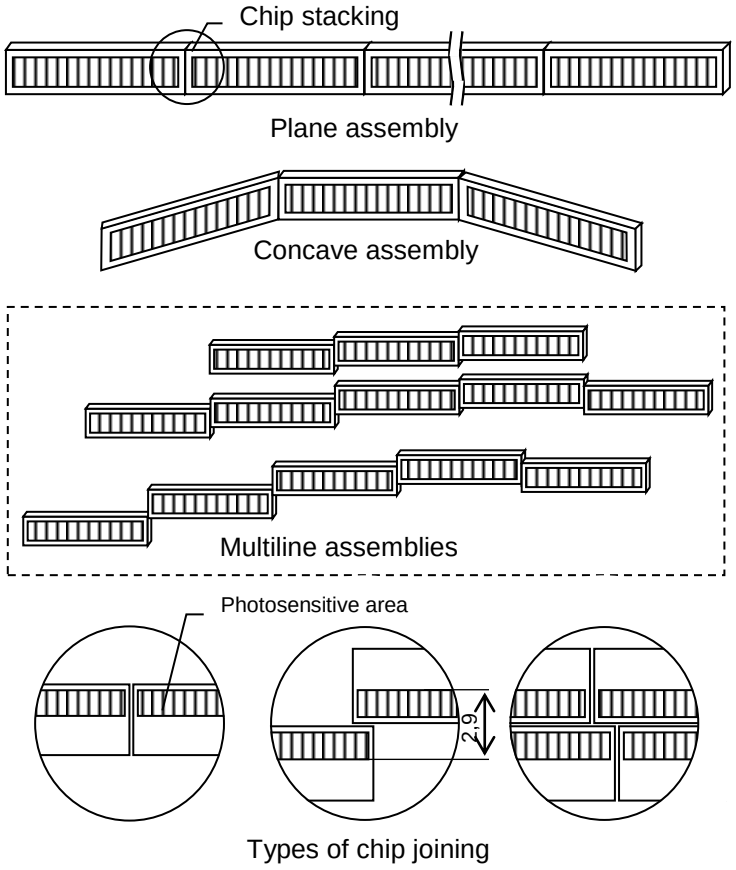
Photodiode array layout



In the multichip assemblies, the chips of photodiode arrays are mounted on a single thermally stabilized base. The photoelectric parameters of the assembly cells are stabilized and their sensitivity threshold is reduced by decreasing and stabilizing the temperature of the arrays using Peltier microcoolers.

The effect of spectral line drift on the results of atomic emission analysis is eliminated by automatic correction of the spectrum temperature shift by 2 or 3 reference lines per assembly.

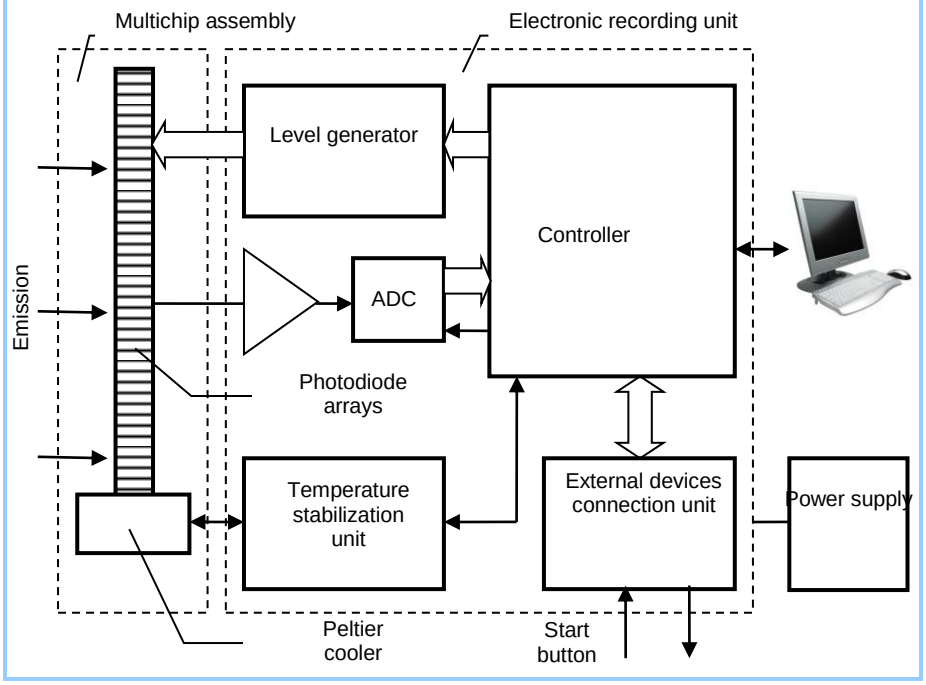
Main types of multichip assemblies



The MAES analyzer includes a multichip assembly, an electronic recording unit, a power supply unit, and a computer with the Atom software. Spectral images obtained at the output of the spectral device are formed on the photosensitive surface of the multichip assembly. All arrays of the multichip assembly simultaneously start and finish spectrum recording. Received signals are converted by a 16-bit analog-to-digital converter (ADC with 65536 counts) into digital values, which are transferred to the computer and processed as a recorded spectrum.

