

CT-1128 Portable Gas Chromatograph – Mass Spectrometer

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Constellation Technology Corporation of Largo, FL, manufactures a field-portable Gas Chromatograph – Mass Spectrometer (GC-MS) for commercial sales. The commercially available Agilent Technologies' 5973 Network Mass Selective Detector was incorporated into a custom-designed gas chromatograph (GC) platform to produce the CT-1128 model GC-MS. This unique design has afforded the analytical power of benchtop instrumentation in a self-contained, one-piece, field-portable instrument weighing only 70 pounds and occupying only 3 cubic feet of space.

Features of the CT-1128 include a self-contained hydrogen carrier gas supply (or compatibility with external standard helium or hydrogen gas cylinders), self-contained vacuum pump system, a temperature-programmable GC oven capable of 25°C/min. ramp rates up to 325°C, and compatibility with standard liquid and solid-phase microextraction (SPME) sampling syringes. A laptop computer controls all functions of the instrument including temperature control, vacuum control, and data collection. A custom designed GC Control software package along with Agilent's MSD Chemstation software provide the user with ease of operation and powerful analytical precision complete with mass spectral library matching using the included NIST/EPA/NIH mass spectral reference library. The unit operates with 110V A/C current and is stable even when drawing power from a portable generator. The instrument is built to withstand extreme temperature and humidity conditions.

The unit is fully capable of detecting a wide variety of volatile and semi-volatile compounds including, but not limited to, chemical warfare (CW) agents and their surrogates, controlled substances (i.e. illicit drugs such as methamphetamine, cocaine, heroin, and LSD), explosives, pesticides, and industry-related solvents and chemicals. In addition, the CT-1128 GC-MS is fully compatible with both liquid and SPME syringes. The instrument is widely used by the Forensic Science Center at LLNL, the Florida National Guard, the Florida Department of Environmental Protection, the Los Angeles County Sheriff's Counterterrorism Unit, and other agencies for performing on site analyses, often using SPME as the preferred sampling technique. An available option of the CT-1128 includes a built-in SPME sample preparation device capable of heating and stirring a sample contained within a headspace vial to accelerate the SPME extraction process.

In 2003 and early 2004, work was completed with funding under an SBIR award to develop a proof-of-concept device in which the traditional air bath oven of the standard model CT-1128 was retrofitted with a low-thermal-mass (LTM) chromatographic column and heater. The proof-of-concept instrument was successfully tested and the LTM device was easily incorporated onto the CT-1128 platform. The time required for a typical analysis using the standard CT-1128 and the time required for recycling the instrument between analyses were reduced greatly while maintaining ample chromatographic resolution of a variety of analytes. Lessons learned from the SBIR work led to improvements incorporated into the current CT-1128 model. Future iterations of the CT-1128 portable GC-MS will incorporate LTM and other innovative technologies to reduce weight, size, analysis time, and power requirements of the current CT-1128 design and to improve the overall performance of the instrument.