MSA Fixed Gas & Flame Detection

Product Guide

Because every life has a ***purpose...***

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How to Use This Guide

The table on page three lists various monitoring applications within four markets: General Industry, HVAC, Water & Wastewater, and Oil, Gas and Petrochemical, indicating MSA products that are suitable for each.

1. Pick your market and application from the table on page three.
2. Identify your products of interest.
3. Locate the product entries by using the Table of Contents.

For more information concerning a product or to obtain an informational bulletin, contact MSA Customer Service at 1-800-MSA-INST, or visit www.MSAgasdetection.com and choose Fixed Gas & Flame Detection under Products.

Market	Product										
	Ultima X Series	Ultima OPIR-5	PrimaX	Toxgard II	Chemgard	Trigard	Multigard	Chillgard Series	Z-Gard Series	FlameGard 5	GasGard Series
GENERAL INDUSTRY											
Combustible gas	■	■	■	■		■	■				■
Toxic gas	■		■	■	■	■	■				■
Oxygen	■		■	■		■	■				■
Flame										■	■
HVAC											
Mechanical Rooms											
Combustible gas	■	■	■			■	■		■		
Toxic gas	■		■			■	■		■		
Oxygen	■		■			■	■				
Refrigerants							■	■			
Parking Garages											
Combustible gas	■	■	■			■	■				
Toxic gas	■		■			■	■		■		
Oxygen	■		■			■	■				
Food Storage & Ammonia Refrigeration											
Oxygen	■		■				■				
Refrigerants								■			
Public Transportation Facilities											
Combustible gas	■	■	■			■	■				■
Toxic gas	■		■			■	■		■		■
Oxygen	■		■			■	■				■
OIL, GAS & PETROCHEMICAL											
Process Areas											
Combustible gas	■	■	■	■	■	■					■
Flame										■	■
Analyzer Buildings											
Combustible gas	■	■	■	■	■	■					■
Toxic gas	■		■	■	■	■					■
Oxygen	■		■	■		■					■
Sulfur Recovery Unit											
Toxic gas	■		■	■							■
Tank Farm/ Spheres											
Combustible gas	■	■	■	■							■
Flame										■	■
WATER & WASTEWATER											
Wet Wells											
Combustible gas	■	■	■								■
Toxic gas	■		■								■
Oxygen	■		■								■
Pumping Stations											
Combustible gas	■	■	■			■					■
Toxic gas	■		■			■					■
Oxygen	■		■			■					■
Digester Building											
Combustible gas	■	■	■			■					■
Toxic gas	■		■			■					■
Oxygen	■		■			■					■

MSA: The World Leader **in Fixed Gas and Flame Detection**

MSA offers a wide variety of fixed gas and flame monitoring solutions to detect combustible gases, toxic gases and oxygen deficiency/enrichment. Our instruments reflect the latest developments in sensor and instrumentation design using electrochemical, catalytic bead, ultrasonic, photoacoustic infrared, and both fixed point and open-path infrared sensing technologies.

We offer many systems to meet your facility's monitoring needs, from a single sensor in a stand-alone application to a large-scale, completely computerized installation consisting of thousands of sensing points. MSA also designs custom systems that are tailored to fit unique monitoring requirements.

MSA
The Safety Company

Gas Detectors/Monitors

Section 1:
MSA Gas Detectors/Monitors

Ultima X Series Gas Monitors

State-of-the-art technology for any gas detection need

Ultima X Series Gas Monitors, engineered using microprocessor-based technology for detection of combustible and toxic gases and oxygen deficiency, provide HART Field Communications Protocol. HART Protocol provides increased sensor data and convenient setup, calibration and diagnostics. HART Protocol also enables use of existing wiring, reducing installation costs.

Features

- Patented sensor disconnect-under-power allows for sensor changeout without declassifying a hazardous area.
- Interchangeable **smart** sensors can be replaced in the field without use of tools. The unit quickly recognizes the new sensor type and reconfigures alarm and relay settings to optimize the new sensor.
- Liquid crystal display conveniently alternates between sensor reading and gas type, and features scrolling messaging to indicate ongoing diagnostic checks such as sensor "end-of-life" condition.
- World-class design features single-board design for ultimate reliability and serviceability. Multiple-entry mounting enclosure is designed to separate electronics and sensor, allowing for problem-free installation and servicing.
- Onboard optional quick-check LEDs and four relay outputs allow for increased indication of alarm and fault conditions.

3 Models:

Ultima XE Monitor: Explosion-proof stainless steel gas detector with display

Ultima XA Monitor: Water- and corrosion-resistant, all-purpose, polycarbonate gas detector with display

Ultima XIR Monitor: Explosion-proof stainless steel, infrared gas detector with display

Ultima X3 Technology for Ultima X Series Gas Monitors features:

Multi-sensing

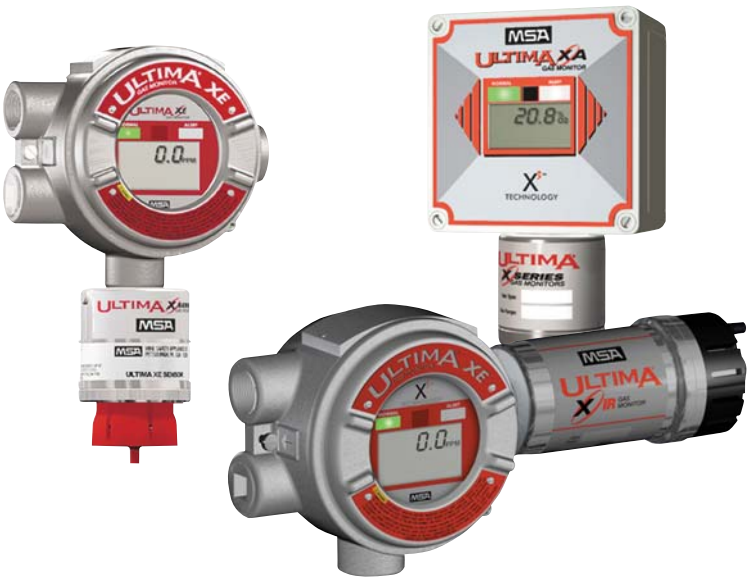
- System can handle 93 sensors (up to 31 monitors with up to three sensors per monitor)
- Accepts any combination of electrochemical, catalytic and infrared sensors
- Scrolling display shows type and reading for all sensors
- Ultima X^3 Monitor operates as a slave device on the network

Signal boost

- Each sensor can be observed remotely up to 3,000 ft. from the monitor
- Universal 85-256 VAC or 7-30 VDC power supply available at remote condulet

Modbus RTU Output

- Industry-standard format
- Provides RS-485 half-duplex communication interface
- Integration into PLC/DCS systems



Specifications for Ultima XE, Ultima XA and Ultima XIR Gas Monitors		
GAS TYPES	XE XA combustibles, oxygen and toxics XIR combustibles 0-100% LEL	
TEMPERATURE RANGE	-40°F to 140°F (-40°C to 60°C) (typical range for some gases may differ)	
DRIFT		
ZERO DRIFT	XE, XA	<5%/year, typical
	XIR	±2%/year, typical
SPAN DRIFT	XE, XA	<10%/year, typical
NOISE	<1% full scale	
ACCURACY		
REPEATABILITY	XE, XA, XIR	±1% full scale or 2 ppm, typical
LINEARITY	XE, XA	±2% full scale or 2 ppm, (O_2, CO)
	XIR	±2% full scale (≤50% LEL)
	XE, XA	±3% full scale (<50% LEL combustibles)
	XE, XA, XIR	±5% full scale (>50% LEL combustibles)
	XE, XA	±10% full scale or 2 ppm, (non-CO toxics)
RESPONSE TIMES		
T20 O_2 & TOXICS	XE, XA	<12 seconds (typically 6 seconds)
T50 O_2 & TOXICS	XE, XA	<30 seconds (typically 12 seconds)
T50 COMBUSTIBLE	XE, XA	<8 seconds
T90 COMBUSTIBLE	XE, XA	<30 seconds
T90 COMBUSTIBLE	XIR	<2 seconds
HUMIDITY	XE, XA	15%-95% RH, non-condensing
	XIR	0%-95% RH, non-condensing
SENSOR LIFE		
OXYGEN & TOXICS	XE, XA	2 years typical
COMBUSTIBLE	XE, XA	3 years typical
COMBUSTIBLE	XIR	5 years typical
WARRANTY	XE, XA	1 year
	XIR	2 years
	XIR, XI	10 years (IR source only)
POWER INPUT	XE, XA	10-30 VDC (oxygen and toxics)
	XE, XA	10-30 VDC @ 450 mA maximum (combustibles)
	XIR	10-30 VDC @ 750 mA maximum (combustibles)
WIRING REQUIREMENTS		
COMBUSTIBLE	XE, XA, XIR	3-wire
OXYGEN & TOXICS	XE, XA	2-wire; no LEDs or relays
OXYGEN & TOXICS	XE, XA	3-wire; LEDs and/or relays
SIGNAL OUTPUT	XE, XA	4-20 mA 2-wire current sink
	XE, XA, XIR	4-20 mA 3-wire current source
RELAY CONTACT RATING	5amp @ 220 VAC; 5 amp @ 30 VDC	
HOUSING ENTRIES	XE, XIR	Four conduit entries, ¾" NPT or 25 mm
	XA	One entry
PHYSICAL		
	XE	316 stainless steel; 10.4 lbs (4.7 kg); 6.3" W x 3.9" D x 10.3" L (160 x 99 x 261 mm)
	XA	Polycarbonate; 1.5 lbs (0.68 kg); 5.1" W x 2.9" D x 9.4" L (130 x 76 x 239 mm)
	XIR	316 stainless steel; 10.8 lbs (4.9 kg); 12.6" W x 3.9" D x 5.7" L (320 x 99 x 144 mm)
APPROVAL RATINGS	XE	FM UL 1203 CSA
INCLUDES X³ TECHNOLOGY		Class I, Div. 1 & 2, Groups A, B, C, & D Class II, Div. 1, Groups F, G Class III
		CSA C22.2 No. 152 C22.2-30 Class I, Div. 1, Groups A, B, C, & D
	XA	NEMA 4X rating
	XIR	UL 1203 & CSA C22.2-30 Class I, Div. 1 & 2, Groups A, B, C, & D; Class II, Div.1, Groups E, F, & G;
		Class III CSA C22.2 No. 152 Class I, Div. 1 & 2, Groups B, C, & D
	XE & XIR	EN 50018 Class I, Zone 1, Group IIC
	XE, XA, XIR	CE Low Voltage Directive: 73/23/EEC, CE EMC Directive: 89/336/EEC
NOT INCLUDING X³ OR HART PRODUCTS	XE, XA, XIR	SIL 2 certification

Ultima X Series Sensor X-Change™ Program

Easily exchange sensors on demand

With the Ultima X Series Sensor X-change Program, you receive replacement calibrated sensor modules when needed, on demand. Sensors arrive prior to the Ultima X Gas Monitor's scheduled calibration due date for easy installation and minimal downtime. Simply replace the old sensor with the new and perform a gas check, and the system is operational.

How the Program Works

1. Replacement sensor modules are shipped at pre-determined intervals of three, four, six, and 12 months.
   Sign a program agreement for your choice of one, two or three years. Some restrictions apply; contact your sales representative for more information.
2. Receive a pre-calibrated sensor module plus complete calibration documentation in a returnable, pre-labeled container.
3. The shipping container that identifies the sensor type is used for return of the old sensor module.

