



Metal and Alloy Analyzers
Emission Spectrometers
Development and Manufacturing

ANALYSIS OF METALS IS EASY AND AFFORDABLE

SPAS-05

Modern Emission Spectrometer
for Elemental Analysis of Metals and Alloys



reliable
engineering
solutions



root-mean-square
deviation 0-3%, detection
limit from 5 ppm



state-of-the-art
and functional
design



Spectrometer SPAS-05
is registered in National Register
of Measuring Equipment of the Russian Federation
under No. 69181-17



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.

SPAS-05 is an optimal decision for the customers who need quick analysis, high specifications, reliability and high accuracy of the results of determination of the whole element composition of metal products at minimal costs on purchase, implementation and usage of the device.

SPAS-05

ADVANTAGES OF THE USE

Alloys and elements to analyze

SPAS-05 identifies the composition of any types of metal alloys both iron alloys (all types of steel and cast iron) and non-ferrous alloys on any basis (Al, Cu, Zn, Ni, Ti, Mg, Co, etc.). The use of UV area of operating range allows analyzing the light elements such as S, P, C.

Metrological performance

The accuracy of measurements, made using SPAS-05, is better than the existing requirements of Russian standards of measuring tools that regulate analysis of metals on the territory of CIS and Eurasian Economic Union.

Each spectrometer SPAS-05 passes through the independent state primary verification at The D.I.Mendeleev All-Russian Institute For Metrology. These tests verify the high metrological qualities of spectrometers SPAS-05 and equate them to the world leaders.

SPECIFICATIONS

OF MAJOR COMPONENTS

Case

The use of composite material with low heat conductivity factor in a **new case design provides:**

- perfect interference immunity, enhanced resistance to temperature fluctuations;
- environmental protection;
- easy accessibility to construction with routine maintenance.

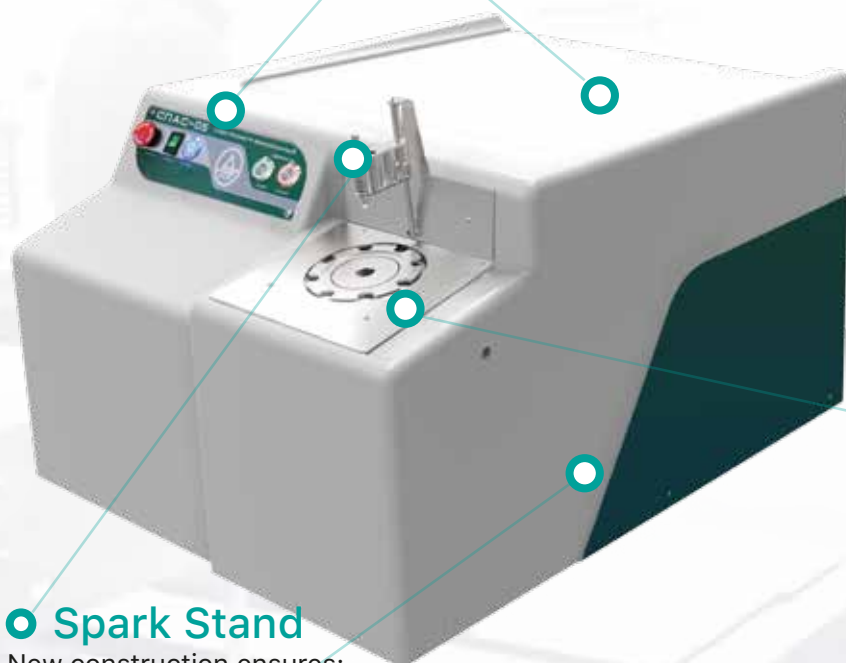
Optical Unit

Vacuum construction:

- allows getting the best metrological performance among spectrometers based on CCD;
- reduces dependence on environmental temperature fluctuations.

New polychromator construction:

- more durable and consistent: resistant to vibrations and transportation
- allows adjusting the key spectral lines of elements as precisely as possible
- Permits resetting in case of considerable changes of analytical tasks.



Spark Stand

New construction ensures:

- easy and fast placing of the sample
- fast lifting of the lid of spark table for electrode area maintenance;
- replacement of the safety glass within 30 seconds, easy access to the lens.