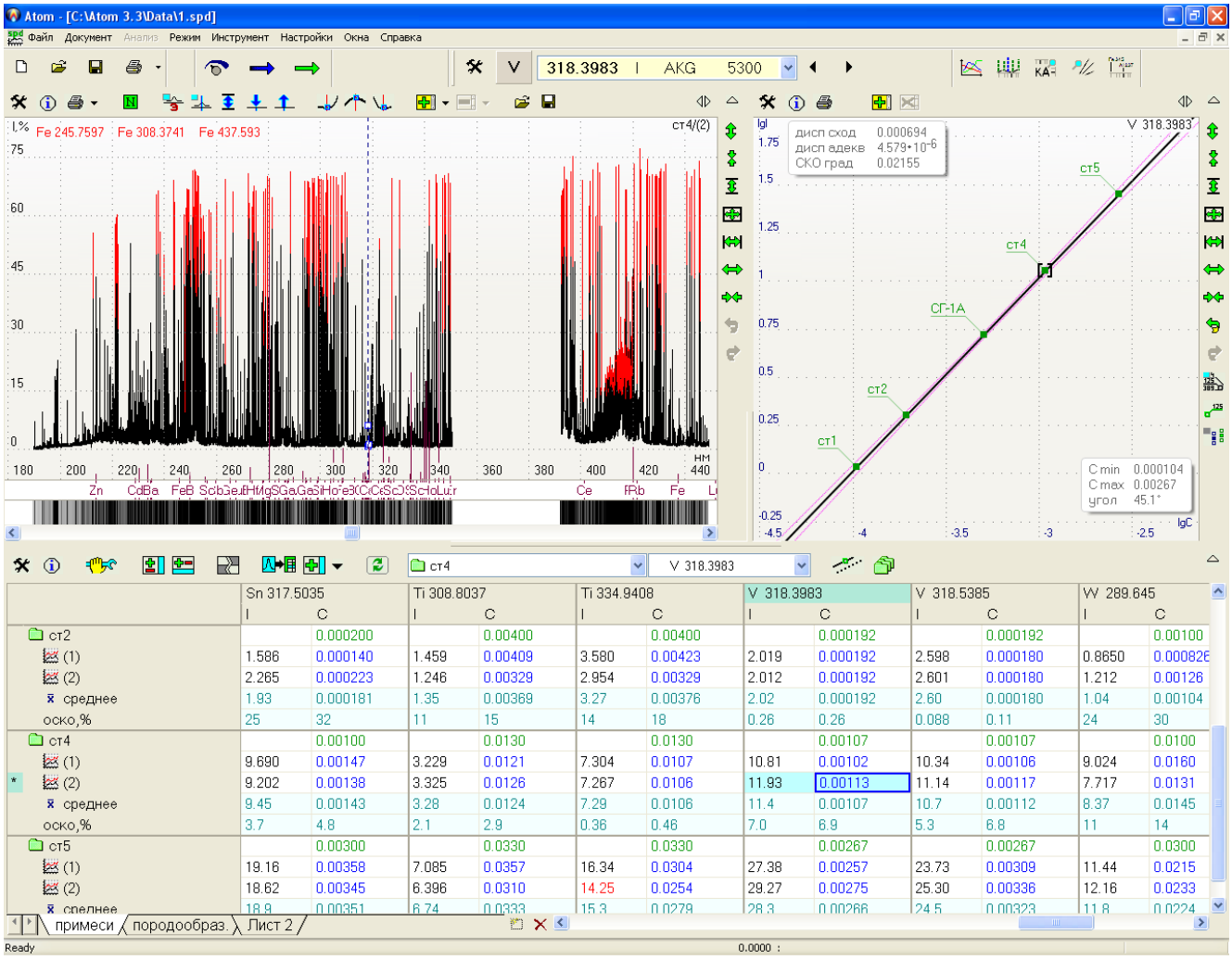
Atomic emission spectral analysis systems with MAES analyzers are instruments for measuring the mass fraction of analyte elements registered under No. 33011-11 in the State Register of Measuring Instruments of the Russian Federation and approved for use in the territory of the Russian Federation.

MAES analyzer layout



Atom software

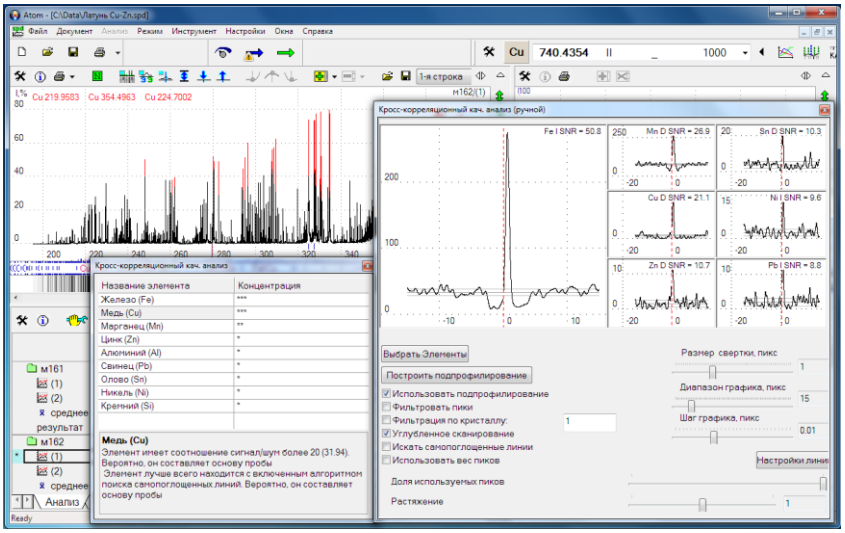
The Atom software runs in MS Windows XP/7/8/10 environment and provides the analyst with a wide range of capabilities for atomic emission spectral analysis, processing atomic emission spectra, calculating concentration, and performing standard and nonstandard tests with maximum efficiency.



The user-friendly interface and the ability to implement almost all known spectral data processing algorithms and to solve most problems of quantitative, semi-quantitative and qualitative atomic emission spectral analysis using reference information (databases of spectral lines, alloys, standards, and reference samples) has made the MAES analyzer attractive for a wide variety of applications.

The Atom software provides:

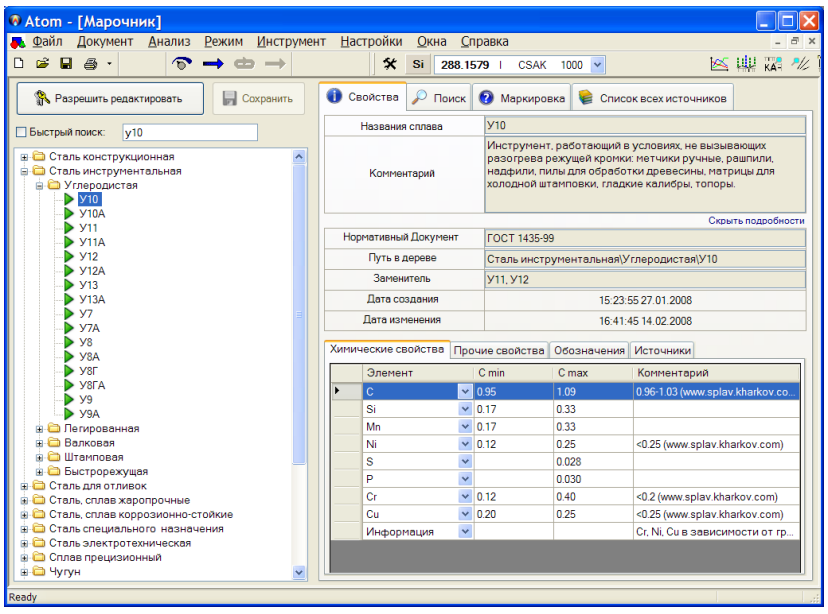
- control of all devices included in the atomic emission spectral analysis system;
- scaling of spectra (overview of the entire spectrum, a spectral region, or a separate line), superimposition of several spectra for visual comparison, display of calibration graphs and tables of results;