Benefits

- Eliminates the need to perform initial field calibrations
- Reduces overall maintenance time
- Greatly reduces calibration cylinder requirements
- Eliminates the need to dispose of sensor modules
- Assures that the installed sensor base has been factory-calibrated by trained MSA technicians prior to operation
- All Ultima X **Smart** Sensors using catalytic bead and electrochemical technologies are available through this program

Gas Types for Ultima X Series Sensor X-Change Program	
AMMONIA	0-50 ppm
AMMONIA	0-100 ppm
AMMONIA	0-1000 ppm
ARSINE	0-2 ppm
BROMINE	0-5 ppm
CARBON MONOXIDE	0-100 ppm
CARBON MONOXIDE	0-500 ppm
CARBON MONOXIDE	0-1000 ppm
CHLORINE	0-5 ppm
CHLORINE	0-10 ppm
CHLORINE	0-20 ppm
CHLORINE DIOXIDE	0-3 ppm
COMBUSTIBLE GAS	0-100% LEL
NATURAL GAS & HYDROGEN	0-100% LEL
PETROLEUM VAPORS	0-100% LEL
DIBORANE	0-50 ppm
ETHYLENE OXIDE	0-10 ppm
FLUORINE	0-5 ppm
GERMANE	0-3 ppm
HYDROGEN FLUORIDE	0-10 ppm
HYDROGEN	0-1000 ppm
HYDROGEN CHLORIDE	0-50 ppm
HYDROGEN CYANIDE	0-50 ppm
HYDROGEN SULFIDE	0-10 ppm
HYDROGEN SULFIDE	0-50 ppm
HYDROGEN SULFIDE	0-100 ppm
HYDROGEN SULFIDE	0-500 ppm
NITRIC OXIDE	0-100 ppm
NITROGEN DIOXIDE	0-10 ppm
OXYGEN	0-10%
OXYGEN	0-25%
OXYGEN -CO_2 TOLERANT	0-25%
OXYGEN -SOLVENT & CO_2 TOLERANT	0-25%
PHOSGENE	0-1%
PHOSPHINE	0-2 ppm
SILANE	0-25 ppm
SULFUR DIOXIDE	0-25 ppm
SULFUR DIOXIDE	0-100 ppm

Ultima XIR Gas Monitor

Infrared technology with display for combustible gas detection

The Ultima XIR Gas Monitor is a microprocessor-based, infrared point gas detector for continuous monitoring of combustible gases and vapors. Designed using a rugged, 316 stainless steel enclosure, the monitor operates with dual-wavelength, heated-optics technology, providing definitive compensation for temperature, humidity and aging effects. IR technology offers excellent long-term stability, eliminates the need for frequent calibrations and reduces overall cost of ownership.

Reliability

- DuraSource technology offers improved IR sensor life
- Extremely fast speed of response
- Designed without sintered disk for optimum performance within harsh, offshore environments
- Operates over extended temperature ranges
- Immune to poisoning
- Operates in high-gas and low-oxygen environments
- Operation fail-to-safety
- 10-year source warranty

Ease of Use

- 4-20 mA, HART and Modbus (X^3 output)
- LCD display with scrolling messaging
- Single-board design for ultimate reliability and easy, no-tool servicing
- Optional quick-check LEDs for increased product visibility
- No-gas calibration; zero adjustment is all that is required for full calibration

Flexibility

- Field-selectable algorithms for many hydrocarbon-based gases
- Optional field-programmable relays feature three alarm levels and one fault

Durability

- 316 stainless steel explosion-proof, multiple-entry-mounting enclosure
- No moving parts, jumpers, switches, or pots
- Sensor life is not reduced by exposure to gas

Specifications for Ultima XIR Gas Monitor	
GAS TYPES AND RANGES	Combustible gases & vapors; 0-100% LEL
TEMPERATURE RANGE	-40˚F to 140˚F (-40˚C to 60˚C)
STABILITY	±5% full scale/year
REPEATABILITY	±1% full scale
ACCURACY	±3% full scale (≤50% LEL) ±5% full scale (>50% LEL)
RESPONSE TIME (W/O SENSOR GUARD)	T90 <2 sec.
HUMIDITY	0%-95% RH, non-condensing
SENSOR WARRANTY	10 years for IR source
POWER INPUT	10-30 VDC, 5 watts
WIRING REQUIREMENTS	3-wire
SIGNAL OUTPUT	4-20 mA 3-wire current source
RELAY CONTACT RATING	5 amp @ 230 VAC; 5 amp @ 30 VDC
PHYSICAL WEIGHT DIMENSIONS	316 stainless steel 10.8 lbs. (4.9 kg) 12.6" W x 3.9" D x 5.7" L (320 x 99 x 144 mm)
APPROVAL RATINGS	cFMus, cULus, CSA Class I, Div. 1 and 2, Groups B, C, & D Class II, Div. 1, Groups E, F, & G Class III ANSI/ISA 12.13.01 CSA C22.2 No. 152 Combustible Gas Performance CE EMC Directive: 89/336/EEC CE ATEX Directive: 94/9/EC II 2G EEx d IIc T5 (Tamb -40˚C to +60˚C) TYPE 4X, IP 66 SIL 2 certification

Ultima Wireless Communication System

Combustible and toxic gases can leak virtually anywhere. Flanges, pump seals, valves, and storage tanks are all potential spots where a potentially hazardous gas or liquid can make its way into a safe area. Unfortunately, these places are often not located near the main part of the plant or other areas where detection instruments are installed. Additionally, gas detection may be desired at the facility boundary where no infrastructure currently exists, making it prohibitively expensive to run conduit and cabling to these locations. Inconvenience and expense, however, do not mitigate the risk of a life-threatening or catastrophic leak.

MSA's Wireless Communication System includes a 900 MHz radio that communicates to a gateway, providing reliable real-time detection data at distances of up to one mile with a clear line of sight. Accepting both analog and Modbus inputs, the system's wireless communication is easily established to the gateway that is located near the PLC or DCS. Radios can also act as repeaters, enabling installations to be located at virtually any distance from the gateway as long as an unobstructed path to the next radio is present. If power is not available, a solar panel, controller, battery, and charger can be provided to ensure up to two weeks of operation even with little to no sunlight.

Alternatively, if the end user has a wireless HART network already in place, a wireless HART adapter can be added to any MSA HART-enabled field device.

Features and Benefits

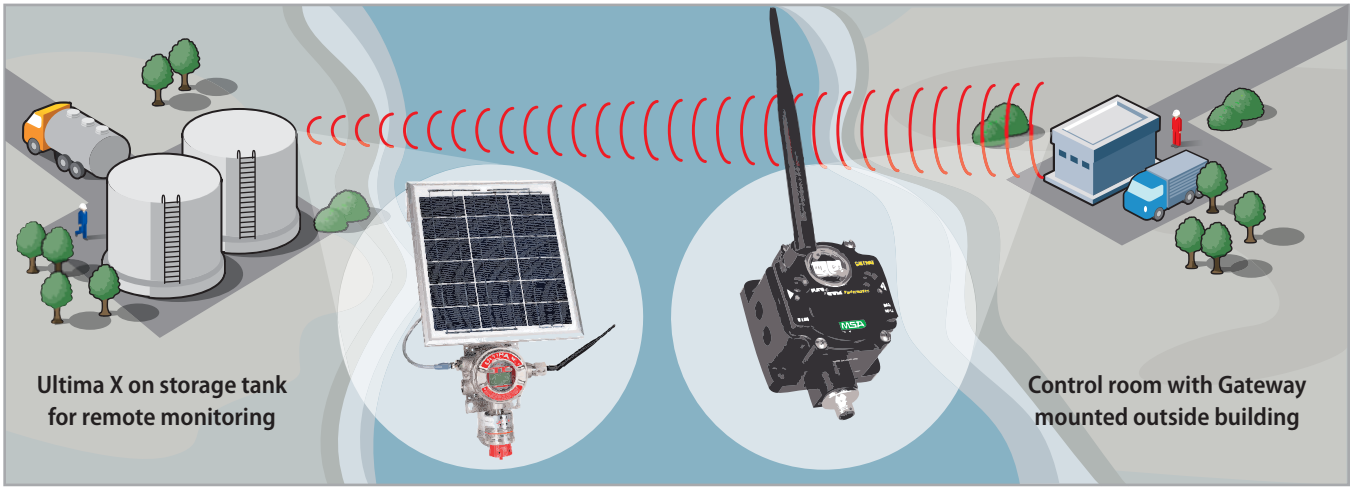
Wireless Radio

- Powerful 900 MHz communications
- No FCC license required
- Simple addressing and network linking
- Analog or Modbus input
- Battery back-up with solar panel for complete autonomy
- Easy installation

Wireless HART

- Industry-standard HART Protocol
- Safe and secure communications
- Mesh network
- Extremely low power consumption
- Self-configuring

Specifications for Ultima Wireless Communication System		
Specifications	**MSA Wireless System**	**Wireless HART**
FREQUENCY	900 MHz	2.4 GHz
INPUTS/OUTPUTS	Analog, Modbus or discrete	HART
SOLAR PANEL	20W	20W
BATTERY BACK-UP	35 Ah or 50 Ah	35 Ah or 56 Ah
DISTANCE	Up to 1 mile line of sight	500 ft
VOLTAGE	10-30 VDC	10-30 VDC
COMPATIBILITY	UltimaX or PrimaX Gas Detectors	Any detector with HART output



Ultima XL/XT Series Gas Monitors

Economical continuous gas monitors with HART Field Communications Protocol

Ultima XL/XT Series Gas Monitors offer an affordable choice for combustible gas, toxic gas and oxygen-deficiency detection and monitoring, while retaining key features of MSA's Ultima X Series Gas Monitors. HART Field Communications Protocol running over 4-20 mA output provides convenient setup, calibration and diagnostics. Hand-held HART communicator, controller or laptop provides display; local calibration employs LEDs and pushbuttons.

Three Models:

Ultima XL Monitor:
Explosion-proof stainless steel

- 316 stainless steel
- Multiple-entry mounting enclosure
- Intrinsically-safe HART port

Ultima XT Monitor:
Water- and corrosion-resistant, all-purpose, polycarbonate

- NEMA 4X rating
- Lightweight (only 1.75 lbs/0.79 kg)
- HART port

Ultima XL IR Combustible Gas Monitor:
Explosion-proof stainless steel, infrared gas detector

- 316 stainless steel
- Multiple-entry mounting enclosure
- Intrinsically-safe HART port
- Fast response time
- Operation based on dual-wavelength, heated-optics technology, providing definitive compensation for temperature, humidity and aging effects
- IR technology offers excellent long-term stability, eliminating the need for frequent calibrations
- Sintered-disk-free design for optimum performance in harsh environments
- No-gas calibration; zero adjustment is all that is required for full calibration
- IP66-rated

Features

- Sensor disconnect-under-power without declassifying hazardous area
- Interchangeable **smart** sensors; no reconfiguration required
- One circuit board for increased reliability and easier serviceability
- Calibrate, setup or perform diagnostics with HART from any point along 4-20 mA line
- Easy installation with two-piece field wiring connectors
- Asset management using HART interface
- Adjustable full scale range

Calibration Options

- Internal pushbutton and LEDs provide local intrusive calibration
- Compatible with handheld communicator, host DCS or laptop

Specifications for Ultima XL, Ultima XT and Ultima XL IR Gas Monitors		
GAS TYPES	XL, XT XLIR	Combustibles, oxygen and toxics Combustibles; 0-100% LEL
TEMPERATURE RANGE	-40°F to 140°F (-40°C to 60°C) (typical range for some gases may differ)	
DRIFT ZERO DRIFT SPAN DRIFT	 XL, XT XLIR XL, XT	 <5%/year, typical ±2%/year, typical <10%/year, typical
NOISE	<1% full scale	
ACCURACY REPEATABILITY LINEARITY	 XL, XT, XLIR XL, XT XLIR XL, XT XL,XT,XLIR XL,XT	 ±1% full scale or 2 ppm, typical ±2% full scale or 2 ppm, (O_2, CO) ±2% full scale (≤50% LEL) ±3% full scale (<50% LEL combustibles) ±5% full scale (>50% LEL combustibles) ±10% full scale or 2 ppm, (non-CO toxics)
RESPONSE TIMES T20 O_2 & TOXICS T50 O_2 & TOXICS T50 COMBUSTIBLE T90 COMBUSTIBLE T90 COMBUSTIBLE	 XL, XT XL, XT XL, XT XL, XT XLIR	 <12 seconds (typically 6 seconds) <30 seconds (typically 12 seconds) <10 seconds <30 seconds <2 seconds
HUMIDITY	XL, XT XLIR	15%-95% RH, non-condensing 0%-95% RH, non-condensing
SENSOR LIFE OXYGEN & TOXICS COMBUSTIBLE COMBUSTIBLE WARRANTY	 XL, XT XL, XT XLIR XL, XT XLIR XLIR	 2 years typical 3 years typical 5 years typical 1 year 2 years 10 years (IR source only)
POWER INPUT	XL, XT XL, XT XLIR	10-30 VDC (oxygen and toxics) 10-30 VDC @ 450 mA maximum (combustibles) 10-30 VDC @ 750 mA maximum (combustibles)
WIRING REQUIREMENTS COMBUSTIBLE OXYGEN & TOXICS	 XL, XT, XLIR XL, XT	 3-wire; LEDs and no relays 3-wire; LEDs and no relays
SIGNAL OUTPUT	XL, XT, XLIR	4-20 mA 3-wire current source, HART
HOUSING ENTRIES	XL, XLIR XT	Three conduit entries, ¾" NPT or 25 mm Two entries
PHYSICAL	XL XT XLIR	316 stainless steel; 7.7 lbs (3.5 kg); 7.1" W x 4.1" D x 8.8" L (180 x 103 x 224 mm) Polycarbonate; 1.75 lbs (0.79 kg); 6.2" W x 3.0" D x 9.4" L (157 x 76 x 239 mm) 316 stainless steel; 8.0 lbs (3.6 kg); 11.4" W x 4.1" D x 6.3" L (288 x 104 x 159 mm)
APPROVAL RATINGS	XL EUROPE INT'L	USA/Canada Class I, Div. 1 & 2, Groups A, B, C, & D Class I, Zone 1 & 2, Groups IIC, IIB & IIA, T6 Type 4X, IP 66 II 2G, 3G, EEx d nA [ib] IIC T6, IP 66 IEC EX scheme, Ex d nA [ib] IIC T6, IP 66

Ultima MOS-5 Intelligent Hydrogen Sulfide Sensor

Microprocessor-based transmitter designed for use with Metal Oxide Semiconductor (MOS) sensor

Suitable for use in SIL 3 systems and approved by FM and CSA, the Ultima MOS-5 Sensor detects ppm levels of hydrogen sulfide (H_2S), providing status indication and alarm outputs. Features include one-person calibration, event logging via HART, wireless capability, and four operating modes. With high tolerance for a broad range of temperatures, humidity levels and short-term high H_2S concentrations, the Ultima MOS-5 Gas Sensor is ideal for use in oil and gas applications, chemical plants and many other industrial applications.

