

New Refinery Flare Regulations 40 CFR Part 63

Review of the Requirements and the Emerson Solution

Agenda



Requirements for 40 CFR Part 63

Emerson Gas Chromatograph Standard Solutions



New Refinery Flare Regulations – 40 CFR 63

Effective January 30, 2019

Regulation 40 CFR 63 Subpart CC for Petroleum Refineries

In 2016, the EPA finalized its refinery sector rule on maximum achievable control technology (MACT) regulations, and gave refineries 18 months to comply with the requirements for flare monitoring (Figure 1). The rule, 40 CFR 63 Subparts CC and UUU, affects any refinery with a flare used as a control device for an emission point, and those refineries must be in compliance by January 30, 2019.

The new regulations set flare operating limits, require a flare management plan (**FMP**), and require a continuous parameter monitoring system (**CPMS**) plan. The new regulations also cover pilot flame monitoring, visible emissions and flare tip velocity—requirements previously found in earlier versions of the rule.

Parameters that must be monitored in the FMP include:

- BTU (British Thermal Units)
- Net heating value in the combustion zone (NHVcz)
- Net heating value dilution parameter (NHVdil)
- Vent gas composition

40 CFR Part 63 Subpart CC - Petroleum Refining Process Unit

- The FMP rule specifically states, “For each flare, the owner or operator shall operate the flare to maintain the net heating value of flare combustion zone gas (NHVcz) at or above 270 British thermal units per standard cubic feet (Btu/scf) determined on a 15-minute block period basis when regulated material is routed to the flare for at least 15 minutes.”
- The rule also says, “For each flare actively receiving perimeter assist air, the owner or operator shall operate the flare to maintain the net heating value dilution parameter (NHVdil) at or above 22 British thermal units per square foot (Btu/ft²) determined on a 15-minute block period basis when regulated material is being routed to the flare for at least 15 minutes.”
- And most important, the CPMS must “...allow the (EPA) Administrator to confirm that the selected site-specific operating limit(s) adequately ensures that the flare destruction efficiency is 98 percent or greater or that the flare combustion efficiency is 96.5 percent or greater at all times.”
- Combustion efficiency, net heating value in the combustion zone, and net heating value dilution parameter are calculated as defined in rule CFR 63.670.