- calculation of calibration graphs, processing of a required number of spectra and analytical lines, the implementation of complex analysis methods, mathematical calculation of the mutual influence of elements;
- automatic detection of elements in a sample by its atomic-emission spectrum using cross-correlation qualitative analysis;
- subsequent multiple processing of stored data with the addition of new analytical lines and changing calculation parameters;
- investigation of the change in line intensity during exposure, reduction in the detection limits due to accounting for the fractional introduction of elements into the discharge plasma;
- automatic correction of the temperature drift of spectra during analysis;
- access to databases of the spectral lines of the elements of the Periodic Table, alloy compositions, reference samples, and analysis results;
- the ability to export data to standard spreadsheet applications such as Excel, as well as to user databases;
- monitoring of analytical activities (for example, Shewhart charts).
- verification of MAES analyzers, operations with spectra (addition, subtraction, multiplication by a factor).

The Atom software meets the modern requirements for software products and makes full use of advances in atomic emission spectrometry. The employed algorithms ensure high quality of the analysis results and have been highly appreciated by the users of the MES analyzer and experts in various fields. The Atom software is being actively developed to meet customers' needs and is constantly supplemented with new options for processing analysis data.

The Atom software is registered under No. 2004611127 in the Register of Computer Programs of the Federal Service for Intellectual Property, Patents and Trademarks of the Russian Federation.



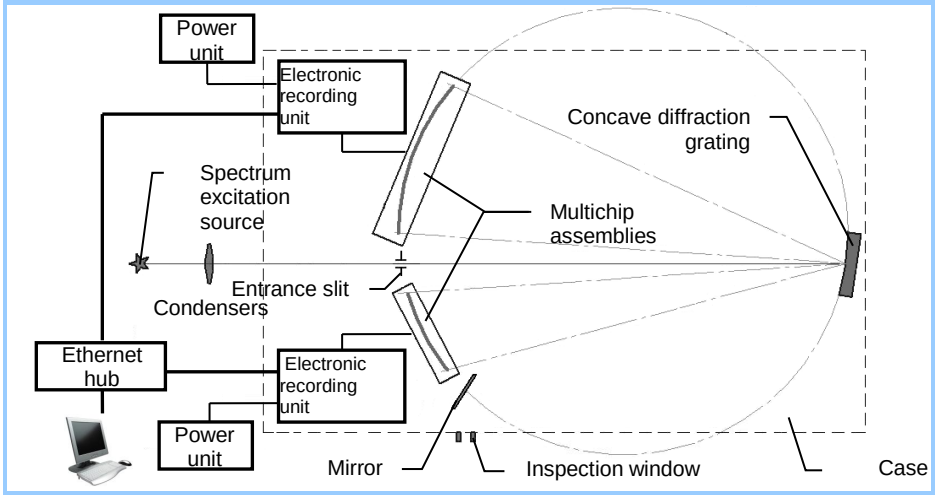
Grand multichannel spectrometers

These spectrometers are designed for qualitative and quantitative spectral analysis of various substances and materials (powders, metals, liquids) in industrial and research laboratories.

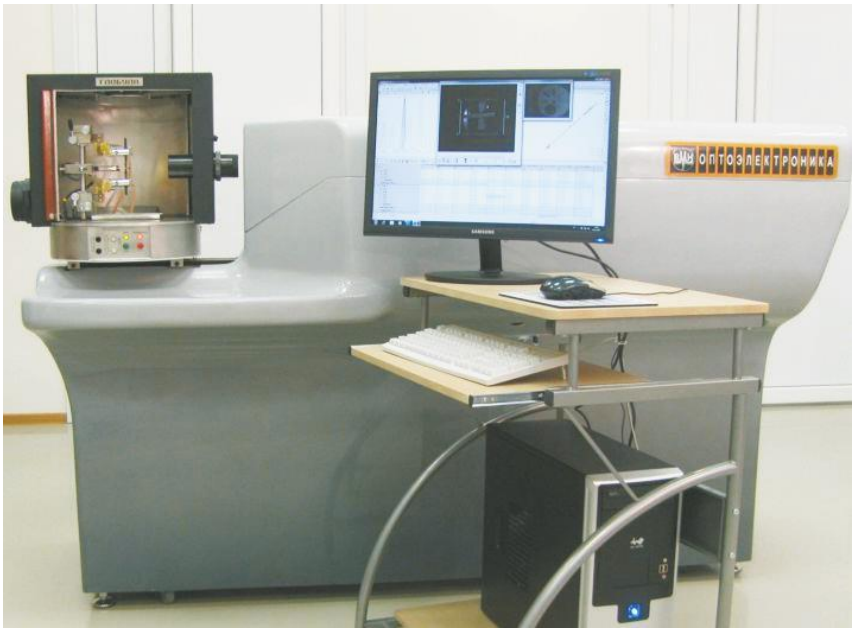
Specifications (TU 4434-932-11855928-2007)		
Name	Grand	Grand-1500
Number of measuring channels	51600	73136
Wavelength range, nm	190–350, 385–470	190–350
Spectral resolution with an entrance slit width of 15 μm, nm	0.012	0.0045
Reciprocal linear dispersion, nm/mm	0.4	0.16
Spectral line shift without profile correction by reference lines, nm/°C	0.002	0.002
Minimum exposure time, ms	80 (3)*	100
Concave diffraction grating: – groove density, g/mm – curvature radius, mm – working order – angle of incidence, deg. – blaze wavelength, nm – ruled area, mm	ruled 2400 1000 first 26.5 220 60×50	holographic 3600 1500 first 39.7 – diameter 60
Dimensions (length×width×height), mm:	1700×750×920	1944×1518×868
Weight, kg	80	180
* for scintillation atomic-emission spectral analysis		

Grand spectrometers are based on a Paschen–Runge mounting with a nonclassical concave diffraction grating and two MAES analyzers (with 12 and 8 photodiode arrays). The array chips are arranged on an arc with a radius of 500 mm. The instrument includes a special table, an optical rail, and a set of condenser lenses. Grand-1500 uses a classical concave diffraction grating and two MAES analyzers, each with 14 photodiode arrays. The array chips are arranged on an arc with a radius of 750 mm.