Highlights of the Ultima MOS-5 Sensor:

- Robust construction, proven for use within extreme environments
- Precise and reliable MOS sensor is highly selective; unaffected by many gases commonly present in plant environments
- User self-calibration: simply activate magnetic switch and apply gas—no special tools or area declassification are required
- Reduced use of H_2S calibration gas and personnel time required to perform routine maintenance saves time and money
- Suitable for use in SIL 3 systems and approved by FM and CSA
- Functions within wide range of ambient temperatures and high humidity
- Two-year product warranty, including long-life MOS sensor

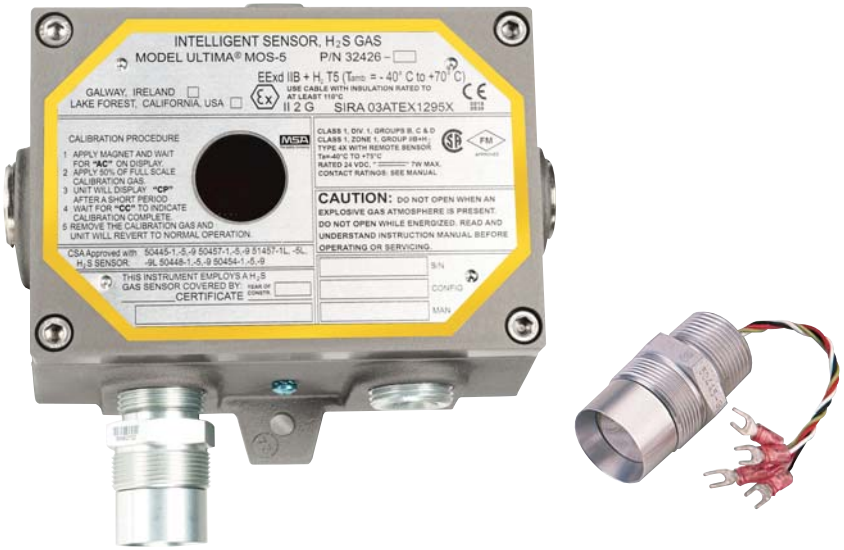
Features

Intelligent Sensor

- Detection ranges (0-20 ppm, 0-50 ppm and 0-100 ppm) enable wide range of applications
- 4-20 mA output is the industry standard for remote alarm and fault indication
- HART and Modbus communication provide complete status and control capability
- Warning, alarm and fault relays provide local alarm capability
- Remaining sensor life indication reduces downtime by providing estimate of remaining sensor life
- Calibration, calibration check and setup modes simplify operation and maintenance
- Event logging stores fault, gas check, calibration, and alarm event history

H_2S Sensor & Accessories

- Solid-state operation functions within harsh environments
- High selectivity—does not respond to hydrocarbons—enables low false alarm risk
- Unaffected by over-range exposure, reducing the need for sensor replacement
- Robust mechanical design is vibration- and shock-resistant
- Resistance to high humidity and range of ambient temperatures makes sensor suitable for worldwide use
- Specific sensors meet ISA-92.0.01 performance standard



System Specifications	
SENSOR TYPE	Continuous diffusion, adsorption type Metal Oxide Semiconductor (MOS)
SENSOR LIFE	3 to 5 years typical
REPEATABILITY	±2 ppm or 10% of applied gas, whichever is greater
RESPONSE TIME	T50: 5-10 seconds (nominal) of full scale with full scale gas applied
MEASURING RANGES	0-20 ppm, 0-50 ppm 0-100 ppm
MODES	Calibration, calibration check, setup, operating
ELECTRICAL CLASSIFICATION CSA/FM ATEX	 Class I, Division 1, Groups B, C & D; Class I, Zone 1 IIB+H2, T6. Type 4X (Tamb = -40°C to 60°C) EEx d IIB+H_2, T5 II2G, IP66 (Tamb = -40°C to 70°C)
WARRANTY	Two years
APPROVALS	ATEX, CSA, FM, CE Marking, HART-registered, SIL 2 and 3 suitable*, FM certified to IEC 61508
STANDARD PART NUMBER	MOS5-10011 0-100 ppm H_2S, 4-20 mA output, w/o relays or Modbus; FM, CSA, ATEX approvals

H2S Sensor Specifications	
TYPE	Metal Oxide Semiconductor (MOS)
RESPONSE TIME	With wire screen flame arrestor: T_{50} ≤10 seconds With sintered stainless steel flame arrestor: T50 ≤30 seconds On application of full scale gas according to ANSI/ISA-92.0.01
TEMPERATURE RANGE CSA FM	 -40°F to 167°F (-40°C to 75°C) -40°F to 140°F (-40°C to 60°C)
LIFE	3 - 5 years
ELECTRICAL CLASSIFICATION	Class I, Div. 1, Groups B, C, and D; Ex d IIC
WARRANTY	2 years

Environmental Specifications	
OPERATING TEMPERATURE RANGE ELECRONICS STD. SENSOR (FM) STD. SENSOR (ATEX)	 -40°F to 167°F (-40°C to 75°C) -40°F to 167°F (-40°C to 75°C) -40°F to 158°F (-40°C to 70°C)
STORAGE TEMPERATURE RANGE	-58°F to 185°F (-50°C to 85°C)
OPERATING HUMIDITY RANGE	5% to 100% RH, non-condensing

Mechanical Specifications	
LENGTH	6.4" (161 mm)
HEIGHT	3.4" (86 mm)
WIDTH	4.1" (104 mm)
WEIGHT	5.5 lbs. (2.5 kg)
MOUNTING HOLES	5.0" (127 mm) (center to center)

Electrical Specifications	
INPUT POWER	24 VDC nominal, 20 to 36 VDC 350 mA max.
RELAY RATINGS (OPTIONAL)	8A @ 250 VAC / 8A @ 30 VDC res. max. (3x) SPDT - Warning, Alarm and Fault
ANALOG SIGNAL MALFUNCTION GAS CHECK/CAL SETUP MODE ZERO READING 0-100% SCALE OVER-RANGE	0-20 mA (650 ohms max. load) 0 mA** 1.5 mA*** 1.5 mA*** 4 mA + 0.2 mA 4-20 mA 20-22 mA
RFI/EMI PROTECTION	Complies with EN50270, EN61000-3-2, EN61000-3-3
STATUS INDICATORS	Three-digit LED display with gas concentration, Warn and Alarm LEDs, calibration prompts, fault codes, and setup options
RS-485 OUTPUT (OPTIONAL)	Modbus RTU, suitable for linking up to 128 units or up to 247 units with repeaters
BAUD RATE	2400, 4800, 9600, or 19200 BPS
HART (OPTIONAL)	HART 6, HART Device Description Language available. AMS Aware
FAULTS MONITORED	Calibration error, sensor heater error, low DC supply, EEPROM, EPROM, setup error, gas check time exceeded, switch input error, internal errors
CABLE REQUIREMENTS	3-wire shielded cable. Max. distance between Ultima MOS-5 Sensor and power source or remote sensor @ 24 VDC nominal (20 ohm loop): 14 AWG - 2240 ft. (824 m) Max. distance for analog output (600 ohms max): 14 AWG - 8000 ft. (2400 m)

* *Use in typical environments has a lower safety rating than in clean environments*

** *Under HART, current values can be either 3.5 mA or 1.25 mA, depending upon user selection*

*** *Under HART, current value can be either 3.5 mA or 1.5 mA, depending upon user selection*

Ultima OPIR-5 Open Path Gas Detector

An open-path IR gas detector that provides continuous monitoring of combustible hydrocarbon gas concentrations

The Ultima OPIR-5 System consists of an IR source and receiver that continuously monitor for methane in both 0 to 5000 ppm•meter and 0 to 5 LEL•meter ranges. 0 to 2000 ppm•meter and 0 to 1 LEL•meter ranges are also available for monitoring propane. The Ultima OPIR-5 Detector provides two 4-20 mA analog signals proportional to each of the above listed ranges, in addition to digital display and relay contacts.

The Ultima OPIR-5 Detector is easily aligned using the digital display and adjustable mounting arms, and does not require any bulky setup equipment such as digital volt meters or handheld alignment aids. Ultima OPIR-5 Detector sensitivity can be checked by placing a test gas film in front of the receiver.

The Ultima OPIR-5 Detector is factory-calibrated and needs no further calibration. This unit also requires little maintenance except for periodic visual inspection, test gas film check (e.g., digital volt meters, handheld alignment aids) and window cleaning to help ensure dependable performance. Sensor data and status information from the receiver can be transmitted up to 9,000 feet to any industrial analog to digital (A/D) converter for use in multi-point computer-based monitoring.

Features

- Dual detection range enables sensitivity to both small (ppm•meter) and large (LEL•meter) gas leaks
- Performance-approved for use in harsh environments
- Single detection beam improves accuracy and reduces drift
- Up to 150 meter path length
- Multiple communication outputs (HART, Modbus, AMS Support) provide complete status and control capability in the control room
- Unitized display for ease of operation and reduced cost
- Automatic gain control compensates for dirty optics, rain and fog

System Specifications	
SENSOR TYPE	Infrared absorption detects hydrocarbon gases over an open path
RANGES METHANE PROPANE	 0 to 5000 ppm•meter 0 to 5 LEL•meter 0 to 2000 ppm•meter 0 to 1 LEL•meter
PATH LENGTH LEL•METER PPM•METER	 5-30 m, 20-100 m, 50-150 m 5-30 m, 20-100 m, 80-150 m
RESPONSE TIME	T90 < 3 s
REPEATABILITY	< +5%
LINEARITY	< +5% of full scale for each scale or +10% of applied gas, whichever is greater
CLASSIFICATION HAZ LOC PERFORMANCE VERIFIED	Class I, Div 1 & 2, Groups B, C & D; Class II, Div 1 & 2, Groups E, F & G Class III; Type 4X Class I, Zone 1, IIB+H2 II 2 G D, Ex d IIB+H2 T4 Gb Ex tb IIIC T135°C Db, IP66/67 (Tamb=-55°C to 65°C) T3C (Tamb=-60°C to 75°C); T4 (Tamb=-55°C to 65°C)
CALIBRATION	No calibration required. Field background zero adjustment provided
MODES	Setup, alignment, test gas, run
ACCESSORIES	Test gas films, mounting arm, mounting base, scope, attenuation plate
WARRANTY	2 years
APPROVALS	CSA, FM, ATEX, IEC Ex, CE Marking. SIL 3-suitable. HART-registered.
STANDARD CONFIGURATION	OPIR5-1-1-1-1-1-2-1-1-1-1 Methane, dual 0-20 mA, dual Modbus, relays, mounting arm, 20-100 m path length, NPT

* *HART units can be configured to never output current less than 3.5 mA if host equipment is incapable of working below this level*

** *0 to 2000 ppm•meter and 0 to 1 LEL•meter on propane unit*

*** *Using optional split range*

Environmental Specifications	
OPERATING TEMPERATURE RANGE	-67°F to 149°F (-55°C to 65°C)
OPERATING HUMIDITY RANGE	0-95% RH, non-condensing

