Rosemount™ 1500XA

Process Gas Chromatograph

Increased pressure to optimize processes is driving an increased demand for accurate and timely composition analysis for use in process control and product quality assurance. The Rosemount™ 1500XA process gas chromatograph combines the proven analytical components of Emerson™ field-mounted GCs with the larger oven capacity of a traditional air-bath oven design. The result is maximum analyzer reliability and analytical flexibility in one package.

Features

- Parallel chromatography breaks down complex analysis into simpler analysis trains to improve cycle times and ease of use.

- Ability to run two analytical trains concurrently for faster analysis times.

- Two clocks allow up to two applications with different analysis cycle times to run simultaneously.

- Dual Ethernet communications for connection to DCS systems and maintenance wide area networks using industry standard protocols.

- Optional inter-column thermal conductivity (ITC) detectors.

- XA series analytical diaphragm valves with proven reliability and easy maintenance across the XA series of gas chromatographs.

- Storage of up to 2,500 chromatograms, including sample calibration and validation streams.

- Archives up to 256 item averages and up to 35 days of standard runs and calculations.

- Choice of thermal conductivity, flame ionization, or flame photometric detectors.

- Thermal conductivity detector (TCD) sensitive down to very low parts-per-million levels.

- Oven capacity for up to eight analytical diaphragm valves and four detectors (two of which can be flame detectors).

- Traditional air-bath oven design for maximum application flexibility.

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Applications

The Rosemount 1500XA is designed for a variety of refining, petrochemical, power, and environmental applications where selected components in gaseous or liquid streams must be precisely monitored on a continuous basis.

Refineries
- Catalytic reformer
- Isomerization unit
- Aromatics unit
- Flares
- Fuel gas lines

Petrochemical
- Ethylene plants
- Polymer plants
- Acrylonitrile plants

Gas processing
- NGL, GTL, and LNG plants
- Cryogenic gas plants

Power generation
- Power generation plants
- Gas turbine control

Environmental monitoring
- Ambient air monitoring
- HR-VOCs in flares and cooling towers
- Sulfur compound monitoring

ROSEMOUNT™

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Internal components

Analytical diaphragm valves

The analytical diaphragm valves used in Emerson's process gas chromatographs are unique to the online gas chromatograph market and are currently the only online gas chromatograph analytical valves with a lifetime warranty.

- Simple mechanical design.
- Sample does not come in contact with internal moving parts.
- More than five million operations per valve.
- Lifetime warranty.

The exceptional durability of the valve is due to the unique double diaphragm actuation design. This eliminates the need for springs, O-rings, and lubrication. The valves are rated for over five million operations before repair (approximately three to five years of usage), which involves simply replacing the diaphragms and can be done easily on-site.

Most importantly, the Emerson valve offers excellent performance. Minimal internal movement of the components in the valve — roughly 1/1000th of an inch contributes to rapid actuation of the valve, which is important for applications using micro-packed and capillary columns.

The analytical diaphragm valves used in the 1500XA are common across the XA series of Gas Chromatographs

Detectors

The Rosemount 1500XA process gas chromatograph has a wide selection of detectors to handle the full range of analytical demands found in typical process applications. Whether the components of interest are in the percent range or down to the parts-per-billion range, precise and reliable measurement is possible.

The thermal conductivity detector (TCD) is the detector of choice for most applications due to its universal response to all compounds. The thermistor TCD from Emerson is also able to go well beyond the normal measuring ranges seen in other designs by being able to do many applications with low parts-per-million measurement requirements.

For measurement of compounds in the low ppm or even ppb ranges, the flame ionization detector (FID) is available. Maintenance and safety features, such as auto-detection of flame loss and relight, are standard. A flame photometric detector (FPD) is also available for measurement of trace sulfur compounds.

For maximum application flexibility, the Rosemount 1500XA can have up to four detectors. Two of the four detectors can be flame detectors - FID and/or FPD. Unused detectors for analysis can be used as inter-column thermal conductivity (ITC) detectors. ITCs can reduce time to perform valve timing adjustments and improve troubleshooting by showing the components as they elute from one column to another.

