Rosemount Analytical 700XA Process Gas Chromatograph

Rosemount Analytical 700XA gas chromatographs provide extended analysis for extreme conditions. The 700XA offers increased analytical capacity, reliability, and maintainability, combined with a wide range of analysis options in a field-mount gas chromatograph (GC).

With a redesigned, single-cast enclosure, the 700XA offers an efficient use of oven space to accommodate both micropacked and capillary columns, as many as four 10-port valves, a rotary valve for liquid injections, up to two thermal conductivity detectors, and an optional micro flame ionization detector (μFID). With a significant reduction in internal cabling used within, the 700XA allows maximum access to valves and internal components, making maintenance quick and easy.

Rosemount Analytical 700XA Gas Chromatograph

Applications

The 700XA gas chromatograph 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

Petrochemical

- Ethylene plants
- Polymer plants

Gas processing

- NGL and LNG plants
- Cryogenic gas plants

Power generation

- Combustion turbines

Environmental monitoring

- Ambient air monitoring
- HR-VOCs in flares and cooling towers

ROSEMOUNT® Analytical

EMERSON™ Process Management

Features and Benefits

Flexible design to meet all process requirements

- Fully compatible with modern Ethernet networks and DCS communication
- Diaphragm-based chromatograph valves available in six-port and ten-port versions
- Thermal conductivity detector (TCD) sensitive down to very low parts-per-million levels
- Flame ionization detector (FID) sensitive to parts-per-billion levels
- Storage of up to 2,500 chromatograms, including sample calibration and validation streams
- Archives up to 64 item averages and over 80 days of standard runs and calculations

Reduced installation costs

- Standard 24V DC power (120/240V AC optional)
- Integrated controller electronics
- Pipe-mount, wall-mount, or floor-mount

Lower operation and maintenance costs

- Designed for field-mounting without the need for expensive analyzer shelters and without sacrificing analytical power
- Low carrier and power consumption
- Longest gas chromatograph valve and column warranties available

Unmatched measurement performance

- Highest C6+ repeatability — ±0.01 % of heating value (±0.1 BTU/1000 BTU) for controlled-environment C6+ analysis and ±0.015 % (±0.15 BTU/1000 BTU) of heating value for uncontrolled-environment (-20° to 60 °C/-4° to 140 °F) C6+ analysis
- Best-in-industry C9+ repeatability — ±0.0125 % of heating value (±0.125 BTU/1000 BTU) for controlled-environment C9+ analysis and ±0.025 % (±0.25 BTU/1000 BTU) of heating value for uncontrolled-environment (-20° to 60 °C/-4° to 140 °F) C9+ analysis
- Wide dynamic range from percent to trace-level components
- Reliable performance over broad ambient temperatures -40° C to 60 °C/-40 °F to 140 °F

Superior Performance

Modular Analytical Oven

Building off of the proven valves, columns, and detectors of the Model 700 and Model 500 gas chromatographs, the 700XA gas chromatograph analytical oven has been redesigned for maximum serviceability and expandability. It features a new, cleaner architecture with fewer cables, making the 700XA simple to maintain. In addition, the oven features a unique, pivot-top base that provides maximum accessibility to the components below. By accommodating as many as four ten-port valves, the 700XA can handle more complex applications, and it can perform standard applications faster.

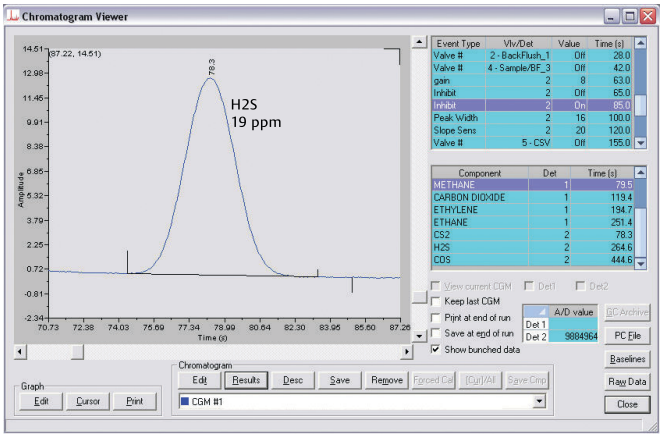
Multiple temperature control zones and up to four valves and two independent detectors provide extreme application flexibility and range. All components in the oven are completely accessible and serviceable in the field.