Mechanical Specifications	
HOUSING	316 stainless steel
SOURCE	5.3" dia. x 12.4" length (135 mm dia. x 315 mm length)
RECEIVER	5.3" dia. x 12.4" length (135 mm dia. x 315 mm length)
CONDUIT ENTRIES	¾" NPT (standard) M25 (optional)

Electrical Specifications		
INPUT POWER	20 to 36 VDC range 24 VDC @ 12 W (max.) – source 24 VDC @ 10 W (max.) – receiver (w/relays) 24 VDC @ 5 W (max.) – receiver (no relays, heater off) *Consult factory for lower power consumption options for other configurations*	
DUAL ANALOG SIGNALS	700 ohm load max.	
	0-5000 ppm•meter	**0-5 LEL•meter**
0 mA*	Startup/fault	Startup/fault
1.5 mA*	Test gas/setup	Test gas/setup
2 mA*	Beam block	Beam block
4-20 mA**	0-5000 ppm•m	0-5 LEL•m
4-12 mA***	0-5000 ppm•m	—
12-20 mA***	—	0-5 LEL•m
21.7 mA	Over-range	Over-range
RELAY RATINGS	8 A @ 250 VAC / 8 A @ 30 VDC res. max. 4 SPDT - Fault, ppm Warning, LEL Warning and Alarm	
RS-485 OUTPUT	Modbus RTU with block and single data transfer modes	
BAUD RATE	2400, 4800, 9600, 19200 or 38400 BPS	
HART	HART 6, HART Device Description available. AMS Device Management Support	
RFI/EMI PROTECTION	Complies with EN 61000-6-4 and EN 50270	
SAMPLE CABLE DISTANCES	For cable resistance of 3 ohms/1,000 ft, max. distance between OPIR-5 and power source @ 24VDC 14 AWG, 1,330 ft (405 m) - receiver 14 AWG, 1,040 ft (317 m) - source For 16 AWG cable with cable resistance of 5 ohms/1,000 ft, max. distance for analog output (100 ohms max.) 10,000 ft (3,048 m).	
DIGITAL DISPLAY	LED indication of scale displayed; 2- digit, 7- segment (auto range change)	

PrimaX Gas Monitor

Versatile gas detection to meet your needs

MSA's new PrimaX Gas Monitor offers proven quality and reliability and is available in explosion-proof and intrinsically-safe versions. Innovative enclosure design, ease of use, fast installation, and suitability for both indoor and outdoor installations make the PrimaX Gas Monitor your choice for versatile gas detection.

PrimaX I Gas Monitor

- Innovative modular design for detection of toxic gases, oxygen or combustible gases
- Robust, anti-static, reinforced nylon, IP66-rated housing
- Calibration via convenient, built-in keypad
- Large, easy-to-read LCD display of menu, gas concentration and error messages
- Plug-in connector for easy and rapid sensor replacement
- 4–20 mA output signal and SIL 2 certification
- Optional HART digital communication provides configuration, calibration and diagnostics

PrimaX P Gas Monitor

- Powder-coated aluminum enclosure (IP66)
- Easy menu navigation using integrated 4-way keypad
- 3- or 4-wire connection
- Plug-in replacement sensor
- 4–20 mA output signal and SIL 2 certification
- HART digital communication and 2 relay options

Description	Values	PrimaX P Monitor	PrimaX I Monitor
Sensors			
COMBUSTIBLE	Catalytic	■	
OXYGEN & TOXIC	Electrochemical	■	■
Performance			
TYPICAL RESPONSE TIME*	t50 ≤ 10 sec. / t90 ≤ 30 sec. (combustible) t20 ≤ 12 sec. / t50 ≤ 30 sec. (oxygen, toxic)	■	■
SENSOR OPERATING LIFE*	Up to 3 years in clean air	■	■
OPERATING TEMPERATURE*	-40°F to +160°F (–40°C to +70°C)	■	■
STORAGE TEMPERATURE*	-40°F to +160°F (–40°C to +70°C)	■	■
OPERATING HUMIDITY RANGE	5% to 95% RH non-condensing	■	■
OPERATING PRESSURE RANGE	80–120 kPa (600-900 mm Hg)	■	■
Electrical			
SUPPLY VOLTAGE	10 to 28 VDC (24 VDC nominal)	■	■
OUTPUT SIGNAL	4–20 mA (max. load 200 ohm)	■	■
POWER CONSUMPTION	3 watt typical at 24 VDC	■	
	0.7 watt typical at 24 VDC		■
TERMINALS	3 or 4 wire – up to 12 AWG	■	
	2 wire – up to 12 AWG		■
Display & Indicators			
DISPLAY	Alphanumeric LCD	■	■
LED STATUS INDICATORS	Green, yellow, red	■	
Options			
HART DIGITAL PROTOCOL	Diagnostics and configuration	■	■
RELAY OUTPUT	Alarm and fault – 1 A / 30 VDC SPDT	■	
Physical			
INGRESS PROTECTION	IP66	■	■
WEIGHT	3.5 lbs. (1.6 kg)	■	
	1.5 lbs. (0.7 kg)		■
DIMENSIONS (H X W X D)	8.6" x 6.4" x 3.9" (220 x 162 x 100 mm)	■	
	8.6" x 6.4" x 3.2" (220 x 162 x 81 mm)		■
MATERIAL	Powder-coated aluminum	■	
	Anti-static reinforced nylon		■
CONDUIT ENTRIES	¾" NPT or M25 x 1.5 mm	■	
Approvals			
ATEX / IEC	Gas - Ex d IIC T4 Gb Dust - Ex ib IIIC Tx Db	■	
	Gas - Ex ia IIC T4 Ga Dust - Ex ia IIIC T130° Db		■
UL	Class I, Div 1, Group B, C, D	■	■
CSA	Class I, Div 1, Group B, C, D	■	■
SAFETY INTEGRITY LEVEL	SIL 2	■	■

** Sensor-dependent*

GASSONIC OBSERVER-*i* Ultrasonic Gas Leak Detector

The GASSONIC OBSERVER-*i* is the world's first ultrasonic gas leak detector equipped with Artificial Neural Network (ANN) real-time broadband acoustic sound processing technology. This technology is based upon extensive studies and real recording of gas leak sounds and industrial background noise from a wide array of industry sources. The ANN algorithm has been "trained" with these recordings to automatically distinguish between unwanted acoustic background noise and potentially hazardous gas leaks.

Using ANN technology, the GASSONIC OBSERVER-*i* makes it possible to fully analyze the sound spectrum from 12 kHz and beyond, as common high pass filters are not used. This process provides a broader leak detection range that also increases sensitivity for detection of smaller gas leaks, without interference from unwanted background noise.

ANN technology enables the GASSONIC OBSERVER-*i* to be installed without time consuming training sequences, and provides industry-leading detection distance with unprecedented suppression of false alarms. In addition, ANN technology ensures that the GASSONIC OBSERVER-*i* has the same gas leak detection coverage within high and low noise areas. Further, as it is self-adaptive, the device requires no alarm set points to be configured, nor do alarm set points need to be adjusted if background ultrasound were to increase or decrease over time.

The GASSONIC OBSERVER-*i* is backwards-compatible with earlier versions of the Gassonic Observer detector family by means of the Classic Mode setting, where ANN is disabled and the electrical interface matches earlier versions of Gassonic Observers. The GASSONIC OBSERVER-*i* features the patented Senssonic™ self-test function. This well-proven self-test checks the device's electrical integrity and microphone every 15 minutes and ensures that the GASSONIC OBSERVER-*i* is operational at all times. The microphone and microphone windscreen are constantly monitored to ensure that the detector always has optimal sensitivity and detection coverage.

Features	Benefits
ARTIFICIAL NEURAL NETWORK (ANN)	Improved detection range and background noise rejection prevents false alarms
SENSSONIC™ INTEGRATED ACOUSTIC SELF-TEST	Fail-safe operation
ONE-PERSON ACOUSTIC SOUND CHECK WITH TRACEABLE PORTABLE TEST UNIT	High reliability and trouble free maintenance
HART AND MODBUS	Provides complete status and control capability in the control room
EVENT LOGGING	Stores fault, sound check, calibration, and alarm event history

Applications

- Floating production
- Storage and offloading vessels (FPSOs)
- Gas compressor and metering stations
- Gas storage facilities
- Hydrogen storage facilities
- LNG/GTL trains
- LNG re-gasification plants
- Offshore and onshore oil and gas installations
- Petrochemical processing plants

System Specifications	
DETECTOR TYPE	Ultrasonic (acoustic) gas leak detector
BACKGROUND NOISE REJECTION METHOD	Artifiicial Neural Network (ANN)
GAS LEAK RECOGNITION METHOD	Artifiicial Neural Network (ANN)
MIN. ACOUSTIC DET. FREQUENCY *(ANN Mode)*	12 kHz
MIN. DETECTION LIMIT	40 dB (u)
ACCURACY	+3 dB
SELF-TEST	Performed every 15 minutes
DETECTOR COVERAGE *(ref. Methane)*	**Classic Mode (@ 0.004kg/sec)** Ultra High 10 ft. (3 m) High 20 ft. (6 m) Medium 36 ft. (11 m) Low 46 ft. (14 m) **Classic Mode (@ 0.01 kg/sec)** Ultra High 16 ft. (5 m) High 30 ft. (9 m) Medium 43 ft. (13 m) Low 52 ft. (16 m) **Classic Mode (@ 0.1 kg/sec)** Ultra High 23 ft. (7 m) High 39 ft. (12 m) Medium 56 ft. (17 m) Low 69 ft. (21 m) **ANN Mode (min. trigger level 49 dB)** 0.004 kg/s 66 ft. (20 m) 0.01 kg/s 82 ft. (25 m) 0.1 kg/s 98 ft. (30 m)
RESPONSE TIME	< 1 s (speed of sound)
APPROVALS CLASSIFICATION	**ATEX/IECEx** Ex d ia IIB+H2 Gb T6, Ex tb IIIC T85°C Db (Ta = -40°C to +60°C) **CSA** Ex d ia IIB+H2 Gb T6, Ex tb IIIC T85°C Db **FM/CSA** Class I, Div. 1, 2 Groups B, C, D; Class II, Div. 1, 2 Groups E, F, G; Class III, T5 (Ta = -40°C to +60°C)
APPROVALS	ATEX, CSA, FM, IECEx, CE HART 6.0 registered FM certified to IEC 61508 (SIL 3)
ACCESSORIES	GASSONIC 1701 Test and Calibration unit GASSONIC SB100 Bump test tool
DEVICE DRIVERS	DDL, DTM available at *generalmonitors.com*
WARRANTY	2 years

Environmental Specifications	
OPERATING TEMPERATURE RANGE	-40°F to 140°F (-40°C to 60°C)
OPERATING HUMIDITY RANGE	10-95% RH, non-condensing

Mechanical Specifications	
HOUSING	Stainless teel AISI 316L
DIMENSIONS	7.99" x 7.99" x 7.91" (203 x 203 x 201 mm)
WEIGHT	16.5 lbs (7.5 kg)
MOUNTING HOLES	2x mounting screws – M8 x 19 max
INGRESS PROTECTION	IP66 / Type 4X
STANDARD CONFIGURATION	OBSERVER-i-1-1-1-1-1-1

Electrical Specifications	
INPUT POWER	15-36 VDC, 250 mA max. 24 VDC, 170 mA max
RELAY RATINGS *(optional)*	8 A @ 250 VAC
CURRENT OUTPUT *(sink or source)*	**Status Indications** 0 mA: Start up, no power 1 mA: Pulsed acoustic error 3 mA: Unit inhibit **Classic Mode** 4 – 20 mA, 40 – 120 dB (u) **ANN Mode** 4 – 12 mA, 40 – 120 dB (u) 16 mA, warning 20 mA, alarm
EMC/RFI	HART, Modbus
CABLE REQUIREMENTS	Max. cable length between Observer-i and power source @ 24 VDC (20 ohm) 2.08 mm^2 (14 AWG) – 5,928 ft. (1,809 m)

Toxgard II Gas Monitor

Versatile monitor for combustible gas, toxic gas or oxygen deficiency detection

Simplicity/Ease of Use

- Large, four-digit LED display
- Large LED alarm indicators
- Internal relay contacts for FAULT, CAUTION, WARNING, and ALARM
- Fail-safe fault relay output
- Diagnostics that appear on the display
- Audible alarm
- 4-20 mA output
- Automatic calibration
- *Replace Sensor* indication when sensor nears its end of life
- Real-time clock for time and date-stamping of events
- Logging of minimum, maximum and average gas concentrations over predetermined time intervals
- Selectable lock-out of output signals during calibration to inhibit alarms and control actions
- Digital, multi-drop communication
- Externally-mounted plug-in sensor is easily replaced
- Remote sensor enables sensors and transmitters to be separated for installations where sensor access may be difficult

