Danalyzer™ 700XA Gas Chromatograph

The Danalyzer™ 700XA gas chromatographs provide extended analysis for extreme conditions. The 700XA gas chromatograph 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 6-port or 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.

Features and Benefits

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
  - Oxygen (0-2%)
  - Trace hydrogen sulfide (0-20 ppm)
  - Carbon dioxide (as fast as 90 seconds)
  - Helium/hydrogen (0-10%)
  - C₉₊ with hydrocarbon dew point calculation

Reduced installation costs
- Standard 24 VDC power or optional 120/240 VAC 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
Unmatched measurement performance

- Highest \( \text{C}_6^+ \) repeatability — ±0.01% of heating value (±0.1 BTU/1000 BTU) for controlled-environment \( \text{C}_6^+ \) analysis and ±0.015% (±0.15 BTU/1000 BTU) of heating value for uncontrolled-environment (-20° to 60° C / -4° to 140° F) \( \text{C}_6^+ \) analysis
- Best-in-industry \( \text{C}_9^+ \) repeatability — ±0.0125% of heating value (±0.125 BTU/1000 BTU) for controlled-environment \( \text{C}_9^+ \) analysis and ±0.025% (±0.25 BTU/1000 BTU) of heating value for uncontrolled-environment (-20° to 60° C / -4° to 140° F) \( \text{C}_9^+ \) 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

Easy to use

- MON 2020™ software setup and diagnostics
- A redesigned architecture with fewer cables and easy accessibility to internal parts

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 \( \text{C}_6^+ \) and \( \text{C}_9^+ \))

The 700XA gas chromatograph offers applications for energy measurement from \( \text{C}_6^+ \) hydrocarbon ranges to \( \text{C}_9^+ \) hydrocarbon ranges. Calculations based on GPA 2145/2172 or ISO 6976 standards can be provided.

Standard Measurement Ranges

- 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+ 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 %

* \( \text{C}_9^+ \) analysis only

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 Dewpoint Monitoring

The 700XA gas chromatograph offers accurate and reliable hydrocarbon dew point calculations from the extended \( \text{C}_9^+ \) 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 DewCalc hydrocarbon dew point software into the gas chromatograph to provide dew point temperatures for up to four user-entered pressures and the cricondentherm 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 $C_6/C_7/C_8$ and $C_9^+$ components allow for an accurate determination of the hydrocarbon dew point for pipeline-quality natural gas using reliable and low-maintenance thermal conductivity detectors (TCD), avoiding standalone dew point analyzers or flame ionization detectors (FID), which require additional utility gas requirements. For heavier gas applications where significant amounts of components above $C_{10}$ 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 most 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.

**SUPERIOR PERFORMANCE**

**The Danalyzer Difference**

**Modular Analytical Oven**

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. By accommodating as many as four 10-port valves, the 700XA can handle more complex applications, and 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.

As an option, the flexible design of the 700XA gas chromatograph oven accommodates a rotary valve for liquid injections, a micro-FID (flame ionization detector), and a methanator.

**Gas Chromatograph Valves**

The 700XA has the capacity to support up to four 10-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 10 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 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 (µFID)**

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 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 and ambient temperature control — 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 and suitable for installation in Class I, Division 1 Groups B, C & D 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+n 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. For applications with widely varying stream composition, 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

**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. Communication to SCADA or flow computer systems can be achieved through three Modbus serial interfaces (RS-232 or RS-485), Modbus or OPC over Ethernet, and an optional Foundation Fieldbus communication module.

**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 MON 2020 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 — assuming a four-minute analysis time, the last 30 days of every analysis record plus 30 days of calibration records (one calibration per day) can be archived automatically by time/date stamp.
- Chromatograms — over one weeks worth of analysis chromatograms and calibration chromatograms (depending on the analysis time) and user selected “Protected Chromatograms” that are permanently stored.
- Drawings and Documents — User manuals and drawings in several file formats are stored in the controller memory for convenient retrieval using the MON 2020 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.

**MON 2020™ Software**

The 700XA gas chromatograph is designed to operate unattended. If adjustments are needed, our exclusive MON 2020™ software allows complete control of your gas chromatographs – either locally or remotely. From within MON 2020, 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.
- Upload and view manuals and drawings stored in the gas chromatograph controller.

MON 2020 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.

MON 2020 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, MON 2020 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.

Data collected from the 700XA gas chromatograph can be stored and displayed in a wide range of options such as trend lines on the user’s monitor screen. In addition, you can download and install the latest GPA 2145 and ISO 6976 physical property factors when they are updated.

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

[Diagram showing features of MON 2020™ Software]
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
- Can use the same network to connect 700XA and 1500XA gas chromatographs
- Able to connect multiple PC workstations using MON 2020
- Connectivity to supervisory systems using industry standard protocols such as Modbus and OPC

The 700XA gas chromatograph supports four types of communication interfaces – 1) 10/100 mbps Ethernet connectivity, 2) a Foundation fieldbus H1 interface, 3) RS-232, RS-422, and RS485 serial communication links, and 4) 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 MON 2020 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’s 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 FF, and through the MON 2020 gas chromatograph software via direct connection over Ethernet.