Columns

Since 1980, Emerson has been refining and improving its process for creating micro-packed columns. The result is improved chromatography with extended column life (several years in most applications without measurable degradation or bleed). Emerson's micro-packed columns produce sharper peaks for improved component separation, short analysis time, and very low carrier-gas consumption. The GC is also available with capillary columns when the application demands. Micro-packed and capillary columns can be used together for maximum flexibility.

Air-bath oven

The air-bath oven uses a conventional instrument air heater design for maximum analytical flexibility. The oven has capacity for up to eight analytical diaphragm valves and capacity to install liquid injection sample valves for heavier samples and operating temperatures up to 120 °C (248 °F).

Parallel chromatography & concurrent applications

With its numerous valves and detectors, the Rosemount 1500XA is able to take complex analysis applications and break them down into smaller, simpler analysis trains. These analytical trains are run in parallel, resulting in reduced analysis time, easier and faster maintenance and troubleshooting, and straightforward data analysis. A complex analysis that may have previously taken 20 minutes may now take less than 10 minutes, allowing quicker response to process changes.

The Rosemount 1500XA has two analytical cycle clocks. This means up to two applications, of different analysis time, can be run concurrently. This in effect gives two virtual GCs inside a single GC, reducing the capital cost associated with the number of GCs and the number and size of analyzer shelters required. There are additional cost savings associated with reduced spare part inventory. The two clocks also allow for multiple streams to run concurrently.

In addition, concurrent analysis can reduce the need for calibration by running two identical analyses, concurrently, of the same stream. These measurements can then be compared to each other. The Rosemount 1500XA can also reduce the update time for a sample stream by running analysis at offset times using the two clocks. This can increase the number of analyses within a set time period.

MON2020™ Software

The Rosemount1500XA process gas chromatograph is designed to operate unattended. If adjustments are needed, our MON2020™ software, used for all of the XA series gas chromatographs, allows complete control of the Rosemount 1500XA either locally or remotely.

From within MON2020, you can:

- Start or stop analysis, calibration, or validation cycles.
- Generate and save current and historical analysis and calibration reports.
- Review and modify analytical settings.
- Upload and display multiple chromatograms for comparison.
- Upload and trend any of the measured results.
- Export data to text, HTML, or Excel for use in third party applications.
- Check on original calibration against the last calibration.
- Perform GC operation checks and modifications simultaneously.
- Upload and view manuals and drawings stored in the gas chromatograph.

MON2020 is Windows®-based software designed to make analyzer configuration, maintenance, and data collection easy. With intuitive drop-down menus and fill-in-the-blank tables, even new users can quickly navigate through the software.