Flexibility

- Can be used as transportable gas monitor with optional internal battery
- Three levels of alarm
- Optional integral pump for sample draw systems

Durability

- Housed in a rugged, metal NEMA 4X enclosure, or standard steel version
- Sensorgard protects sensor from dirt and water and acts as a baffle in windy environments

Specifications for Toxgard II Gas Monitor	
GAS TYPES	Combustibles, oxygen, toxics
TEMPERATURE RANGE TOXICS AND OXYGEN COMBUSTIBLES	 -4°F to 122°F (-20°C to 50°C) *(Range on some models may differ.)* -40°F to 194°F (-40°C to 90°C)
ZERO DRIFT	<5%/yr., typically
SPAN DRIFT	<10%/yr., typically
NOISE	Less than 1% FS
ACCURACY REPEATABILITY LINEARITY	 ±1% FS or 2 ppm ±2% FS (combustible, O_2, CO) ±10% FS or 2 ppm (others)
STEP CHANGE RESPONSE T20 O_2 AND TOXICS T50 O_2 AND TOXICS T50 COMBUSTIBLES T90 COMBUSTIBLES	 < 12 sec. (typ. 6 sec.) < 30 sec. (typ. 12 sec.) < 8 sec. < 20 sec.
HUMIDITY	0-95% RH, non-condensing
SENSOR LIFE COMBUSTIBLES TOXICS AND O_2	 3 years typically 2 years typically
FULL REPLACEMENT WARRANTY	1 year
HAZARDOUS AREA RATING	General purpose, XP remote sensor assembly can be installed in Class I, Div I areas
POWER INPUT	110-220 VAC power input
SIGNAL OUTPUT 4-20 mA DIGITAL	 2-wire current source See bulletin #1600-08
INTERNAL RELAYS	Fault, Caution, Warning, Alarm
INTERNAL RELAY CONTACT RATING	5 amp @ 125 VAC; 5 amp @ 30 VDC
BATTERY BACK UP BATTERY TYPE	12V lead acid
BATTERY OPERATING TIME No options; minimal alarm activity: TOXICS AND O_2 COMBUSTIBLES Full options; depending on alarm activity: E-CHEM COMBUSTIBLES	 up to 24 hr. up to 10 hr. 1-4 hrs. 0.5-2 hr.
PHYSICAL ENCLOSURE WEIGHT	 10" W x 12" H x 5" D (254 x 305 x 127 mm) 13 lbs. (6 kg)

Trigard Gas Monitor

The MSA Trigard Monitoring System is designed for monitoring toxic gases, combustible gases and oxygen deficiency or enrichment. It is an affordable monitoring solution for a variety of applications, including water and wastewater plants, lab space, boiler rooms, commercial and general industry.

Features

- Adjustable range
- Multiple sensor mounting options
- AC- or DC-powered
- NEMA 4X design
- LCD display with highly visible LED indicators
- Piezo horn with horn silence button
- Simple push-button calibration
- Available as single-point or 3-point unit

Advanced Features

Sensor Disconnect Under Power

- MSA's patented feature allows for sensor change-out without declassifying a hazardous area

Interchangeable Smart Sensors

- Pre-calibrated sensor modules are ready for installation out of the box. Sensors can be replaced in the field without the use of tools. The unit quickly recognizes the new sensor type and reconfigures alarm and relay settings to optimize the new sensor

State-of-the-Art Display

- Liquid crystal display conveniently alternates between sensor reading and gas type, and features scrolling messaging, indicating ongoing diagnostic checks such as sensor end-of-life condition

Onboard LEDs and Relays

- Quick-check LEDs and four relay outputs allow for increased indication of alarm and fault conditions
- Quick-check LEDs, viewable from up to 50 feet, indicate NORMAL (green) and ALERT (red) status conditions
- Field-program-mable alarm levels and normally energized/de-energized, normally opened/closed and latching/non-latching relay functions offer three levels of alarm and a fault

Options

- One or two strobes
- Back-up battery
- Internal power supply

Sensor Options

- Oxygen, toxic and combustible sensors
- Integral mounting
- Remote general purpose
- Remote explosion proof
- Pre-wired shielded cable for sensors in 25-, 50- and 100-ft. lengths (oxygen and toxic only)

Specifications for Trigard Gas Monitor	
GAS TYPE	Toxic, oxygen and combustible (catalytic bead or infrared)
GAS SAMPLING	Diffusion
OUTPUT TYPE	1 sensor: 4-20 mA, 3-wire or Modbus RTU; 2 or 3 sensors: Modbus RTU only
SENSOR LOCATION	Local or remote sensor (up to 100 ft.)
ENCLOSURE	General purpose polycarbonate enclosure
SENSOR TEMPERATURE RANGE	14˚F to 104˚F (typical)
ACCURACY	Repeatability +1% FS (typical)
SENSOR LIFE	18 months to 2 years
RELAYS	5 amp SPDT; 4 relays (3 alarm, 1 fault) @ 220 VAC or 30 VDC
POWER INPUT	12-30 VDC (standard), 85-256 VAC (optional)
ALARM TYPE	Piezo horn (95 dB) with horn silence button
BATTERY BACKUP	Optional (1,200 mAh)
ENVIRONMENTAL PROTECTION	Designed to meet NEMA 4X

Chemgard Series Infrared Gas Monitors

Precise photoacoustic IR monitors many industrial gases including hydrocarbons, solvents, alcohols, alkanes, and toxics

Chemgard Series Monitors provide low-cost, high-performance monitoring that is extremely stable and highly selective to the gas of interest. Detectability is as low as 0.01 ppm for certain applications; unit can operate for months with virtually no zero drift. All monitors are UL 2075-approved.

Simplicity/Ease of Use

- Direct-reading display shows actual gas value, alarms and diagnostic messages
- Data logging provides access to date-stamped information concerning key events including gas readings, alarms and fault conditions. Data is accessible through front panel display or RS-232 port.
- Easy to install, operate and maintain
- Easy-to-read display showing gas concentration(s) and alarms
- Three alarm levels with relay output
- All user functions are configurable through front panel
- Three system alarm levels with relays
- Normally energized trouble and alarm relays for fail-safe operation

Flexibility

- Variety of output ranges
- Three enclosure styles: explosion-proof, NEMA 4 or rack-mounted
- Can be expanded to monitor up to eight locations simply by adding multipoint sequencer option
- Operates over wide temperature range
- Can be installed within numerous environments and configurations
- Monitor one, four or eight sampling points per instrument
- Discreet relays expandable up to three per sample line (separate enclosure)

Specifications for Chemgard Series Infrared Gas Monitors	
Performance characteristics subject to change, depending upon gas to be monitored and full scale range.	
FOR 0-1000 PPM RANGE ACCURACY LINEARITY SENSITIVITY RESOLUTION	 0-100 ppm ±2 ppm; 100-1000 ppm ±10% reading 0-100 ppm linear, 100-1000 ±2% of full scale 2 ppm 1 ppm *Note: specifications for other ranges are dependent upon application. Consult factory.*
REPRODUCIBILITY	±2 ppm over 12 months at specified operating conditions
RESPONSE	Updated reading every 7 seconds
OPERATING TEMPERATURE	32°F to 122°F (0°C to 50°C)
TEMPERATURE EFFECT	±0.3% per °C of reading
RELATIVE HUMIDITY	0-99% non-condensing- no effect on reading
SAMPLE FLOW RATE	1.5 liter/minute
MAXIMUM TOTAL TUBING LENGTH	150 ft with ⅛" ID (46 m with 3 mm ID) 500 ft with ³⁄₁₆" ID (152 m with 5 mm ID)
OPERATING POWER REQUIREMENTS	120 VAC ± 10% at 0.56 amps, or 240 VAC; ±10% at 0.3 amps
ALARM RELAYS	3 relays @ 8 amps resistive
APPROVALS	UL 2075 for many configurations
PHYSICAL ENCLOSURE NEMA 4 DIMENSIONS WEIGHT	 18" H x 16" W x 7" D (457 x 406 x 178 mm) 40 lbs. (18 kg)
19" RACK MOUNT DIMENSIONS WEIGHT	 7" H x 17⅜" W x 15¼" D (178 x 448 x 387 mm) 19 lbs. (9 kg)
EXPLOSION PROOF (XP) DIMENSIONS WEIGHT	 19⅛" H x 19⅛" W x 9½" D (486 x 486 x 495 mm) 100 lbs. (45 kg)

MultiGard Gas Sampling System

Simple, efficient, cost-effective gas detection

The MultiGard Sampling System draws gas samples from remote locations and delivers them to customer-selectable internal analyzers. Maintenance and calibration are simplified because all maintenance is performed at a single location.

- Modular construction allows simple installation and maintenance
- Easy setup via front touchscreen panel display
- Auto-standardization
- Common or discrete alarm and fault relays
- Gas flow failure indication
- Flexible sample point order
- Options include relays and readouts
- Sensing technology options include electrochemical, catalytic bead and both photoacoustic and nondispersive infrared

Efficiency

- Efficient, cost effective gas detection method
- Gas samples are sequentially delivered to internal analyzers
- Timesharing among multiple locations provides significant cost savings
- Includes up to four analyzers, reducing floor space and eliminating multiple systems and duplicate tubing

Reliability

- Reliability is enhanced through use of single set of analyzers
- All calibrations completed at MultiGard System analyzer(s), with no need to enter monitored area
- Manual or auto-standardization of sensors or analyzers when desired

Adaptability

- MultiGard System adapts to provide optimum time for a given analyzer
- Each location can have different sample transport time
- Critical sampling points can be sampled more frequently
- Ethernet capable (IP addressable) to be viewed and controlled via computer
- A dual-sequencer system can be used; up to two analyzers are dedicated to each half of sampling points

Specifications for MultiGard Gas Sampling System	
ENCLOSURE	
AREA CLASSIFICATION	General purpose for non-hazardous areas enclosure rating
8/16 POINT	NEMA 12
24/32 POINT	NEMA 12
DUAL 8 POINT	NEMA 1
DUAL16 POINT	NEMA 1
PHYSICAL	
8/16/DUAL 8	24" W x 30" H x 12" D (609.6 x 762 x 304.8 mm) 125 lbs. (56.7 kg)
24/32/DUAL 16	30" W x 30" H x 12" D (762 x 762 x 304.8 mm) 150 lbs. (68 kg)
OPERATOR INTERFACE	
TYPE	Integrated color TFT touch-screen display
SIZE	
8/16 POINT	6" (152 mm) diagonal (optional 10.5" (267 mm) diagonal)
24/32/DUAL 8/DUAL 16	10.5" (267 mm) diagonal
OUTPUTS	2 levels of alarm
COMMON ALARMS	Form C contacts (SPDT), 8 amp, 250 VAC optional user-configurable
DISCRETE ALARMS	Form C contacts (SPDT), 10 amp, 250 VAC optional user-configurable
SOLID STATE OUTPUTS	100 mA @ 24 VDC, sinking
FLOW SYSTEM	
SCHEME	
LOOK AHEAD BYPASS CONNECTIONS	⅛ NPT
SAMPLE LINE TUBING	500 ft (152 m) max. w/0.250" (6.35 mm) OD tubing, longer lengths possible with external pump
SAMPLE LINE FLOW RATE	(0.175" ID tubing): 20 SCFH (10 lpm) typical, no-load 10 SCFH (5 lpm) typical, full load
TEMPERATURE	
OPERATING	32°F to 95°F (0°C to 35°C)
NON-OPERATING	14°F to 140°F (-10°C to 60°C)
SAMPLE	0°F to 140° F (-17°C to 60°C)
HUMIDITY	30 to 85% RH non-condensing

Chillgard RT Photoacoustic Infrared Refrigerant Monitor

The industry standard for refrigerant leak detection monitors

The Chillgard RT Photoacoustic Infrared Refrigerant Monitor provides economical, low-level monitoring of refrigerant gases used in most refrigeration systems or chillers. By detecting leaks early enough to prevent major loss of refrigerant gas, the monitor reduces operating costs. Chillagard RT Monitors meet requirements of ANSI/ASHRAE 15.

Sensor Technology

The Chillgard RT Monitor uses very stable and highly selective photoacoustic infrared (IR) technology to sense refrigerant gases at levels as low as one part per million.