Software

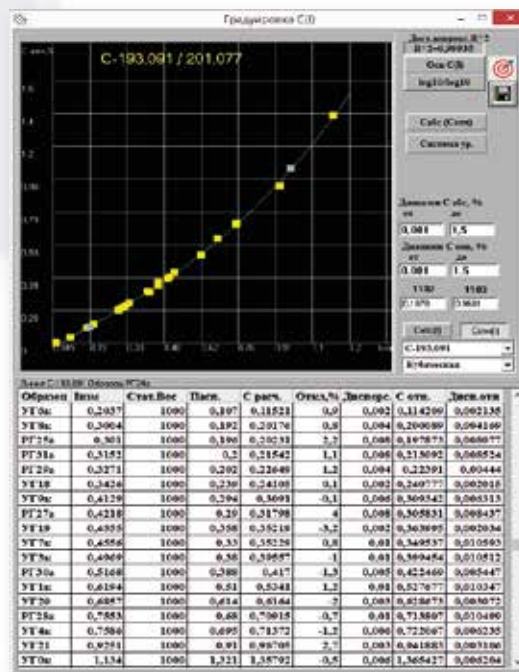
Spectrometer SPAS-05 software is adapted for Microsoft Windows and has the following wide range of functions:

- gas and vacuum system control;
- graphic representation of spectrum with opportunity to identify spectral lines;
- export of analysis results into MS Word and OpenOffice;
- calculation of concentrations in % and ppm;
- database of alloys with opportunity to add own grades;
- one-point and two-point recalibration;
- analysis process indicator;
- qualitative analysis possibility if there is no corresponding method installed on the spectrometer possibility;
- access security to factory calibrations (operating mode "Lab Assistant") with the possibility to perform such works under control of representative from manufacturing plant (operating mode "Engineer");
- possibility to create own analytical methods.

Spark Gap 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 parameters, including quasi-arc parameter – allow solving wide range analytical tasks.



Approved device

of international standart



SPAS-05 is the fifth generation of SPAS-series spectrometers being produced since 2007. More than 200 devices operate in 7 countries all over the world.

The 10-year experience of manufacturing and use of one of the most popular and demanded spectrometers SPAS-02 and other modifications has been taken into account in spectrometer SPAS-05.

NOVELTY

Our specialists are constantly working at the improvements of main units of the spectrometer, using the best achievements of the world science and technology, in order to improve reliability, consumer-oriented features and ergonomics, possibility of widening of the stated basic metrological characteristics.

We have kept nothing but the best from the previous models. However, the following range of new progressive technical solutions was realized in spectrometer SPAS-05:

- combined thermal stabilization of optical unit which includes isolation outer composite case and active thermal stabilization system inside polychromator;
- «clear optics» system which automatically monitors vacuum level and controls residual medium composition of optical unit with a view to prevent optical elements from pollution;
- possibility to correct factory analytical settings while in operation,
- easy replacement of the safety glass, fast lifting-installation of the upper lid of spark table (without the use of tools).
- reduction of vacuum pump operation up to 20 times with regard to total operating time of spectrometer (pump life increases, temperature decreases, possibility of oil mist generation decreases).

All mentioned new advantages are tried and true on the latest devices of the previous model SPAS-02 manufactured in 2017.

DEMONSTRATION

OF ANALYTICAL CAPABILITIES

Table 1

Example of accuracy of low-alloy steel CRM analysis results

Element	Rated content, %	Rated error, %	Measured content, %	Difference, %
Al	0,47	0,02	0,458	0,012
C	0,088	0,001	0,0902	0,0022
Cr	1,51	0,01	1,507	0,003
Cu	0,49	0,003	0,4811	0,0089
Mn	0,177	0,002	0,1713	0,0057
Mo	0,049	0,001	0,0518	0,0028
Ni	1,87	0,01	1,851	0,019
P	0,0067	0,0004	0,0061	0,0006
S	0,0055	0,0006	0,0049	0,0006
Si	0,135	0,004	0,1344	0,0006
Ti	0,027	0,002	0,024	0,003
V	0,121	0,002	0,123	0,002
W	0,43	0,01	0,4262	0,0038

