

Cirrus™ 3-XD

The Ultimate Performance for Atmospheric Pressure Gas Monitoring



The Cirrus™ 3-XD system is designed to more easily detect and monitor trace gases for researchers and engineers who need to work beyond the limits of conventional quadrupole mass spectrometry (MS) technology.

The proven Cirrus Quadrupole MS platform utilizes MKS' patented-V-lens™ ion optics with a double-focussing and deflection capability to produce a consistently low baseline for any gas species - enabling trace level detection with greater clarity and confidence than ever before. With its versatile, compact design and powerful, automatable software control, the Cirrus 3-XD system provides a new level in performance, robustness, and ease of use for the most challenging trace gas analyses. Cirrus systems are ideal for 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.

Cirrus systems are easy to install and operate, featuring automatic start-up and shut-down routines, and built-in vacuum and heater interlocking for system protection. Cirrus 3-XD is manufactured from quality field-proven materials to ensure reliability and maximize uptime. The Cirrus 3-XD is designed for ease of maintenance and service.

Product Features

- V-lens technology for a gas-independent low baseline, and robust detection to low ppb levels
- Wide dynamic range allows detection across a wide range of concentrations from trace levels (low ppb) to high abundance (percentage levels)
- Supreme temperature stability with unique oven design offers stable and reliable performance
- Fast response of 250 data points per second, and silica capillary inlet heated to 300°C, for sampling different gas conditions with multiple inlet options
 - Stainless steel capillaries
 - Low flow capillaries
- Automated variable pressure inlet enables accurate profiling of pure gases and gas mixtures
- Versatile recipe-driven Process Eye™ Professional software for automated operation and calibration
- Direct Ethernet interface, fully network compatible
- Compact, modular design for ease of serviceability and maintenance
- Multiple inlet options for sampling different gases



Applications

- Monitoring trace contaminants to low ppb, in process gases of all types
- Gas purity and manufacturing QC
- Catalysis studies including chemisorption
- Fuel cell monitoring and development
- Environmental monitoring
- Thermogravimetric analysis (TGA) and Differential thermal analysis (DTA)
- Fermentation process monitoring
- Heat treatment/furnace monitoring
- Membrane studies
- Glove box gas monitoring
- Lamp manufacture
- Freon detection and identification

Introduction

Cirrus systems are based on quadrupole mass spectrometry, widely acknowledged as a preferred technological platform for many atmospheric pressure gas analysis applications. The Cirrus 3-XD system, with its innovative V-lens ion optics and its compact mechanical design, provides a new level of performance and robustness in space efficient and flexible configurations that are ideal for a wide range of analytical applications and environments. Cirrus 3-XD is precision engineered to provide supreme speed and stability in response, with the ability to accurately detect and quantify gases and gas mixtures with a single analyzer. Gas composition can be monitored over a wide dynamic range, from percentage down to low ppb levels.

V-lens™ Technology

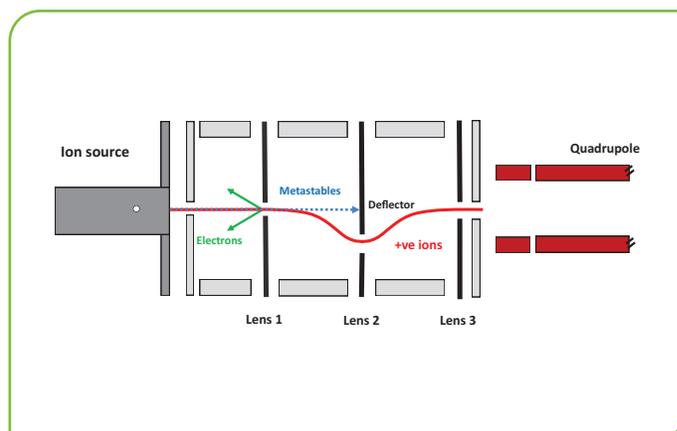
V-lens ion-optics technology uses a unique, patented double-focussing and deflection mechanism to significantly reduce background and enhance sensitivity. The result is an atmospheric pressure gas analyzer with low limits of detection (typically in the mid to low ppb range) without compromise to any other aspect of instrument performance - even when working with the most challenging gases that can produce large amounts of chemical background noise via metastable decay. This novel technological design provides significant improvements in quality and clarity in the data obtained, for any application where detecting the lowest levels of contamination with confidence is important.

Quadrupole Analyzer

At the heart of every Cirrus 3-XD 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.

Heating and Vacuum System

The Cirrus 3-XD features a number of advancements in design that aid stability and reproducibility of results. The vacuum chamber (with quadrupole analyzer) and inlet interface assembly is housed within a precision



Novel V-lens™ Ion Optics Technology

engineered stainless steel oven, providing low heat sink characteristics. This offers high temperature uniformity and eliminates potential cold spots that could otherwise cause undesirable sample condensation and variance in analyses. The oven design enables user-defined temperature control of the oven and capillary, allowing for finer analytical control.

The quadrupole analyzer itself is contained within a stainless steel vacuum chamber which is pumped by a high compression turbo molecular/diaphragm pump combination. The vacuum system is backed by an internal 4-stage diaphragm pump to maintain the integrity of the compact design. The entire Cirrus 3-XD vacuum chamber can also be baked to reduce residual gas background species and to minimize any memory effects.

