

Danalyzer™ 700XA Natural Gas Chromatograph

Danalyzer™ 700XA Gas Chromatographs provide the most accurate analysis of natural gas available in a field mounted gas chromatograph (GC). The 700XA features a design that increases analytical capability, maximizes ease of use, and widens the range of analysis options in a GC with an ambient temperature rating of -20 °C to 60 °C/ -4 °F to 140 °F. These enhanced features make the 700XA ideal for natural gas custody transfer and applications requiring advanced analysis such as C9+ (with hydrocarbon dew point and cricondenthem calculations) and C6+ with hydrogen sulfide (H₂S).

Features

Unmatched measurement performance

- Best C6+ heating value/BTU repeatability available
± / -0.01 % (± / -0.1 BTU/1000 BTU) in temperature controlled environment
± / 0.015 % (± / -0.15 BTU/1000 BTU) in uncontrolled environment (-20° to 60 °C/-4° to 140 °F) with a three minute cycle time
- Best-in-industry C9+ repeatability available
±0.0125 % of heating value (±0.125 BTU/1000 BTU) for controlled environment
±0.025 % (±0.25 BTU/1000 BTU) of heating value for uncontrolled environment (-20° to 60 °C/-4° to 140 °F) with a five minute cycle time
- Wide dynamic range from percent to trace level components down to 2 ppm
- Reliable performance over broad ambient temperatures -40 °C to 60 °C/-40 °F to 140 °F

Easy to use

- Single bolt analytical valve design for easy overhaul in the field
- Large column canister for both micro-packed and capillary columns of long lengths
- Internal stream selection and valve actuation solenoids that can be replaced easily in under five minutes
- Easy to use MON2020 software for diagnostics
- Two portholes in the electronics housing for easy wiring access



Danalyzer™ 700XA Natural Gas Chromatograph

- One package for fiscal metering or gas quality
- Custody transfer analysis from C6+ to C9+
- Contaminant monitoring – trace hydrogen sulfide, carbon dioxide, oxygen, etc.
- Combine measurements and reduce analysis cost
 - C9+ with hydrocarbon dew point
 - C6+ with H₂S (3 to 30 ppm H₂S)
 - C6+ with oxygen
 - C6+ with helium and hydrogen
 - C9+ with methanol and water

Reduced installation costs

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

Lower operation and maintenance costs

- No shelter or instrument air required
- Low carrier and power consumption
- Longest gas chromatograph valve and column warranties available in the market today

Applications

Standard Natural Gas Applications

Emerson Process Management has made popular end-user energy and gas quality applications standard on all Danalyzer gas chromatographs. Applications may vary by components of interest, analysis time, reduced hardware, or improved precision. For non-standard natural gas applications, Emerson can custom-engineer the 700XA Gas Chromatograph to fit most requirements.

Energy Measurement (to C6+ and C9+)

The 700XA Gas Chromatograph standard applications for energy measurement include C6+ (three minutes), C7+ (ten minutes), and C9+ (five minutes). The latest GPA 2145/2172, AGA-8, and ISO 6976 calculations are available and can be configured to be calculated together.

Standard Measurement Ranges

		C6+	C9+
Methane	65 to 100 mole %		
Ethane	0 to 20 mole %		
Propane	0 to 10 mole %		
N-Butane	0 to 5 mole %		
Iso-Butane	0 to 5 mole %		
N-Pentane	0 to 1 mole %		
Iso-Pentane	0 to 1 mole %		
Neo-Pentane	0 to 1 mole %		
Hexane C6+**	0 to 0.7 mole %		
Nitrogen	0 to 20 mole %		
Carbon Dioxide	0 to 20 mole %		
Hexanes*	0 to 1 mole %		
Heptanes*	0 to 1 mole %		
Octanes*	0 to 0.5 mole %		
Nonane**	0 to 0.5 mole %		

* C9+ analysis only

** Not included in C9+ analysis results

Gas Quality Analysis

Natural gas contaminants, such as hydrogen sulfide and oxygen, reduce pipeline integrity over time. Most contaminants can be easily measured in the 700XA Gas Chromatograph for online quality assurance. Contaminant monitoring can be combined with energy measurements for complete custody transfer analysis. To the extent possible, these combined applications utilize independent gas chromatograph valves, detectors, and columns for each primary measurement. This technique offers greater reliability, increased speed, and easier troubleshooting. This application approach also simplifies field upgrades and re-applications in the 700XA Gas Chromatograph by minimizing internal piping changes.