With its ability to communicate with your enterprise network and export to numerous file types, MON2020 is a powerful tool that ensures operators, engineers, maintenance personnel, and management have access to critical data when they need it, in a format they can use.
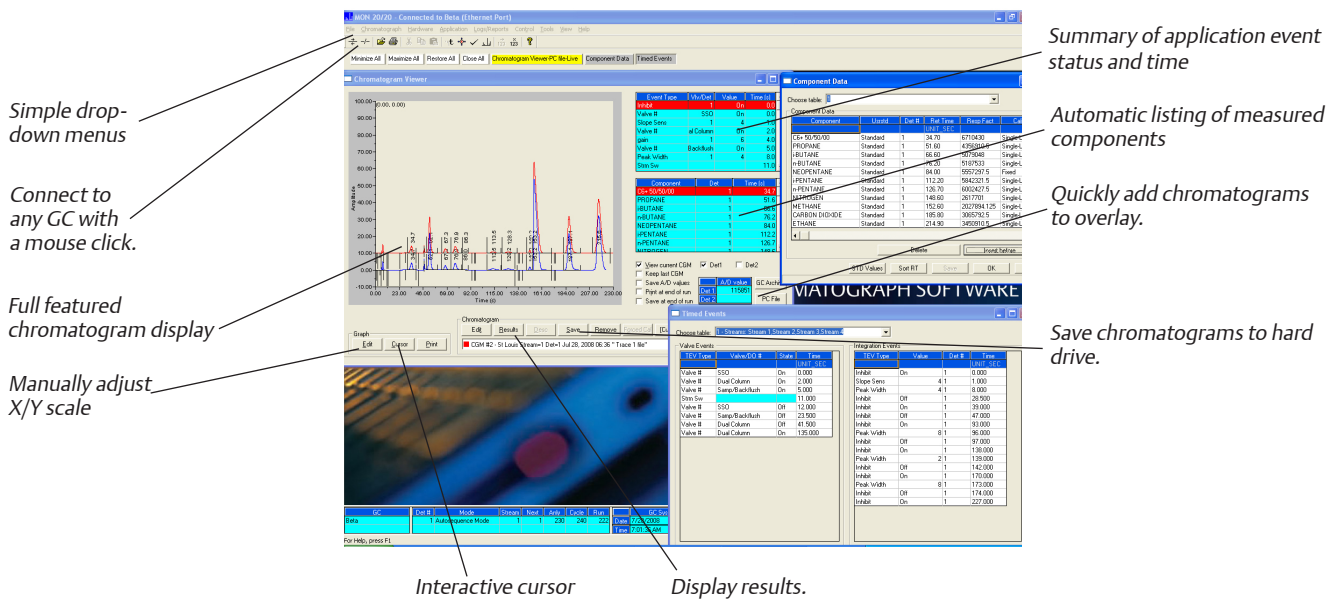
MON2020's chromatogram viewer allows you to view and compare both live and archived chromatograms simultaneously. Despite its small size (less than 100 kb), the chromatogram file (.xcgm) includes analysis and calculation results, integration and valve timing settings, retention time settings, and raw peak data.

MON2020's trend viewer makes it easy to trend multiple variables on a single chart. To help diagnose process or analysis issues, you can select single or multiple points on the trend viewer; the chromatograms associated with these points open in the chromatogram viewer. The trends can be saved as trend files or exported as text, CSV, or Microsoft Excel® files. MON2020 can connect to a 1500XA via Ethernet directly or over your local or wide area network.

MON2020 is equipped with multi-level user name and password security settings to limit and control access to the GC and provide five levels of authority ranging from read-only access to full control of the GC and its data.

MON2020's unique *Diagnostic File* feature makes remote diagnostics and documenting the analyzer performance easy and consistent. The diagnostic data file includes chromatograms, alarm logs, event logs, and configuration details into a single file that is time and date stamped. The generation of the diagnostic file is a simple menu selection and not only creates the file, but also creates an email with the time-stamped file attached, ready for dissemination.

The MON2020 software is supplied with the 1500XA, and it is also available free to download from the Emerson website, making it easy to access.

Simple drop-down menus

Connect to any GC with a mouse click.

Full featured chromatogram display

Manually adjust X/Y scale

Summary of application event status and time

Automatic listing of measured components

Quickly add chromatograms to overlay.

Save chromatograms to hard drive.

Interactive cursor

Display results.

Touch key local operator interface

The Rosemount 1500XA local operator interface (LOI) permits maintenance and operation of a GC without a laptop or PC. The LOI is a high-resolution color display with infrared touch keys that supports all core GC operations inside hazardous areas.

Features of the LOI include:

- Color LCD with full VGA (640 x 480 pixels) resolution
- Adjustable auto-back-lighting for easy viewing
- Eight infrared-activated touch keys
- Maintains the GC hazardous area classifications
- Indicates complete GC status, control, and diagnostics, including full chromatogram display

Integration with third-party networks

Whether you want to network process gas chromatographs throughout the plant or simply link a single process gas chromatograph to the DCS system, the Rosemount 1500XA can be configured to handle almost any scenario.

- Choice of Ethernet, Modbus® Serial, or 4–20 mA analog outputs.
- Use multi-dropped serial or Ethernet networks to connect multiple XA series gas chromatographs .
- Able to connect multiple PC workstations using MON2020.
- Connectivity to plant control systems using industry standard protocols such as Modbus and OPC.

The Rosemount 1500XA process gas chromatograph supports three types of communication interfaces: 10/100 Mbps Ethernet connectivity, RS-232, RS-422, and RS485 serial communication links, and 4–20 mA analog outputs.