Grand spectrometer layout



Grand spectrometers come with an electric arc device for analysis of powder samples using the Potok spill-injection method or with Globula or Kristall spectroanalytical stands with Sharovaya Molniya or Vesuvii-3 generators.
The spectrometers may come with an extra display, a desk for samples, closed circulation water cooling unit, and other equipment according to the spectrum excitation source.



The spectrometers are enclosed in a special case (Extra embodiment) to protect their components from the influence of temperature changes, light, and dust. A dust catcher and a noiseless fan create excessive air pressure and ventilation inside the case.

Systems based on Grand spectrometers are instruments for measuring mass fractions of analyte elements (No. 33011-06 in the State Register of Measuring Instruments of the Russian Federation).

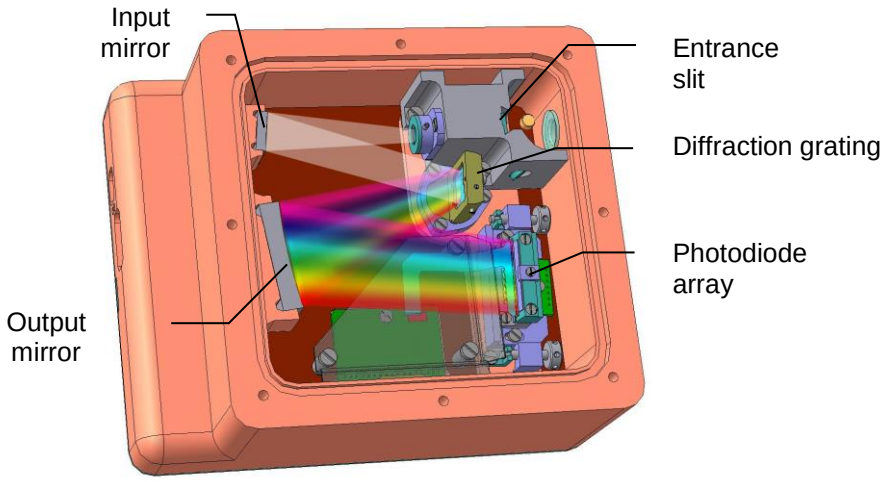
Kolibri-2 compact multichannel spectrometer

The spectrometer is designed for simultaneous determination of alkali and alkaline-earth metals by flame photometry in industrial and research laboratories.

Specifications (TU 4434-931-11855928-2007)									
Number of measuring channels	2612 (BLPP-369)/2048 (BLPP-2000)								
Plane diffraction grating:	ruled						holo-graphic	ruled	
− groove density, g/mm	300	400	600	600	600	1200	1440	1500	1800
− blaze wavelength, nm	315	270	300	500	300	250	240	530	600
− working order	first								
− ruled area, mm	15 × 15				12.7 × 12.7			15 × 15	
Wavelength range, nm	190 –1100	190 –940	200 –670	390 –860	200 –670	190 –430	190 –360	440 –600	470 –590
Spectral resolution, nm	1	0.7	0.4			0.25	0.17	0.2	0.1
Reciprocal linear dispersion, nm/mm	30.9	24	14.4			7.8	7.2	5.3	4.3
Scattered light, %	0.05								
Focal length, mm	100								
Aperture ratio	1:6				1:8			1:6	
Dynamic range (single spectrum recording)	10^4 (BLPP-369)/10^3 (BLPP-2000)								
Minimum exposure time, ms	4 (BLPP-369)/0.4 (BLPP-2000)								
Control	computer								
Power source	single-phase, 220 V, 50 Hz								
Dimensions, mm	150×200×80								
Weight, kg	3.8								

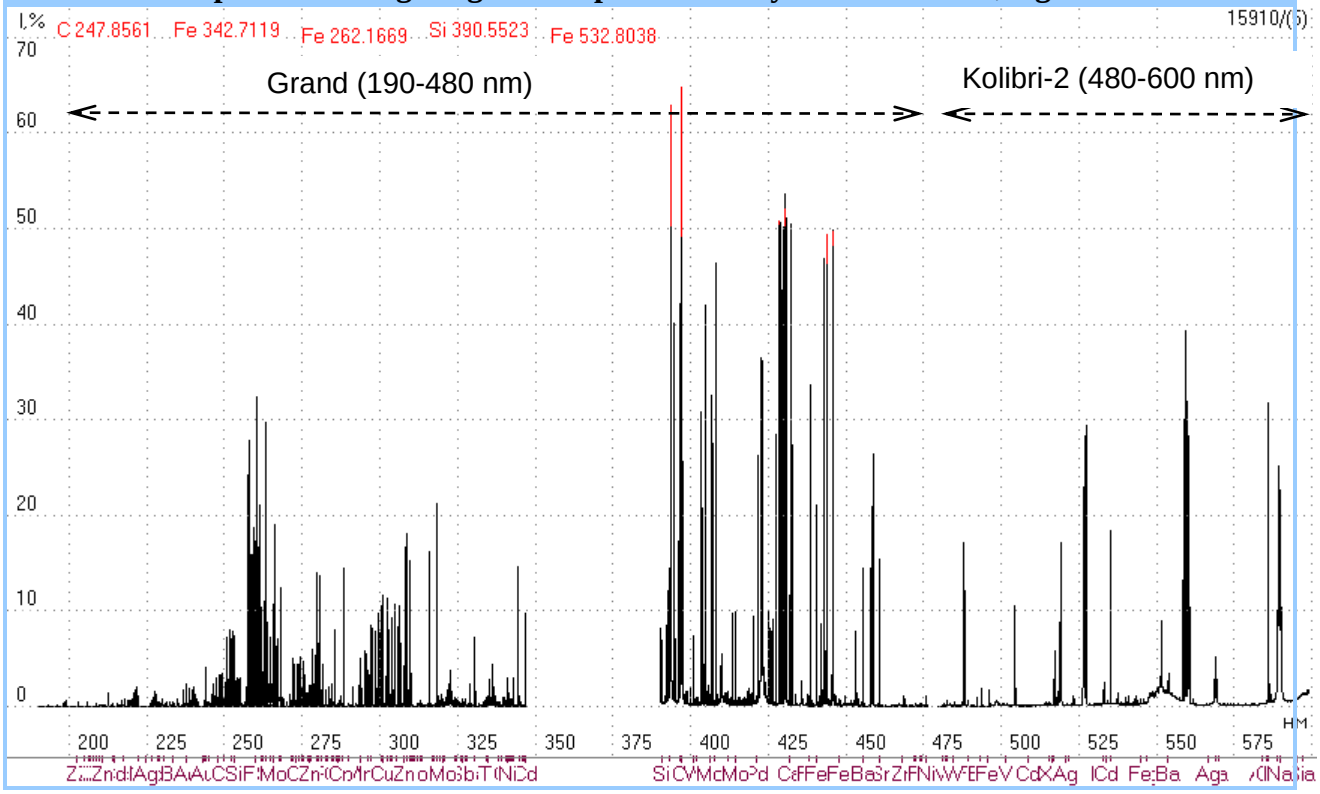
The spectrometer has a Czerny-Turner configuration based on a plane diffraction grating and a MAES analyzer with a single photodiode array. Its optical layout and design are optimized to obtain high quality spectra with low background radiation within the 190–1100 nm spectral range. The working spectral region is varied by changing and rotating the diffraction gratings. The sealed spectrometer case is filled with an inert gas. Radiation is coupled into the spectrometer by means of a quartz condenser lens or a fiber-optic cable.

