mks
Technology for Productivity

Gas Analysis

WWW.MKSINST.COM

CIRRUS™ 2

ATMOSPHERIC PRESSURE GAS MONITORING

Cirrus 2™ offers the versatility of state-of-the-art Microvision 2 quadrupole mass spectrometry in a convenient bench-top configuration. Incorporating an Ethernet interface, Cirrus 2 systems may be operated from a local PC or connected directly into an Ethernet network hub or switch for remote operation.

Cirrus 2 systems are ideal for the on-line monitoring and analysis of gases and gas mixtures including trace contaminants in process gases; solvent vapors; hydrocarbons; atmospheric and inorganic gas species (including corrosives); freons and noble gases.

Gas compositions can be tracked over a wide dynamic range (ppb to percentage levels) with a speed of up to 250 data points per second. The heated silica capillary inlet ensures a rapid response to changes in gas composition.

Cirrus 2 systems are manufactured from quality, field proven materials, which maximize reliability and uptime. The systems are easy to install and operate and feature automatic start-up and shut-down routines as well as built-in vacuum and heater interlocking for system protection.

Particular consideration has been paid to ease of service and maintenance. Cirrus 2 has been designed to allow easy access to the vacuum system, pump and inlet components for preventative maintenance and the replacement of consumable items (ion source filaments, capillary etc.).

Features & Benefits

- Monitors multiple gas species over a wide dynamic range of composition at atmospheric pressure
- Compact, modular design for ease of serviceability and maintenance
- Direct Ethernet interface - fully network compatible
- Recipe driven Process Eye™ Professional software for automated operation and calibration
- Fast response, silica capillary inlet heated to 150°C

For sampling different gas conditions, inlet options available are:

- Stainless steel capillary
- Low flow capillaries
- Multi-stream inlets
- Automated variable pressure inlet

Applications Examples

- Monitoring of trace contaminants in process gas
- Catalyst studies
- Fuel cell monitoring and development
- Heat treatment/furnace monitoring
- Membrane studies
- Glove box gas monitoring
- Lamp manufacture
- Gas supply monitoring (cylinder checks and special gas production)
- Freon detection and identification
- Environmental monitoring
- Thermal analysis - TGA, DTA
- Fermentation process monitoring

Cirrus 2™ Design Overview

Quadrupole mass spectrometers are now widely acknowledged as the preferred solution for many atmospheric pressure gas analysis requirements. They offer fast, on-line analysis with the ability to monitor a large number of different gases and gas mixtures with a single analyzer. Gas composition can be monitored over a wide dynamic range from ppb to percentage levels.

At the heart of every Cirrus 2 system is a precision-built quadrupole analyzer incorporating a closed ion source, a triple mass filter and a dual (Faraday and Secondary Electron Multiplier) detector system. This analyzer configuration is selected to optimize sensitivity and long term stability performance.

The Cirrus 2 analyzer operates inside a stainless steel vacuum chamber, which is pumped by an oil free high compression turbomolecular/diaphragm pump combination. The whole vacuum chamber and inlet interface assembly is housed inside an oven with a radiant heater. The oven may be used to raise the temperature of these components during analysis, thereby preventing sample vapor condensation.

Alternatively, the entire Cirrus 2 vacuum chamber can be baked to reduce residual gas background species and to minimize any memory effects.

The Cirrus 2 internal oven has a removable cover allowing easy access to the inlet interface, vacuum chamber and analyzer ion source. This is particularly helpful for routine maintenance like filament and capillary replacement. A cold cathode gauge is incorporated for independent vacuum pressure measurement and to provide an interlock signal for protection of the mass spectrometer. A temperature sensor also ensures that the electron multiplier detector cannot be switched on at high temperatures. The Cirrus 2 is designed with a lubricant free pumping system and no elastomer seals are used in the sample inlet system or in the high vacuum region of the system.

Gas Inlet

An essential feature of any gas analyzer is that it should not contaminate or alter the gas sample in any way. The Cirrus 2 inlet assembly consists of an inert silica lined capillary, which can be heated to a constant temperature.

The low volume and surface area of the assembly serves to maximize response speed while minimizing memory effects. Cirrus 2 systems can also be configured with inlets for multi-stream sampling, stainless steel capillaries for resistance to fluorine based compounds and a pressure controller inlet to allow sampling from supplies which vary from the nominal 1 bar inlet requirement.

The Cirrus 2 vacuum system utilizes a high compression turbomolecular pump so light gases such as hydrogen and helium can be sampled with no additional expensive pumping requirements.

Eight way multi-stream inlet option

Process Eye™ Professional — Cirrus 2 Control Platform

Cirrus 2 is operated using Process Eye Professional software, a recipe-driven platform that communicates with the system over a TCP/IP network. Process Eye Professional is designed for use with the latest Microsoft® operating systems including 32bit or 64 bit Windows® XP, Vista, Server 2008 and Windows 7.

The features and benefits are as follows:

- Data presented in units relevant to the application
- Allows for fully automated operation and calibration
- User-configurable alarms and warnings
- Can be configured to track data from other process sensors (temperature, pressure, flow, etc.)

