

Model 700 On-line Gas Chromatograph

NATURAL GAS MEASUREMENT - Power, Precision, Reliability



ROSEMOUNT[®]
Analytical

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Process Management

Model 700 Gas Chromatograph



The Model 700 Gas Chromatographs offer the broadest range of analysis options available today in a field-mount gas chromatograph. Whether it is heating value measurement, trace contaminant monitoring, pipeline integrity, or product quality/process control, the Model 700 is flexible enough to meet your analysis needs. Based on the same proven technology and software as the Model 500 series' the new Model 700 design offers **legendary reliability and precision, lower installation and operating costs, greater application flexibility, and unmatched measurement performance.**

Legendary Reliability

Emerson Process Management pioneered the use of on-line Gas Chromatographs (GC) for natural gas energy measurement over 20 years ago. The Model 500's reliable performance in over 7000 installations – most of which are in rugged and uncontrolled environments -- have made it the industry standard for natural gas analysis. Today, we've packaged this experience in the Model 700. It is a new GC series that's more powerful and economical than ever before.

Model 700 - Benefits

● One package for fiscal metering or as quality

- Custody transfer analysis from C₆+ to C₉+
- Contaminant monitoring - trace H₂S, CO₂, Oxygen, etc.
- Combine measurements and reduce analysis cost
 - Oxygen (0-2%)
 - Trace H₂S (0-50 ppm)
 - CO₂ (as fast as 90 seconds)
 - Helium/Hydrogen (0-10%)
 - Hydrocarbon dew point (± 2 .C)

● Reduced installation costs

- 24 VDC power standard
- Integrated controller electronics
- Pipe-mount, wall-mount or floor mount

● Lower operation and maintenance costs

- No shelter or instrument air required
- Low helium and power consumption
- Longest GC valve and column warranties available

● Unmatched measurement performance

- Highest stated precision (± 0.25 BTU/1000 for ambient C₆+ analysis)
- Wide dynamic range from percent to trace level components
- Reliable performance over broad ambient temperatures -30°C to 55°C (-20°F to 130°F)

● Easy to use

- Compatible with Model 500/2350A
- MON2000 software setup and diagnostic software
- Identical setup and operation - no additional training

Applications

Standard Natural Gas Applications

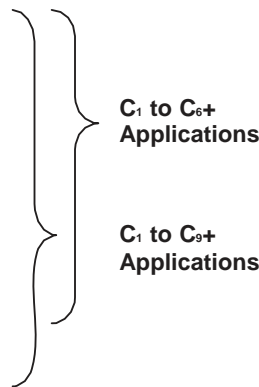
We've made our most popular energy and gas quality applications standard (Table 1). Applications may vary by components of interest, analysis time, reduced hardware (economics), or improved precision. Choose the one that's right for you or we'll create one that's customized for your specific application.

Energy Measurement (to C₆₊ and C₉₊)

The Model 700 offers applications for energy measurement from C₆₊ hydrocarbon ranges, to C₉₊ hydrocarbon ranges. Calculations based on GPA2145 or ISO6976 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%



Gas Quality Analysis

Natural Gas contaminants reduce pipeline integrity over time. Most can be easily measured in the Model 700 for on-line quality assurance. Contaminant monitoring can be combined with energy measurements for complete custody transfer analysis. To the extent possible, these combined applications utilize independent GC valves, detectors and columns, for each primary measurement. This technique offers greater reliability, increased speed, and easier troubleshooting. This application approach also makes field upgrades and re-applications in the Model 700 a snap, by minimizing as internal piping changes.

