



Active Co. Ltd.

Analyzers of metals and alloys  
Emission spectrometers  
Development and manufacturing

*Analysis of metals. Easy and affordable!*



**SPAS-02**

Modification 2015

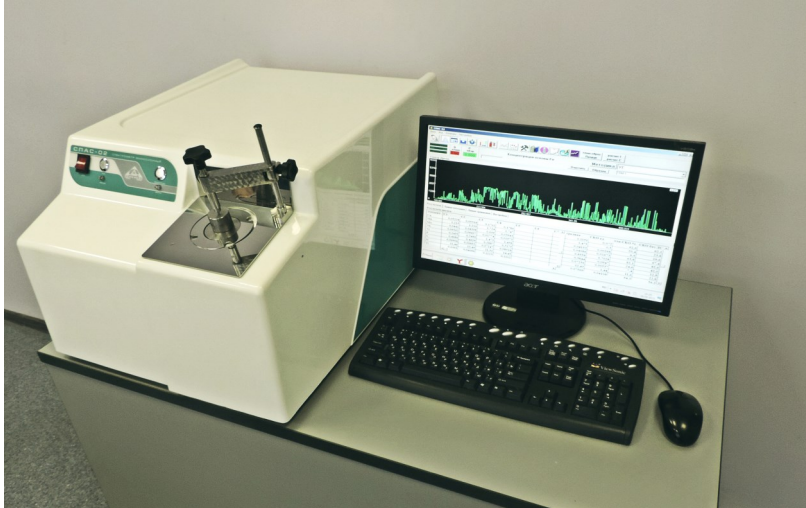


*Modern emission spectrometer for elemental analysis  
of metals and alloys*

[www.activespectr.com](http://www.activespectr.com)

## SPAS-02 — optical emission spectrometer

SPAS-02 is an optimal decision for the customers, who need quick analysis, high specifications, safety and high accuracy of the results of determination of the whole element composition of metal production at minimal costs on purchase, introduction and usage of the device.



### The sphere of application:

- Industrial analytical laboratories of metallurgical and machine-building factories;
- Express-analysis of alloys while melting in workshops;
- Identification of alloy grade in warehouses;
- Research institutes and educational institutions.

## YOUR ADVANTAGES WHILE USING SPAS-02

### ✓ Price

- You get the accurate quantitative analysis of metals and alloys at the best price in the world!
- We keep ourselves in the lower price range of the similar devices in principal, proving in practice, that the accurate analysis of metals is available. Besides, while concluding a contract, a flexible discount system is applied.
- We are ready to reduce the price for you, in case someone will make you a more profitable offer.

### Alloys and elements to analyze

- ✓ SPAS-02 identifies the composition of as well as iron alloys (all types of steel and cast iron) and non-ferrous alloys on any basis (Al, Cu, Zn, Ni, Ti, Mg, Co, Pb etc.).
- The usage of linear arrays allows analyzing the whole range of basic elements used in metallurgy, including S, P, C.

### Metrological performance

- ✓ The accuracy of measurements, made using SPAS-02, is better than the existing requirements of Russian standards of measuring tools.
- Each spectrometer SPAS-02 passes through the state initial inspection at The D.I.Mendeleev All-Russian Institute For Metrology.
- These tests verify the high metrological qualities of SPAS-02 spectrometers and equate them to the world leaders.
- The range of concentrations of measured elements varies from 0,0005% to 45%.
- The relative error varies from 0,3% up to 5% (depending on the concentration).

### Approved device of international standard

✓ SPAS-02 is being produced since 2007. More than 100 devices operate in 7 countries all over the world. Additionally, "Active Co. Ltd.", which is the author and manufacturer, has the ISO 9001 management certificate.

In SPAS-02 spectrometer the 8-year experience of manufacturing and usage of one of the most popular and demanded spectrometers has been taken into account.

Our specialists are constantly working at the improvements of main units of the spectrometer, soaking the best achievements of the world science and technology up, in order to improve:

- Safety;
- Consumer-oriented features and ergonomics;
- Possibility of widening of the stated basic metrological characteristics.

