

MultiGard 5000 Gas Sampling System Engineering Specification

- 1.0 Gas Sampling System Specification - Paragraphs 1.1 through 2.2 details the specification for the Gas Sampling System.
- 1.1 General - The monitoring system shall draw, via an internal pump, gas samples to the internal analyzer(s) from up to 32 locations and sequentially measure the gas concentration. The system shall provide visual alarm indication when preset levels are exceeded. Relay outputs for the purpose of external alarm or control shall be provided. Gas concentrations and alarm settings can be exported to a flash drive into a .CSV format.
- 1.2 Measured Gas - The system shall measure (Gas(es)) in the concentration range of zero to (value) full scale.
- 1.3 System Configuration - The system shall consist of the following three sub-systems:
 - 1 - System Controller
 - 2 - Gas Sample Handler
 - 3 - up to four Analytical or Sensors

All sub-systems shall be mounted in a single enclosure. Any of the analytical sub-systems, however, may be optionally located separately.

- 1.3.1 Enclosure Type - The system enclosure shall be rated as NEMA 1 and shall conform to Paragraphs 1.3.1.1 through 1.3.1.7.
 - 1.3.1.1 Access Door - A full length front access door shall be provided.
 - 1.3.1.2 Electrical Entry - A gasketed, removable plates shall be provided in the enclosure bottom for purposes of providing electrical entry.
 - 1.3.1.3 Sample Tubing Connection - NPT fittings suitable for the connection of ¼" OD, 3/16" inch ID tubing shall be provided on the sides of the enclosure for the purposes of connection, sample lines, calibration gases and exhaust.
 - 1.3.1.4 Indicators - An impact resistant 10" diagonally measured color TFT touchscreen Display for gas sample systems shall be provided on the access door of the enclosure for the purpose of viewing all operational parameters of the unit.
 - 1.3.1.5 Mounting - Brackets suitable for wall mounting shall be provided.
 - 1.3.1.6 Size - No dimension (Height, Width, Depth) shall exceed 1.5 meters (4.5 feet).
 - 1.3.1.7 Controls - There shall be no switches, levers or buttons on the front cover of the unit. The operator interface to the unit shall be via the soft buttons on the front panel display. These soft buttons are activated by touching the front panel display screen.

- 1.4 Controller - The controller sub-system shall conform to Paragraphs 1.4.1 through 1.4.8.

- 1.4.1 Type - The controller shall be an Allen-Bradley (AB) CompactLogix Logic Controller.
- 1.4.2 Programmable Functions - All programmable functions will be entered via the soft keys on the front panel touch screen. The following functions shall be programmable:
 - a. Sequencing point order
 - b. Manual calibration sequence

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- c. Automatic standardization, sequence and associated timing parameters and adjustment limits
 - d. Parameters for the common alarm relays:
 - 1. latching or non-latching alarm function
 - 2. upscale or down scale acting alarms
 - 3. fail safe or non-fail safe relay operation
 - 4. On delay relay operation
 - 5. Off delay relay operation
 - e. Removal or skipping of any location from the sampling sequence
 - f. Setting Trouble, Warning and Alarm trip point levels per sampling point per analyzer or sensor
 - g. Changing the password
 - h. Setting the gas sample transport time per sampling point
 - i. Setting the analysis time
 - j. Enabling the extended analysis time with the following trigger threshold parameters:
 - 1. Rate of signal rise per analyzer or sensor
 - 2. Signal level increasing to a preset level
 - 3. Signal level decreasing to a preset level
 - k. Setting the alarming hysteresis per analyzer or sensor
 - l. Parameters for the optional user configured output relays:
 - 1. fail safe or non-fail safe relay operation
 - 2. On delay relay operation
 - 3. Off delay relay operation
 - 4. Steady or pulsed outputs
- 1.4.3 Programming Lock Out - A password shall be necessary for the purpose of preventing unauthorized personnel from altering the systems programmed parameters.
- 1.4.4 System Memory - All programmed values shall be stored on a Secure Digital (SD) Card that is local to the processor. Battery backup shall be provided to retain current status if power is lost.
- 1.4.5 Alarm/Control - Four common alarm/control set point levels shall be provided for all sample location. These four will be: Horn, Trouble, Warning and Alarm. These relays will be single pole double throw (SPDT) at least 8 amp @ 250 VAC. The system shall have the capability of providing up to 64 optional user configurable discrete alarm relays or solid state outputs.
- 1.4.5.1 Optional user configurable discrete alarm relays
 - 1.4.5.1.1 These optional discrete alarm relays shall be single pole double throw (SPDT) at least 10 amp @ 250 VAC.
 - 1.4.5.1.2 These optional discrete alarm relays shall be available in the following configuration:
 - a. 16 warning & 16 alarm relays
 - b. 32 warning & 32 alarm relays
 - 1.4.5.2 Optional user configurable solid state outputs
 - 1.4.5.2.1 These optional solid state outputs shall be capable of sinking 100 mA @ 24 VDC.
 - 1.4.5.2.2 These optional solid state outputs shall be available in the following configuration:
 - a. 16 warning & 16 alarm outputs
 - b. 32 warning & 32 alarm outputs
- 1.4.6 Front panel display- The front panel display shall be provided for the purpose stated in Paragraphs 1.4.6.1 through 1.4.6.5.
- 1.4.6.1 Alarm Indication

