

SPECIFICATION

GASGARD 1 GAS MONITORING SYSTEM

- 1.0 System Configuration - The system design, consisting of monitor/readout units and sensors/transmitters, shall conform to Paragraphs 2.0 through 4.0. Deviations are not acceptable. Paragraph 5.0 is included for system layout and product ordering assistance.
- 2.0 General - The Gas Monitoring System shall measure and display gas concentration. The system shall provide audio and visual alarms when preset limits are exceeded. Relay outputs for alarms and analog signals representing gas concentrations shall be provided.
- 3.0 Monitor/Readout Unit - The monitor/readout unit must comply with Paragraphs 3.1 through 3.7.
 - 3.1 Monitor/Readout Description - The system shall consist of a monitor/readout unit and separate gas sensor units. The sensor units shall be capable of being located remote from the monitor/readout unit by up to 4000 feet. Sensor units shall receive power from and send signal corresponding to gas values to the monitor/readout unit. All sensor outputs must be 4-20mA output, in two-wire or three-wire configuration.
 - 3.2 Monitor/Readout Configuration - The monitor/readout shall be the enclosed wall mount type. It shall conform to Paragraphs 3.2.1 through 3.2.6.
 - 3.2.1 Number of Sensors per Enclosure - Each monitor/readout shall have the capability of monitoring one sensor as described in Paragraph 3.1.
 - 3.2.2 Type of Enclosure - The enclosure shall be suitable for general-purpose type areas. Access to the inside of the enclosure, monitor front panel and wiring connections shall be through a front panel. The panel shall have a shatterproof window of sufficient size to allow the viewing of all meters and alarm indicating lights. **They shall not be mounted in hazardous locations as defined by the NEC (National Electric Code).**
 - 3.2.3 Enclosure Size - The enclosure shall be not greater than 10 inches in any dimension.
 - 3.2.4 Mounting Provisions – The unit shall mount to a flat surface through mounting holes on the back of the unit.
 - 3.2.5 External Controls - An external sealed switch shall be provided to allow for alarm reset and audio alarm silencing without opening the enclosure. There must be a connection for wiring an external alarm reset and audio alarm-silencing switch or for wiring to a pump module for indicating sensor flow failure status.

3.2.6 The monitor/readout unit must have CE approval or certification.

3.3 Monitor/Readout Requirements

3.3.1 Readout Displays - A separate four-digit readout shall be provided for displaying the gas value from the sensor. The value displayed shall be a direct reading of the gas concentration indicated on the sensor/transmitter. The readout must also be able to be configured to read any value between 0.5 through 5000ppm, for ppm levels or 0-99.9%, for percentage levels.

3.3.2 Visual Alarm Indicators - The monitor shall have a separate indicating light for indicating four levels of alarms and a fault indicator. The lights shall be color-coded. Blue, green or white shall not be used.

3.3.3 Alarm Set Point Levels - Four separate alarm set point levels shall be provided for the sensor. The set points shall be independently adjustable for any value in the readout range. The set points shall provide drive signals to user-interface relays. All four of the alarm set points shall have the capability of providing the user a selection of latching or non-latching mode, alarm on upscale or downscale, and energized or de-energized through software selectable options.

3.3.4 Relay Outputs - The alarm set point drive signals shall activate user relays as specified in Paragraphs 3.3.4.1 through 3.3.4.3.

3.3.4.1 Number of Relays - As a minimum, one relay for each set point level shall be provided.

3.3.4.2 Contact Rating - All relays shall be Form B, single-pole, single-throw. Contacts shall be rated for 2 amps resistive at 250 VAC.

3.3.4.3 Contact Selection - The contacts shall be capable of being selected normally open or normally closed, normally energized or normally de-energized, latching or non-latching and increasing or decreasing activation.

3.3.5 Malfunction Indication - System trouble indication shall be provided in accordance with Paragraphs 3.3.5.1.1 and 3.3.5.1.5.