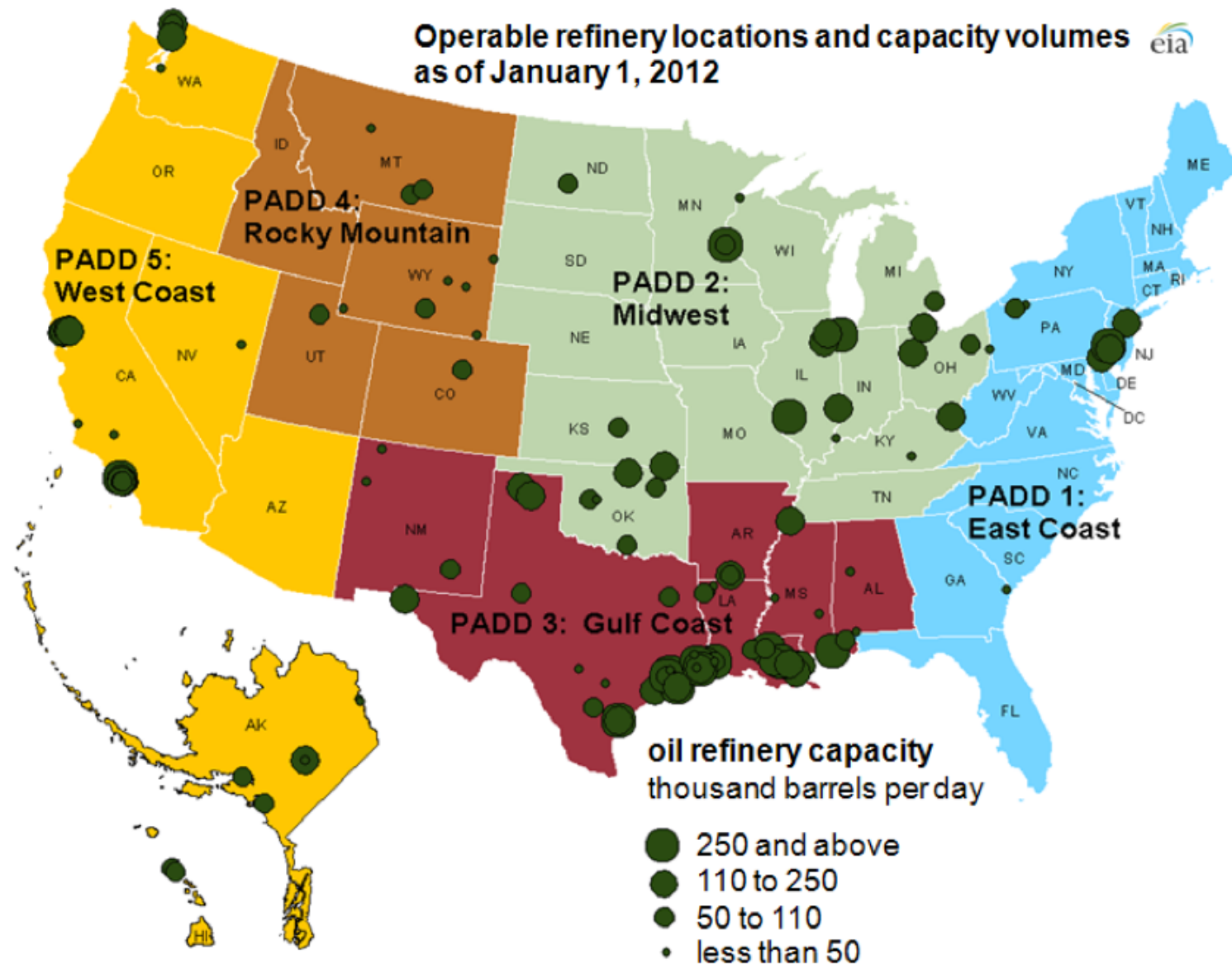
Requirements for Gas Chromatographs

Additional requirements for Gas Chromatographs:

- Meet quality assurance per Table 13 (Performance Specification 9 of 40 CFR part 60, appendix B, except that a single daily mid-level calibration check can be used, the multi-point calibration can be conducted quarterly, and the sampling line temperature must be maintained at a minimum temperature of 60 °C)
 - **Calibration Error (CE).** The average CEMS calibration response must not differ by more than 10 percent of calibration gas value at each level after each 24-hour period
 - **Calibration Precision and Linearity.** Any one injection shall not deviate more than 5 percent from the average concentration measured at that level. The linear regression curve for each organic compound shall have an $r^2 \geq 0.995$
 - **Measurement Frequency.** The sample to be analyzed shall flow continuously through the sampling system. The sampling system time constant shall be ≤ 5 minutes or the sampling frequency specified in the applicable regulation, whichever is less

Calibration gas(es) to contain Hydrogen, Methane, Ethane, Ethylene, Propane, Propylene, n-Butane, iso-Butane, Butene (general), 1,3-Butadiene, n-Pentane, Acetylene (optional), Carbon monoxide (optional), Propadiene (optional), Hydrogen sulfide (optional).