## PARTICULAR QUALITIES AND NOVELTY

In SPAS-02 spectrometer (modification 2015) the following range of the advanced engineering solutions has been realized:

### Optical block

Vacuum construction:

- Allows getting the best metrological characteristics among the spectrometers, made with the help of linear arrays;
- Does not depend on the noble gas quality in comparison with the non-vacuum analogs.

New polychromator construction:

- More solid and repair-suitable;
- Allows adjusting the key spectral lines as precisely as possible;
- Permits resetting in case of considerable changes of analytical tasks.

### Frame

The new frame design made with composite material provides with:

- The great interference immunity;
- Resistance to the temperature oscillations;
- Protection from the environment's influence;
- Easy availability under the maintenance.

### Spark oscillator

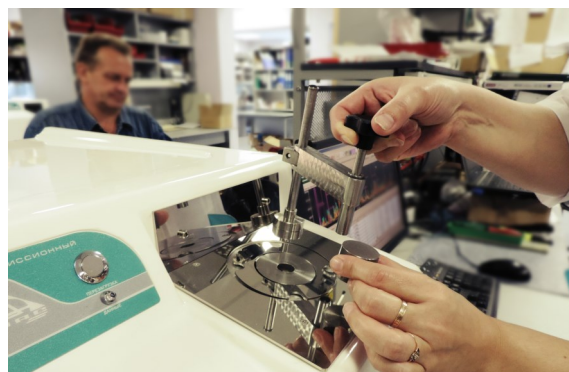
The new spectrum excitation source allows choosing configuration which is optimal for the posed analytical task.

Various modes and their combination – high-energy sparking, spark modes with various options, including quasi-arc – allow solving wide range analytical tasks, including analysis of ultra pure copper and alloys with high silicon level content.

### Spark rack

The new construction provides with:

- Easy and quick setting of the sample;
- Simple tungsten counter electrode's maintenance;
- Replacement of the safety glass within 30 seconds;
- Bidirectional air cooling using argon and adapters allow analyzing thin and small samples.





SPAS-02

File View Commands Settings

Blowing 90 Calculate t Calculate C

Q, U/min: 0.00 P, mBar: 0.0001

Concentration of the matrix -Fe 95,117 % Method Low-, Med-Alloyed Steels

Clear Sample Steel sample test

Results Method lines Comparison lines Settings

Analysis results

Element	C1	C2	C3	C4	C5	C6	C7	C8	Average	SD single	SD rel, %
Al	0,3213	0,3049	0,3093	0,3099	0,3085				0,3108	0,0062	2,0
C	0,2959	0,2863	0,2898	0,2877	0,2866				0,2893	0,004	1,4
Cr	0,1728	0,1707	0,1708	0,1781	0,1735				0,1732	0,003	1,7
Cu	0,165	0,1593	0,1639	0,1596	0,1574				0,161	0,0032	2,0
Mn	0,6128	0,6147	0,6127	0,6156	0,6157				0,6143	0,0015	0,2
Mo	0,2635	0,2549	0,2616	0,2602	0,2596				0,26	0,0032	1,2
Ni	0,1468	0,1413	0,1454	0,1433	0,1433				0,144	0,0021	1,5
P	0,007185	0,006551	0,006997	0,007366	0,006958				0,007011	0,000305	4,3
S	0,007952	0,008149	0,007887	0,007981	0,008477				0,008089	0,000237	2,9
Si	0,2352	0,2258	0,2332	0,2309	0,2256				0,2301	0,0043	1,9
Ti	0,2061	0,1983	0,2022	0,1962	0,1961				0,1998	0,0043	2,2
V	1,169	1,187	1,151	1,165	1,18				1,17	0,014	1,2
W	1,322	1,297	1,324	1,32	1,312				1,315	0,011	0,8

### Analysis results in the SPAS-02 software:

- 5 parallel measurements C1, C2, C3, C4, C5;
- The average value of the concentration of the chemical elements (Average)
- The relative standard deviation (SD rel, %)