Hydrocarbon Dew Point Monitoring

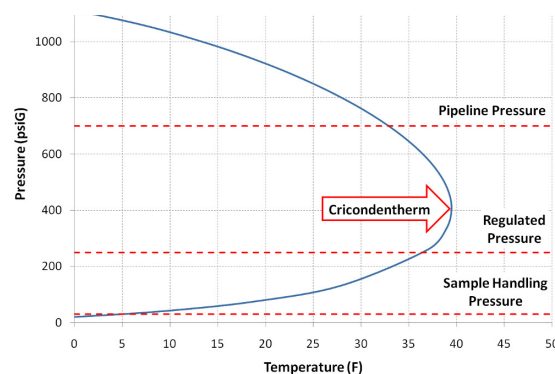
The 700XA Gas Chromatograph offers accurate and reliable hydrocarbon dew point calculations from the extended C9+ analysis by combining two detectors and a controller within a single housing – reducing complexity, minimizing maintenance and spare parts requirements, simplifying the scope of analyzers at the pipeline, and reducing the overall cost of the analytical solution.

The 700XA integrates hydrocarbon dew point software into the gas chromatograph to provide dew point temperatures for up to four user-entered pressures and the cricondetherm using the Peng-Robinson or the Redlich-Kwong-Suave equations of state. Real-time dew point results can be provided by using analog or Modbus inputs from another device for the calculation pressures.

The measured C6/C7/C8 and C9+ components allow for an accurate determination of the hydrocarbon dew point for pipeline-quality natural gas using reliable and low-maintenance thermal conductivity detectors (TCDs), avoiding standalone dew point analyzers or flame ionization detectors (FIDs), which require additional utility gas requirements. For heavier gas applications where significant amounts of components above C10 are expected, an FID can be combined with a TCD to provide for further extended analysis.

Custom Applications

If Emerson's standard applications do not fit your needs, the 700XA Gas Chromatograph can be customized to meet many measurement requirements. Simply submit a completed application data sheet found at the end of this data sheet with your request, or ask our Application Engineers for assistance.



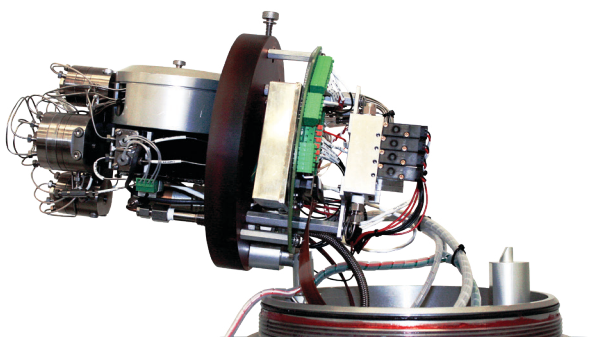
A typical phase curve showing the Cricondetherm and the hydrocarbon dew point calculated at three pressures for practical operational use.

Superior Performance

The Danalyzer Difference

Building off of the proven valves, columns, and detectors of the Model 500 and Model 700 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.

Multiple temperature control zones and up to four six-port or ten-port valves and two independent detectors provide extreme application flexibility and range. All components in the oven are completely accessible and serviceable in the field to reduce the total cost of ownership over the life of the analyzer.



Unique analytical assembly design pivots to allow instant access to all components.

Gas Chromatograph Valves

The 700XA has the capacity to support up to four ten-port or six-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.

Stream Switching Module

The internal sample stream switching module is available in four or eight-stream versions. For applications with widely varying stream composition, double-block-and-bleed configuration is optionally available.

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 found in the 700XA Gas Chromatograph is able to measure well beyond the normal ranges seen in other designs and is sensitive enough 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.

Micro Flame Ionization Detector (μ FID)

The micro-flame ionization detector, coupled with a new detector pre-amplifier/electrometer board, permits measurement of trace hydrocarbons in a variety of samples at parts-per-billion (ppb) concentrations. The μ FID 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.

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.

Six-port and ten-port XA valves build on legendary performance of the Model 500 six-port valve, with reduced dead volume and a single retention bolt to simplify maintenance.