Standard Model 700 Applications and Repeatability (Table 1)

Code	Components Analysis Time Application type	Repeatability (BTU/1000)	
		@ Ambient	Over 0-130 F
612	C ₁ to C ₆₊ , CO ₂ , N ₂ 12 minutes Low-volume BTU/CV	0.5	1.0
604	C ₁ to C ₆₊ , CO ₂ , N ₂ 4 minutes Standard BTU/CV	0.25	0.5
602	C ₁ to C ₆₊ , CO ₂ , N ₂ 2 Minutes Gas Turbine BTU/CV/Density	0.5	1.0
TS2	Trace H ₂ S (0-30 ppm) 90 Seconds Gas Quality	2 ppm	3 ppm
LF8	C ₁ , N ₂ , CO ₂ , O ₂ , 8 minutes Landfill BTU/CV	0.25	0.5
LF3	C ₁ , N ₂ , CO ₂ , O ₂ , 3 minutes Landfill BTU/CV (mole sieve)	0.25	0.5
6PS	C ₁ to C ₆₊ , CO ₂ , N ₂ , H ₂ S (%) 4 minutes Production BTU/CV	0.25	0.5
6PO	C ₁ to C ₆₊ , CO ₂ , N ₂ , O ₂ (%) 4 minutes Standard BTU/CV/Oxygen	0.25	0.5
708	C ₁ to C ₇₊ , CO ₂ , N ₂ , 8 minutes Rich Gas BTU/CV	0.25	0.5
6HH	C ₁ to C ₆₊ , CO ₂ , N ₂ , HE, H ₂ 4 minutes Production Gas BTU/CV	0.25	0.5
6TS	C ₁ to C ₆₊ , CO ₂ , N ₂ , H ₂ S (ppm) 7 minutes Standard BTU/CV/Gas Quality	0.25	0.5
905	C ₁ to C ₉₊ , CO ₂ , N ₂ 5 minutes Rich Gas Extended BTU/CV (Optional HC Dew point SW)	0.25	0.5

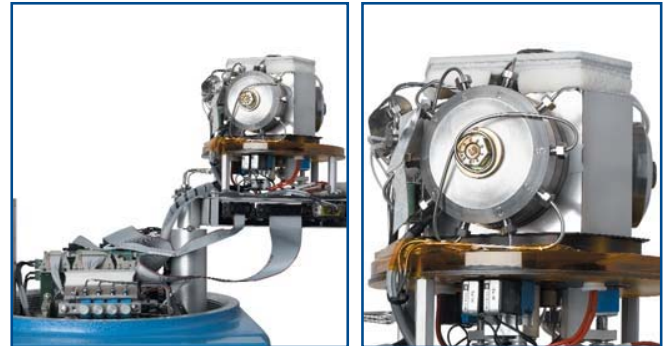
Custom Applications of Your Choice

If our standard applications do not fit your needs, we can customize an application to meet your measurement requirements. Submit a completed Application Data Sheet (ADS) with your request, or ask our application engineers for assistance.

Technology

Modular Analytical Oven

An element key to the Model 700 Gas Chromatograph's application flexibility is the new modular analytical oven. Using field-proven valves, columns, and detectors, the analytical oven has been redesigned to make it modular and scalable. Six- or Ten-port valves and detectors mount to a triangular "kiosk" block - which facilitates valve heating and pneumatic actuation. 3 temperature control zones, and up to 3 valves and two detectors operating independently, the oven provides extreme application flexibility and range. All components in the oven are completely accessible and serviceable in the field.



Maintenance of the Model 700 oven is simplified with all components mounted on the surface of the kiosk. Furthermore the kiosk is mounted on the rotating plate that can be pivoted out of the way when access to other components is needed.



The diaphragm valve used in the Model 700 is available in both 6-port and 10-port versions for maximum application flexibility.

GC Valves

At the heart of the Model 700's legendary reliability is the Emerson Process Management six- and ten-port diaphragm/piston gas chromatograph valves. These pneumatic valves are guaranteed for the life of the gas chromatograph and specified to operate between *5 and 10 million times* between service. By minimizing internal movement (1/1,000 inch (0.0254 mm)) of the pistons, which never come in contact with sample, abrasive mechanical wear is virtually eliminated. This unique double diaphragm design removes the need for all springs, O-rings, or lubrication. Valve service is performed by replacing a cost effective diaphragm set, normally completed in less than 10 minutes.