- Can operate for months with virtually no zero drift
- Inherent stability eliminates need for auto-zeroing techniques that take the monitor offline at regular intervals, leaving the area unprotected
- Fresh air sampling line or online scrubber is not required
- High immunity to interferents such as cleaning agents and solvents
- Unaffected by changes in humidity
- Operates over wide temperature range
- Detects single or multiple refrigerants

Expandability

Simply by adding the Multipoint Sequencer, the Chillgard RT Refrigerant Monitor can expand to monitor up to eight locations, resulting in:

- More cost-effective monitoring, especially when monitoring large areas or multiple locations or chillers
- The fastest possible response to any leak or spill
- Fresh sample pumped from locations up to 500 feet for each sample

Simplicity/ Ease of Use

- Easy to install, operate and maintain four front-panel keys configure the entire system
- Front panel displays all alarm and trouble messages. If trouble condition occurs, message is clearly shown on display and type of trouble is indicated
- Three-line x 20-character vacuum fluorescent display shows alarm indications, monitored location and actual gas concentration
- Three alarm levels with relay outputs for each level
- Password protection

Accessories

Remote Relay Module

Provides discrete relay outputs on a per-channel basis when the Multipoint Sequencer is in use. Relays can be utilized to provide a relay output for either Caution, Warning, Alarm, or all of these conditions. These relay outputs are commonly used to activate horns, strobes or ventilation equipment for separate areas that are monitored by the Chillgard RT Multipoint Sequencer

Gas Monitor Remote Display

Meets ASHRAE 15 requirement of entryway signalling at the entrance to mechanical equipment rooms

Specifications for Chillgard RT Photoacoustic Infrared Refrigerant Monitor	
PERFORMANCE STABILITY	0-50 ppm ±1 ppm; (ammonia ±2 ppm) 51-1000 ppm ±10% reading
LINEARITY	0-50 ppm ±1 ppm, (ammonia ±2 ppm) 51-1000 ±10% of reading
RESPONSE	Updated instrument reading every 7 seconds
OPERATING TEMPERATURE	32°F to 122°F (0°C to 50°C)
TEMPERATURE EFFECT	±0.3% per °C of reading
RELATIVE HUMIDITY	0-95% non-condensing, no effect on reading
SAMPLE FLOW RATE	0.75 liter/minute
MAXIMUM TOTAL TUBING LENGTH	150 ft. with ⅛" ID; 500 ft. with 3⁄16" ID (46 m with 3.175 mm ID; 152 m with 4.763 mm ID)
OPERATING POWER REQUIREMENTS	120 VAC ±10% at 0.56 amps, or 240 VAC ±10% at 0.3 amps
ALARM RELAYS	3 relays @ 8 amps resistive
AUDIBLE OUTPUT	Sonic alert 75 db standard
ANALOG OUTPUT	0-10 V, and 4-20 mA isolated sourcing
SERIAL OUTPUT	RS-232
MAXIMUM SIGNAL LOAD	0-10 V into 2 kohms, or 4-20 mA into 1 kohms
SAMPLE TUBING CONNECTIONS	¼" with ⅛"ID or 3⁄16" ID (6.35 mm with 3.175 mm ID or 4.763 mm ID)
FLOW SWITCH	Activates at flow < 0.5 liter/min.
PERFORMANCE, MULTIPOINT SEQUENCER MAXIMUM SAMPLED POINTS MAXIMUM SAMPLE TUBING LENGTH	 8 150 ft. ea. standard, 500 ft. optional (¼" OD, 3⁄16" ID tubing) 46 m ea. standard, 152 m optional (6.35 mm OD, 4.763 mm ID tubing)
PHYSICAL ENCLOSURE TYPE DIMENSIONS WEIGHT	 Designed as NEMA 4 18" H x 16"W x 7" D (457 x 406 x 178 mm) 45 lb. (20.4 kg)
APPROVALS	UL 2075 for many configurations

UL Approved

The Chillgard RT Refrigerant Monitor has been listed to proposed UL 2075. This assures not only protection from fire and shock hazards, but also assures performance of the instrument to the specifications listed

Applications

Common refrigerant gases used in industries can also be monitored. These include:

- Propellant filling operations
- Solvent cleaning stations
- Cold storage and transport facilities
- Meat packing plants
- Supermarkets and refrigerant storage locations

Chillgard LE Refrigerant Monitor

Refrigerant sensor and control module in one enclosure

The Chillgard LE Photoacoustic Infrared Refrigerant Monitor provides fast, reliable and economical low-level monitoring of refrigerant gases used in most refrigerant systems or chillers, including R-123, R-134A, R-11, R-12, and R-22. Unit's full scale range is 0-1,000 ppm with capability of measuring refrigerant leaks as low as 20 ppm, well below established threshold limit values. The unit's standard 4-20 mA output can be connected directly to any existing Building Automation System (BAS) or other controller. 4-20 mA output can be used to provide leak indication prior to workers entering the room containing the refrigerant gas. With integral display, status LEDs and optional strobe, workers have visual indication of refrigerant levels within their work area. Sample draw units can be mounted inside or outside of the room, providing detailed information such as gas level and alarm status before workers enter.

- Single-point diffusion or four-point pumped models
- Complies with ANSI/ASHRAE 15-2001
- UL approval
- Photoacoustic Infrared (PIR) sensing technology
- No moving parts in diffusion model
- Water- and corrosion-resistant plastic enclosure
- 24 VAC/DC or 110/220 VAC power
- Five LEDs indicating power, fault and three levels of alarm
- Digital signal processing
- Standard outputs: 4-20 mA and RS-485

Specifications for Chillgard LE Refrigerant Monitor	
SINGLE-POINT DIFFUSION MODEL OPERATING RANGE	0-1000 ppm
MINIMUM DETECTABILITY	20 ppm
LINEARITY	0-100 ppm linear, 100-1000 ppm ±5% of reading
WARM-UP TIME	10 minutes
RESPONSE TIME	50% of a step change in less than 60 seconds
OPERATING TEMPERATURES	0 to 40˚ C (32 to 104˚ F)
NON-OPERATING TEMPERATURES	-40 to 60˚ C (-40 to 140˚ F)
TEMPERATURE EFFECT	<4%/10˚ C
RELATIVE HUMIDITY	0 to 99%
OPERATING POWER OPTIONS	24 VAC/DC standard, 110/220 VAC optional
ANALOG OUTPUT	4-20 mA
PHYSICAL	14.7" high x 11.2" wide x 5" deep
WEIGHT	9.5 lbs.
WARRANTY	2 years

Chillgard LS Refrigerant Monitor

Flexible, reliable gas monitor

The Chillgard LS Refrigerant Monitor detects the five most commonly used refrigerant gases (R-11, R-12, R-22, R-123, and R-134a). Standard features include five LEDs to indicate power, alarm and fault conditions, 4-20 mA output and RS-485 Modbus output for communication to the Chillgard LC Control Module. The Chillgard LS Refrigerant Monitor sensor module meets requirements of ASHRAE 15 for detection below TLV for refrigerant gases.

- Available in either single-point diffusion (no pump needed) or four-point pumped version for remote sampling
- Works as either stand-alone unit or in conjunction with Chillgard LC Control Module
- Full scale range of 0-1,000 ppm with capability of measuring as low as 20 ppm
- Fast reliable detection for low level leaks prevents major loss of costly refrigerant gas
- Integral status LEDs and optional strobe provide visual indication of refrigerant level

Simplicity and Upgradeability

- Designed for easy installation, operation and maintenance
- No moving parts in diffusion version simplifying maintenance and repair

Sensor Technology

- Uses very stable and highly selective photoacoustic infrared (PIR) technology
- Can operate for months with virtually no zero drift
- Inherent stability eliminates need for auto-zeroing techniques that take monitor offline at regular intervals
- Fresh air sampling line or online scrubber is not required

Specifications for Chillgard LS Refrigerant Monitor	
Single-point Diffusion Model	
OPERATING RANGE	0-1000 ppm
MINIMUM DETECTABILITY	20 ppm
LINEARITY	0-100 ppm linear, 100-1000 ppm ±5% of reading
WARM-UP TIME	10 minutes
RESPONSE TIME	50% of step change in less than 60 seconds
OPERATING TEMPERATURES	32°F to 104°F (0°C to 40°C)
NON-OPERATING TEMPERATURES	-40°F to 140°F (-40°C to 60°C)
TEMPERATURE EFFECT	<4%/10°C
RELATIVE HUMIDITY	0 to 99%
OPERATING POWER OPTIONS	24 VAC/DC standard, 110/220 VAC optional
ANALOG OUTPUT	4-20 mA
PHYSICAL	14.7" H x 11.2" W x 5" D (373 x 284 x 127 mm)
WEIGHT	9.5 lbs. (4.3 kg)
WARRANTY	2 years
4-point Pumped Model	
Same as above except for the following:	
MINIMUM SAMPLE FLOW RATE	0.75 liters/min.
MAXIMUM TOTAL TUBING LENGTH	300 ft. (91.4 m)
PHYSICAL	14.7" H x 11.2" W x 5" D (373 x 284 x 127 mm)
WEIGHT	9.5 lbs. (4.3 kg)
WARRANTY	2 years

Chillgard LC Control Module

Microprocessor-based controller

The Chillgard LC Control Module can communicate with up to eight sample points from Chillgard LS Refrigerant Monitors over an RS-485 communication line. The Chillgard LC Module remotely displays gas concentration, alarm status, calibration, and fault diagnostics for Chillgard LS Monitors.

- Expandable: configurable with up to eight Chillgard LS Sensor module points of detection
- Easy to use: 20-position LCD display with four-button keypad
- Three LEDs—power, fault and alarm—offer a quick visual indication of monitor status
- Four internal relays: fault and three alarm levels
- Beacon option
- 85 db piezo horn with 100 db option
- Analog outputs: 0-10 V and 4-20 mA
- Serial output: RS-232 with data logging and RS-485 Modbus
- Water- and corrosion-resistant enclosure
- Four power options:
  - 24 VDC output powers remote L Series sensor module up to 100 ft.
  - 24 VAC output option powers up to five remote L Series sensor modules
  - 110 VAC 50/60 Hz
    220 VAC 50/60 Hz
- Two-year warranty

Specifications for Chillgard LC Control Module	
INPUT POWER	24 VAC/DC standard, 110 VAC/220 VAC 50/60 Hz optional
POWERING REMOTE SENSORS	110/220 VAC unit can power Chillgard LS Sensor from up to 100 feet. 110/220 VAC transformer unit can power up to 5 Chillgard LS Sensors
OPERATING TEMPERATURE	32°F to 104°F (0°C to 40°C)
NON-OPERATING TEMPERATURE	-40°F to 140°F (-40°C to 60°C)
RELATIVE HUMIDITY	0 to 99%
OUTPUT	0-10 V and 4-20 mA analog and RS-232 with data logging
RELAYS	4 form C SPDT, 8 amps @ 240 VAC
PHYSICAL	7.1″ H x 10″ W x 4.25″ D (830.3 x 254 x 120.7 mm) transformer version: 14.7″ H x 11.2″ W x 5″ D (373.4 x 284.5 x 127 mm)
WEIGHT	5.5 lbs. (2.5 kg)
TRANSFORMER VERSION	8.4 lbs. (3.8 kg)
WARRANTY	2 years

Chillgard NH_3 Gas Monitor

Provides fast, reliable detection of low-level ammonia leaks

Simplicity/ Ease of Use

- Single-board design for ultimate reliability and serviceability
- Interchangeable **smart** sensors—pre-calibrated sensor modules are ready for installation out of the box. Sensors can be field-replaced without use of tools
- Integral display and status LEDs provide visual indication of area's ammonia level
- State-of-the-art display – liquid crystal display (LCD) conveniently alternates between sensor reading and gas type and features scrolling messaging, indicating ongoing diagnostic checks such as sensor end-of-life condition
- Onboard LEDs and relays - optional quick-check LEDs and four relay outputs allow for increased indication of alarm and fault conditions. Quick check LEDs, viewable from afar, indicate Normal (green) and Alert (red) status conditions
- Simple and flexible installation and operation
- Easy-to-follow calibration instructions displayed on monitor
- No need to open enclosure during setup and calibration when using accessory calibrator or controller

Flexibility

- Standard 4-20 mA output can be connected directly to any existing building automation system or other controller to provide workers leak indication prior to room entry

Durability

- Water- and corrosion-resistant NEMA 4X enclosure

Specifications for Chillgard NH_3 Gas Monitor	
RANGE	0-1000 ppm
TEMPERATURE RANGE	-40°F to 104°F (-40°C to 40°C)
DRIFT ZERO DRIFT SPAN DRIFT	 <5%/year, typical <10%/year, typical
NOISE	<1% full scale
ACCURACY REPEATABILITY LINEARITY	 10 ppm, typical 10 ppm
RESPONSE TIME T20 T50	 <6 seconds <12 seconds
HUMIDITY	15%-95% RH, non-condensing
SENSOR LIFE	2 years, typical 1 year warranty
POWER INPUT	7-30 VDC Internal heater option for operation down to -40°F (-40°C)
WIRING REQUIREMENTS	2-wire - no heater or relays; 3-wire - with heater or relays
SIGNAL OUTPUT	4-20 mA
RELAY CONTACT RATING	5 amp @ 220 VAC; 5 amp @ 30 VDC
PHYSICAL	Polycarbonate; 1.5 lbs (0.68 kg) 5.1"W x 2.9"D x 9.4"L (130 x 76 x 239 mm)
APPROVAL RATINGS	NEMA 4X rating

Z-Gard S & DS Sensors

Reliable sensors for commercial applications

The Z-Gard S Sensor detects the presence of carbon monoxide, nitrogen dioxide and combustible gases in air.