3.3.5.1 Trouble Relay - A relay shall be provided to indicate trouble when any of the following conditions exist:

3.3.5.1.1 System power loss.

3.3.5.1.2 Signal loss from any sensor.

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- 3.3.5.1.3 Signal greater than 15% of full scale or lower than 15% below zero.
- 3.3.5.1.4 Within 30 seconds of applying power.
- 3.3.5.1.5 Control module malfunction or removal
- 3.3.6 Display Indication - The readout display described in Paragraph 3.3.1 shall display a separate unique character when an over-range, or greater than 10% under range condition exists.
- 3.3.7 Audible Alarm - A 75 dB audible horn, buzzer or tone shall be provided when an alarm condition occurs.
- 3.3.8 Output Signals - A 4-20 mA signal representing the gas concentration shall be provided for each gas sensor in the system. The signal shall be a sourcing type capable of driving a 250-ohm load.
- 3.3.9 Operating Modes and Parameters Selection - The selections listed in this paragraph shall be accomplished by the use of software and internal push button type controls:
 - 3.3.9.1 Sensor range value.
 - 3.3.9.2 Alarm levels for all four of the alarm set points.
 - 3.3.9.3 Alarm on upscale or downscale for all four of the alarm set points.
 - 3.3.9.4 Setting relay contacts energized or de-energized.
 - 3.3.9.5 Latching or non-latching alarms for all four of the alarm set points.
 - 3.3.9.6 Setting audible alarm or off.
 - 3.3.9.7 Setting external wiring for external alarm reset switch or flow failure fault indicator.
- 3.3.10 Front Panel Controls - The functions listed in this paragraph shall be accomplished using push button type controls readily accessible on the front panel:
 - 3.3.10.1 Acknowledge button that silences audible alarms.
 - 3.3.10.2 Acknowledge button that resets latching alarm conditions after alarm condition has cleared.

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- 3.3.10.3 Test button that displays all software selectable programming.
- 3.3.11 Sensor Input Signal - The sensor signal shall be a 4-20mA input signal.
- 3.3.12 System Power Requirements - The system shall operate on 115 or 220 VAC, 50 or 60 Hz. Power shall not exceed 100 VA.
- 3.4 Maximum System Maintenance Requirements - The system shall require no periodic maintenance other than periodic checking of sensor unit function. Periodic sensor checking, calibration, or actual adjustment of the sensor units shall be capable of being accomplished by one person at the sensor unit location.
- 3.5 Approvals - The monitor/readout unit must be CE approved.
- 3.6 Manufacturer Capability Requirements - As a minimum, the Gas Monitoring Equipment manufacturer must meet the requirements outlined in paragraphs 3.6.1 through 3.6.4.
 - 3.6.1 Capable of supplying all equipment used to check or calibrate the sensor units.
 - 3.6.2 Capable of providing on site service with factory trained personnel.
 - 3.6.3 Capable of providing on site training for the owner/operator.
 - 3.6.4 Capable of supplying in house service and assistance.
- 3.7 The Monitor/Readout Unit shall be a Mine Safety Appliances Company Gasgard1 Gas Monitor or equal.
- 4.0 Sensor/Transmitters - The sensor/transmitter used in conjunction with the Gasgard1 monitor must have two-wire or three-wire 4-20mA output and must comply with location requirements for all areas of installation. The sensor/transmitter must meet all requirements of the Gasgard1 monitor.
- 5.0 The following checklist is included for system documentation purposes.
 - 5.1 Number of Gasgard1 Monitors:

	Number Of Monitors
GASGARD1 MONITORS	_____

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5.2 Number and Types of Monitoring Points - The number and type of monitoring points shall be as follows:

Gas	Range/Full Scale	Number of Sensor/Transmitters
Combustible Gas		
Natural Gas & H ₂	0-100% LEL	_____
Combustible Gas		
Petroleum vapors	0-100% LEL	_____
Combustible Gas		
Solvents	0-100% LEL	_____
Carbon Monoxide - (CO)	0-100 ppm	_____
Carbon Monoxide - (CO)	0-500 ppm	_____
Hydrogen Sulfide - (H ₂ S)	0-10 ppm	_____
Hydrogen Sulfide - (H ₂ S)	0-50 ppm	_____
Hydrogen Sulfide - (H ₂ S)	0-100 ppm	_____
Chlorine Dioxide - (ClO ₂)	0-3ppm	_____
Oxygen - (O ₂)	0-25%	_____
Nitric Oxide - (NO)	0-100 ppm	_____
Nitrogen Dioxide - (NO ₂)	0-10 ppm	_____
Sulfur Dioxide - (SO ₂)	0-25 ppm	_____
Chlorine- (Cl ₂)	0-5 ppm	_____
Hydrogen Cyanide - (HCN)	0-50 ppm	_____
Hydrogen Chloride - (HCl)	0-50 ppm	_____
IR Combustible Methane	0-100% LEL	_____
IR Combustible Non-Methane	0-100% LEL	_____
Phosphine - (PH ₃)	2.0 ppm	_____
Arsine - (AsH ₃)	2.0 ppm	_____
Germane (GeH ₄)	3.0 ppm	_____
Silane (SiH ₄)	25 ppm	_____
Diborane (B ₂ H ₆)	50 ppm	_____
Fluorine (F ₂)	5.0 ppm	_____
Bromine (Br ₂)	5.0 ppm	_____
Ammonia (NH ₃)	0-50 ppm	_____
Hydrogen (H ₂)	0-1000 ppm	_____
Ethylene Oxide (EtO)	0-10 ppm	_____
IR Carbon Dioxide (CO ₂)	0-2%	_____
Oxygen (O ₂)	0-10%	_____