Gas Chromatograph Valves

The 700XA has the capacity to support up to four six-port or ten-port diaphragm/piston gas chromatograph valves. These pneumatic valves are guaranteed for the life of the gas chromatograph and are specified to operate over five million cycles. The unique, double-diaphragm design removes the need for springs, o-rings, or lubrication. Valve service is performed by replacing a cost-effective diaphragm set, which can normally be completed in less than ten minutes.

Thermal Conductivity Detectors

The thermal conductivity detector (TCD) is the detector of choice for most applications due to its universal response to all components of interest in natural gas and light refinery and hydrocarbon processing gas analysis. The TCD in the 700XA gas chromatograph is able to measure well beyond the normal ranges seen in other designs by being able to perform many applications with low parts-per-million measurement requirements. This greatly simplifies the gas chromatograph design and lowers the cost to the end user when a simple and rugged TCD can be used.



For many part-per-million applications, a simple, easy-to-maintain TCD detector can be used rather than a more complicated FID or FPD due to the superior sensitivity of the Rosemount Analytical TCD design.

Micro Flame Ionization Detector (μFID)

The micro-flame ionization detector permits measurement of trace hydrocarbons in a variety of samples at parts-per-billion (ppb) concentrations. The μFID is unique in the industry because of its small size (less than three inches high) that fits inside the explosion-proof housing of the 700XA gas chromatograph. Typical applications include measuring trace impurities in gases and light hydrocarbons, as well as ambient air monitoring.

Flame Photometric Detector

The flame photometric detector (FPD) module enables the measurement of trace sulfur compounds when integrated with 700XA gas chromatographs. The flame photometric detector and associated electronic boards are installed in temperature-controlled, flame-proof enclosures and mounted on a stand complete with the flame air and hydrogen controls. The design eliminates the need for instrument air greatly reducing installation cost of the process gas chromatograph.

The FPD module comes fully integrated with a 700XA gas chromatograph. The FPD module is ATEX-approved for Zone 1 & 2 locations.

Micro-packed Columns

The 700XA gas chromatograph offers micro-packed columns with a superior combination of features found in both capillary and conventional packed columns — speed, sharp peak resolution, and low carrier gas consumption. In addition, the unique design provides for greatly extended column life and the longest warranty available on the market (five years on the standard C6+ natural gas set). Standard capillary columns may also be used in 700XA applications as required.

Stream Switching Module

The internal sample stream switching module is available in four- or eight-stream versions. This saves end users the additional hardware and assembly costs associated with externally mounted stream selection assemblies. The module utilizes helium-rated 24-volt solenoids for operation, with easy access for tubing changes and maintenance. For applications with widely varying stream composition, a double-block-and-bleed configuration is optionally available.

Controller Electronics and Communications

Modular Electronics

The control electronics, option cards, and field termination boards are packaged conveniently in the lower section of the 700XA gas chromatograph. Customer-terminated power and output connections are also made in this lower section of the gas chromatograph.

Local Indication and Operation Panel

Analyzer health and valve status can be viewed through the front cover of the gas chromatograph. The panel displays green (healthy), yellow (warning), and red (failure) LEDs, along with LEDs indicating gas chromatograph valve on/off actuations, power, and CPU health. Each valve can be actuated manually for simplified troubleshooting and fast system purging after maintenance.

Touch Key Local Operator Interface (Optional)

The 700XA local operator interface (LOI) permits maintenance and operation of a 700XA without a laptop or PC. The LOI is a state-of-the-art, high-resolution color display that is touch key infrared activated and supports all core GC operations. Features include:

- Color LCD with full VGA (640 x 480 pixels) resolution
- ASCII text and graphics modes
- Auto-backlighting (adjustable)
- Eight infrared-activated touch keys and screen saver

In addition, the LOI:

- Eliminates external magnetic pen requirement and tactile buttons
- Maintains the 700XA hazardous area classifications
- Indicates complete GC status, control, and diagnostics, including full chromatogram display and alarm messages

Flexible I/O

The 700XA offers flexible I/O, including five discrete digital outputs, five discrete digital inputs, two analog inputs, six analog outputs for digital/analog signal I/O, plus expansion slots to accommodate additional I/O as required.