Controller Electronics and Communications

Modular Electronics

The control electronics, option cards, and field termination boards are all 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 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
- User adjustable auto-backlighting
- Eight infrared-activated touch keys and screen saver
- Indicates complete GC status, control, and diagnostics, including full chromatogram display

Flexible I/O

The 700XA is built with enough I/O to handle most applications, including:

- Five discrete digital outputs
- Five discrete digital inputs
- Two analog inputs
- Six analog outputs
- Three Modbus serial ports (RS-232/RS-485/RS-422)
- Two Modbus enabled Ethernet ports (one with DHCP server for local access)
- FOUNDATION™ Fieldbus (optional)

If there is a need for more I/O, the 700XA includes two expansion slots that use the I/O cards from the ROC-800 family of flow computers.

Data Archiving and Reports

Includes expanded reports and data archiving that conforms to the latest API 21.1 requirements for metering audit purposes and back up of the primary systems such as flow computers or SCADA systems. Every analysis is time and date stamped and archived for retrieval via the MON2020 software.

- **Security** – four levels of password-protected security, configurable to read/write or read-only for third-party access.
- **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.
- **Chromatograms** – over 1,700 worth of analysis chromatograms and 370 chromatograms and user selected "Protected Chromatograms" that are permanently stored, including the factory testing chromatograms.
- **Drawings and Documents** – user manuals and drawings in several file formats are stored in the controller memory for convenient retrieval using the MON2020 software eliminated the risk of manuals and drawings being misplaced. User generated documents (such as maintenance checksheets or installation drawings) can also be uploaded to the controller for later retrieval.

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 from the calibration response factors 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.

MON2020™ Software

The Danalyzer 700XA Gas Chromatograph is designed to operate unattended. If adjustments are needed, our exclusive MON2020™ software allows complete control of the XA series of gas chromatographs – either locally or remotely.

From within MON2020, a user 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 for use in other third-party applications in text, HTML, or Excel™ file formats
- Check original calibration against last calibration
- Perform GC operation checks and modifications simultaneously
- Upload and view manuals and drawings stored in the gas chromatograph controller

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.

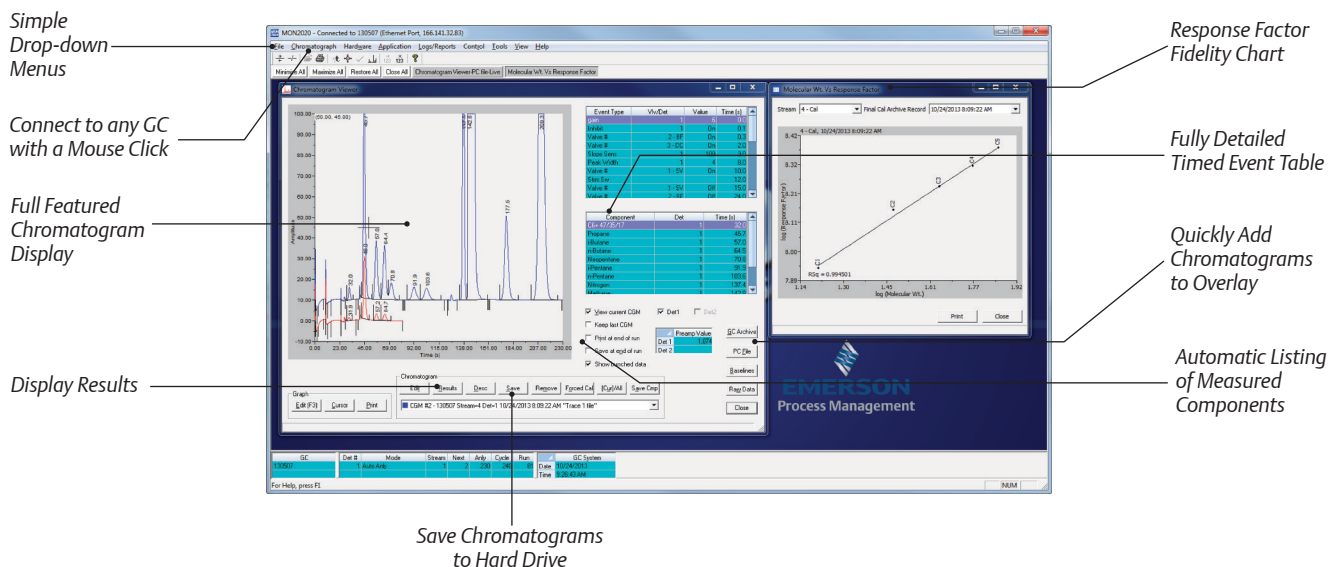
With the ability to communicate to the enterprise network or export to numerous file types, MON2020 is a powerful software tool that ensures operators, engineers, maintenance personnel, and management have access to critical data, such as current and archived chromatograms, alarm history, event logs,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

The chromatogram viewer allows you to look and compare chromatograms stored in a connected GC or offline disk storage, and the currently running analysis. The small chromatogram files (less than 100 KB in size) also include analysis and calculation results, integration and valve timing settings, retention time settings, and the raw peak data. The small size and format of the chromatogram files (file extension .xcgm) facilitate easy sharing of chromatograms over email.