Micro-packed Columns

Emerson Process Management micro-packed columns offer a superior combination of features found in both capillary and conventional packed columns -- speed, sharp peak resolution, and low carrier gas consumption. In addition, Emerson Process Management's unique design provides for greatly extended column life - the longest warranty available on the market (5 years on the standard C₊ natural gas set).



Emerson Process Management Standard 1/16" micro-pack columns are the longest lasting in the industry.



Internal heated four-stream switching module enables easy service and built-in expandability.

Stream Switching Module

New to the Model 700 gas chromatograph series is the internal sample stream switching module. Available in 4 or 8 stream versions, this module utilizes the same helium-rated 24-volt solenoids used in the analytical oven. It is temperature controlled for operation above the sample dewpoint. For applications with widely varying stream composition, double block and bleed configuration is optionally available.

Controller electronics and communication

Modular electronics

The controller electronics, option cards, and field termination boards are packaged conveniently in the lower enclosure of the Model 700. Separate power and output connections are made through this enclosure.

2350A compatible electronics/software

The Model 700 uses the same CPU board as the Model 500/2350A, thus making features, options, and operation nearly identical. No new training is required.

Local indication and operation panel

Analyzer health and valve status can be viewed through the glass cover of the lower enclosure. The panel displays green (OK), yellow (warning), and red (failure) LEDs, along with LEDs for all gas chromatograph valve actuations, power, and CPU health. Each valve can be actuated manually for simplified troubleshooting and fast system purging after maintenance.

Data archiving and reports

The Model 700 with expandable solid-state memory virtually eliminates the need for external data storage. Every analysis is time/date stamped and archived, for retrieval via the MON2000 software. Pre-configured reports can be displayed, printed, and/or stored internally. Results can be trended directly or exported easily in ASCII format.

Security

Three 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 operator name recorded.

Alarm logs

A continuous record of all historical alarms, time/date stamped with alarm state and description.

Maintenance log

A "scratch pad" for keeping track of maintenance or testing performed on a GC system.

Archiving

The last 99 days of each analysis and 400 calibrations are archived automatically by time/date stamp. Last chromatogram stored for each sample and calibration stream.

Standard reports

Pre-configured reports include:

Average reports: Hourly, 24-hr., weekly, monthly and variable averages.

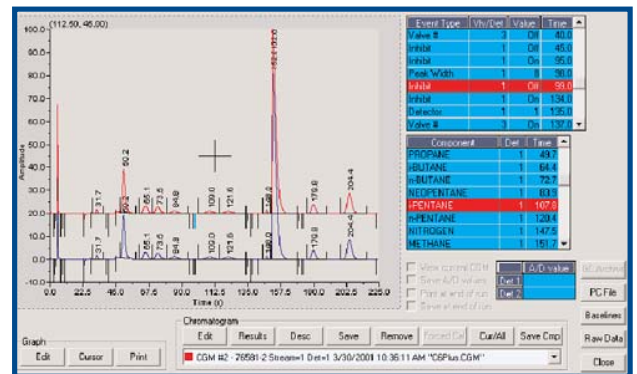
Analysis reports: Physical property calculations by component and group for analysis and alarms.

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 for last calibration.