Number of Refineries

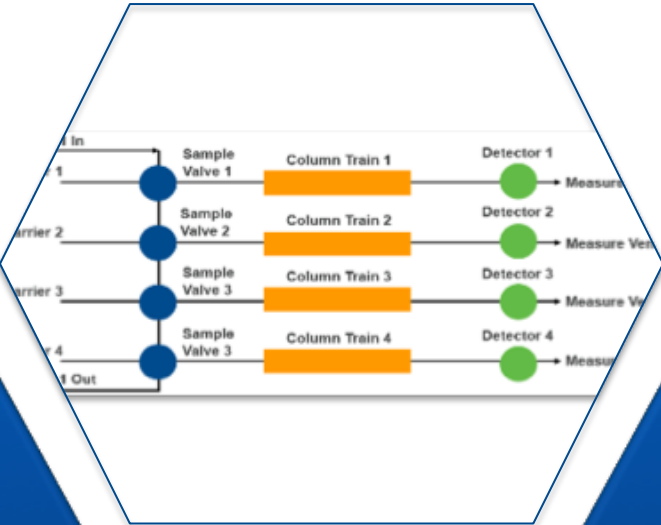
139+

Analyzer Sales Price

\$150-250K

Emerson Solution to 40 CFR Part 63

Emerson Chromatograph 1500XA

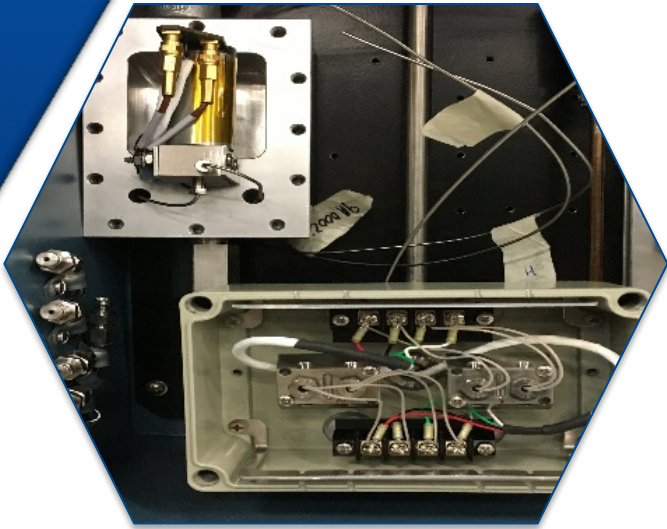


Intercolumn
(ITC) Detectors

Redesigned
Detector
Housing

4 Detectors

2 Clocks



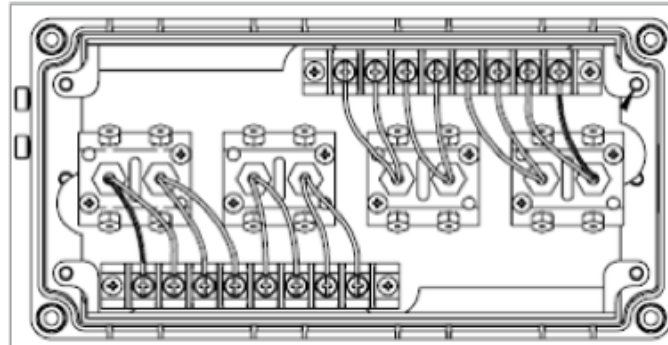
Emerson Chromatograph 1500XA

4 Detectors

Parallel Chromatography -

Allows for breaking down a complex train into the simpler trains that can be run simultaneously

Intercolumn (ITC) detector - Detector can be used to show components as they elute from one column to another



TCD

4 Maximum

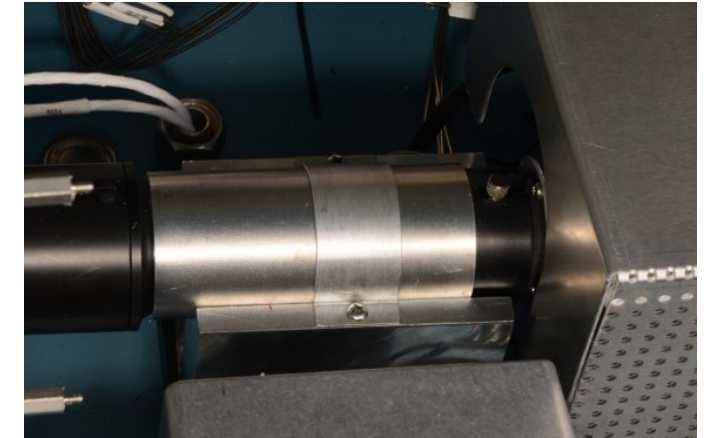
Can be used as intercolumn (ITC) detector