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5.3 The following table breaks down the required enclosure rating of the listed sensor/transmitters:

Gas	General Purpose GP/Nema 4X	Enclosure rating Explosion proof	Intrinsically Safe
Combustible Gas - Natural Gas & H ₂	_____	_____	_____
Combustible Gas - Petroleum vapors	_____	_____	_____
Combustible Gas - Solvents	_____	_____	_____
Carbon Monoxide - (CO)	_____	_____	_____
Carbon Monoxide - (CO)	_____	_____	_____
Hydrogen Sulfide - (H ₂ S)	_____	_____	_____
Hydrogen Sulfide - (H ₂ S)	_____	_____	_____
Hydrogen Sulfide - (H ₂ S)	_____	_____	_____
Chlorine Dioxide - (ClO ₂)	_____	N/A	_____
Oxygen - (O ₂)	_____	_____	_____
Nitric Oxide - (NO)	_____	_____	_____
Nitrogen Dioxide - (NO ₂)	_____	N/A	_____
Sulfur Dioxide - (SO ₂)	_____	_____	_____
Chlorine- (Cl ₂)	_____	N/A	_____
Cyanide - (HCN)	_____	N/A	_____
Hydrogen Chloride - (HCl)	_____	N/A	_____
IR Combustible Methane	_____	_____	N/A
IR Combustible Non-Methane	_____	_____	N/A
Phosphine - (PH ₃)	_____	_____	_____
Arsine - (AsH ₃)	_____	_____	_____
Germane (GeH ₄)	_____	_____	_____
Silane (SiH ₄)	_____	_____	_____
Diborane (B ₂ H ₆)	_____	N/A	_____
Fluorine (F ₂)	_____	N/A	_____
Bromine (Br ₂)	_____	N/A	_____
Ammonia (NH ₃)	_____	N/A	_____
Hydrogen (H ₂)	_____	_____	_____
Ethylene Oxide (EtO)	_____	N/A	_____
IR Carbon Dioxide (CO ₂)	_____	_____	N/A
Oxygen (O ₂)	_____	_____	_____

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5.4 The following table breaks down the required mounting style of the listed sensor/transmitters:

Gas	Sensor Mounting Style	
	Single Condulet	Remote sensor
Combustible Gas - Natural Gas & H ₂	_____	_____
Combustible Gas - Petroleum vapors	_____	_____
Combustible Gas - Solvents	_____	_____
Carbon Monoxide - (CO)	_____	_____
Carbon Monoxide - (CO)	_____	_____
Hydrogen Sulfide - (H ₂ S)	_____	_____
Hydrogen Sulfide - (H ₂ S)	_____	_____
Hydrogen Sulfide - (H ₂ S)	_____	_____
Chlorine Dioxide - (ClO ₂)	_____	_____
Oxygen - (0-25% O ₂)	_____	_____
Nitric Oxide - (NO)	_____	_____
Nitrogen Dioxide - (NO ₂)	_____	_____
Sulfur Dioxide - (SO ₂)	_____	_____
Chlorine- (Cl ₂)	_____	_____
Hydrogen Cyanide - (HCN)	_____	_____
Hydrogen Chloride - (HCl)	_____	_____
IR Combustible Methane	_____	_____
IR Combustible Non-Methane	_____	_____
Phosphine - (PH ₃)	_____	_____
Arsine - (AsH ₃)	_____	_____
Germane - (GeH ₄)	_____	_____
Silane - (SiH ₄)	_____	_____
Diborane - (B ₂ H ₆)	_____	_____
Fluorine - (F ₂)	_____	_____
Bromine - (Br ₂)	_____	_____
Ammonia (NH ₃)	_____	_____
Hydrogen (H ₂)	_____	_____
Ethylene Oxide (EtO)	_____	_____
IR Carbon Dioxide (CO ₂)	_____	_____
Oxygen (0-10% O ₂)	_____	_____