Alloys database

Add/Edit

Element	Sample	Cr 25	03X18H11	35.1	Cr 35	30Γ	20.1	Cr 20
n/n	Steel sample tes	ГОСТ 10150-88	ГОСТ 5632-72	ГОСТ 977-88	ГОСТ 10150-88	ГОСТ 4543-88	ГОСТ 977-88	ГОСТ 101
Al	0,3108							
C	0,2893	0,22-0,3	0,0-0,3	0,32-0,4	0,32-0,4	0,27-0,35	0,17-0,25	0,1
Cr	0,1732	0,0-0,25	17,0-19,0		0,0-0,25	0,0-0,3		0,2
Cu	0,161	0,0-0,3			0,0-0,3	0,0-0,3		0
Mn	0,6143	0,5-0,8	0,0-2,0	0,45-0,9	0,5-0,8	0,7-1,0	0,45-0,9	0,3
Mo	0,26							
Nb	<0,001							
Ni	0,144	0,0-0,3			0,0-0,3	0,0-0,3		0
P	0,007011	0,0-0,035	0,0-0,03	0,0-0,04	0,0-0,035	0,0-0,035	0,0-0,04	0,0
S	0,008089	0,0-0,04	0,0-0,02	0,0-0,04	0,0-0,04	0,0-0,035	0,0-0,04	0,2
Si	0,2301	0,17-0,37	0,0-0,8	0,2-0,52	0,17-0,37	0,17-0,37	0,2-0,52	0,1
Ti	0,1998							
V	1,17							
W	1,315							
Fe	95,117 %							
Truly		87,83%	87,83%	87,2%	87,2%	87,01%	86,92%	86

### Identification of alloy grade using the database of alloys in the SPAS-02 software



Spark spots on burning samples

## Software

SPAS-02 software is adapted to Microsoft Windows OS and has a wide range of functions:

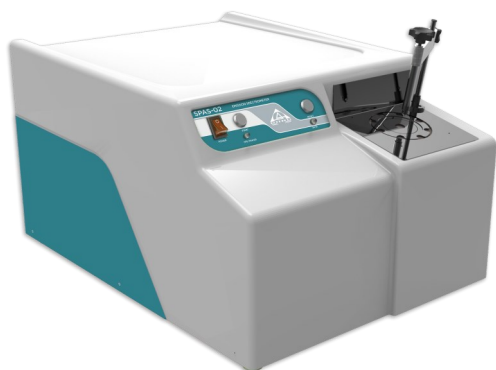
- Control of the gas-vacuum system;
- Automatic profiling and accounting drift;
- Graphic spectrum representation with the opportunity of spectral lines identification;
- Export of the results of the analysis into MS Word;
- The calculation of concentrations in % and ppm;
- Database of alloys with the opportunity to add one's own grades;
- One-point and two-point recalibration;
- The indicator of the analysis process and the self-diagnostic of electronics;
- Possibility to make qualitative analysis if there is no corresponding methods installed on the spectrometer;
- Free access to the factory calibrations and curves;
- Possibility to create one's own analytical methods;
- Individual account of spectral background for each line;
- Use of several spectral lines and comparing lines for each element;
- Automatic selection of the best lines of comparison;
- A unique algorithm of processing results, based on the methods of correlation analysis for reduce the random and systematic errors;
- Automatic account inter-element additive and multiplicative effects.