Ethernet Connectivity

Two Ethernet interfaces are available on the Rosemount 1500XA. Each interface can be configured with a static IP address, subnet mask, and gateway. The Ethernet interfaces on the GC serve two purposes:

- MON2020 connections
- Modbus TCP (SIM 2251 or User Modbus) requests

The dual Ethernet interfaces can be used in many ways, such as:

- Connect one Ethernet interface to a plant maintenance network for GC maintenance personnel and the other to a control network running a Modbus TCP server.
- Connect one to a broadband cellular wireless gateway for remote GC access for data collection and maintenance and the other for a local laptop connection.

The Rosemount 1500XA's Ethernet connection can be commissioned in two ways:

- Through the local operator interface (LOI) on the gas chromatograph's upper enclosure front panel
- Through the MON2020 gas chromatograph software via direct connection over Ethernet

Modbus serial

The Modbus protocol is widely used today, because it is simple and effective. It allows full GC database access, which provides the greatest level of flexibility when connecting a Rosemount 1500XA to a DCS or flow measurement system. Modbus uses RS-232, RS-422, and RS-485 to physically connect to the gas chromatograph.

4–20 mA analog outputs

The Rosemount 1500XA process gas chromatograph supports 4–20 mA analog outputs. The analog outputs allow very long connections to traditional DCS measurement points using existing plant wiring infrastructure. Six analog outputs are built into the GC as standard features and can be expanded to twenty-two analog outputs with up to four ROC800 communication modules.

Analytical systems & integration services

Emerson offers a comprehensive range of analytical system solutions and third party integration services. From standalone panels and cabinets to three-sided shelters and environmentally controlled walk-in enclosures, our complete range of capabilities is backed by over 60 years of analytical expertise across thousands of process installations throughout the world.

From front end engineering design (FEED) and consulting services to manufacturing, integration, and testing to commissioning services and on-going lifecycle support, Emerson provides complete turnkey analytical solutions.

With seven full scope analytical systems and integration centers and sixteen regional support facilities strategically located across the world, Emerson has the global resources and analytical expertise to provide localized support.

Engineered sample systems

Any process gas chromatograph is only as good as the quality of the sample it measures. Every sample system for Emerson's process gas chromatographs is engineered for the specific requirements of the application.

Common features include:

- Heated and open-panel designs
- All components rated for the area classification
- Automatic calibration/validation available as an option
- Variety of sample probes to extract a reliable and stable sample from the process
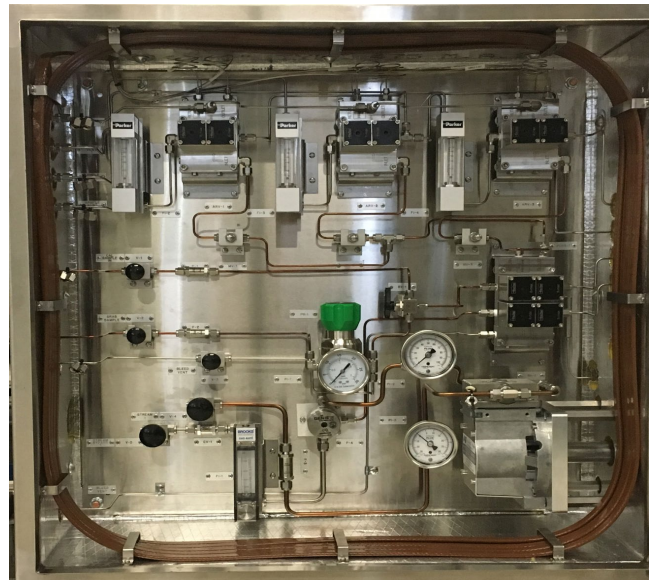
Our custom-engineered sample systems meet the specifications of each unique requirement.

Environmental chamber testing

Every Emerson gas chromatograph that leaves our facility undergoes rigorous testing throughout assembly. The majority of our systems are put into a 24-hour environmental chamber test, where they must operate to specification in an environment where the temperatures cycle between -18 and 54 °C (0 and 130 °F) for a minimum of 24 hours.