Data Archiving and Reports

With its expandable, solid-state memory, the 700XA virtually eliminates the need for external data storage for archiving and reports. Every analysis is time and date stamped and archived for retrieval via the MON2020 software. Pre-configured reports can be displayed, printed, and/or stored internally. Results can be trended directly or exported easily in ASCII format.

- **Security** – four levels of password-protected security, configurable to read/write or read-only for third-party access.
- **Audit logs** – data and event logging fully conforms to API report 21.1 for metering audit purposes and backup to primary systems (flow computer, SCADA, DCS).
- **Event logs** – a continuous record of all operator changes, with time, date, and password-identified name records.
- **Alarm logs** – a continuous record of all historical alarms, time/date stamped with alarm state and description.
- **Maintenance log** – a "scratch pad" for tracking maintenance or testing performed on the gas chromatograph system.
- **Archiving** – over 31,700 analysis records (which is over 65 days for a C6+ three minute application), 370 final calibration records, 370 Validation records are archived automatically with time and date stamps.

Standard reports include:

- **Average reports** – hourly, 24-hour, weekly, monthly, and variable averages.
- **Analysis reports** – physical property calculations for component and group analysis and alarms.
- **Raw data report** – retention times, peak areas, detector number, method, integration start/stop, and peak width for the analysis.
- **Calibration report** – raw component data, new response factors, retention times, and deviation from last calibration.
- **Final calibration report** – results for final calibration, response factor, and retention time adjustments.
- **Molecular Weight vs. Response Factor Graph** – the response factors plotted on a log/log graph as outlined in the GPA2198-03 Appendix B to confirm the fidelity of the detector response across components.

Rosemount Analytical 700XA Gas Chromatograph LOI

MON2020™ Software

The 700XA gas chromatograph is designed to operate unattended. If adjustments are needed, our exclusive MON2020™ software allows complete control of your gas chromatographs locally or remotely. From within MON2020, a user can:

- Review and modify analytical settings on one screen
- Upload and display multiple chromatograms on the screen for comparison
- Upload and trend any of the measured results
- Export data for use in other third-party applications
- Check original calibration against last calibration
- Perform GC operation checks and modifications simultaneously

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. Users of previous-generation MON software will be familiar with the layout and functionality of the software, and will be impressed with the additional features that make the software even easier to use.

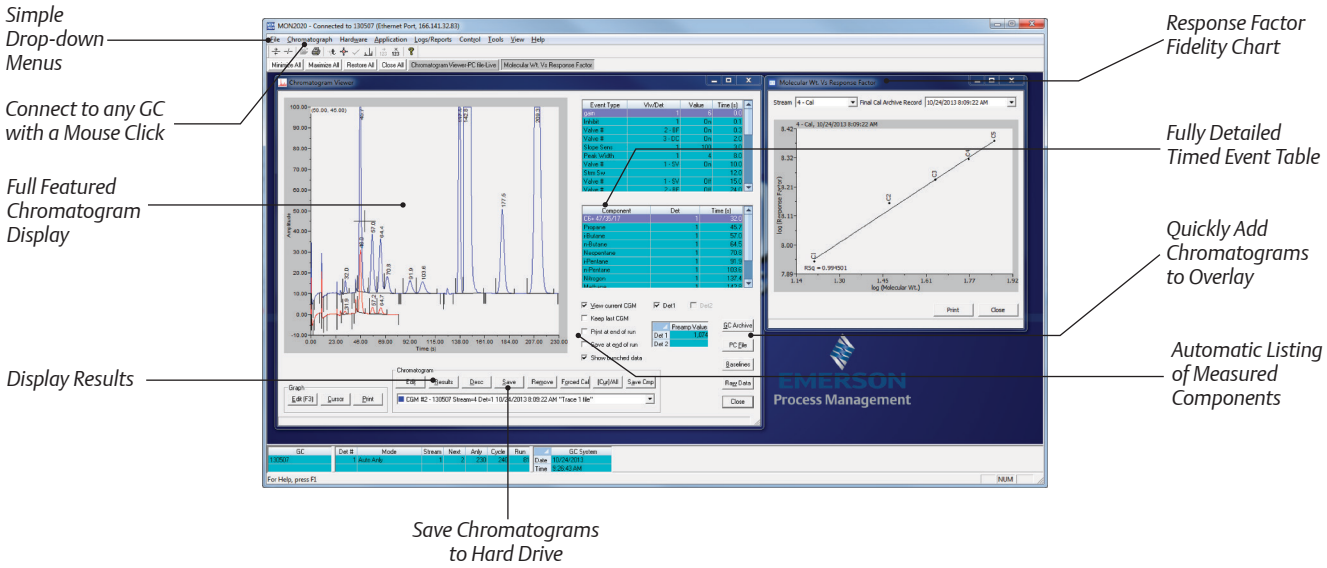
MON2020 software collects and organizes the analyzed data from the 700XA gas chromatograph. With the ability to communicate to the enterprise network or export to numerous file types, MON2020 is a powerful software tool that ensures operators, engineers, maintenance personnel, and management have access to critical data, such as current and archived chromatograms, alarm history, event logs, and maintenance logs.