FID

2 Maximum

Can be combined with TCDs/FPD

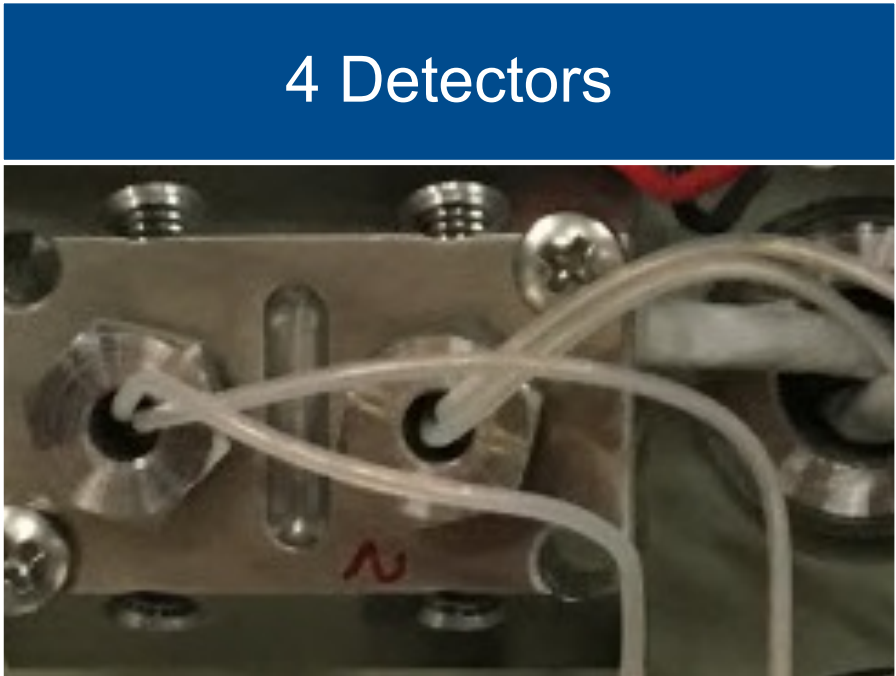


FPD

1 Maximum

Can be combined with TCDs/FID

Emerson Chromatograph 1500XA



4 Detectors

Parallel
Chromatography
Inter-Column
Detectors (ITC)
2 Flame Detectors

Parallel
Chromatograph

of parallel
trains
increases by
2X

**Reduces Cycle
Time
Simplifies
Troubleshooting**

Inter-Column
Detectors

TCD detector
used to help
set valve
timing with
heartcut

**Reduces
Maintenance
Time & Costs**

2 Flame
Detectors

Previously
required 2
GCs

**Reduces Total
Costs &
Footprint**

Emerson Solution to 40 CFR Part 63

- Emerson offers two standard solutions to meet the **Flare vent gas composition monitoring requirement of 40 CFR Part 36**
- Custom solutions are also available as the Operator/Owner is responsible for confirming the components that are in the flare and need to be measured

Emerson Standard Solutions

Solution 1:

Hydrocarbons, H₂S, H₂, CO and CO₂ Detection

Solution 2:

Hydrocarbons, H₂S, H₂, CO, CO₂ and Benzene Detection

Emerson Solution to 40 CFR Part 63

	Solution 1: No Benzene	Solution 2: With Benzene
Gas Chromatograph	Next generation 1500XA	Next generation 1500XA
Cycle Time	8 minutes	8 minutes
Sample	Vapor	Vapor
Detectors	3 TCDs (thermal conductivity)	4 TCDs (thermal conductivity)
Carrier Gas	Argon, Helium	Argon, Helium
Columns	1/16” Micropacked	1/16” Micropacked
Valves	Mixture of 6 & 10-port diaphragm	Mixture of 6 & 10-port diaphragm
Instrument Air Required?	Yes	Yes