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1.4.6.2 Location Indicator

1.4.6.3 Malfunction Indicator - The display shall be indicate any of the following conditions:

- a. analyzer under range
- b. analyzer over range
- c. auto standardization limit exceeded
- d. flow failure

1.4.6.4 Sequence Mode Indication

1.4.6.5 Calibration Mode Indication

1.4.7 Automatic Analyzer Correction - The controller must be capable of introducing zero and calibration gases and automatically correcting the gas value reading. Timing and limits setting shall be programmable according to Paragraph 1.4.2.

1.4.8 Data Storage – Gas concentrations and alarm setting shall be capable of being exported to a flash drive in .CSV format via a removable SD Card.

1.4.9 Digital Output – An optional; Modbus TCP or BACnet IP output shall be available to enable communication to other equipment or controllers.

1.4.10 Remote Access- A remote display option shall be available enabling viewing of display screens available on integral front display

1.5 Sample Handling - The sample handling sub-system shall conform to Paragraphs 1.5.1 through 1.5.7.

1.5.1 Sample Line Compatibility - The system shall be capable of drawing a gas sample through 3/16" ID NPT tubing for a distance of 166.6 meters (500 feet).

1.5.2 Sample Line Flow Rate - The system shall be capable of drawing a gas sample through 0.175" ID tubing at a rate of at least 20 SCFH (10 LPM) typical, no load. The full load rate shall be: 10 SCFH (5 LPM) typical.

1.5.3 Gas sampling scheme - The system shall employ a look ahead bypass sampling scheme. The system will not only pump on the current sampling point but also pump on the next sampling point even if the sampling point order is not in numeric order.

1.5.4 Sample Conditioning - The system shall provide adequate filtration of the sample suitable to protect the analyzer.

1.5.5 Exhaust - Exhaust fitting shall be provided on the side of the enclosure for the purpose of attaching exhaust lines to the sample and bypass flows.

1.5.6 Calibration Gas Connection - Inlet fittings shall be provided on the side of the enclosure for the purpose of connecting the calibration gas supplies (zero and span).

1.5.7 Flow Failure Detection - The system shall be capable of detecting a flow failure in any of the sampling lines.

1.6 Analyzer - The analyzer(s) sub-system shall operate on the (specify) principle.

1.7 System Performance - The system shall meet the requirements of Paragraphs 1.7.1 through 1.7.3.

1.7.1 Analyzer Reproducibility requirement - The analyzer(s) must keep its output signal reproducible within the limits of +2% Full Scale (FS).

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- 1.7.2 Analyzer Stability requirement - The 24 hour zero or span drift of the analyzer(s) must be less than 2% without the aid of automatic or manual recalibration.
- 1.7.3 Environmental Specifications
 - 1.7.3.1 Temperature - The system shall operate over the range:
 - Operating: 32° to 95°F (0° to 35°C)
 - Non-Operating: 14° to 140°F (-10° to 60°C)
 - Gas Sample: 0° to 140°F (-17° to 60°C)
 - 1.7.3.2 Humidity- The system shall operate over the range:
 - 5 to 85% RH non-condensing
- 1.8 Programming Limits - The system parameters shall be capable of being adjusted within the following limits:
 - a. Gas Sample Point Dwell Time = 10-300 seconds (in one second increments) per point.
 - b. Alarm Levels = 0-100% of full scale in one percent increments
 - c. Frequency of Automatic Zero = Every 8 hours
 - d. Frequency of Automatic Span = Every 8 hours
 - e. Automatic Adjustment Limits = "5% (before trouble is indicated)
- 1.9 Power Requirement - The system shall need the following electrical power to operate:
 - 5 Amp. @ 115 VAC, 60 Hz, Single Sequencer Systems
 - 10 Amp. @ 115 VAC, 60 Hz, Dual Sequencer Systems
- 2.0 Max System Maintenance Requirement - With the exception of resupply of zero and span gas, no routine maintenance shall be required.
- 2.1 Manufacturer Capability Requirements - As a minimum, the system manufacturer must meet the following requirements:
 - a. be capable of supplying all equipment used to calibrate the system
 - b. be capable of providing on-site service with factory trained personnel
 - c. be capable of providing start-up assistance and training
- 2.2 Gas Monitoring System shall be a MSA MultiGard 5000 Gas Sampling System or equal.