MON2020 also has a number of tools built in to help users manage their analyzers such as:

- Automatic recording of alarms in a log file
- Event logs that provide a continuous record of all operator changes with time and user name stored
- Maintenance log scratch pad for keeping track of maintenance or testing done

Data can also be exported in formats compatible with most third-party Windows® applications.

Figure 1 - MON2020 Interface



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 700XA can be configured to handle most any communication scenario.

- Choice of Ethernet, FOUNDATION™ Fieldbus, Modbus Serial, or 4–20 mA analog outputs
- Can use the same network to connect 700XA and 1500XA Process Gas Chromatographs
- Connectivity to plant control systems using industry standard protocols such as Modbus and OPC

The 700XA supports four types of communication interface:

- 10/100 mbps Ethernet connectivity
- FOUNDATION™ fieldbus H1
- RS-232, RS-422, and RS-485 serial communication links
- 4–20 mA analog output

Ethernet Connectivity

Two Ethernet interfaces are available on the 700XA. Each interface can be configured with a static IP address, subnet mask, and gateway. The Ethernet interfaces on the 700XA serve two purposes – serve MON2020 connections and serve Modbus TCP requests. The dual Ethernet interfaces can be used in many ways. Examples:

- One to connect to a plant network for GC maintenance personnel and the other to a control network running a Modbus TCP server
- 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 700XA Ethernet connection can be commissioned in several ways – through the local operation interface on the actual gas chromatograph, through the AMS Device Manager software over FOUNDATION™ fieldbus, and through the MON2020 software via direct connection over Ethernet.

OPC

With the optional GC-OPC server, the 700XA can connect via OPC with fully configurable definition files and remote operation control capabilities.

FOUNDATION™ Fieldbus

Emerson's 1500XA and 700XA gas chromatographs are the first and only gas chromatographs that are certified by the Fieldbus Foundation. FOUNDATION™ Fieldbus is quickly becoming the industry standard, and use of this protocol reduces the amount of engineering necessary during the installation process, as it doesn't require the manual point mapping of the Modbus protocol. It also requires less wiring, fewer junction boxes, cable trays, and I/O cards, which means a cleaner, simpler, easier to understand analytical footprint as compared to traditional I/O installations.

Modbus Serial

The Modbus protocol is widely used today because it is simple and effective. Although engineering-intensive at first (may take several days to be fully operational), it requires very little hardware to run it, which saves valuable space within the GC, maximizing space for valves and columns and other critical components. Modbus uses RS-232, RS-422, and RS-485 to physically connect to the gas chromatograph.

4–20 mA Analog Outputs

The 700XA gas chromatograph supports isolated 4–20 mA analog outputs. Although considered a legacy solution, a key advantage of this communication protocol is the accuracy of the signal, which isn't affected by a voltage drop in the interconnecting wiring, which ensures that the loop can continuously supply operating power to the gas chromatograph. Six analog outputs are built into the 700XA as standard features, but it can be expanded to 14 analog outputs with optional expansion cards.

Data Communication

The 700XA gas chromatograph can provide data to third-party products, such as control systems or flow computers, using FOUNDATION™ Fieldbus, Modbus TCP (SIM 2251 and User Modbus), Modbus Serial, and 4–20mA analog outputs.