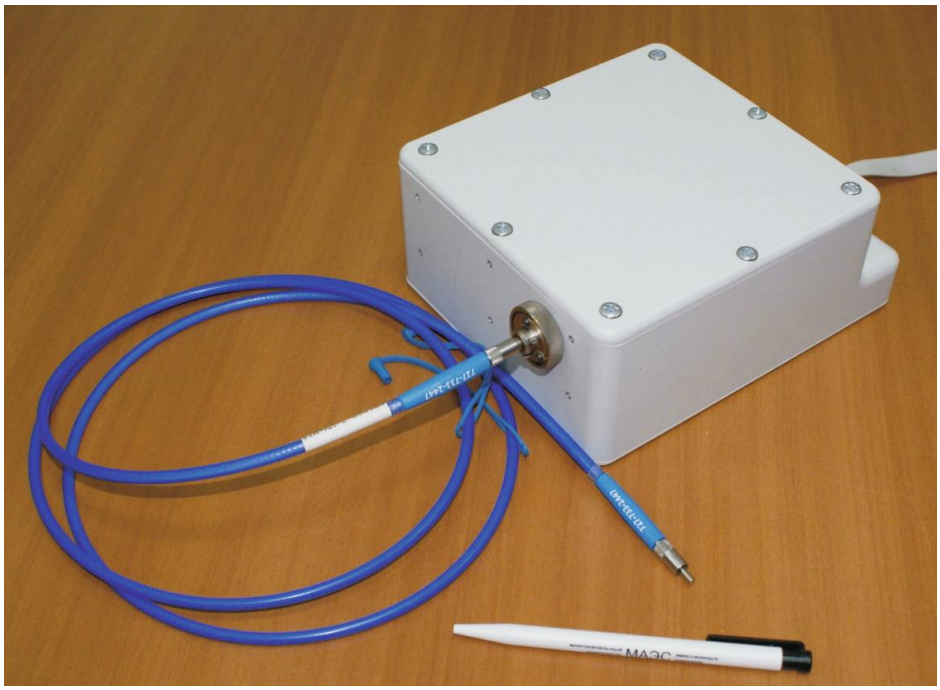
Optical layout of the spectrometer



The spectrometer can be used as an additional instrument for extending the wavelength range of quantometers and spectrographs to determine elements by their most intense lines in the visible and near-IR spectrum. For example, a combination of a Grand spectrometer and a Kolibri-2 spectrometer extends the spectral range to longer wavelengths up to 600 nm, which increases the range of detectable silver concentrations and allows detection of sodium and barium.