Our product testing procedures are much stricter than the industry standard for analytical measurement products. When you purchase an Emerson gas chromatograph, you can be assured that you're purchasing the highest-quality process gas chromatograph or natural gas chromatograph available.

As a result of chamber testing, 100 % of all gas chromatographs that we ship are proven to operate to the performance specifications across the stated operating temperature range.

Specifications

Please consult Rosemount if your requirements are outside the specifications listed below. Improved performance, other products, and material offerings may be available depending on the application.

Construction

Environment: -18 to 55 °C (0 to 130 °F) for TCD/FID
20 °C ± 5 °C (70 °F ± 10 °F) for FPD

Dimensions (without sample system): Height x Width x Depth: 50 x 40 x 24 in. (127 x 102 x 61 cm)

Mounting: Wall-mount (standard); free-standing (optional)

Approximate weight (without sample system): Approximately 150 lb (68 kg)

Area classification options (hardware dependent): Designed to meet (no 3rd party certification) Class I, Division 2, Groups B, C, D using Z-Purge; optional NRTL certification for US and/or Canada available for use in Class I, Division 2, Groups B, C, D hazardous locations using Z-Purge.

Instrument air: 4 SCFM at 40 psig of oil-free instrument air for purge and oven heat and 90 psig for valve actuation.

Power: 115 Vac ±10 %, 220 Vac ±10 %, 50/60 Hz
400 watts running or 1100 watts start-up

Performance capabilities

Oven: Air bath oven, maximum 120 °C (248 °F)

Valves: Six-port and ten-port valves; piston-operated diagphragms with pneumatic actuation

Carrier gas: Application-dependent.
Typically zero-grade helium, nitrogen, or hydrogen at 90–120 psig input pressure

Sample input pressure range (recommended):
15–20 psig for vapors. LSVs are application dependent.

Columns: Supports micro-packed and capillary columns

Detector: Thermal conductivity detector (TCD), flame ionization detector (FID); flame photometric detector (FPD) available. Up to four detectors, two of which can be flame detectors.

Peak detection: Fixed-time automatic slope sense detection of peaks

Streams: Up to 20 streams

Communications
Standard connections

Serial communication ports: Three termination blocks, configurable as RS-232, RS-422, or RS-485, and one D-sub (9-pin) port for PC connection

Analog inputs: Two connectors on the backplane, isolated

Standard analog outputs: Six connectors on the backplane, isolated

Discrete digital inputs: Five connectors on the backplane

Digital outputs: Five relay *Form C* contacts on Phoenix connectors on the backplane. Relay contact rating 24 Vdc nominal at 1 amp

Ethernet: Two available connections – one RJ-45 port and one four-wire termination – with 10/100 Mbps

Optional connections

Four expansion slots available for additional communications. Each slot has the capacity to hold one of the following:

- Four analog inputs (isolated) card
- Four analog outputs (isolated) card
- Eight digital inputs (isolated) card
- Five digital outputs (isolated) card
- One RS-232, RS-422, or RS-485 serial connection card (up to two maximum)