Custom-Engineered Process Analytical Systems

A complete online analytical solution is more than just the analyzer. Sample conditioning systems to prepare the sample for analysis, communication links to the plant control computer, and packaging of the analytical equipment into a cabinet or shelter all play an important role.

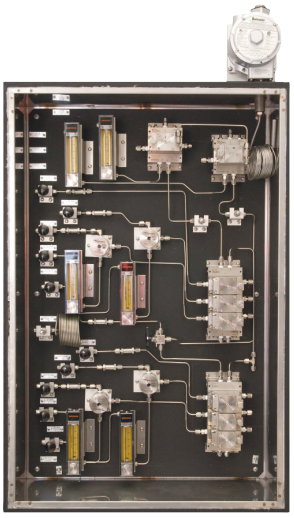
Emerson Process Management has decades of experience providing complete turnkey solutions ranging from simple single-analyzer cabinets up to large integrated shelters with multiple types of analyzers.

The key to successful system integration begins at the proposal stage where Emerson Process Management develops a custom engineered solution. This is followed by experienced project management during the system fabrication and on to installation and training once the system is delivered to the field.

Custom-Engineered Sample Systems

Any process gas chromatograph is only as good as the quality of the sample it measures. So every sample system for Emerson's process gas chromatographs is custom 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



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 0° and 130 °F (-18° and 54 °C) 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 rigorous lab and chamber testing, 100 % of all gas chromatographs that we ship will operate to the performance specifications across the quoted temperature range.

The Emerson Process Management Process Gas Chromatograph Difference

- Built tough to stand up against any environment
- Rigourously tested to ensure performance
- Field-mountable technology means solid performance at reduced cost
- High-sensitivity thermal conductivity detectors can often replace more complex detectors
- Micro-packed columns that are made to last
- Diaphragm valves with a lifetime warranty
- Broad application scope with single- or dual- detector capability
- Easy-to-use MON2020 software for advanced diagnostics and simplified troubleshooting — it is simply the best in the industry

(This page purposely left blank for your notes)

Specifications

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

Construction

Hazardous Area Certified for: -20° to 60 °C/-4° to 140 °F

Reliable performance over broad ambient temperatures: 40° to 60 °C/-40° to 140 °F

Enclosure Protection Rating: IP66

- **Dimensions** (without sample system):
- **Wall-mount:** 711 mm H x 445 mm W x 498 mm D

  (28" H x 17.5" W x 19.6" D)
- **Pipe-mount:** 711 mm H x 445 mm W x 671 mm D

  (28" H x 17.5" W x 26.4" D)
- **Floor-mount:** 1532 mm H x 445 mm W x 612 mm D

  (60.3" H x 17.5" W x 24.1" D)

Corrosion Protection:

- **GC Enclosure Material:** Copper free aluminum coated with industrial grade powder coat suitable for high humidity and salt-laden environments.
- **Process Wetted Materials:** Stainless steel. Where the function of an item excludes the use of stainless steel (e.g. glass rotameter tubes), materials that are resistant to corrosion are used.
- **Electronics:** All electronic circuit boards are tropicalized with a clear conformal coating.

Mounting: Floor-standing (standard), wall- or pipe-mount (optional)

Approximate Weight (without sample system): 50 kg (110 lbs.)

Area Safety Certification Options:*

- **CSA:**
  - **For USA:** Class I, Zone 1, AEx d IIC, Enclosure Type 4 Class I, Division 1, Groups B, C, and D, IP66
  - **For CANADA:** Class I, Zone 1, Ex d IIC, Enclosure Type 4 Class I, Division 1, Groups B, C, and D, IP66
- **ATEX / IECEx**
  - Ex II 2G
  - Ex d IIC Gb T6 (Ta = -20 °C to 60 °C)

*Stated T-ratings can vary based on applications.