Arc spectrum of a geological sample with analytical lines of Ba, Ag and Na





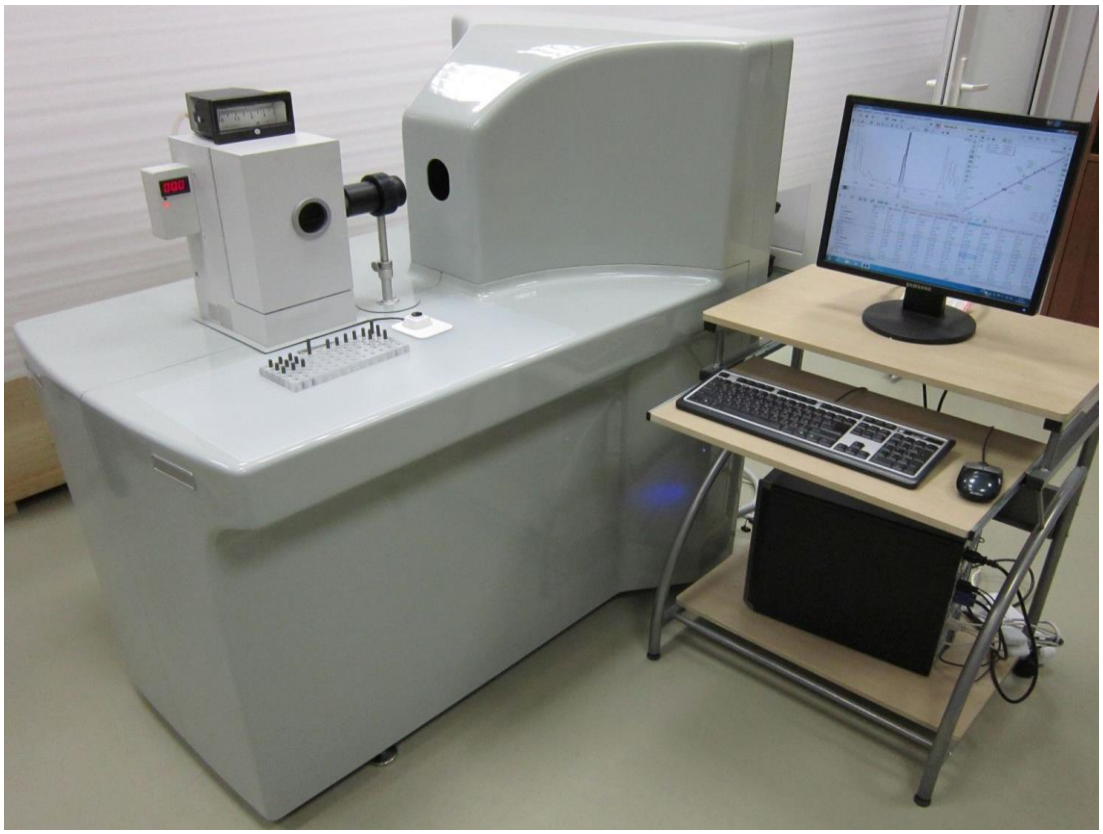
«Express» universal spectrometer

The delivery set consists of spectrometer with MAES preinstalled in it, stand with arc/spark semiconductor generator, a computer, a table and a chair, printer stand, and some additional equipment as well - probe preparation machine, calibration probe sets for initial setup and routine control, etc.

This spectrometer is designed to perform direct qualitative and quantitative spectrum analysis of different substances and materials (powders, metals, liquids) in industrial and research labs.

"Express" is distinguished for its compact size thanks to vertically placed optical Paschen–Runge scheme. Based on nonclassical concave diffraction grating with two MAES analysers 10 photodiode arrays each. Arrays are forming 520mm radius. Express comes with special table with the built-in computer and the spectrum excitation source.

Technical specifications	
Amount of measuring channels	31 344
Wavelength range, nm	190 ÷ 410
Spectrum resolution with an entrance slit 15 μm, nm	0,016
Reciprocal linear dispersion, nm/mm	0,55
Minimal exposition time, ms	100
Diffraction grating (concave, grooved): - Groove density, lines/mm - Radius, mm - Reflection order - Angle, º - Blaze wavelength, nm - Grooves area size, mm	 1800* 1000 20 260 66 ´ 40
Dimensions, mm	1230´750´1400
Weight, kg	110
* – spectrometer can be equipped with diffraction grating with groove density 600, 900, 1200 или 2400 lines/mm	



To eliminate temperature changes, excess light and dust, spectrometers can be equipped with a special protective case. Inside of such case there is a dust-catcher and a noiseless fan, which creates an excessive air pressure and a ventilation of an inside area.

Features
«Express» universal spectrometer comes with generator "Vesuviy-3", "Crystal" and other universal stands, and a stand-alone cooling system for electrode arms.
To eliminate temperature changes, excess light and dust, spectrometers can be equipped with a special protective case.

Systems based on «Express» spectrometer are a measuring devices for a fractions of total mass of detected elements of substances and materials (№ 33011-11 in Russian state registry of measuring devices).

Pavlin flame emission spectrometer

The Pavlin flame emission spectrometer is designed for rapid detection of sodium, lithium, potassium, calcium, barium, cesium, rubidium in technological solutions of a wide range of concentrations (up to eight orders of magnitude). Atoms are excited in an air–acetylene flame.

The device consists of a three-slot burner with flame control, a pneumatic nebulizer, a spray chamber, an optical system for coupling radiation into a Kolibri-2 spectrometer, and an automatic air and acetylene supply system with gas flow control.

The three-slot burner provides increased flame temperature over the central slot of the burner due to the outer layers of the flame, making it possible to detect low concentrations of calcium and barium. At the same time, impurities in highly concentrated solutions can be determined without clogging of the burner slots.

Due to the mirror-lens illumination system of the spectrometer, light is collected from both sides of the burner and coupled into the polychromator.

The spray chamber and burner are made of a chemically resistant alloy in order to analyze highly concentrated lithium solutions.

The small dimensions of the device allow desktop use.

Specifications	
Wavelength range, nm	390–860
Number of measuring channels	2612
Spectral resolution, nm	0.8
Detectable concentration range, mg/dm^3	0.001–10^5
Acetylene flow, liter/min	0.4–0.5
Air inlet pressure, not exceeding, kPa	400
Acetylene inlet pressure, no more than, kPa	150
Control	computer, manual
Power source, V	220
Power consumption, no more than, W	100
Dimensions, mm	500x400x400
Weight, kg	20

Vesuvii-3 universal generator

The Vesuvii-3 universal generator is designed to produce an electric arc or a combined discharge in atomic-emission spectral analysis instruments and provides impurity detection in powder samples from craters of graphite electrodes and direct analysis of metals and alloys.

The generator electronic circuit provides arc current stability with changes in the interelectrode gap and high efficiency at small dimensions. The use of a power factor corrector allows the generator to operate over a wide range of input voltage (150–250 V) to obtain reproducible analysis results under normal factory conditions around the clock.

The generator discharge parameters - the magnitude and polarity of the current and the current pulse and pause durations - can be changed during a single exposure period.

The generator has additional features:

• sound and light indications of the short-circuited stand electrodes facilitate the procedure of setting the value of the analytical gap;

• temperature control of the generator units prevents device failure due to, e.g., deterioration of cooling;

• arc voltage measurement during exposure provides developers of new analysis techniques with additional information.

During generator operation, the current mode name and arc current value are displayed on the front panel of the generator and in the Atom program window. Storing generator modes in the internal non-volatile memory allows the device to operate in an offline mode with local or remote control.

Specifications	
Arc current range, A	2–25
Arc current stability, %	0.5
Arc pulse length, ms	0.5–1000
Pause length, ms	2–1000
Combined discharge parameters: – capacitor voltage, V – capacitor capacitance, μF – inductance, μH – resistance, Ω current impulse frequency, Hz	 300–1000 3 300 0.1 0–400
Power consumption, W	1500
Efficiency, %, not less	75
Control	remote, manual, computer
Power supply	single-phase, 150–250 V, 50 Hz
Dimensions, mm	400×350×200
Weight, kg	16

Sharovaya Molniya spectroanalytical generator

The Sharovaya Molniya (ShM) generator is designed to produce electric arc and spark discharges in atomic-emission spectral analysis systems. The generator is developed specifically for use in the spectral analysis of complex composition samples involving the simultaneous determination of impurities and alloying components over a wide range of concentrations.