The Z-Gard DS Sensor detects the presence of carbon monoxide and nitrogen dioxide gases in parking garages, vehicle storage areas or wherever these two toxic gases can be found.

Both sensors employ solid state, electrochemical or catalytic sensors that generate an output signal proportional to calibrated operating range. All Z-Gard S and DS Sensors are available with 4-20 mA analog output or addressable RS-485 digital signal. Z-Gard Sensors with RS-485 digital output are specifically designed to operate as a system with any Z-Gard C 485 or Z-Gard CXII Controller. Z-Gard Sensors with 4-20 mA can be installed as stand-alone sensors typically integrated with the Z-Gard C Controller or common commercial equipment including PLC, DCS or building automation systems.

Features

- Two sensor output options: 4-20 mA analog output or RS-485 digital signal
- Sensor status is shown by green OK LED, indicating proper device operation
- Switch drive output to percentages of full scale. This feature is useful for testing remote devices that may be connected to sensor output.
- Easy, non-intrusive one-person calibration of zero and span

Specifications	
SOLID STATE CARBON MONOXIDE	
DETECTION RANGE	0 to 100 ppm or 0 to 200 ppm
ACCURACY	±5%, full scale
HUMIDITY	25 - 95% RH
OPERATING TEMPERATURE RANGE	32°F to 104°F (0°C to 40°C)
ELECTROCHEMICAL CARBON MONOXIDE	
DETECTION RANGE	0 to 100 ppm or 0 to 200 ppm
ACCURACY	±5%, full scale
HUMIDITY	0 - 95% RH
OPERATING TEMPERATURE RANGE	-4°F to 104°F (-20°C to 40°C)
ELECTROCHEMICAL NITROGEN DIOXIDE	
DETECTION RANGE	0 to 10 ppm
ACCURACY	±5%, full scale
HUMIDITY	0 - 95% RH
OPERATING TEMPERATURE RANGE	32°F to 104°F (0°C to 40°C)
CATALYTIC COMBUSTIBLE	
DETECTION RANGE	0 - 100% LEL
ACCURACY	±5%, full scale
HUMIDITY	0 - 95% RH
OPERATING TEMPERATURE RANGE	-4°F to 104°F (-20°C to 40°C)
4-20 MA SENSORS	
OPERATING POWER	24 VAC or DC, 150 mA (250 mA for combustible sensor)
SIGNAL OUTPUT	4-20 mA, 3-wire non-isolated, 4-wire isolated
RS-485 SENSORS	
OPERATING POWER	24 VAC or DC, 100 mA (250 mA for combustible sensor)
SIGNAL OUTPUT	RS-485, network connection
ALL Z-GARD S SENSORS	
CALIBRATION	Factory calibrated. Sensor can also be field-calibrated
ENCLOSURE	Powder-coated metal double-gang box with ¾" conduit opening
DIMENSIONS	5.5" H x 5.5" W x 2.2" D (140 x 140 x 56 mm)
CERTIFICATION	cCSAus C22.2 NO. 61010-1; Fire, Shock and Safety
Z-GARD DS SENSORS	
CALIBRATION	Factory-calibrated. Sensor can also be field-calibrated.
ENCLOSURE	Polycarbonate enclosure
DIMENSIONS	10.5" H x 8.5" W x 4.5" D (267 x 216 x 114 mm)
CERTIFICATION	cCSAus C22.2 NO. 61010-1; Fire, Shock and Safety

Z-Gard COmbo Gas Monitor

Gas alarm monitor with integrated solid-state carbon monoxide sensor

Simplicity/ Ease of Use

- Economical and reliable
- Onboard solid-state (MOS) carbon monoxide sensor
- 100 and 200 ppm full scale ranges available
- Local audio/visual alarm status indication
- Relay contact outputs can be employed to interface with air handling equipment to control vehicle exhaust emissions or general air quality inside buildings
- All relays are factory-configured to be normally de-energized. All relays return to inactive state once condition clears
- Alarm relay can be made in activated position even after alarm is cleared
- Pushbutton to silence an audible alarm or to reset the latching alarm relay
- Sensor status feature provides indication if either integral sensor or any other remote sensor fails to communicate properly
- 4-20 mA output proportional to calibrated operating range
- Optional LED readout with auto-ranging available that displays internal sensor's gas concentration level

Expandability

- Can also act as master panel, managing up to seven additional remote gas sensors connected to monitor's RS-485 network port

Specifications	
POWER REQUIREMENTS STANDARD OPTIONAL	 110 VAC, 50/60 Hz at 0.5 amps 220 VAC, 50/60 Hz at 0.25 amps or 24 VDC at 1.5 amps
DIGITAL SIGNAL PORT	RS-485, 4-wire serial network for remote sensor connections
OPTIONAL 4-20 mA OUTPUT	Exhibits highest reading derived from all associated sensors
OPTIONAL DIGITAL READOUT	4-digit LED display. First digits for channel number and 3 digits for concentration readings
STATUS DISPLAY	Common LED for Power, Warning, Alarm, and Sensor Status
RELAY CONTACTS	All relays can be selected as normally-energized or de-energized. Alarm relay can also be selected as latching or non-latching.
RELAYS 10 AMPS 6 AMPS 5 AMPS	1-Warning SPDT, 1-Alarm SPDT and 1-Sensor Fail SPDT ⅛ H.P., 125 VAC ⅛ H.P., 277 VAC 30 VDC
WARNING & ALARM SET POINTS	Field-adjustable and factory-set at 25 ppm and 50 ppm CO
TIME DELAYS	5 minutes ON delay for alarm and 5 minutes OFF delay for warning or selected with NO delay action
AUDIBLE DEVICE	93 dB at 0.3 meters with solid ON or user-selected variable option
TEMPERATURE OPERATING STORAGE	 32°F to 104°F (0°C to 40°C) 14°F to 122°F (-10°C to 50°C)
PUSH-BUTTON	Alarm reset and audible device silence feature
ENCLOSURE STANDARD OPTIONAL	 Metal NEMA 1 Fiberglass NEMA 4
DIMENSIONS	8.25" H x 8.25" W x 4.0" D (210 x 210 x 102 mm)
CERTIFICATION	CSA Certificate of Compliance No. LR51078-5

Section 2:
MSA Flame Detectors

FlameGard 5 Series of Flame Detectors

Advanced infrared and ultraviolet technologies for superior flame detection capability

MSA FlameGard 5 Flame Detectors are ideal for use in chemical plants, aircraft hangers, gas turbines, and hydrogen storage and test facilities. FlameGard 5 Detectors also provide detection for numerous applications in the oil, gas and petrochemical industry, including drilling and production platforms, LNG/LPG processing and storage facilities, refineries, and many others.

Four FlameGard 5 Flame Detectors are available:

FlameGard 5 MSIR Multi-Spectral Infrared Flame Detector

Combines precision multi-spectral infrared sensing array with highly intelligent neural network processors for high accuracy through superior false alarm immunity.

FlameGard 5 UV/IR Flame Detector

Uses ultraviolet and infrared technologies for flame detection.

FlameGard 5 UV/IR-H2 Flame Detector

Uses ultraviolet and infrared technologies to detect hydrogen fires.

FlameGard 5 Test Lamp

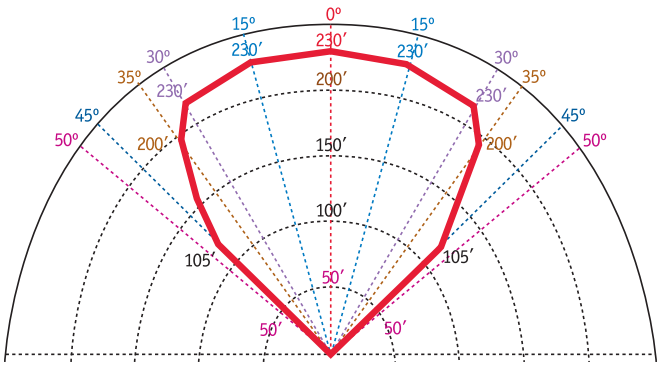
Provides an easy way to verify functionality of all FlameGard 5 Detectors.

Features that set the FlameGard 5 Series apart from competitive similar products:

- Multi-spectral infrared sensing array (FlameGard 5 MSIR Detector) with highly intelligent neural network processors provides high accuracy through superior false alarm immunity
- Wide field of view
- SIL 3-suitable products
- Continuous Optical Path Monitoring (COPM) checks optical path integrity and electronic circuitry once every minute

FlameGard 5 MSIR Multi-spectral Infrared Flame Detector Specifications

System Specifications	
SPECTRAL RANGE	2 - 5 microns (IR)
MAXIMUM RANGE	230 ft (70 m)*
TYPICAL RESPONSE TIME	<10 s
MINIMUM ARC IMMUNITY DISTANCE	5-15 ft (1.5-4.6 m) depending upon rod used
MAXIMUM FIELD OF VIEW	100° @ 100 ft; 90° @ 210 ft†



* *1 sq. ft. n-heptane fire using high sensitivity. This value is nominal: different results may arise depending on the source of each fire.*

† *Maximum field of view is the angle at which FlameGard 5 MSIR Detector can detect flame at 50% of maximum specified range.*

ACCESSORIES	Test Lamp, Mounting Bracket
CLASSIFICATION	Class I, Div. 1, Groups B, C, D; Class II, Div. 1, Groups E, F, G; Class III II 2GD Ex d IIC T5 Gb Ex tb IIIC T100°C Db
WARRANTY	2 years
APPROVALS	CSA, FM, ULC, ATEX, IECEx & CE Marking. HART-registered SIL 3-suitable FM-certified to IEC 61508

Environmental Specifications	
OPERATING/STORAGE TEMPERATURE RANGE	-40°F to 176°F (-40°C to 80°C)
OPERATING HUMIDITY RANGE	0% to 95% RH, non-condensing
Mechanical Specifications	
HOUSING	316 stainless steel
HEIGHT	4.3" (109 mm)
DIAMETER	5.4" (137 mm) base 3.5" (89 mm) optical housing
WEIGHT	7.9 lbs (3.6 kg)
MOUNTING	Stainless steel mounting bracket
CABLE ENTRY	2 x ¾ inch NPT
Electrical Specifications	
INPUT POWER	20-36 VDC; 24 VDC @ 150 mA (3.6 W)
ANALOG SIGNAL	0-20 mA (600 ohms maximum)
FAULT MODE	0 mA to 0.2 mA
TEST MODE	1.5 mA, ±0.2 mA
COPM FAULT	2 mA, ±0.2 mA
READY MODE	4.3 mA, ±0.2 mA
WARN MODE	16 mA, ±0.2 mA
ALARM MODE	20 mA, ±0.2 mA
RELAY CONTACT RATING	8 A @ 250 VAC, 8 A @ 30 VDC resistive maximum
RFI/EMI PROTECTION	Complies with EN6100-6-4: 2001 and EN50130-4: 1995+A2: 2003
SELECTABLE OPTIONS SENSITIVITY WARN & ALARM RELAYS	 High, medium or low alarm time delay up to 14 seconds with dip switches and up to 30 seconds with Modbus Latching/non-latching Energized/de-energized
RS-485 OUTPUT	Modbus RTU, suitable for linking up to 128 units and 247 units with repeaters
BAUD RATE	2400, 4800, 9600, 19200, or 38400 bit/s
HART	HART 6, HART Device Description
STATUS INDICATORS	2 LEDs with status and fault cues
FAULT MONITORING	RAM, EPROM and EEPROM checksum errors, optics failure/blockage and low supply voltage
CABLE REQUIREMENTS	3-wire shielded cable minimum configuration. Distance between Flamegard 5 MSIR Detector and power source or remote sensor @ 24 VDC nominal (20 ohm loop): Typical - 18 AWG - 1,540 ft (470 m) Please consult manual for longer wiring runs Distance for analog output (250 ohms max): Typical - 18 AWG - 3,840 ft (1160 m) Please consult manual for longer wiring runs
STANDARD PART NUMBERS	5MSIR-1013110 Dual Modbus, no relays, 0 - 20 mA, high sensitivity, 10-second delay 71370-1 mounting bracket