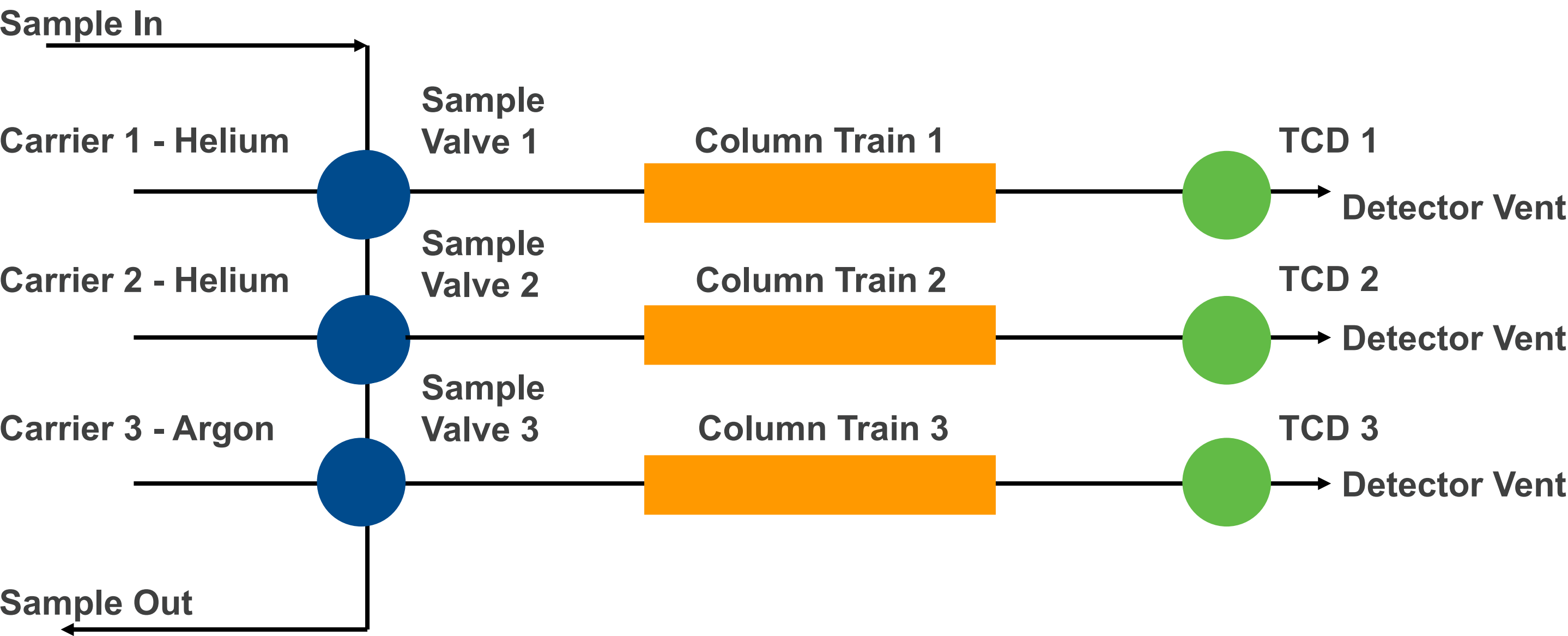
Solution 1: Hydrocarbons, H2S, H2, CO and CO2 Detection

Stream Components	Units	Measured Range	
		Min.	Max.
HYDROGEN SULFIDE (H2S)	ppm	3	300 PPM
NITROGEN / OXYGEN	Mole%	0	1
CARBON MONOXIDE	Mole%	0	1
HYDROGEN	Mole%	0	40
METHANE	Mole%	0	60
ETHANE	Mole%	0	20
ETHYLENE	Mole%	0	20
PROPANE	Mole%	0	10
PROPYLENE	Mole%	0	10
ISOBUTANE	Mole%	0	10
n-BUTANE	Mole%	0	10
C4 OLEFINS	Mole%	0	10
ISOPENTANE	Mole%	} C5+ = 0 - 10	
n-PENTANE	Mole%		
CO2	Mole%	0	1
BTU / LB		0	500
WATER	Mole%		