# ANALYTICAL CAPABILITIES FOR THE MOST POPULAR GROUPS OF ALLOYS\*

Element	Fe-base		Cu-base		Al-base	
	Min, %	Max, %	Min, %	Max, %	Min, %	Max, %
<b>C</b>	0,001	4,0	0,002	0,04	-	
<b>Si</b>	0,001	4,0	0,0001	7,5	0,0003	25,0
<b>Mn</b>	0,001	28,0	0,0005	7,0	0,0001	12,0
<b>P</b>	0,0005	1,2	0,0005	1,1	0,001	0,02
<b>S</b>	0,0005	0,7	0,0004	0,13	-	
<b>Cr</b>	0,001	30,0	0,00002	2,5	0,0001	0,37
<b>Ni</b>	0,001	35,0	0,00005	35,0	0,001	4,5
<b>Mo</b>	0,0005	11,0	-		0,005	0,02
<b>V</b>	0,0005	11,0	-		0,0005	0,12
<b>W</b>	0,005	19,0	-		-	
<b>Fe</b>	reference		0,0004	6,5	0,001	3,3
<b>Cu</b>	0,0005	8,0	reference		0,001	22,0
<b>Al</b>	0,001	3,0	0,0005	12,5	reference	
<b>Ti</b>	0,0005	3,0	0,0001	0,9	0,0005	0,3
<b>Mg</b>	0,005	0,12	0,0001	0,2	0,0001	11,0
<b>Zn</b>	0,001	0,03	0,0001	46,0	0,0001	12,0
<b>Pb</b>	0,003	0,25	0,0005	22,0	0,0005	1,0
<b>Sn</b>	0,0004	0,19	0,0003	22,0	0,001	1,0
<b>Sb</b>	0,005	0,15	0,0005	1,3	0,005	0,14
<b>Nb</b>	0,001	3,0	0,005	1,3	-	
<b>As</b>	0,001	0,1	0,0001	0,5	0,001	0,01
<b>Ag</b>	-		0,0001	1,6	0,0003	1,1
<b>B</b>	0,0004	1,1	0,0002	0,01	0,0002	0,03
<b>Bi</b>	0,007	0,12	0,0001	4,5	0,001	0,65
<b>Be</b>	-		0,0001	3,5	0,0001	2,8
<b>Co</b>	0,0005	10,0	0,0001	2,4	0,001	0,65
<b>Ca</b>	0,0001	0,01	-		0,0001	0,02
<b>Cd</b>	-		0,0003	0,13	0,001	0,35
<b>Ce</b>	0,0025	0,25	-		0,0025	0,05
<b>Se</b>	0,001	0,4	0,0001	1,4	-	
<b>Zr</b>	0,001	0,1	0,0002	0,4	0,0001	0,33
<b>Li</b>	-		-		0,0002	0,05
<b>Ga</b>	-		-		0,0005	0,04
<b>Te</b>	-		0,0003	0,07	-	

\* Undoubtedly, spectrometer SPAS-02 can analyze any other alloys on the basis of Ni, Co, Mg, Zn, Ti, Pb, Sn etc.

## BRIEF TECHNICAL CHARACTERISTICS



### Dimensions and weight

Length, not more than, mm	690
Width, not more than, mm	510
Height, not more than, mm	400
Weight, not more than, kg	50

### Optical scheme

- Paschen-Runge scheme
- Rowland circle's diameter is 330 mm
- Reciprocal dispersion is 1.4 nm/mm
- Spectral resolution in the range is not more than 0.04 nm
- Diffraction grating is 2100 line marks/mm
- Multi-element CCD system with a total of more than 25,000 channels and the size of the channel about 8 microns
- Spectral range is 174-455 nm (non-vacuum option: 185-455 nm)
- Automatic profiling and accounting drift
- Minimum time cycle of spectrum accumulation - not less than 0,001 s

### Vacuum system

- Vacuum pump
- Trap oil mist
- Computer control of vacuum

### Excitation system of spectrum

- Low voltage unipolar spark in an argon atmosphere (or quasi-arc in an argon atmosphere)
- Voltage in modes: 300, 400, 500 V
- Capacitance in modes: 2, 4, 6 uF
- Computer control of the discharge frequency, voltage and pulse energy
- Automatic change of the discharge parameters in the transition from sparking to the analysis
- Open design of table
- Tungsten electrode

### System of control and data processing

- Integrated computer
- Operating system Windows 7 or higher
- The output to the monitor and printer
- Ability to connect to the corporate network and the Internet
- Transfer measurement results using USB-drive

### Operating conditions of the spectrometer

Spectrometer to be operated indoors, satisfying the requirements of the laboratory premises:

To ensure proper operation of the device the table with the spectrometer must be installed on a hard floor in a room with low vibration.

Ambient temperature	10-35 °C
Atmospheric pressure	84-106,7 kPa (630-800 mmHg)
Relative humidity (at T=25 °C )	not more than 80%
Electrical power	(220 <sup>+22</sup> <sub>-33</sub> ) V, (50±2) Hz



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