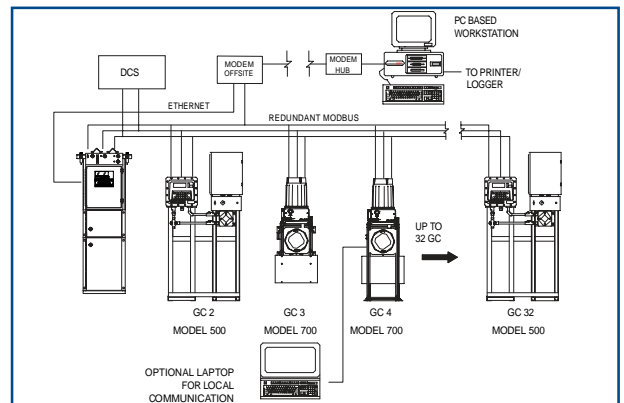
Final calibration report: Results of final calibration, response factor and retention time adjustments

MON2000 GC Software



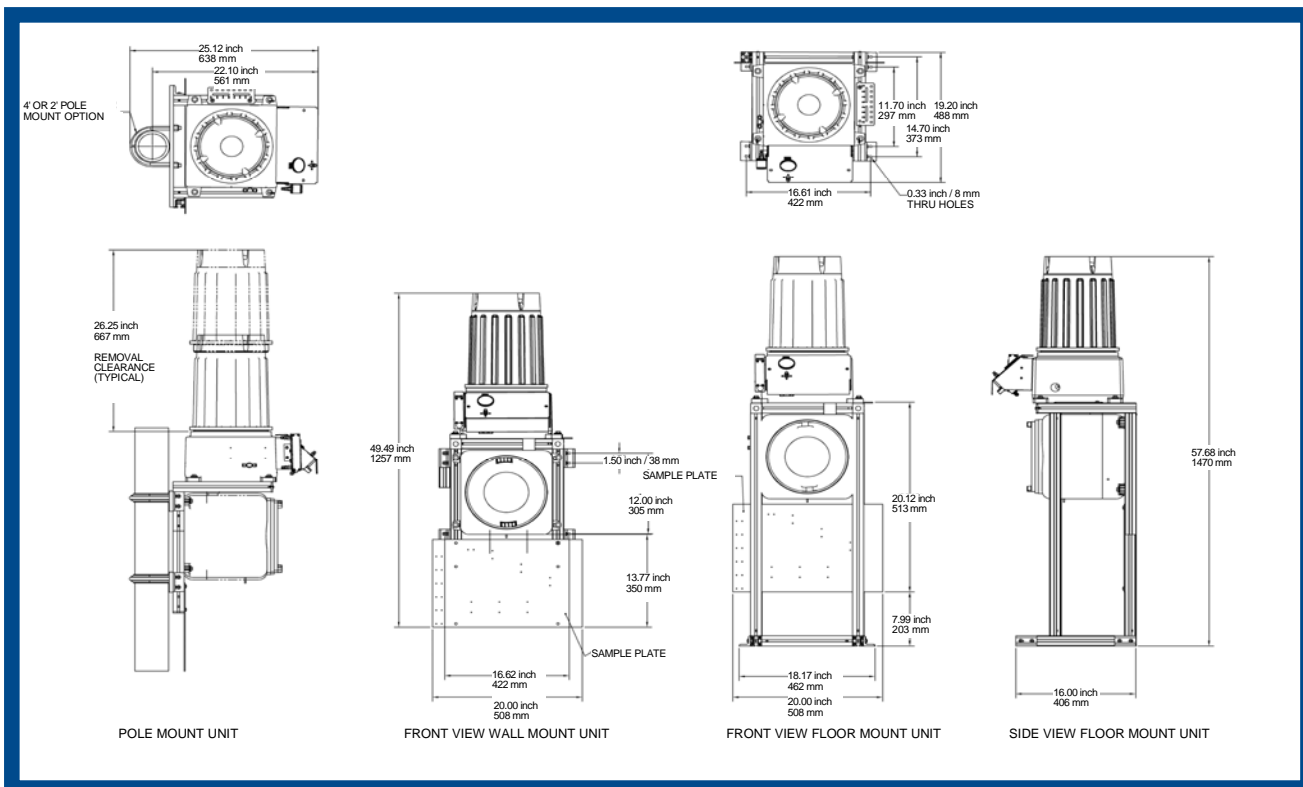
Simplified Set-up and Troubleshooting

- See Timed events, peak integration parameters, chromatograms on one screen
- Use hot-key shortcuts for instant access of raw data and analysis results
- Choose from up to 5 discrete application methods (component data tables) for maximum measurement accuracy
- Enjoy the convenience of the latest GPA 2145 and ISO 6976 physical property constants and calculations included
- Overlay and compare chromatograms for proactive trend analysis
- Trend any component or calculated value and store files
- Send via email for others to review chromatogram files which are compressed to a small file format (<20 kbytes)