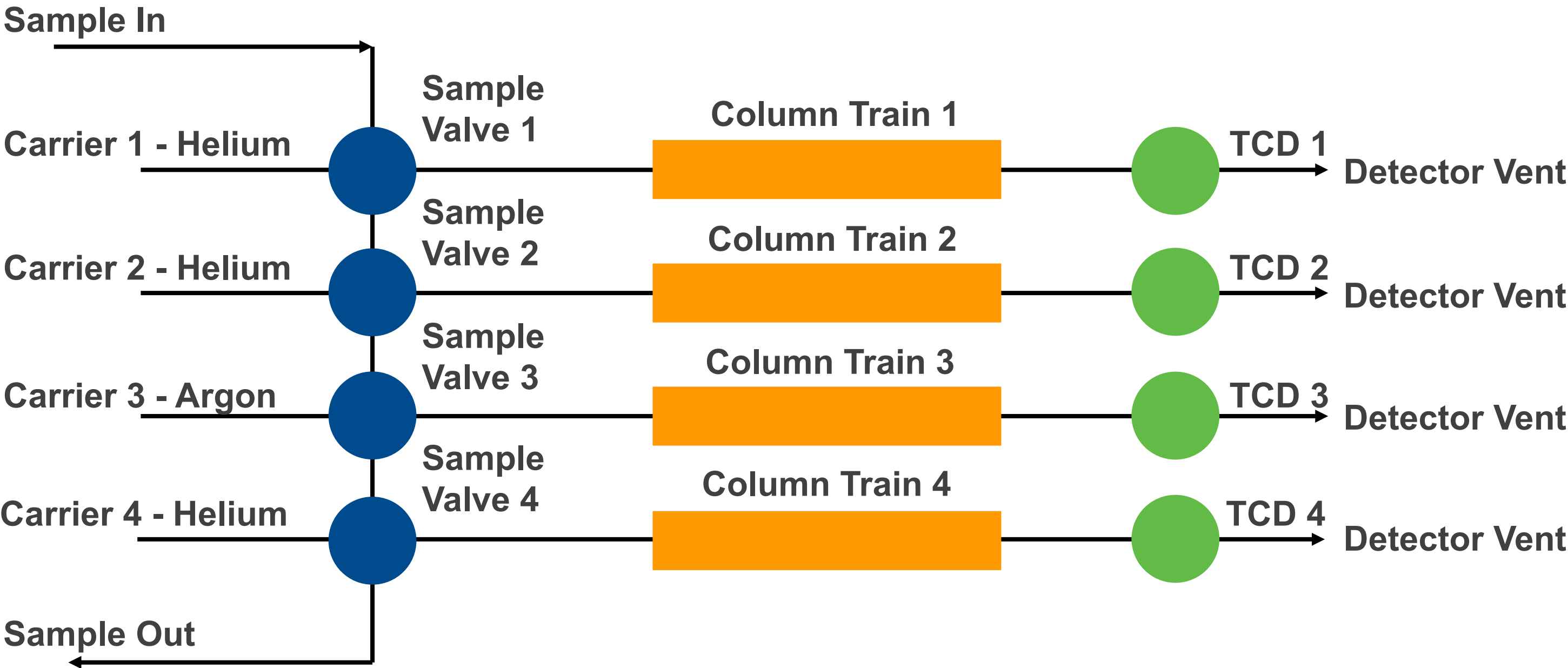
Solution 1: Hydrocarbons, H2S, H2, CO and CO2 with Benzene Detection

Stream Components	Units	Measured Range	
		Min.	Max.
HYDROGEN SULFIDE (H2S)	ppm	3	300 PPM
NITROGEN / OXYGEN	Mole%	0	1
CARBON MONOXIDE	Mole%	0	1
HYDROGEN	Mole%	0	40
METHANE	Mole%	0	60
ETHANE	Mole%	0	20
ETHYLENE	Mole%	0	20
PROPANE	Mole%	0	10
PROPYLENE	Mole%	0	10
ISOBUTANE	Mole%	0	10
n-BUTANE	Mole%	0	10
C4 OLEFINS	Mole%	0	10
ISOPENTANE	Mole%	} C5+ = 0 - 10	
n-PENTANE	Mole%		
CO2	Mole%	0	1
BENZENE	Mole%	0	5
BTU / LB		0	500
WATER	Mole%		