Gas Inlet

An essential feature of any gas analyzer is the ability to not contaminate or alter the gas sample in any way. The Cirrus 3-XD inlet assembly incorporates either fused silica or stainless steel capillaries that can be heated to a stable user-defined temperature. The inlet assembly allows for easy replacement of capillaries, while the optimized insulation maximizes stability and reduces heat radiation.

The low volume and surface area of the assembly serves to maximize response speed while minimizing memory effects. Cirrus 3-XD 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 (incorporating a gas independent capacitance manometer) to allow sampling from sources that vary from the nominal 1 bar inlet requirement. The Cirrus 3-XD vacuum system utilizes a high compression turbo molecular pump, so light gases such as hydrogen and helium can be sampled with no additional expensive pumping requirements.

Maintenance and Access

The Cirrus 3-XD 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 hot cathode ion 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 3-XD 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.

Process Eye™ Professional Software

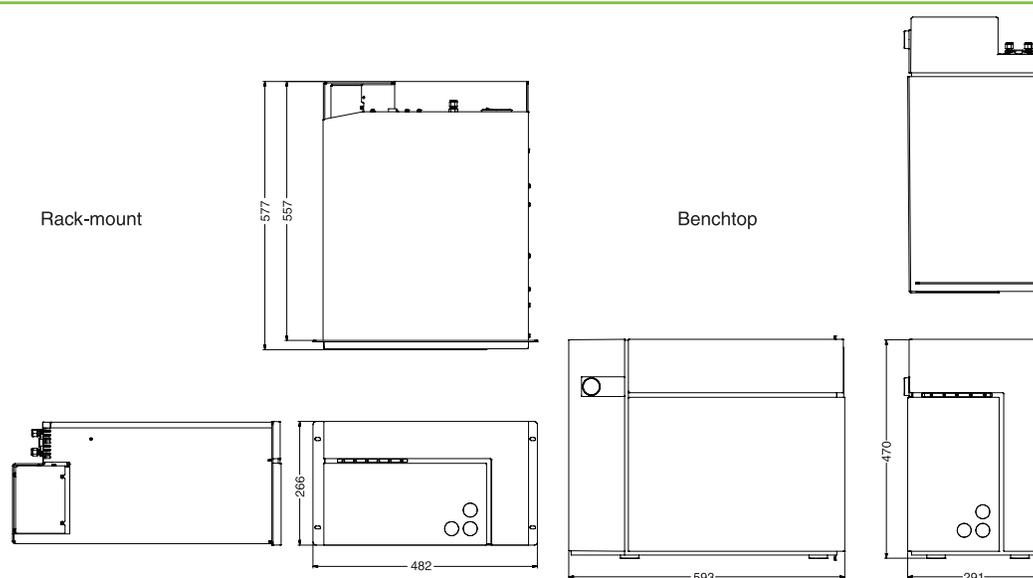
Cirrus 3-XD is operated using proven Process Eye Professional software, a recipe-driven platform that communicates with the system over a TCP/IP network. Process Eye Professional is designed for use with the latest Microsoft® operating systems including 32 bit or 64 bit Windows 7 and 10. Features and Benefits include:

- Data presented in units relevant to the application
- Fully automated operation and calibration
- New workflow “Recipes” for quantitative applications
- User-configurable alarms and warnings
- Can be configured to track data from other process sensors (temperature, pressure, flow, etc.)

Options

- Multiple gas stream inlet (4-, 8- or 16-way)
- Corrosive gas sampling version
- Regulated ion source pressure option to compensate for variation in inlet pressure and gas composition
- High mass resolution (1-100 amu HP)

Dimensional Drawing



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

Specifications

Dimensions & Weight	<ul style="list-style-type: none"> Benchtop System: 593mm L x 291mm W x 470mm H, 35 Kg Rack-mount System: 577mm L x 482mm W x 266mm (6U) H, 35 Kg
Mass Range	1 to 100, 100HP, 200 or 300 amu options
Detection Limits	Gas and Mass Independent - the minimum detectable concentration 3 sigma baseline noise is <15 ppb (specified with Argon or Nitrogen)
Electron Energy & Emission Current	Operator variable
Maximum Operating Temperature (Turbo pump & electronics)	5°C to 35°C, 20% to 80% RH (non-condensing)
Temperature (Vacuum chamber & inlet interface)	180°C for bakeout, user-definable for operation – typically 80°C
Capillary Inlet	2.0m long with ¼" Swagelok® end connection, heated to 150°C (optional heating to 300°C, with stainless steel only). 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 turbo-molecular pump with internal 4-stage diaphragm backing pump standard, corrosive gas pumping with all internal pumps optional
Automated Inlet Pressure Controller	A 640 (Baratron® capacitance manometer based) automated inlet pressure controller is available as an option
Recommended PC Spec	Microsoft 32 bit or 64 bit Windows 7 or 10
Computer Interface	1 x LAN port required
I/O Capability	<ul style="list-style-type: none"> 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 100 – 240 VAC / 50 – 60 Hz Power supply specified at 700W. Maximum consumption(during bakeout) typically 300W
Compliance	CE

Ordering Information	Part Number
Rack-Mount	
Cirrus 3-XD (100 amu)	470-12E-A30
Cirrus 3-XD (200 amu)	470-22E-A30
Cirrus 3-XD (300 amu)	470-32E-A30
Benchtop	
Cirrus 3-XD (100 amu)	471-12E-A30
Cirrus 3-XD (200 amu)	471-22E-A30
Cirrus 3-XD (300 amu)	471-32E-A30