Table 2

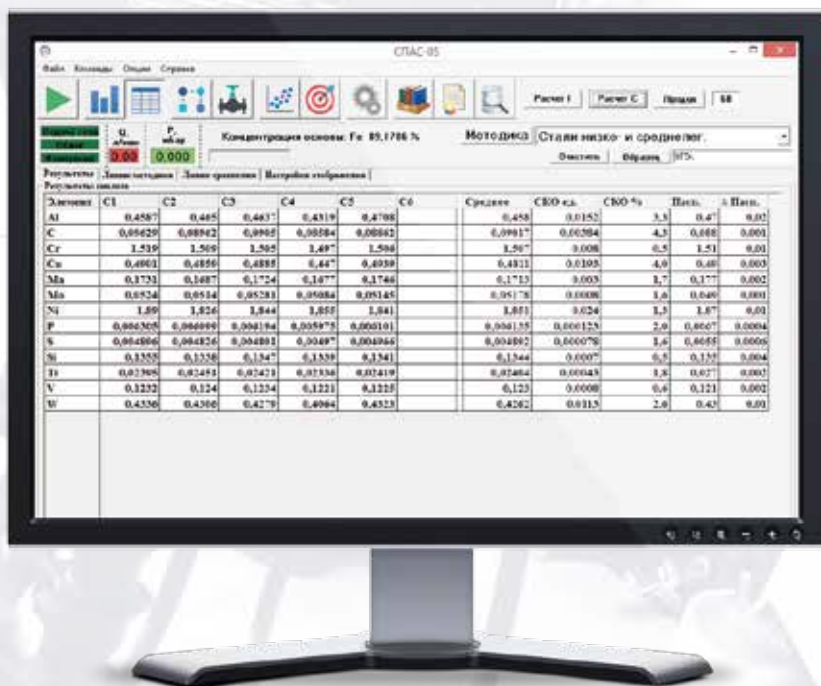
Example of accuracy of low-alloy cast iron CRM analysis results

Element	Rated content, %	Rated error, %	Measured content, %	Difference, %
C	2,94	0,02	2,904	0,036
Cr	0,476	0,004	0,4725	0,0035
Cu	0,7	0,01	0,68	0,02
Mn	0,454	0,004	0,446	0,008
Mo	0,406	0,005	0,401	0,005
Mo	0,049	0,001	0,0518	0,0028
Ni	0,542	0,004	0,529	0,013
P	0,232	0,004	0,223	0,009
S	0,036	0,001	0,04	0,004
Si	1,5	0,01	1,501	0,001
Ti	0,027	0,001	0,028	0,001
V	0,086	0,001	0,0847	0,0013

Table 3

Example of accuracy of high-alloy stainless steel CRM analysis results

Element	Rated content, %	Rated error, %	Measured content, %	Difference, %
Al	0,01	0,003	0,0118	0,0018
C	0,038	0,001	0,0367	0,0013
Cr	15,01	0,07	15,18	0,17
Cu	0,045	0,001	0,0437	0,0013
Mn	2,05	0,02	2	0,05
Mo	0,141	0,004	0,137	0,004
Ni	12,04	0,05	11,88	0,16
P	0,0132	0,0005	0,0117	0,0015
S	0,017	0,0007	0,0186	0,0016
Si	0,65	0,01	0,638	0,012
Ti	0,26	0,01	0,271	0,011
V	0,128	0,006	0,132	0,004
W	0,05	0,001	0,053	0,003



BASIC SPECIFICATIONS

Optical scheme

- Paschen-Runge scheme;
- Rowland circle's diameter: 330 mm;
- Reciprocal dispersion: not more than 1.4 nm/mm;
- Diffraction grating: 2100 line marks/mm;
- Multi-element CCD sensor system with a total or more 25,000 channels and the size of the channel about 8 μm ;
- Spectral range: 174-455 nm (non-vacuum option: 185-455 nm);
- Width of spectral slit – not more than 10 μm ;
- spectral resolution – not more than 0,05 nm.
- Minimum time cycle of spectrum accumulation – not less than 0,001s

Excitation system of spectrum

- Low-voltage unipolar spark in an argon atmosphere (or quasi-arc in an argon atmosphere);
- Bidirectional air cooling (lateral and coaxial) of spark gap using argon;
- Computer control of the discharge frequency, voltage and pulse energy;
- Optimization of spectrum excitation parameters both for additives (ppm units) and for high contents of elements (up to 45%);
- Automatic change of the discharge parameters in the transition from sparking to the analysis;
- Tungsten electrode that does not require replacement;
- Preliminary spark gap ensures stable reproducibility of discharge pulse parameters.

Overall dimensions, weight of spectrometer

length/width/height, mm – 670x500x400;
weight, kg – 50

Vacuum system «Clear Optics»

- Low-noise vacuum pump with shutoff valve and oil mist trap;
- Computer control of residual medium composition in polychromator, maintenance of vacuum optimum level;
- Discrete operating mode of vacuum pump (ratio of on-line state to total operating time 1 to 20) with a view to eliminate vacuum oil heating and to enhance pump operational life;
- Vacuum system can operate in autonomous twenty-four-hour mode; as a result, spectrometer is ready for operation any time.

System of control and data processing

- Integrated computer;
- Operating system Windows 10;
- monitor FullHD, keyboard, mouse, uninterruptible power supply;
- Ability to connect printer, additional or back-up monitor;
- Ability to connect to the corporate network and the Internet.



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