Performance Capabilities

Oven: Airless, maximum 150 °C (302 °F)

Valves: Six-port and ten-port diaphragm chromatograph valves. Other types of valves, such as liquid injection or rotary valves, may be used depending on the application

Carrier Gas: Application-dependent. Typically zero-grade helium, nitrogen, or hydrogen

Sample & Calibration Gas Input Pressure Range: 0.2068–2.0684 bar: 1.0342 bar (recommended) or 15 psig

Carrier Gas Input Pressure Range (recommended): 6.2052–6.8947 bar (90–100 psig)

Detector: Thermal conductivity detector (TCD), flame ionization detector (FID), TCD/TCD or TCD/FID dual detector configurations possible; flame photometric detector (FPD) available.

Gating Options: Fixed-time, slope sensing gating of peaks

Streams: Up to 20 externally controlled streams or up to 8 internal (includes calibration stream)

Chromatograms stored/archived internally: Stores over 80 days of analysis report data and up to 2500 individual chromatograms.

Electronics

Power:

- **Standard:** 24V DC (21–30 VDC)
- **Optional:** 90–264V AC, 47–63 Hz

Typical Power Consumption at 22 °C (72 °F):

- **Startup:** 105 Watts DC (125 Watts AC)
- **Steady State:** 35 Watts DC (40 Watts AC)

Note: Add 15.5 Watts DC (18 Watts AC) for LOI

Communications (Standard)

- Ethernet: Two ports – one RJ-45 and one four-wire – with 10/100 mbps
- Analog inputs: Two standard isolated inputs filtered with transient protection, 4–20 mA (user scalable and assignable)
- Analog outputs: Six self-powered isolated outputs (4–20 mA)
- Digital inputs: Five inputs, user assignable, optically isolated, rated to 30V DC @ 0.5 A
- Digital outputs: Five user-assignable outputs, Form C and electromechanically isolated, 24V DC
- Serial: Three termination blocks, configurable as RS-232, RS-422 or RS-485 and one RS-232 D-sub (9-pin) Modbus/PC Connection

Communications (Optional)

Two expansion slots available for additional communications. Each slot has the capacity to add 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
- One modem card, 300-19.2k baud

Additionally, a FOUNDATION™ fieldbus module is available.

Memory Capacity: 1 GB of flash memory for data storage; 128 MB of SDRAM system memory with 2 MB static RAM (battery-backed)

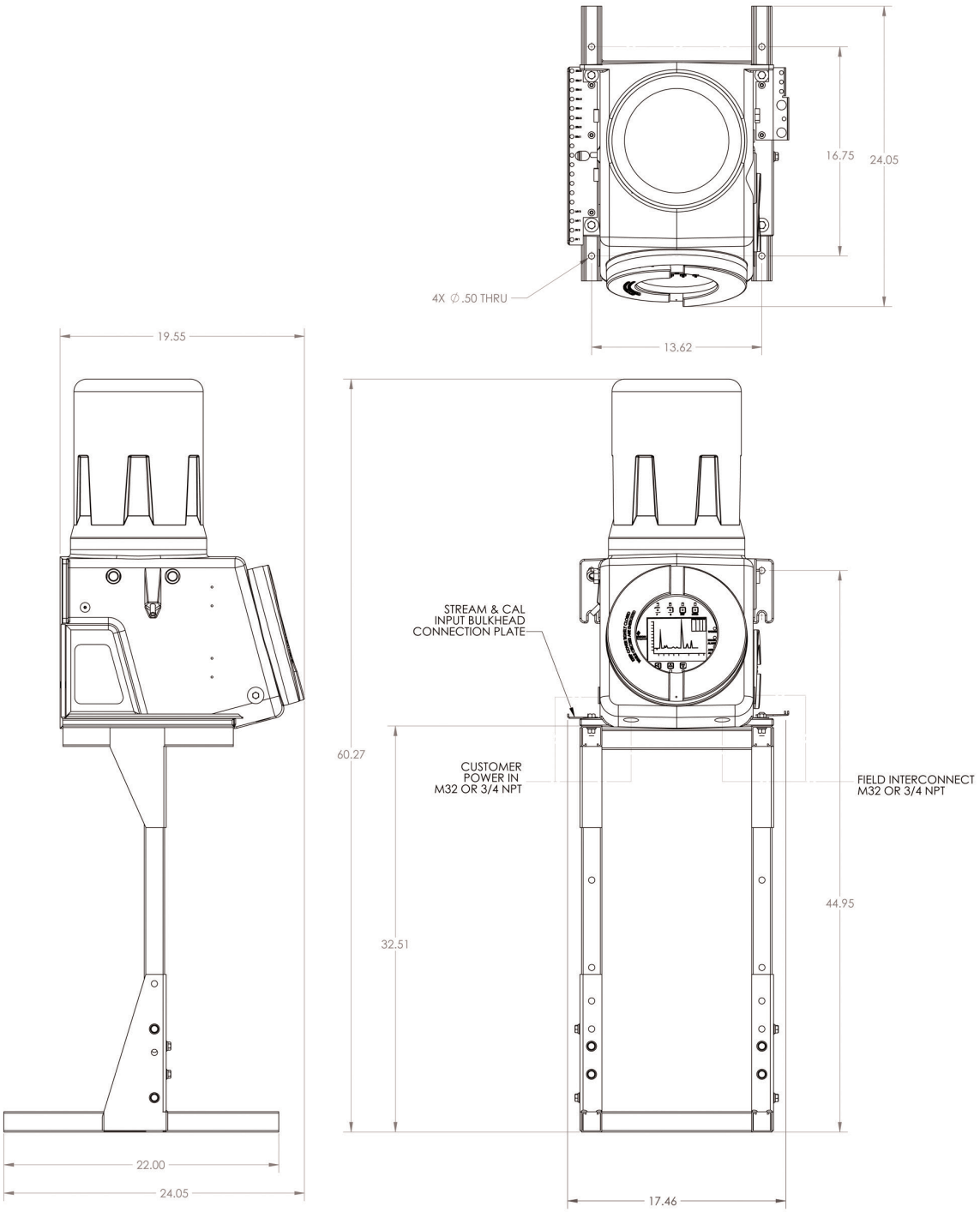
Touch Key Local Operator Interface (Optional)