Sharovaya Molniya is a reliable, high-tech, and versatile device based on power IGBT transistors. The generator operation is controlled by an embedded microcontroller which allows the analyst to set optimal spectrum excitation conditions, including changing the polarity, duration, and current intensity during a single exposure. Sequential operation of spark and arc discharge modes during a single exposure provides high convergence for major sample components along with low detection limits for impurities.

Operation modes:

• arc modes: AC/DC arc, intermittent arc, and an arc with a step current of given polarity up to 40 A;

• spark modes of variable or specified polarity with a frequency of 1 to 1000 Hz.

Specifications		
	ShM-40	ShM-250
Arc current range, A	2–40	0.5–40
Current pulse amplitude, A	2–40	0.5–250
Arc current setting increment, A	0.1	
Discharge pulse frequency, Hz	1–1000	
Duty cycle, %	1–100	
Current stabilization accuracy, %	0.1	
Number of modes per exposure	8	
Discharge step duration, s	1–1000	1–255
Discharge current rise rate, A/μs	0.1	50
Discharge pulse duration, A/μs	20	10–2000
Maximum pulse energy, J	1	10
AC output frequency range, Hz	1–500	
Frequency range of unipolar intermittent output current, Hz	1–1000	
Current stability (change in output current with a 10% change in input voltage or load resistance, %	1	
Energy conversion efficiency (800W, active load of 2Ω), %	90	
Maximum output power, W	2000	
Maximum power consumption, W	3000	
Control	computer	
Power supply	single-phase, 220 V, 50 Hz	
Dimensions, mm	480×450×170	
Weight, kg	25	30

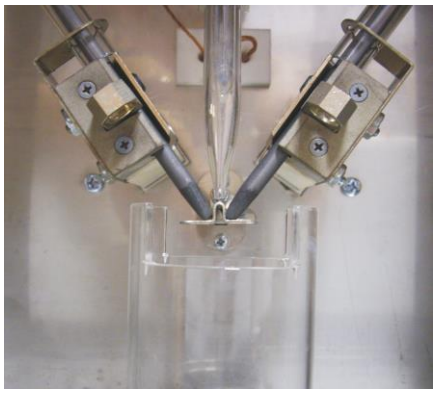
Potok electric arc system for analysis of powder samples using the spill-injection method

The system is designed to produce atomic emission spectra of powder samples in an electric arc using the spill-injection method. It provides high-performance routine analysis, is characterized by low consumption of graphite electrodes, and is used in conjunction with any spectral instruments – Grand, STE-1, DFS-458, MFS-8, PGS-2, etc.

Main applications:

- spectral analysis of powder samples of complex composition;
- mass analysis of geological powder samples;
- analysis for gold, scintillation;
- sample analysis in alumina, silicon, and ferroalloy production.

The compact monoblock design of the system integrates electromechanical devices for sample handling and automatic calibration of the electrode gap, an AC generator up to 40 A, and a computer communication module.



The system shows highly stable operation. The arc powering unit based on advanced semiconductor components provides high efficiency and stabilizes the discharge current, regardless of the electrode condition and sample flow. The electrode gap adjusting means and the funnel mounted on the outer casing of the combustion chamber ensure accuracy in sample conveying and maintaining the electrode gap in continuous operation. The funnel is mounted in such a manner that its cleaning or replacement does not lead to the need for further alignment relative to the electrode gap.

Operation modes: AC/DC arc, intermittent arc, and step-current arc of specified polarity.

Specifications	
Maximum consumption power, W	3000
Pulse frequency, Hz	1, 5, 10, 20, 50, 100, 200, 400, 625, 833, 1000
Arc current range, A	5–40
Energy conversion efficiency (at 800 W, active load 2Ω), %	90
Current stability, %	1
Electrode material	graphite, copper
Electrode dimensions, mm: – diameter – length	 6 50–200
Performance, samples per hour	60–90
Sample feed conveyor, mg/s	1–20
Sample flow path purity, %	99.5–99.9
Control	computer
Power supply	single-phase, 220 V, 50 Hz
Dimensions, mm	400×450×300
Weight, kg	32

Globula spectroanalytical sample stand

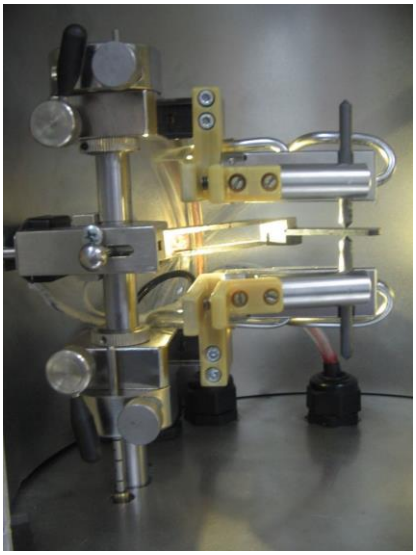
The stand is designed for use in spectroanalytical systems to obtain arc spectra for qualitative and quantitative atomic-emission spectral analysis. Long-term exposures do not require the operator to correct the electrode gap; it is sufficient to set up the electrodes and press the Start button.

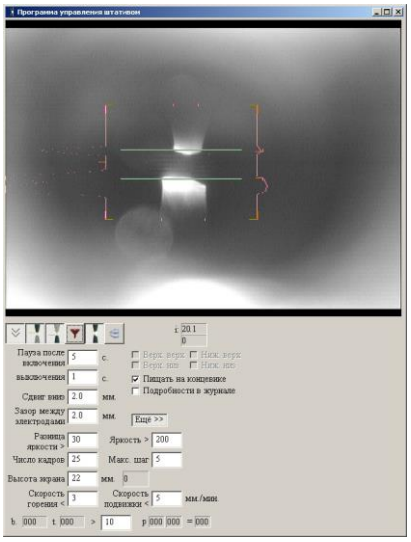
The built-in video camera and electrode holder actuators are used to automatically maintain the electrode gap during sample evaporation by computer analysis of real-time images of the arc discharge, as well as to set the initial position of the gap relative to the optical axis. The electrodes are cooled by a closed cycle cooling unit using water.