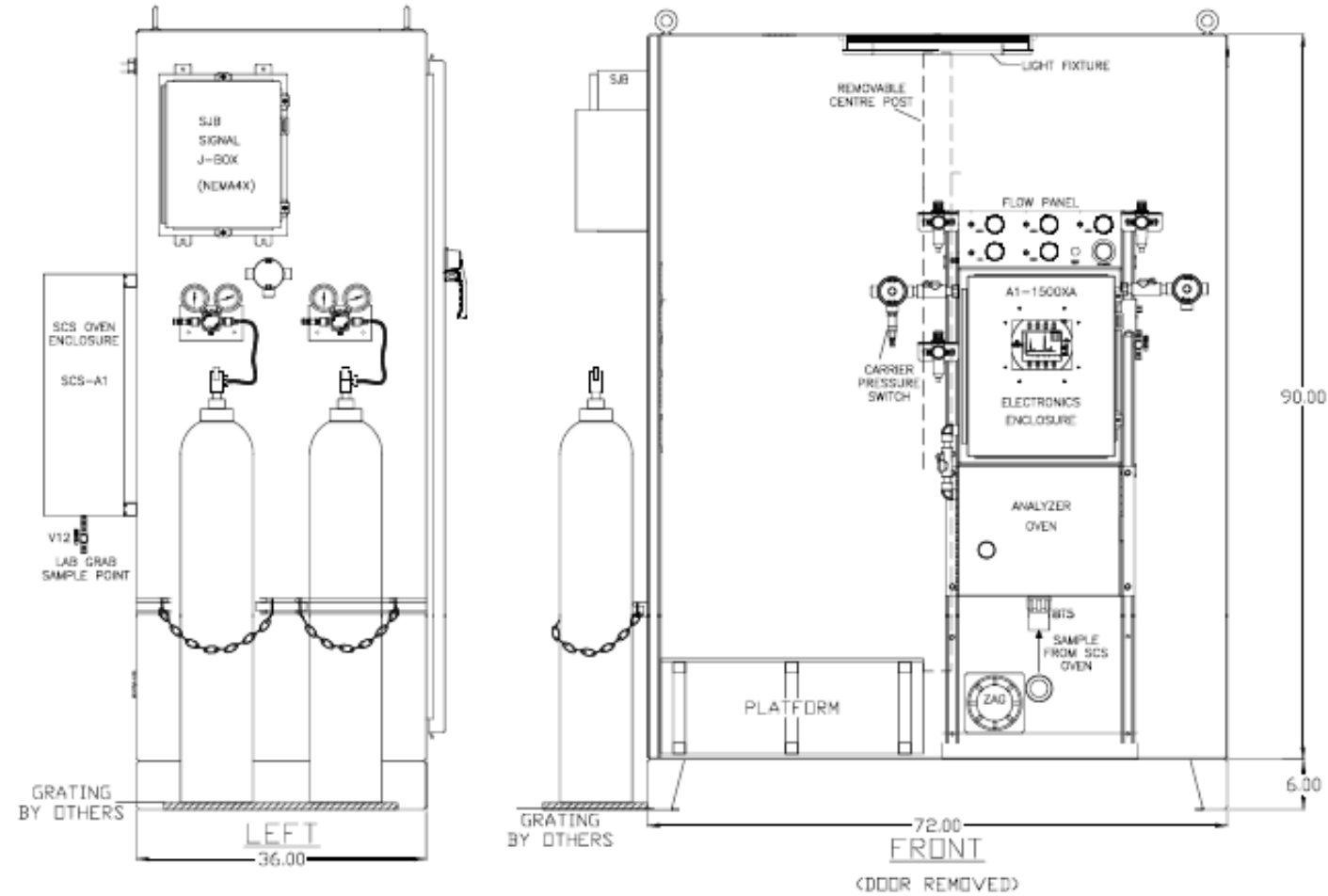
Block Diagram – Hydrocarbons, H2S, H2, CO and CO2 Detection



Block Diagram – Hydrocarbons, H2S, H2, CO, CO2 and Benzene Detection



3-Sided shelter and Cabinet Options Enable Complete Solution



Simplifies installation and startup with out of the box solution already assembled

Promotional Support for 40 CFR Part 63

APPLICATION DATA SHEET

REFINING

Emerson Solutions to Petroleum Refinery Flare Regulations – 40 CFR Part 63

By January 30, 2019, 40 CFR Part 63 requires Petroleum Refinery owners or operators of flares used as control devices for emissions point to meet the requirements of §63.670, regardless of the construction date of the flare. The regulation is part of the 1990 Clean Air Act that regulated emission standards for hazardous air pollutants (HAP) and is in addition to 40 CFR 60 Subpart Ja requirements. Emerson Rosemount has developed two standard solutions that are compliant with 40 CFR Part 63 using its Rosemount 1500XA gas chromatograph..