Simplified Network Communications - Multiple serial ports with Ethernet option can be field configured to provide redundant data highways.

Outline and Mounting Details



Packaging Accessories

Emerson Process Management offers standard and custom GC packaging accessories to meet your installation requirements.

GC visor
Provides direct sun and rain protection for GC, and mounts directly to Model 700 frame.

GC system enclosure (not shown)
Complete GC protection -- encloses GC and calibration gas. Internally heated to meet API 14.1. Helium cylinders mount on rear.

GC three-sided enclosure (not shown)
Complete protection for GC and operator. Economical and easy to assemble

Standard auxiliary equipment

- Probe/pressure regulators/filters
 - Fixed or removable.
- Carrier Gas Systems
 - Two cylinders with dual manifold
 - regulators for uninterrupted operation
- Calibration gasses and heating blankets
 - Standard or custom blends

Calibration gasses with heating blankets

GC Visor

Probes and membrane filters

Dual carrier gas manifold

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    graph TD
        C1[CARRIER CYLINDER 1] --- V1[V-1]
        C2[CARRIER CYLINDER 2] --- V4[V-4]
        V1 --- V2[V-2]
        V4 --- V3[V-3]
        V2 --- V3
        V2 --- A[ANALYZER]
        V3 --- A
        V1 --- ATM1[ATM]
        V4 --- ATM2[ATM]
    
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Ordering Matrix for Model 700

Model 700 Gas Chromatograph

Ordering Matrix (must select only 1 option for each column)

770 A W D 4 SN N S4 612 1N S (Example)

Code Approvals

A ATEX

C CSA

Code Mounting

W Wall-mount

P Pipe-mount

F Floor-mount

Code Power

DC 24 VDC

AC Universal 85 to 240 VAC

Code Digital/Analog I/O

04 5 Digital In; 4 Digital Out; 4 Analog In; 4 Non-isolated Analog Out

08 5 Digital In; 4 Digital Out; 4 Analog In; 8 Analog Out, 4 Non-Isolated/4 Isolated

12 5 Digital In; 4 Digital Out; 4 Analog In; 12 Non-isolated Analog Out

Code Serial Communications/Local Keypad-LCD

SN Standard/No Keypad-LCD {(2) RS232, (1) 422/485 Factory/Field configurable}

EN Extended/No Keypad-LCD {(4) RS232, (2) RS422/485 Factory/Field configurable}

Code Internal Modem and/or Ethernet

N No Modem or Ethernet

M Modem only

E Ethernet only

B Modem and Ethernet

X Special (consult factory)

Code Internal Stream Switching

(Total max. # streams = Sample + Calibration streams)

S4 Standard – Up to 4 streams

S8 Standard – Up to 8 streams

D4 Double Block and Bleed - Up to 4 streams

D8 Double Block and Bleed - Up to 8 streams

ES External Stream Switching - (consult factory)

XX Special (consult factory)

Code Oven Assembly/Application

612 BTU/CV C6+ / 12 min.

604 BTU/CV C6+ / 4 min.

6GT BTU/CV C6+ / 2 min./Turbine

TS2 Trace H2S / 3 min.

LF8 Landfill Gas / 8 min.

LF3 Landfill Gas / 3 min. (mole-sieve)

6PS Std. C6+ with % H2S

6PO Std. C6+ with % Oxygen

6HH Std. C6+ with Helium/Hydrogen

6TS C6+ / 7 min and ppm H2S / 7 min.

