A SMALL ATOMIC–ABSORBING METER OF LIAD MICROCONTENT IN SOLIDS, LIQUIDS, AND ATMOSPHERIC AEROSOLS

The instrument is intended to measure small contents of lead in liquids, solids, and atmospheric aerosols in field and laboratory conditions in real time.

Its general principle of operation is the absorption of radiation from a resonant lamp by lead vapor obtained through atomization of the examined sample in a high–temperature graphitic tube furnace (cavity). Thermal atomization is accompanied, as a rule, by nonresonance attenuation of radiation from this lamp by molecular impurities and aerosols. In connection with this, the instrument is equipped with an effective device correcting a measurable signal and harnessing the Zeeman effect in atoms in a transverse static magnetic field.

Preliminary preparation of the sample is not required for an analysis of the lead content in liquids. The examined liquid is loaded directly into the analytic cavity. The samples for an analysis of atmospheric aerosols are intaken by means of air pumping through the cavity. Aerosol particles are deposited on its internal walls under electric field. Solids must be dissolved, as a rule, for their subsequent analysis.

The meter consists of three principal units. An optical unit incorporates a hollow–cathod–lamp, an acousto–optical modulator of the polarization of radiation from this lamp, an electrothermic atomizer, a magnetic system, a spectral device, and a photodetector. A unit of control and signal processing incorporates electronic blocks of control over the optical unit. It processes the recorded signals, displays the results on a digital display, and stores them on external paper and magnetic media in the format of documents. A unit of electrostatic aerosol intake is capable of air intake at arbitrary distance from the analytic unit. It includes a microcompressor for pumping of the sample, a high–voltage supply for creation of the electric field inside the cavity, a timer, and an accumulator.

The meter operates semiautomatically. The cavity with the sample is inserted into the analytic unit. The instrument warms up this cavity in four regimes, controlled by an automated program for about 1 s, measures the lead content, and represents the results in the format of documents.

To evaluate the absolute concentrations, the instrument must be calibrated against standard solutions.

SPECIFICATIONS

Limiting detectable lead content in a sample	$2 \cdot 10^{-12}$ g
Range of measurable lead content in a sample	$(10–2000) \cdot 10^{-12}$ g
Instrumental error	no more than 5%
Average supplied power	40 W, 220 V
Pulsed supplied power	1.5 kW
Overall dimensions: optical unit	500×200×150 mm^3
electronic unit	50×300×150 mm^3
air intake unit	200×200×70 mm^3
Weight	no more than 30 kg
Maintenance personnel	1 operator

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In 1994 the Editorial Board of the Journal *Atmospheric and Oceanic Optics* intends to publish the thematic issues on the following problems:

* Image transfer through scattering media,
* Ecological monitoring of the atmosphere in local territories,
* Atmospheric adaptive optics,
* Application of laser radar and local methods to the study of atmospheric and water pollution of the Volga Basin.

All the questions about these thematic issues you may address to the Editorial Board of the Journal.