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. The 700XA can be configured to use the flow computer industry standard SIM_2251 Modbus map or fully customized Modbus maps using either single register per floating point (ENRON Format) or two registers per floating point format used in DCS and PLC systems. 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. 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 SCADA systems or flow computers, using Foundation fieldbus, Modbus TCP (SIM 2251 and User Modbus), Modbus Serial, and 4-20mA analog outputs.
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. So every sample system for Emerson’s 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.

Environmental chamber testing is offered to our customers free of charge for all Emerson gas chromatographs prior to shipment.

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 will operate to the performance specifications across the stated operating temperature range.

www.EmersonProcess.com
SPECIFICATIONS

Power:
- **Standard**: 24 VDC (21-30 VDC), 6.25A (150W)
- **Optional**: 90-264 VAC, 47-63 Hz

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

Environmental temperature:
-20° to 60° C (-4° to 140° F)

Environmental temperature without safety certification:
-40° to 60° C (-40° to 140° F)

Enclosure Protection Rating: IP66 and NEMA 4X

Dimensions (without sample system):
- **Wall-mount**: 711.20 mm H x 444.5 mm W x 497.84 mm D (28” H x 17.5” W x 19.6” D)
- **Pipe-mount**: 711.20 mm H x 444.5 mm W x 670.56 mm D (28” H x 17.5” W x 26.4” D)
- **Floor-mount**: 1531.62 mm H x 444.5 mm W x 612.14 mm D (60.3” H x 17.5” W x 24.1” D)

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

Approximate Weight (without sample system): 49.895 kg (110 lbs.)

Area Safety Certification Options:*
- **CSA**:
  - USA
    - Class I, Zone 1, A Ex d IIC, T6
    - Class I, Division 1, Groups B, C, D, T6, Enclosure Type 4
  - Canada
    - Class I, Zone 1, Ex d IIC, T6
    - Class I, Zone 1, Ex d IIC, T6
- **ATEX/IECEx**
  - Ex II 2G
  - Ex d IIC Gb T6

Valves: 6-port and 10-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 Input Pressure Range (recommended): 15-20 psig

Carrier Gas Input Pressure Range (recommended): 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 (see FPD module data sheet)

Gating Options: Fixed-time or automatic, slope-sense gating of peaks

Streams: Up to 18 streams (including calibration stream), 8 streams standard

Chromatograms stored/archived internally: Stores up to 30 days of analysis report data and up to 2500 individual chromatograms.

Communications (Standard):
- **Ethernet**: Two available connections – one RJ-45 port & one 4-wire termination – with 10/100mbps
- **Analog inputs**: Two standard inputs filtered with transient protection, 4-20mA (user scalable and assignable)
- **Analog outputs**: Six isolated outputs, 4-20mA
- **Digital inputs**: Five inputs, user assignable, optically isolated, rated to 30VDC @ 0.5A
- **Digital outputs**: Five user-assignable outputs, Form C and electro-mechanically isolated, 24VDC
- **Serial**: Three termination blocks, configurable as RS-232, RS-422 or RS-485 and one D-sub (9-pin) port for PC connection

Communications (Options):
Two expansion slots available for additional communications. Each slot has the capacity to add one of the following:
- 4 analog inputs (isolated) card
- 4 analog outputs (isolated) card
- 8 digital inputs (isolated) card
- 5 digital outputs (isolated) card
- 1 RS-232, RS-422 or RS-485 serial connection card
- 1 modem card, 300-19.2k baud

Additionally, a FOUNDATION fieldbus module is available as an option.

Memory Capacity: 128 Mb of flash memory for data storage; 64 Mb of SDRAM system memory with 2 Mb static RAM (battery-backed)

Internal Modem (optional): 14.4K bps with V.42 bis. Providing up to 57.6K bps throughput.

Ethernet: 10/100 mbps with RJ-45 port and phoenix terminals.

*Stated T-ratings can vary based on applications.
Application Data Sheet

If your application does not fit the standard applications outlined, a custom built configuration for your application can be requested. To request a free quotation, simply fill out the information below and send it to your world area contact information located on the back cover of this datasheet.

Name: ___________________________ Your Reference #: ___________________________

Title: ___________________________ Project Name: ___________________________

Company: _________________________ Process Unit: ___________________________

Address: _______________________________ Stream Name(s): ___________________________

Hazardous Area Classification: ___________________________

Phone #: ___________________________

Fax #: ___________________________

Email: ___________________________

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<tr>
<th>Stream Composition</th>
<th>Units</th>
<th>Stream 1</th>
<th>Stream 2</th>
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<td>Min</td>
<td>Normal</td>
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(For more than two streams, make copies of this page)

Stream Temperature: ___________________________

Stream Pressure: ___________________________

Stream Phase (vapor/liquid): ___________________________

Stream Contaminants: ___________________________

Distance to GC from sample point: ___________________________

Power: 120/240 VAC ( ) 24 VDC ( )

Mounting: Wall ( ) Pipe ( ) Stand ( )

Data communication: Analog output ( ) Modbus ( ) OPC ( ) Modem ( ) Foundation Fieldbus ( )

Analyzer network: Ethernet ( ) RS-232 ( ) RS-485 Multi-Drop ( )

Other options: Carrier Gas ( ) Calibration Gas ( ) Start-up ( ) Training Class ( )

Special Instructions:
OUTLINE AND MOUNTING DETAILS

Floor Mounted
Wall and Pole Mounted
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