Cirrus 2™ Special Options

- Multi-stream inlet version (4, 8 or 16 stream)
- Corrosive gas sample version
- Regulated ion source pressure version for samples of varying pressure
- High mass resolution version

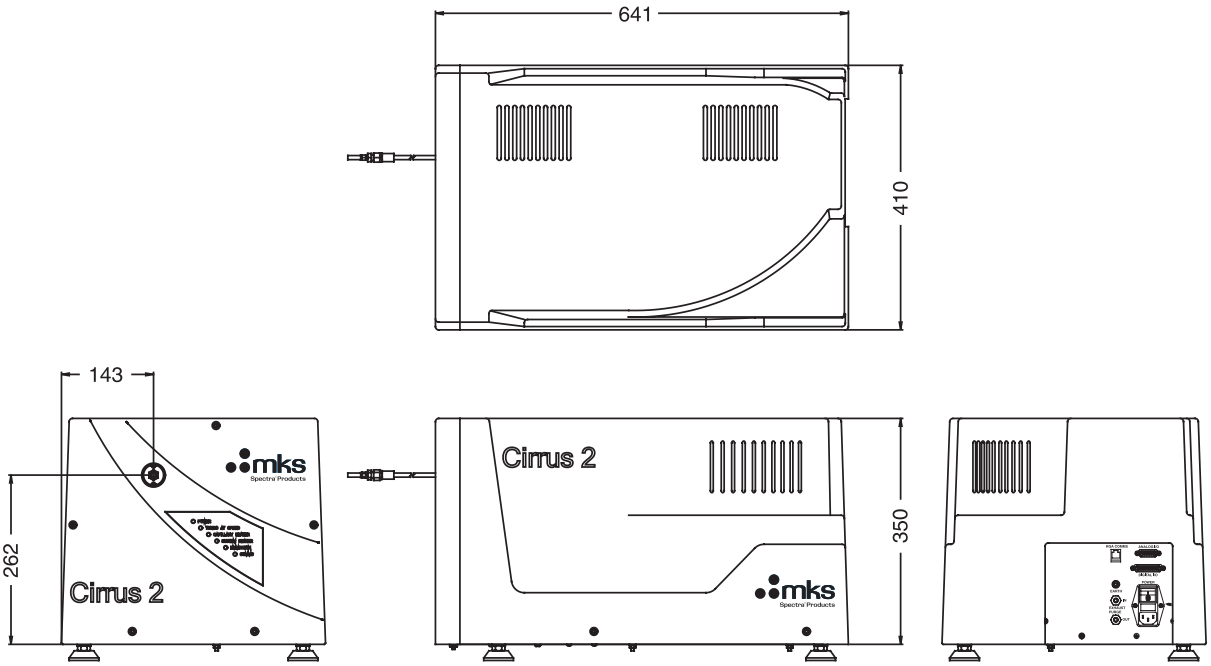
Specifications

Dimensions & Weight	645mm L x 410mm W x 350mm H, 34.5 Kg
Electronics	1 to 100, 200 or 300 amu or 1 to 6 high resolution options
Detection Limits	Gas dependant, typically < 100 ppb for non-interfering species
Electron Energy & Emission Current	Operator variable
Maximum Operating Temperature (Turbo pump & electronics)	35°C, 80% RH (non-condensing)
Oven Temperature (Vacuum chamber & inlet interface)	180°C for bakeout, 80°C setting for operation at elevated temperatures
Capillary Inlet	2.0m long with ¼" Swagelok® end connection, heated to 150°C (optional heating to 300°C). Standard fused silica and optional stainless steel.
Gas Consumption	20 ml/min, lower uptake rate capillaries options are available
Sample Pressure	1 bar nominal
Pumping System	• High compression turbomolecular pump with internal • 4-stage diaphragm backing pump standard, corrosive gas pumping with all internal pumps optional
Multi-stream Inlet	4, 8 or 16 way multi-stream inlet with option to continuously pump all streams for faster response times (requires all gas streams to be chemically compatible).
Automated Inlet Pressure Controller	A Baratron based automated inlet pressure controller is available as an option
Integrated NIR Carbon Monoxide Detector	For catalysis applications, a dedicated optical CO detector is available which integrates directly with the Cirrus 2 sample inlet and data processing systems
Recommended PC Spec	Pentium® IV or equivalent; Microsoft® 32bit or 64 bit Windows® XP, Vista, Server 2008 and Windows 7.
Computer Interface	1 x LAN port required
I/O Capability (Cirrus 2-based)	• 4 analog inputs (-11 to +11 volt, 22 bit) • 2 analog outputs (0-10 volt, 12 bit) • 16 TTL digital I/O
Power	• Universal mains input 90 – 264 VAC /44 – 66 Hz • Maximum power consumption 800W (during bake-out)

Ordering Information

Product Ordering Codes: Non-process	Process*
Cirrus 2 (100 amu, non-process): 467-124-A30	Cirrus 2 (100 amu, process): 467P-124-A30
Cirrus 2 (200 amu, non-process): 467-224-A30	Cirrus 2 (200 amu, process): 467P-224-A30
Cirrus 2 (300 amu, non-process): 467-324-A30	Cirrus 2 (300 amu, process): 467P-324-A30

** Process package includes on site applications start-up assistance*
For other options such as multi-stream, corrosion resistance, inlet pressure control, lower inlet flow capillaries, capillary material and temperature, high resolution 1 to 6 amu or integrated NIR detector contact a local MKS sales office for applications assistance.



Dimensional Drawing —

Note: Unless otherwise specified, dimensions are nominal values in mm.

Technology for Productivity

Global Headquarters
2 Tech Drive, Suite 201
Andover, MA 01810
Tel: 978.645.5500
Tel: 800.227.8766 (in USA)
Web: www.mksinst.com

MKS Gas Analysis
134 W. Rio Robles Drive
San Jose, CA 95134
Tel: 408.750.0300

MKS Gas Analysis
Cowley Way
Crewe, Cheshire CW1 6AG
Tel: +44.1270.250150

Cirrus 2 - 7/11