The trend viewer makes it easy to trend multiple variables on a single chart. To help diagnosing process or analysis issues, single or multiple points on the trend can be selected and the corresponding chromatogram(s) opened straight from the trend viewer screen. The trends can be saved as MON2020 trend files or exported as text, comma separated values, or Microsoft® Excel™ files.

The MON2020 software connects to an XA series GC via Ethernet (10/100 Mb) directly or over the local or wide area network. A multiple level username/password security implementation is used to limit and control access to a gas chromatograph providing read only or up to four levels of write enabled access.

Figure 1 - MON2020 Interface



Integration with Third-Party Networks

Whether you want to network gas chromatographs throughout your network or simply link a single gas chromatograph to a flow computer, the 700XA can be configured to handle most any scenario.

- Choice of Ethernet, FOUNDATION™ fieldbus, Modbus Serial, or 4–20 mA analog outputs
- Uses industry standard non-proprietary communication protocols that allows connection to other XA series or legacy gas chromatographs over the same network.
- Use MON2020 for diagnostics, configuration, and data retrieval over Ethernet, Serial, or Modem connections.

The 700XA Gas Chromatograph supports four types of communication interfaces

- 10/100 Mbps Ethernet connectivity
- A FOUNDATION™ fieldbus H1 interface
- RS-232, RS-422, and RS485 serial communication links
- 4–20 mA analog outputs

Ethernet Connectivity

Two Ethernet interfaces are available on the 700XA Gas Chromatograph. Each interface can be configured with a static IP address, subnet mask, and gateway. The RJ45 connector Ethernet port can be configured to operate as a DHCP host to simplify local PC access. 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 using Modbus TCP
- One to a broadband cellular wireless gateway for remote GC access for data collection and maintenance, and the other for a local laptop connection

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. It 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. The 700XA can be configured to use the flow computer industry standard SIM-2251 Modbus map and be compatible with communication links from legacy Danalyzer GC installations, or fully customized Modbus maps can be configured using either single register per floating point (ENRON Format) or two registers per floating point format used in DCS and PLC systems.

Three hard-wired serial ports that can be configured as RS-232, RS-485, or RS-422 links to communicate to host systems using the Modbus protocol. Additionally, an additional fourth serial port is configured for RS-232 with a nine-pin D-type connector and can be used for direct connection to a Daniel® ultrasonic meter or local MON2020 access. The ultrasonic flow-meter link enables the online calculation of the speed of sound for continuous validation of the custody measurement. If more serial links are required, up to two additional serial ports can be added using the two expansion ports using ROC800 series I/O cards.

4–20 mA Analog Outputs

The 700XA Gas Chromatograph supports six isolated 4–20 mA analog outputs that can be expanded to 14 analog outputs with optional expansion cards.

Custom-Engineered Solutions

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 gas chromatograph is only as good as the quality of the sample it measures. The standard sample system includes a particulate filter and liquid filter/shut-off for each sample stream. If required, the sample system can also be custom engineered for the specific requirements of the application.

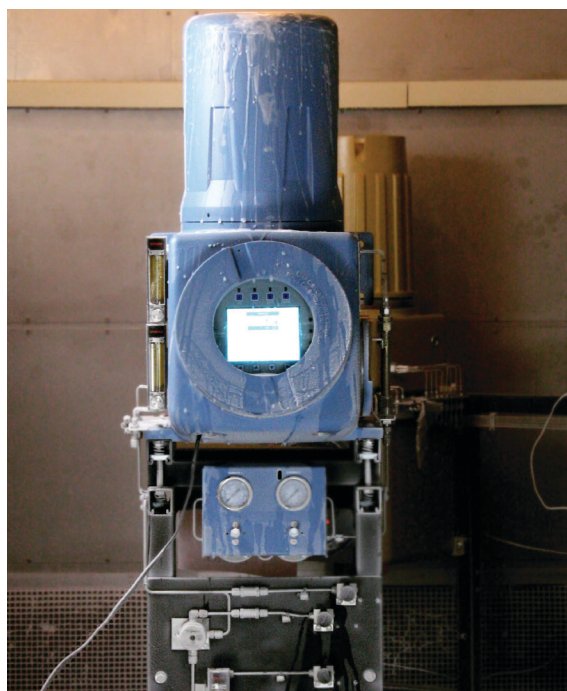
Common features include:

- Heated and open-panel designs
- All components rated for the area classification
- 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 are investing in the highest-quality online gas chromatograph available. As a result of chamber testing, we can guarantee all gas chromatographs that we ship will operate to the performance specifications across the stated operating temperature range.