905 Std. C9+ / 5min.

HC9 Std. C9+ and HC Dew

XXX Special

Code Sample Conditioning (sample streams only)

1N 1 stream plate

1G 1 stream plate, with Fast Loop/Membrane Filter

2N 2 stream plate

2G 2 stream plate, with Fast Loop/Membrane Filters

3N 3 stream plate

3G 3 stream plate, with Fast Loop/Membrane Filters

4N 4 stream plate

4G 4 stream plate, with Fast Loop/Membrane Filter

5N 5 stream plate

5G 5 stream plate, with Fast Loop/Membrane Filter

6N 6 stream plate

6G 6 stream plate, with Fast Loop/Membrane Filter

7N 7 stream plate

7G 7 stream plate, with Fast Loop/Membrane Filter

XX Special (consult factory)

Code Application Software

S Std. GPA 2172/GPA2145

I ISO 6976:1995

X Special (consult factory)

Model 700 Specifications

Power:

24 VDC Std., 21-30VDC; 80 watts
90-264 VAC, 47-63 HZ; 80 watts
80 watts startup; 33 watts nominal

Environment: -29°C to 60°C

Repeatability (CV/BTU):

Ambient: $\pm 0.025\%$ or 0.25 BTU/1,000
-18°C to 55°C: $\pm 0.05\%$ or 0.5 BTU/1,000

Area classifications:

Canada: Class 1, Zone 1, Exd IIB (+H2), T4
USA: Class 1, Zone 1, Aex d IIB (+H2), T4
Int'l: CENELEC/IEC Zone 1, Eex d IIC, T4
ATEX CE EX II 2 G

Enclosure: IP56/NEMA4X **Weight:** approx. 80 kg

Mounting/Dimensions (without sample system):

Wall-Mount: 91cm H x 38cm W x 48cm D
Pipe-Mount: 91cm H x 38cm W x 48cm D
Floor-Mount: 137cm H x 38cm W x 48cm D

Columns: 1/16 inch micro-packed

Oven: Isothermal (airless), max. 100°C,

Valves: pneumatic 6-port or 10-port

Carrier gas: Application dependent, typically zero-grade helium, nitrogen, argon or hydrogen @ 90 psig

Valve actuation gas:

Instrument air or carrier gas @ 80 psig

Wetted material: 316 stainless steel and Viton diaphragm

Stream selection:

4-stream manifold (sample + calibration streams)
- Optional 8-stream manifold
- Optional double block and bleed configuration

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Serial Ports: 3 standard field configurable (RS 232, RS 422 or RS 485) - Optional 4 additional serial ports (ports 4 -7)

Protocol/registers: ASCII or RTU Modbus/Sim2251 or user-definable registers

Digital inputs: One common GC alarm, four user-assignable

Digital outputs:

Five user-assignable, (3 Form C, 2 solid-state optically isolated)

Analog inputs:

Four 4-20mA, transient protected, user scalable and assignable

Analog outputs:

Four 4-20mA, non-isolated std, four additional 4-20mA, isolated (optional) or eight non-isolated 4-20mA (optional)

Parallel port:

One parallel port for dedicated, automatic printed reports

Detectors: Thermal conductivity detector (TCD), Flame ionization detector (FID); TCD/TCD or TCD/FID dual detector configurations possible; Flame photometric detector (FPD) module

Data storage: 16 MB "disk on chip" solid state

Data archiving:

Last 99 days of each analysis, time-date stamped

Chromatogram archiving: Last stream, last calibration

Methods: Four independent methods

Peak integration: Automatic slope sensitivity detect

PC software: MON2000 (Windows®) 2.4 or higher

PC operating systems: Windows 95, 98, 2000, NT, XP

Additional communications options:

Internal modem: 9.6 to 33.6K baud-configurable
Ethernet card: 10 mbps with RJ-45 port

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