

# SPECIFICATION

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## SUPREMA CONTROL 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 Control System shall measure and display gas concentration for up-to 256 inputs and 512 outputs. Input types shall include 4-20mA output devices, along with smoke and heat sensors. Output types shall include relay contacts and 4-20mA output signals. The system shall provide visual alarms when preset limits are exceeded.
- 3.0 System Safety – The Control System shall be capable of being configured for redundancy. This redundancy shall be TUV-approved SIL 3 rated.
- 4.0 Monitor/Readout Unit - The monitor/readout unit must comply with Paragraphs 3.1 through 3.7.
  - 4.1 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.
    - 4.1.1 The monitor must be field-serviceable and upgrade-able for additional points of gas detection measuring.
    - 4.1.2 Start-up and configuration shall be accomplished through the front panel display or through an RS-232 interface and software.
  - 4.2 Monitor/Readout Configuration - The monitor/readout shall be a rack mount type. It shall conform to Paragraphs 3.2.1 through 3.2.6.
    - 4.2.1 Number of Sensors per Enclosure - Each rack mount monitor/readout shall have the capability of monitoring up-to 64 inputs as described in Paragraph 3.1.
    - 4.2.2 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).**

4.2.3 Enclosure Size - The enclosure shall be a standard industrial 18 inch rack design.

4.2.4 Mounting Provisions – The unit shall mount to a flat surface through mounting holes on the unit.

4.2.5 The monitor/readout unit must have ATEX and CE approval and TUV certification.

4.3 Monitor/Readout Requirements

4.3.1 Readout Displays – LCD readout shall be provided for displaying the gas value from the sensors. The value displayed shall be a direct reading of the gas concentration indicated on the sensor/transmitter.

4.3.2 The sensor/transmitter readout shall be viewable through RS-232 and PC interface software. The readout shall be in the following selectable forms:

4.3.2.1 List mode 4.3.2.2

Bar graph mode 4.3.2.3

LED mode

4.3.3 Visual Alarm Indicators - The monitor shall have common visual alarms for four levels of alarms and a fail indicator for all input signals and three indicators for system power and fail and inhibit.

4.3.4 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.

4.3.5 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. The system supplies relay driver outputs (open collector 24V, 300mA) to switch external relays.

4.3.5.1 Number of Relays – There shall be 8 common relays for activation of the eight visual alarms listed in Paragraph 3.3.2. All other relays shall be assignable to any input configured in the control system.

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

4.3.5.3 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.

### 4.3.6 Optional Output Signals

4.3.6.1 A 4-20 mA signal representing the gas concentration shall be available for each gas sensor in the system. The signal shall be a sourcing type capable of driving a 250-ohm load.

4.3.6.2 Optional RS-232 output for printer functions.

4.3.6.3 Optional RS-485 (Modbus) output for networking.

4.3.7 Operating Modes and Parameters Selection - The selections listed in this paragraph shall be accomplished by the use of software through a RS-232 interface or through push button type controls located on the front panel of the monitor. Access to the software shall be password protected.

4.3.7.1 Sensor range value.

4.3.7.2 Sensor engineering units.

4.3.7.3 Alarm levels for all four of the alarm set points.

4.3.7.4 Alarm on upscale or downscale for all four of the alarm set points.

4.3.7.5 Setting relay contacts energized or de-energized.

4.3.7.6 Latching or non-latching alarms for all four of the alarm set points.

4.3.7.7 Time delays prior to alarm inhibit.

4.3.7.8 Time and date.

4.3.7.9 Password code change and reset.

4.3.7.10 Printer configuration for printing software selections.

4.3.7.11 Voting logic for relay configuration

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4.3.7.12 Maintenance log

4.3.7.13 Setting language.

4.3.8 Front Panel Controls - The functions listed in this paragraph shall be accomplished using push button type controls readily accessible on the front panel:

4.3.8.1 Acknowledge button that silences audible alarms.

4.3.8.2 Acknowledge button that resets latching alarm conditions after alarm condition has cleared.

4.3.8.3 Escape button to back out of configuration set-ups

4.3.8.4 Reset button to reset configurations

4.3.8.5 Four buttons for configuration.

4.3.9 Sensor Input Signal - The sensor signal shall be a 4-20mA input signal.

4.3.10 System Power Requirements - The system shall operate on 85 to 260 VAC, 43 to 63 Hz. Power shall not exceed 100 VA.

4.4 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.

4.5 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.

4.5.1 Capable of supplying all equipment used to check or calibrate the sensor units.

4.5.2 Capable of providing on site service with factory trained personnel.

4.5.3 Capable of providing on site training for the owner/operator. 4.5.4

Capable of supplying in house service and assistance.

4.6 The Monitor/Readout Unit shall be a Mine Safety Appliances Company Suprema Control System or equal.

5.0 Sensor/Transmitters - The sensor/transmitters used in conjunction with the Suprema

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Control System 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 Suprema Control System.

6.0 The following checklist is included for system documentation purposes.

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

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

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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
Combustible Gas - Natural Gas & H <sub>2</sub>		
Combustible Gas - Petroleum vapors		
Combustible Gas - Solvents		
Carbon Monoxide - (CO)		
Carbon Monoxide - (CO)		
Hydrogen Sulfide - (H <sub>2</sub> S)		
Hydrogen Sulfide - (H <sub>2</sub> S)		
Hydrogen Sulfide - (H <sub>2</sub> S)		
Chlorine Dioxide - (ClO <sub>2</sub> )		
Oxygen - (O <sub>2</sub> )		
Nitric Oxide - (NO)		
Nitrogen Dioxide - (NO <sub>2</sub> )		
Sulfur Dioxide - (SO <sub>2</sub> )		
Chlorine- (Cl <sub>2</sub> )		
Cyanide - (HCN)		
Hydrogen Chloride - (HCl)		
IR Combustible Methane		
IR Combustible Non-Methane		
Phosphine - (PH <sub>3</sub> )		
Arsine - (AsH <sub>3</sub> )		
Germane (GeH <sub>4</sub> )		
Silane (SiH <sub>4</sub> )		
Diborane (B <sub>2</sub> H <sub>6</sub> )		
Fluorine (F <sub>2</sub> )		
Bromine (Br <sub>2</sub> )		
Ammonia (NH <sub>3</sub> )		
Hydrogen (H <sub>2</sub> )		
Ethylene Oxide (EtO)		
IR Carbon Dioxide (CO <sub>2</sub> )		
Oxygen (O <sub>2</sub> )		

5.4 The following table breaks down the required mounting style of the listed

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sensor/transmitters:

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