Danalyzer 700XA Gas Chromatograph inside the environmental testing chamber

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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)

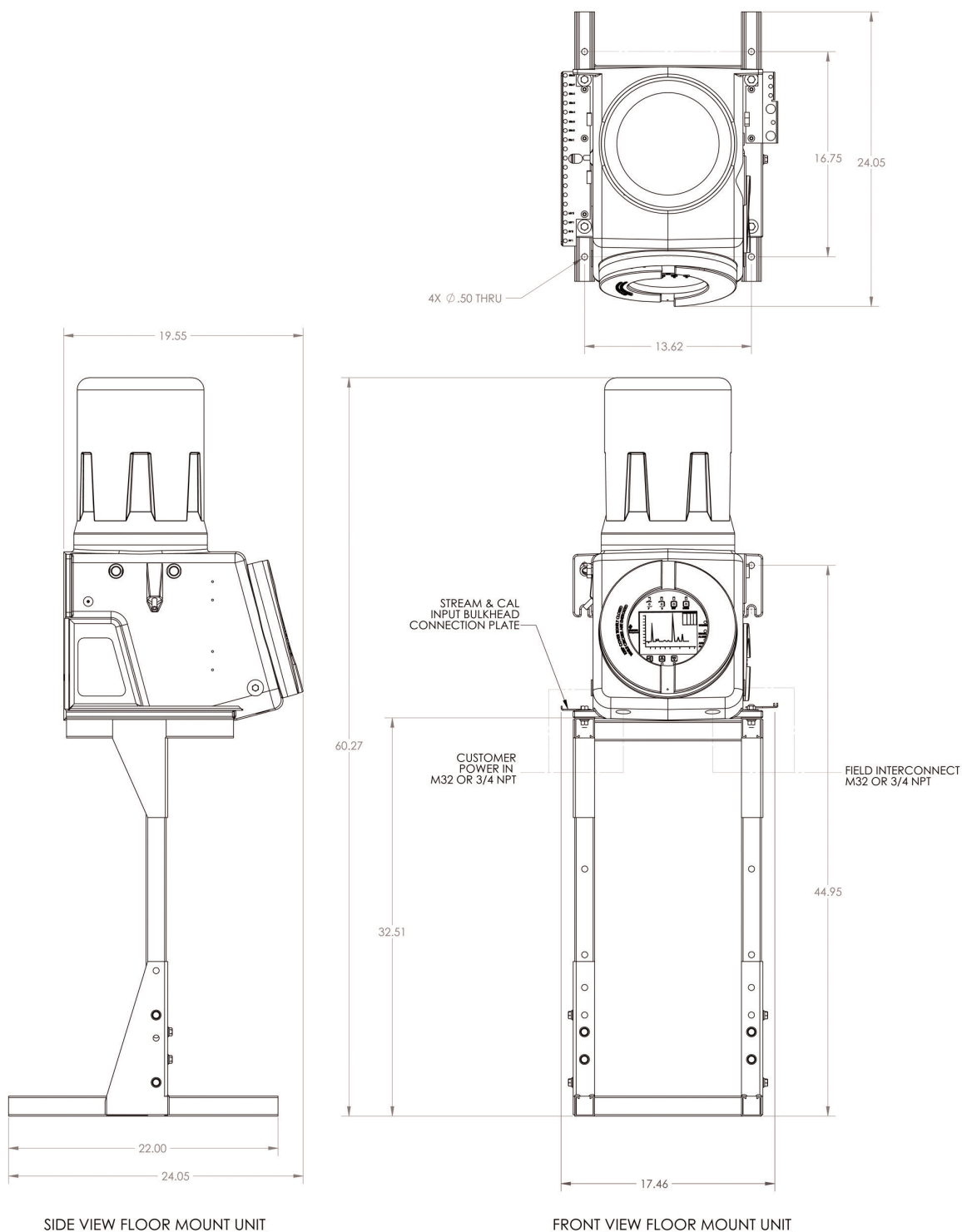
Touch Key Local Operator Interface (Optional)

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 Gas Chromatograph. Please consult Rosemount Analytical for detailed installation recommendation of your application.

