GDS900 Glow Discharge Spectrometer

Specification Sheet

Grating	0.75 m focal length, 900 groove mm, Littrow-mounted, holographic rule grating
Detector	Charge-coupled array with 16,000 active pixels (14.0 mm W x 0.9 mm H pixel size)
Spectral Range	Complete spectral coverage (160 nm to 460 nm)
Resolution	50 pm (0.050 nm)
Source	4 mm diameter Grimm-type glow discharge (2 mm and 7 mm optional)
Source Cooling	Internal closed-loop water recirculation system
Vacuum Pump	External vacuum pump (optional noise abatement enclosure)
Purge System	0.25 lpm N_2 (UHP) with optional recirculating system
Gas Requirements	Source/Spectrometer: Argon, 99.998% purity, 40 psi (2.8 bar) ±10% Pneumatics: 60 psi (4.1 bar) ±10% (oil and water free) Purge: Nitrogen, 99.999% pure; 20 psi (1.4 bar) ±10%
Environmental Conditions	Operating Temperature: 18 °C to 30 °C (64 °F to 86 °F) Humidity: 20 to 80% (non-condensing)
Electrical Power Requirements	230 V~ (±10% at max load), 50/60 Hz, single phase, 12 A (breaker)
Thermal Load	1800 Btu/hr
Sound Pressure Level	53 dBa (max reading at operator's level per IEC/EN 61010-1)
Dimensions	51 in H x 21 in W x 85 in D (129.5 cm H x 53.3 cm W x 215.9 cm D); instrument only
Weight (approx.)	700 lb (317.5 kg)

Part Numbers

GDS900C	GDS900 Package with PC, touch-screen, software
GDS900RC	GDS900 Package with PC, touch-screen, software, and nitrogen purge recirculation system

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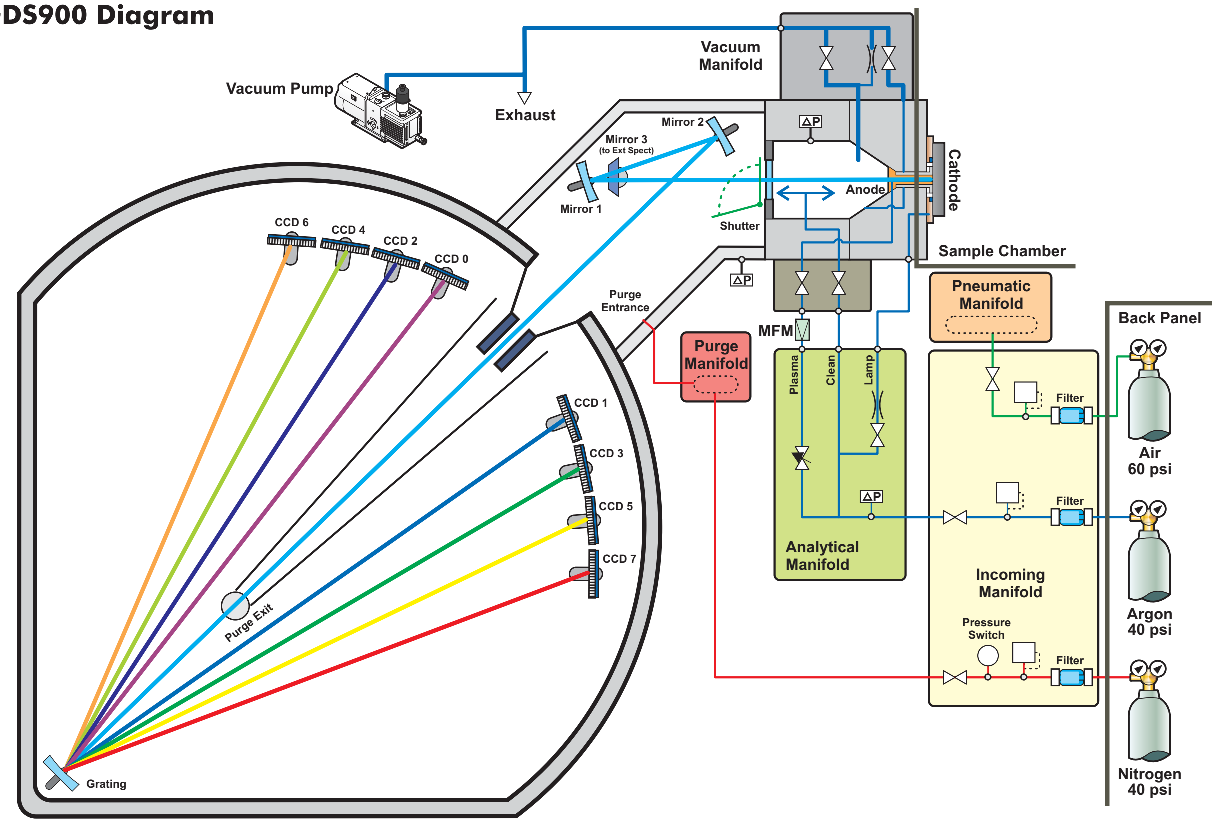
Theory of Operation

Glow Discharge Spectrometry (GDS) is an analytical method for direct determination of the elemental composition of solid samples. A prepared flat sample is mounted on the glow discharge source, the source is evacuated and backfilled with Argon. A constant electric field is applied between the sample (cathode) and the electrically grounded body of the lamp (anode). These conditions result in the spontaneous formation of a stable, self–sustained discharge, which is called a glow discharge. The applied current is regulated by the power supply and the lamp voltage is held constant through regulation of the Argon pressure. As soon as the plasma is initiated, inert gas ions formed in the plasma are accelerated by the electric field toward the sample (cathode). Through a process called cathodic sputtering, kinetic energy is transferred from the inert gas ions to the atoms on the sample surface, which causes some of these surface atoms to be ejected into the plasma.

Once the atoms are ejected into the plasma, they are subject to inelastic collisions with energetic electrons or metastable Argon atoms. Energy transferred by such collisions causes the sputtered atoms to become electrically excited. The excited atoms quickly relax to a lower energy state by emitting photons. The wavelength of each photon is determined by the electronic configuration of the atom from which it was emitted. Since each element has a unique electronic configuration, every element can be identified by its unique spectrochemical signature or emission spectrum.

A spectrometer is used to measure the emission signals from the glow discharge. In order to ensure that the media within the spectrometer is transparent to ultra-violet light (160-460 nm), the entire optical system is purged with nitrogen. Photosensitive Charge-Coupled Device (CCD) arrays are positioned at the focal plane in such a manner that the complete emission spectrum is recorded from 160 to 460 nm. The CCD arrays convert the spectrum into an electrical signal, which is digitized and processed to remove dark current signal, normalize the pixel response, extend the dynamic range, and eliminate pixelation. Since the number of photons emitted by each element is proportional to its relative concentration in the sample, analyte concentrations can be deduced by calibration with reference samples of known composition.

GDS900 Diagram



Specifications and part numbers may change.
Consult LECO for latest information.

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