40 CFR Part 63 regulations require determining the concentration of individual components in the flare vent gas within 15 minutes or direct monitoring of the net heating value of the flare vent gas at standard conditions. Emerson Rosemount's 1500XA gas chromatograph offers the greatest flexibility in measuring, calculating, and recording the individual component concentrations present in the flare vent gas. Emerson is offering two standard 8-minute solutions using the Rosemount 1500XA with multiple thermal conductivity detectors (TCDs) to meet the requirements of 40 CFR Part 63 Subpart CC (Refinery MACT 1) and 40 CFR Part 63, Subpart UUU (Refinery MACT 2). Solution 1 looks at hydrocarbons, H₂S, H₂, CO and CO₂. Solution 2 is identical to Solution 1 with the addition of Benzene detection. Custom solutions that measure, calculate and record operators' specific flare compositions are available.


40 CFR Part 63 Gas Chromatograph Requirements

40 CFR Part 63 requires gas chromatograph use to measure Net Heating Value meet Performance Specification 9 of 40 CFR Part 60 Appendix B accuracy requirements, perform single mid-level daily calibration check, and quarterly multi-point calibration. The Rosemount 1500XA accuracy rate is well within the specified relative error rate of less than 10%. Daily calibration checks can be run automatically through Emerson's exclusive MON2020 software

Features

- No shelter required – significant overall total costs savings
- 100% chamber tested – guarantees the GC will work reliably and repeatedly over full temperature range of -18 °C to 55 °C (0 °F to 130 °F)
- Fully compatible with modern Ethernet networks and DCS communication
- Use of thermal conductivity detectors (TCD) with sensitivity down to very low parts-per-million levels – allows for simple, easy-to-maintain detectors rather than more complicated flame ionization detectors (FID) or flame photometric detectors (FPD)
- 2 clock allow 2 streams to run simultaneously





Operations Manual
3-9000-762, Rev A
March 2017

Rosemount™ 1500XA Gas Chromatograph





1500XA GC System Cabinet
PGC_PDS_1500XA_GC_System_Cabinet

Product Data Sheet
2017

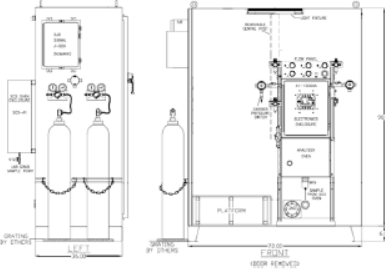
1500XA Gas Chromatograph System Cabinet

An enclosed, pre-packaged solution for your GC installations

Rosemount Analytical offers a pre-packaged system for the 1500XA gas chromatograph designed to simplify the installation and start-up process of your online gas chromatograph by reducing the complexity down to just four easy steps:

1. SECURE the cabinet onto a concrete foundation
2. WIRE to the power and signal junction boxes
3. CONNECT the carrier, calibration, and sample gases
4. ANALYZE


The 1500XA gas chromatograph system cabinet is rated for Class I, Division 2 hazardous area applications and ideal for extreme hot or cold climate conditions ranging from -40 to 130 °F (-40 to 55 °C). In addition, the cabinet provides secure, enclosed access to the gas chromatograph and allows the carrier and calibration gas bottles to be locked safely at the rear of the cabinet for easy access.



The 1500XA System Cabinet showing the 1500XA pre-installed in the insulated and heated cabinet ready for fast and easy on-site hook-up.

Specifications

Features



Competitive Advantages of the Emerson Solution



No analyzer house required

Most locations 3-sided shelter or cabinet acceptable



100% chambered tested

Guaranteed performance over temperature



MON2020 Software

Common software across all XA GCs

Intuitive to use

Thank you



Business Development Manager, Gas Chromatographs
Jamie Marsden