

Specifications for a furnace atomic absorption system with Zeeman graphite furnace.

SPECTROMETER:

- The spectrometer must be a single-path optical system. The optical system must be sealed within protective covers and incorporate front-surfaced, reflecting optics with protective coating.
- The monochromator must have a minimal spectral range of 190-870 nm and wavelength selection must be automated and controlled through the instrument computer.
- The monochromator must be of a Littrow design with a minimum focal length of 267 mm.
- The grating must be dual blazed for optimal performance in both the UV and visible regions of the spectrum. The grating must have a minimum rule density of 1800 lines/mm and a minimum area of 4600 mm².
- The grating must be blazed at both 236 nm and 597 nm.
- The instrument must have at least three separate bandwidth slits that are automatically selectable. These slits must be 0.2, 0.7, and 2.0 nm.
- The instrument must accommodate up to eight lamps. The lamps must not have any manual lamp adjustments. All lamp alignments must be accomplished automatically through the instrument controller. The lamp mounts must be fixed and not in a turret.
- The optical system must be compatible for optimal use with coded hollow cathode lamps, electrodeless discharge lamps, or both. The hollow cathodes must not have any cables attached to them. Boosted "super" lamps are not a suitable replacement for EDL lamps.
- The instrument must include an integrated, four lamp electrodeless discharge lamp (EDL) power supply.
- The instrument must be able to perform Zeeman corrected graphite furnace determinations.
- The instrument must utilize a wide range segmented state-of-the-art solid state detector, including a built-in low-noise CMOS charge amplifier array. Photomultiplier detectors are not acceptable.

GRAPHITE FURNACE:

- The graphite furnace must be heated transversely so that the entire length of the graphite tube heats uniformly.
- All graphite furnace analyses shall be performed off of an integrated platform in the graphite tube.
- Background correction in the graphite furnace must be accomplished using the Zeeman effect.
- The Zeeman magnet must be longitudinal to the graphite tube.
- The internal and external gas flows in the graphite furnace must be controlled separately.
- The system must have the ability to use an alternate gas such as oxygen or 5% hydrogen/95% argon along with the normal gas, argon. The system must be able to use an alternate gas for either the internal or external gases.
- The graphite furnace must be able to accept analytical programs of up to 12 steps. Each step must have control of temperature, ramp and hold times, gas type and flow, and read.
- Tube tension, opening, and closing must be pneumatically controlled.

- The graphite furnace must fully comply with EPA method 200.9 at Stabilized Temperature Platform Furnace (STPF) criteria.
- The instrument must include the capability of performing Baseline Offset Correction (BOC).

Graphite Furnace Autosampler:

- The autosampler for the graphite furnace must have the ability accommodate up to 85 - 2ml samples or 145 - 1.1 ml samples. One additional position for a blank and one overflow container for pipette washing must be included.
- The autosampler must have the ability to automatically:
 - Add up to two matrix modifiers to samples and standards.
 - Dilute up to 15 stock standards to make a calibration curve of up to 15 point plus a blank.
 - Dilute samples that exceed the concentration of the highest standard by using up to 5 alternate volumes.
 - Have variable pipetting speed and volumes ranging from 1-99 ul in 0.1 ul increments.
 - Perform post digestion spiking of samples in any order or increment with user defined spiking and acceptance levels.
 - Must be able to automatically perform method of standard additions to samples.
 - The system must be able to add up to 15 additions.

SYSTEM CONTROLLER:

- The system must be a computer with 3 GHz Intel Core 2 Duo or AMD Athlon II X2 processor operating under Windows XP Professional SP3. The system must include a color, inkjet page printer.
- The controller must have 16x DVD +/- RW SATA ; 3.5 Floppy Drive; Optical Mouse and 17 (minimally) inch flat-panel monitor.
- The controller must have a minimum of a 160 Gb hard disk

SYSTEM SOFTWARE:

The software must allow for...

- The simultaneous display of multiple screen windows to monitor system operations in real time.
- Operation under the Microsoft Windows XP Pro operating environment.
- Saving all data generated with individual sample identification (I.D) information., time & date of analysis, raw and calculated results, statistics, standard calibration curve data, peak profiles, peak height and peak area values shall be automatically saved to disk in permanent files if selected. If desired, all data must be accessible for post run analysis, reporting, reformatting, etc.

- Calibration using linear, non-linear, methods of addition, or methods of addition calibration with calculated or forced zero calibration for linear calibration types..
- Standard and sample units which are operator selectable may be different. Appropriate factors should be applied automatically during the analysis to provide results directly in the desired concentration units.
- Automatic selection of sample replicates based on the first replicate absorption value. The range may be selected by the operator prior to the start of analysis.
- User-defined correlation coefficient criteria for calibration curves.
- Sample identification files with sample position, weight, and dilution factors.
- The software must have built-in diagnostics for performance verification. Verifications parameters must include IEEE connections, interlocks, and lamps installed.
- Reformatting of analytical data files so that the data may be passed over to third party software packages or LIMS systems.
- The software must conform to GLP and GLAP protocols.
- The software must have built in diagnostics for performance verification.

GRAPHITE FURNACE SOFTWARE FEATURES:

- Automatic calculation and preparation of up to 15 standards from stock standards.
- Automatically add up to 15 additions for standard additions.
- Automatic dilution of over range samples with up to 5 alternate volumes.
- Automatic spiking of samples with a known standard and calculation of % recovery.
- Automatic periodic recalibration, resloping, and/or autozeroing.
- Check the precision between injections and allow for user defined acceptance limits and corrective action .
- Periodic check sample analysis with up to 15 different check samples that will allow for automatic stop, continue, recalibrate and continue, or recalibrate and rerun all when the values were outside the preselected, user defined limits
- The software must include an automated graphite furnace method development routine.
- The system must allow for the addition of an optional, automated slurry sampler
- The system must allow for flow injection/graphite furnace analysis.

PERFORMANCE: Zeeman, transversely heated graphite furnace.

The instrument must be able to, on a 50 ul injection, meet these 3σ detection limits using peak area:

Element	Det. Limit (pg)
As	6.0
Se	8.0
Pb	8.0
Mn	1.5
Cr	0.4
Cu	4.0
Tl	7.5

MISCELLANEOUS:

- The system must have a one year warranty for parts, labor, and travel.
- The system must be factory trained service installed.
- Tuition for one at a vendor supplied training course must be included.
- Factory Service Engineer must be located within a 100 mile travel area