The 700XA local operator interface (LOI) allows for maintenance and operation of a 700XA without a laptop or PC. The LOI is a state-of-the-art high resolution color display that is touch key infrared activated and supports all core GC operations.

Recommended Installation

The drawings below represent the minimum recommended installation guidelines for the 700XA Process Gas Chromatograph. Please consult Rosemount Analytical for detailed installation recommendation of your application.

Floor Mounted Details



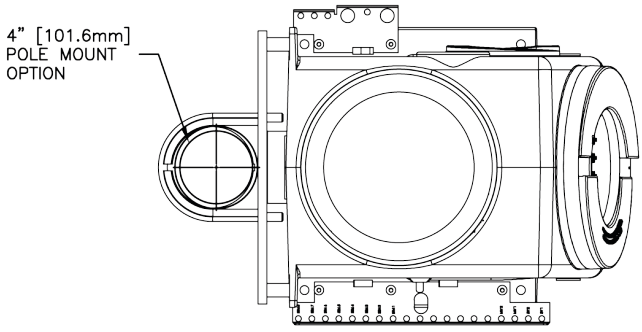
SIDE VIEW FLOOR MOUNT UNIT

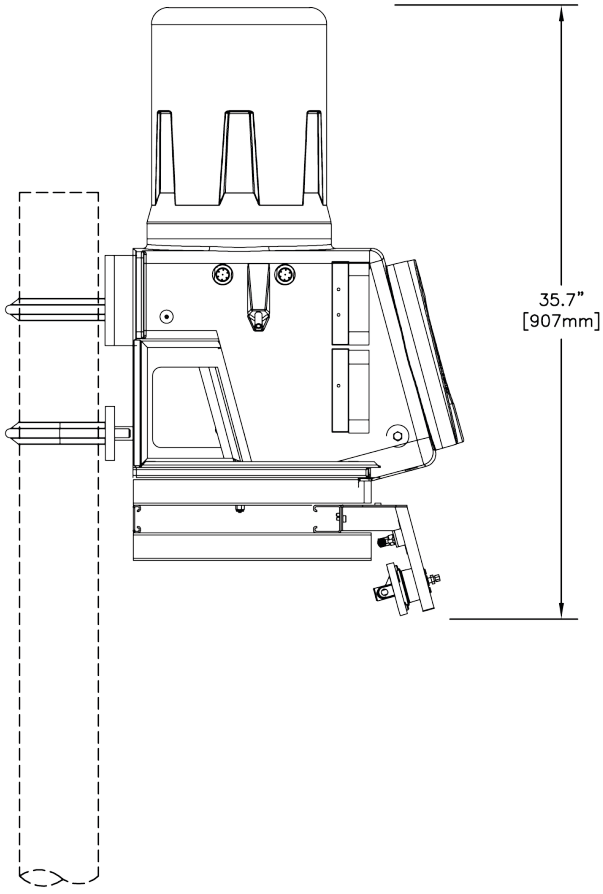
FRONT VIEW FLOOR MOUNT UNIT

Recommended Installation

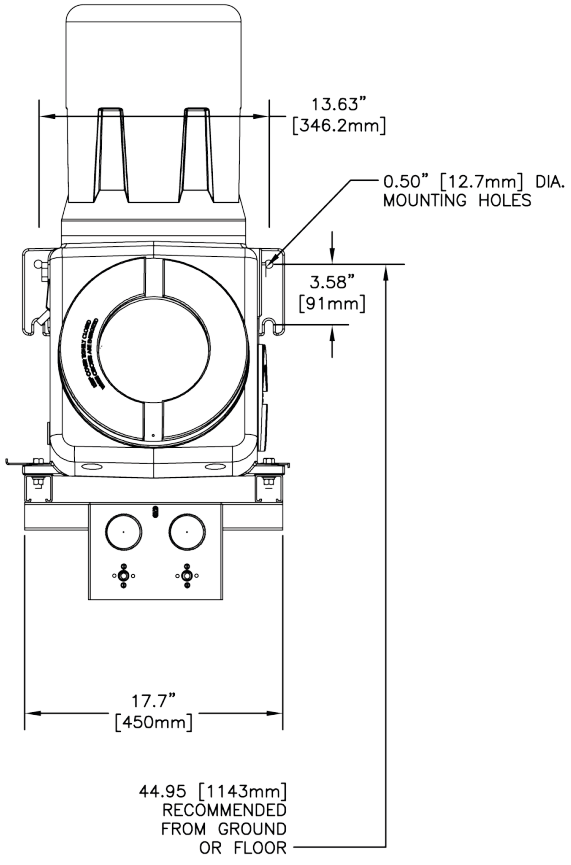
The drawings below represent the minimum recommended installation guidelines for the 700XA Process Gas Chromatograph. Please consult Rosemount Analytical for detailed installation recommendation of your application.

Wall and Pole Mounted Details





PIPE MOUNT SIDE VIEW



WALL MOUNT FRONT VIEW

www.RosemountAnalytical.com

www.analyticexpert.com

www.twitter.com/RAIhome

www.youtube.com/user/RosemountAnalytical

www.facebook.com/EmersonRosemountAnalytical

AMERICAS
Emerson Process Management
Rosemount Analytical
Analytical Center of Excellence
10241 West Little York, Suite 200