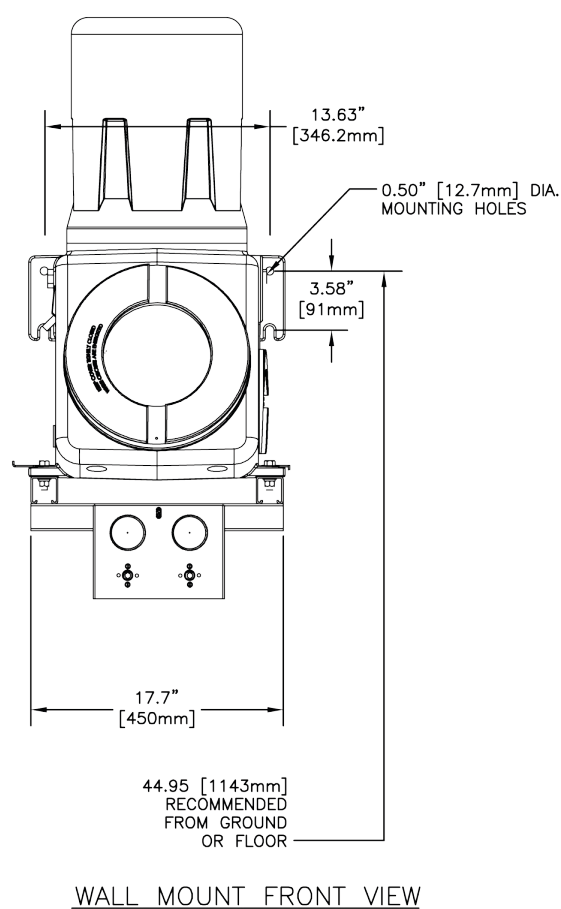
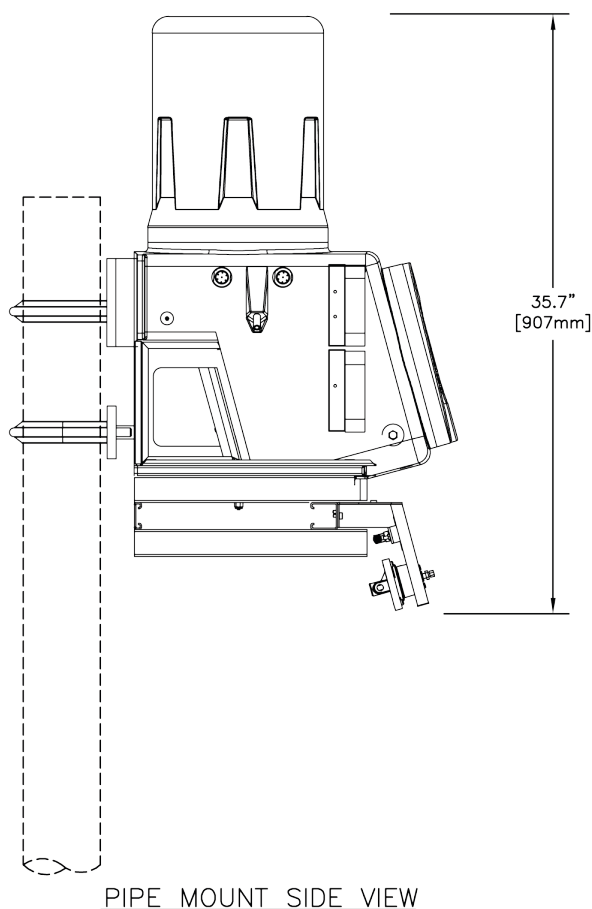
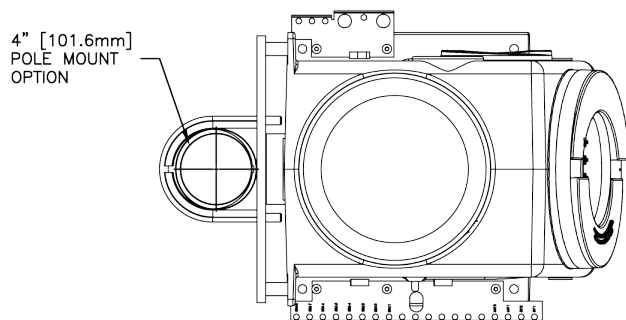
Floor Mounted Details



Recommended Installation

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Wall and Pole Mounted Details



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