Recommended installation

The drawing below represents the minimum recommended installation guidelines for the Rosemount1500XA process gas chromatograph. Consult Rosemount for detailed installation recommendation of your application.
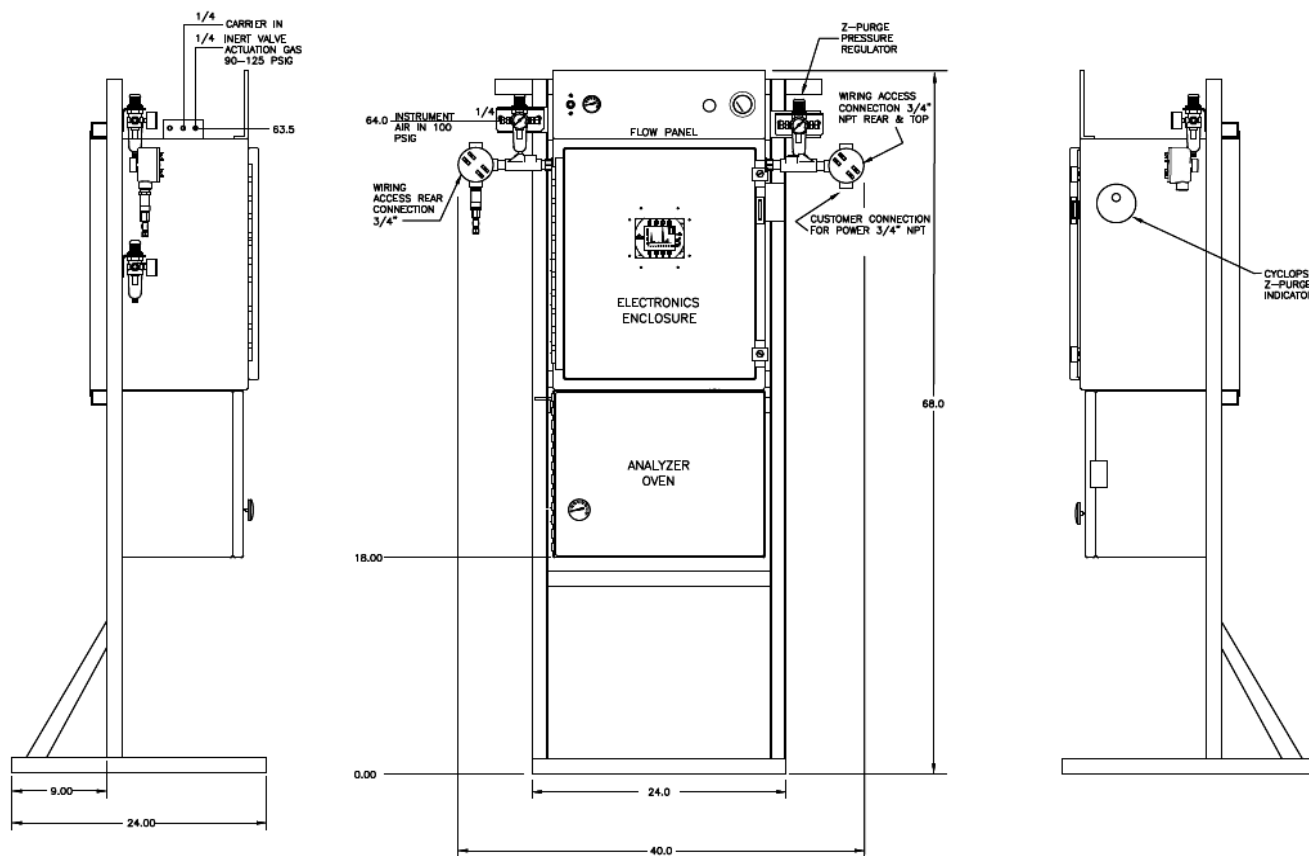
Dimensions are in inches (mm).

Americas

Emerson Automation Solutions

10241 West Little York, Suite 200
Houston, TX 77040
📱 +1 866 422 3683 or +1 713 396 8880
🖨 +1 713 466 8175
✉ GC.CSC@Emerson.com

Europe Regional Office

Emerson Automation Solutions Europe GmbH

Neuhofstrasse 19a P.O. Box 1046
CH 6340 Baar
Switzerland
📱 +1 954 846 5030
🖨 +1 952 846 5121
✉ GC.CSC@Emerson.com

Asia Pacific Regional Office

Emerson Automation Solutions Asia Pacific Pte LTD

1 Pandan Crescent
Singapore 128461
📱 +65 6777 8211
🖨 +65 6777 0947
✉ GC.CSC@Emerson.com

Middle East and Africa Regional Office

Emerson Automation Solutions

Emerson FZE P.O. Box 17033
Jebel Ali Free Zone - South 2
📱 +971 4 8118100
🖨 +971 4 88665465
✉ GC.CSC@Emerson.com

📶 Analyticexpert.com

in Linkedin.com/company/Emerson-Automation-Solutions

🐦 Twitter.com/Rosemount_News

f Facebook.com/Rosemount

▶ Youtube.com/user/RosemountMeasurement

G+ Google.com/+RosemountMeasurement