Houston, TX 77040 USA
Toll Free 866 422 3683
T +1 713 396 8880 (North America)
T +1 713 396 8759 (Latin America)
F +1 713 466 8175
gc.csc@emerson.com

EUROPE
Emerson Process Management
Bond Street, Dumyat Business Park
Tullibody FK10 2PB UK
T +44 1259 727220
F +44 1259 727727
sales.gcema@emersonprocess.com

MIDDLE EAST AND AFRICA
Emerson Process Management
Emerson FZE
Jebel Ali Free Zone
Dubai, United Arab Emirates, P.O. Box 17033
T +971 4 811 8100
F +971 4 886 5465
gc.csc@emerson.com

ASIA-PACIFIC
Emerson Process Management
Asia Pacific Private Limited
1 Pandan Crescent
Singapore 128461
Republic of Singapore
T +65 6 777 8211
F +65 6 777 0947
analytical@ap.emersonprocess.com

©2015 Emerson Process Management. All rights reserved.

The Emerson logo is a trademark and service mark of Emerson Electric Co. Rosemount Analytical is a mark of one of the Emerson Process Management family of companies. All other marks are the property of their respective owners.

The contents of this publication are presented for information purposes only, and while effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available on request. We reserve the right to modify or improve the designs or specifications of our products at any time without notice.

ROSEMOUNT® Analytical

EMERSON™ Process Management