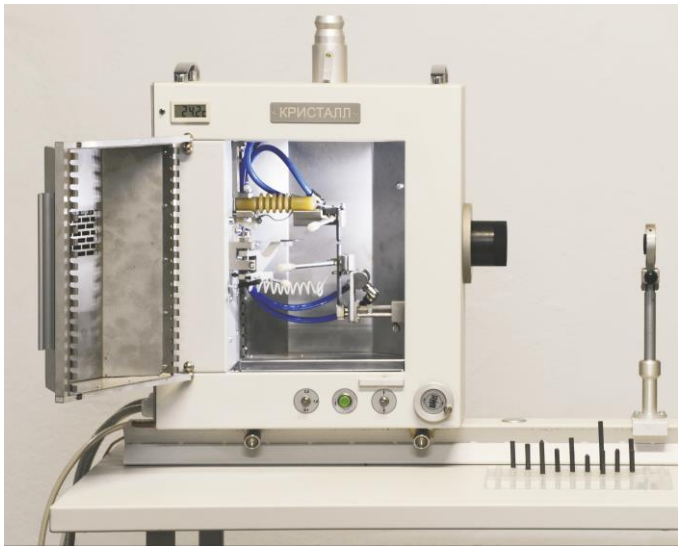
Main applications:

- analysis of pure metals in a globule arc;
- analysis of geological, natural, and industrial non-conductive materials.

Specifications	
Maximum arc current, A	40
Maximum arc current for continuous operation, A	20
Power consumption, W	100
Electrode gap control accuracy, mm	0,1
Control	computer
Power supply	single-phase, 220 V, 50 Hz
Dimensions, mm:	
– stand	365×425×535
– water cooling unit	230×450×520
Weight, kg:	
– stand	32
– water cooling unit (without water)	15







Kristall general sample stand

The Kristall stand is designed to produce atomic spectra of samples for qualitative and quantitative atomic-emission spectral analysis of industrial materials. It is a universal device used in spectral systems.

The sample stand kit includes three interchangeable lower electrode holders for mounting various samples:

- cylindrical (6-60 mm in diameter) and arbitrarily-shaped metal samples weighing up to 2 kg;
- metal and graphite rods (20–150 mm long and 2–12 mm in diameter);
- large wide chips and thin sheet material.

It is possible to use any of the lower electrode holders of the UShT-4 stand. The electrode holders and the stand are cooled by a closed-cycle cooling unit using water.

The doors of the Kristall sample stand are located on both sides, allowing easy access to the electrode holders and water cooling hoses.

Integrated LED lighting of the electrodes along the optical axis allows visual verification of the positions of the electrodes relative to the spectrometer slit.

Automatic setting of the interelectrode gap at 2, 1, and 0.1 mm is possible.

Specifications	
Maximum arc current, not more than, A	100
Maximum arc current for constant operation, no more than, A	25
Power consumption, W	100
Automatic setting of the interelectrode gap, mm	2; 1; 0.1
Power supply (from the generator) , V	12
Dimensions, mm:	
– stand	280×390×430
– stand chamber	218×280×285
Weight, kg	15

Two-pulse laser source for atomic emission spectroscopy

The laser source is designed to produce atomic emission spectra of solid materials such as metal, minerals, glass, etc. for qualitative spectral analysis.

The source is based on a two-pulse YAG:Nd electro-optical Q-switched laser operating at 1064 nm. The duration of each pulse is not more than 10 μs, and the interpulse interval is adjustable between 0 and 60 μs. Focusing the laser beam to a spot size of 300 to 1000 μm makes it possible to carry out microanalysis of inclusions, two-dimensional scanning of surfaces or a local analysis of samples with no damage to the surface. An important advantage of the laser source is rapidity and no need for special sample preparation for a wide range of conductive and non-conductive materials.

Visual observation and guiding the beam onto a sample is accomplished by means of an integrated stereoscopic microscope and a high-resolution digital video camera with image transfer to the computer.

The instrument table with a fixed sample is moved manually for adjusting or by stepper motors in two directions during analysis, which provides surface scanning and spectrum recording with reference to video data. The system can be used in conjunction with any spectral devices — Grand, Aspekt, Ekspress, Kolibri-2, STE-1, DFS-458, MFS-8, PGS-2, and others.

Main applications:

- analysis of microinclusions in geological samples;
- comparative criminological research.

Operation modes: single pulses, series of pulses at a single point, scanning an area or a track.

Specifications	
Maximum power consumption, W	300
Pulse frequency, Hz	1–60
Laser pulse energy, mJ	200–600
Microscope magnification	10
Optical resolution, pairs of lines/mm	100
Spot size, μm	300–1000
Scanning range, mm	20 x 20
Video image resolution	1280x1024
Control	computer
Power supply	single-phase, 220 V, 50 Hz
Dimensions, mm	550x250x700
Weight, kg	15

Fakel two-jet arc plasmatron

The Fakel plasmatron is designed for direct atomic-emission spectral analysis of powder samples. Atoms are excited by argon arc DC plasma. Weak matrix effects and low detection limits allows this excitation source to be used to analyze various samples with both mineral and organic matrices.

The plasmatron comprises a plasma head unit and power supply, sample entry, gas control, and cooling systems. The plasma heads unit provides the alignment of the heads relative to each other and the alignment of the jet merging zone relative to the optical axis of the spectrometer. All adjustments are possible during operation. The design of the heads is patented.

The power supply system provides arc discharge ignition and arc current control and stabilization. A feature of the system is that the energy conversion and pulse-width stabilization of the arc occur at a frequency of 25 kHz using advanced solid-state components. This makes it possible to reduce noise and weight-size parameters, to increase the efficiency to 93%, and to provide high stabilization of the current. The automated sample entry system provides the supply of a powder sample with argon flow to the analytical site of the plasma.

The plasma head unit and the power system are cooled with distilled water. The closed-cycle water-cooling machine has a cooling capacity of 6 kW.

Specifications	
Number of plasma heads	2
Angle between jets, deg.	60–100
Arc current adjustment range, A	40–100
Arc current stabilization error, no more than, %	1
Arc potential difference, no more than, V	150
Argon consumption, liter/min	5
Output power, no more than, kW	15
Control	computer
Power supply, V	380
Dimensions, mm:	
– plasma head unit with protective case	250×250×450
– power system	530×450×360
– sample entry system	410×185×130
– gas control system	300×360×195
– Weight, kg:	
– plasma head unit with protective case	11
– power system	51
– sample entry system	4
– gas control system	9