FlameGard 5 UV/IR Flame Detector Specifications

System Specifications	
WAVE LENGTHS	185 to 260 nm (UV) 4.35 microns (IR)
FIELD OF VIEW	120° max. conical
SENSITIVITY	Approved performance specifications – 50 ft (15.2m) distance for a 1 sq. ft (0.092 m^2) heptane fire
TYPICAL RESPONSE TIME	< 3 sec @ 50 ft
MINIMUM SENSOR RESPONSE TIME	500 ms
CLASSIFICATION	Class I, Div 1 & 2, Groups B, C & D Class II, Div 1 & 2, Groups E, F& G Class III, Type 4X, Ex d IIC, T5, IP66
WARRANTY	2 years
APPROVALS	CSA, FM, ATEX, IECEx, HART-registered, SIL 3-suitable, FM-approved to IEC 61508
STANDARD PART NUMBER	5 UV/IR - 1513111 FlameGard 5 UV/IR Flame Detector Single Modbus, Aluminum, 0-20 mA Output, relays, Aluminum housing
ACCESSORIES	Mounting bracket, test lamp

Environmental Specifications	
OPERATING TEMPERATURE RANGE	-40°F to 185°F (-40°C to 85°C)
STORAGE TEMPERATURE RANGE	-40°F to 185°F (-40°C to 85°C)
OPERATING HUMIDITY RANGE	0% to 100% RH, non-condensing

Mechanical Specifications	
HOUSING	Aluminum (stainless steel optional)
LENGTH	5.5" (140 mm)
DIAMETER	6" (152 mm)
WEIGHT	5 lbs (2.3 kg) – aluminum 16 lbs (7.3 kg) – stainless steel
MOUNTING	¾" (19 mm) NPT (2 ports)
CABLE ENTRY	2 x ¾" NPT or 2 x 25 mm ISO or 2 x 20 mm ISO or 2 x 13.5 PG

Electrical Specifications	
INPUT POWER	20-36 VDC 24 VDC @ 150 mA max. (3.4 W max.)
ANALOG SIGNAL	0 – 20 mA (600 ohms maximum)
FAULT MODE	0 – 0.2 mA*
COPM FAULT	2 mA, ±0.2 mA**
READY SIGNAL	4.05 mA, ±0.05 mA
IR SIGNAL	8 mA, +0.2 mA
UV SIGNAL	20 mA, ±0.2 mA
WARN SIGNAL	8 A @ 250 VAC, 8 A @ 30 VDC resistive maximum
ALARM SIGNAL	Complies with EN6100-6-4: 2001 and EN50130-4: 1995+A2: 2003
RELAY CONTACT RATING	8 A 250 VAC, 8 A @ 30 VDC resistive (North America) 8 A @ 30 VDC resistive (Europe)
DIP SWITCH SELECTABLE OPTIONS SENSITIVITY TIME DELAY WARN & ALARM RELAYS	 100%, 75%, 50% alarm 2, 4, 8 or 10 seconds Latching/non-latching Energized/de-energized
RS-485 OUTPUT	Modbus RTU, suitable for linking up to 128 units or up to 247 units with repeaters. Dual Modbus (optional)
BAUD RATE	2400, 4800, 9600, or 19200 BPS
HART (OPTIONAL)	HART 6, HART Device Description Language available. AMS Aware
RFI/EMI PROTECTION	Complies with EN 50130-4, EN 61000-6-4
CABLE REQUIREMENTS	Max. distance between detector and power source @ 24 VDC nominal (20 ohm loop), 14 AWG – 4500 ft (1370 m) Terminal blocks – 14-22 AWG
STATUS INDICATOR	2 LEDs with status, fault and alarm indication
FAULTS MONITORED	Memory checksum, reset line shorted, optics failure/blockage, internal voltages, low supply voltage

* *Under HART, current values can be either 3.5 mA or 1.25 mA, depending upon user selection*
** *Under HART, current value can be either 3.5 mA or 2.0 mA, depending upon user selection*

FlameGard 5 UV/IR-H_2 Flame Detector Specifications

System Specifications	
SPECTRAL RANGE	2.7 to 3.2 microns (IR))
FIELD OF VIEW	120° horizontal
TYPICAL RESPONSE TIME	<3 sec @ 15 ft
ACCESSORIES	Swivel elbow union, mounting bracket, test lamp
CLASSIFICATION	Class I, Div 1 & 2, Groups B, C & D Class II, Div 1 & 2, Groups E, F & G Class III, Type 4X, Ex d IIC, T5, IP66
WARRANTY	2 years
APPROVALS	CSA, ATEX, IECEx HART-registered
PATENT NUMBER	5,914,489
STANDARD PART NUMBER	5 UVIR - 1513311 Single Modbus, relays, hydrogen, 100% sensitivity, 4-second delay, aluminum housing

Environmental Specifications	
OPERATING TEMPERATURE RANGE	-40°F to +185°F (-40°C to +85°C)
STORAGE TEMPERATURE RANGE	-58°F to +185°F (-50°C to +85°C)
OPERATING HUMIDITY RANGE	0% to 100% RH, non-condensing

Mechanical Specifications	
HOUSING	Aluminum (stainless steel optional)
LENGTH	5.5 inches (140 mm)
DIAMETER	6 inches (152 mm)
WEIGHT	5 lbs (2.3 kg) – aluminum 16 lbs (7.3 kg) – stainless steel
MOUNTING	3/4" NPT (2 ports)
CABLE ENTRY	2 x ¾" NPT or 2 x 25 mm ISO or 2 x 20 mm ISO or 2 x 13.5 PG

Electrical Specifications	
INPUT POWER	20-36 VDC 24 VDC @ 150 mA max. (3.4 W max.)
ANALOG SIGNAL	0 – 20 mA (600 ohms maximum)
FAULT MODE	0 – 0.2 mA*
COPM FAULT	2 mA, ±0.2 mA**
READY SIGNAL	4.05 mA, ±0.05 mA
IR SIGNAL	8 mA, ±0.2 mA
UV SIGNAL	12 mA, ±0.2 mA
WARN SIGNAL	16 mA, ±0.2 mA
ALARM SIGNAL	20 mA, ±0.2 mA
RELAY CONTACT RATING	8A 250 VAC, 8A @ 30 VDC resistive (North America)
DIP SWITCH SELECTABLE OPTIONS SENSITIVITY TIME DELAY WARN & ALARM RELAYS	 100%, 75%, 50% alarm 2, 4, 8, or 10 seconds Latching/non-latching Energized/de-energized
RS-485 OUTPUT	Modbus RTU, suitable for linking up to 128 units or up to 247 units with repeaters. Dual Modbus (optional)
BAUD RATE	2400, 4800, 9600, or 19200 BPS
HART (OPTIONAL)	HART 6, HART Device Description Language available. AMS Aware
RFI/EMI PROTECTION	Complies with EN 50130-4, EN 61000-6-4
CABLE REQUIREMENTS	Max. distance between detector and power source @ 24 VDC nominal (20 ohm loop), 14 AWG – 4500 ft (1370 m) Terminal blocks – 14-22 AWG
STATUS INDICATOR	2 LEDs with status, fault and alarm indication
FAULTS MONITORED	Memory checksum, reset line shorted, optics failure/blockage, internal voltages, low supply voltage

* *Under HART, current values can be either 3.5 mA or 1.25 mA, depending upon user selection*
** *Under HART, current value can be either 3.5 mA or 2.0 mA, depending upon user selection*

FlameGard 5 Test Lamp Specifications

System Specifications	
OUTPUT SPECTRUM	Broadband emissions in UV, visible and IR spectra
CHARGING TIME	3.5 hours max.
CHARGER INPUT	110-240 VAC, 50/60 Hz, 1.5 A
CHARGER OUTPUT	24 VDC @ 2.1 A
CLASSIFICATION	Class I, Zone I, T4 (110°C) Ex d IIB + H2
WARRANTY	2 years
APPROVALS	CSA, ATEX, CE marking
STANDARD PART NUMBERS	5TL-02 FlameGard 5 MSIR Test Lamp 5TL-12 FlameGard 5 UVIR Test Lamp Includes power supply adapter

Environmental Specifications	
OPERATING TEMPERATURE RANGE	5°F to 122°F (-15°C to 50°C)
OPERATING HUMIDITY RANGE	0-90% ±3% RH, non-condensing

Mechanical Specifications	
LENGTH	13" (330 mm)
DIAMETER	5" (127 mm)
WEIGHT	7.9 lbs (3.5 kg)

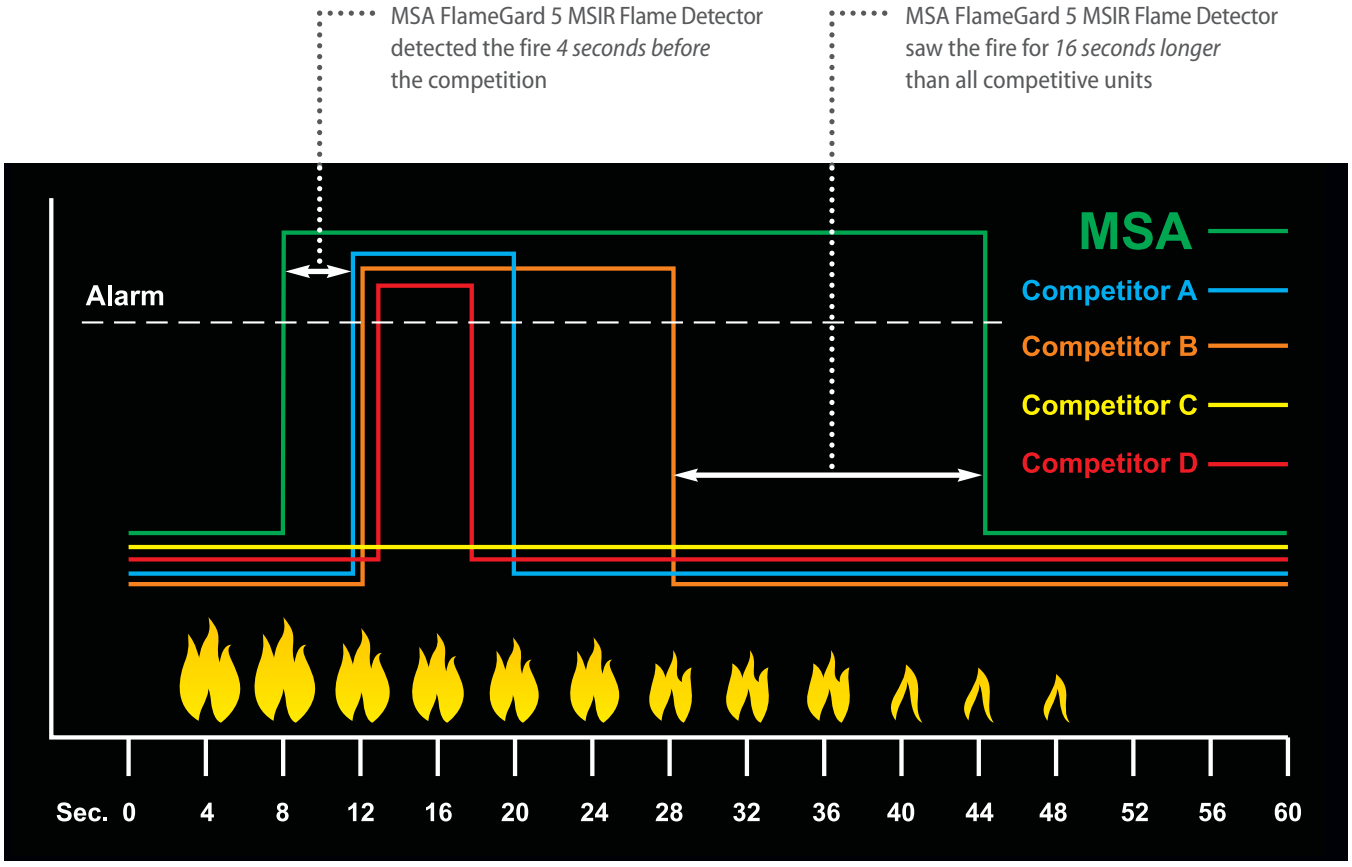
FlameGard 5 MSIR Flame Detector Performance Comparison

Exclusive Neural Network Technology (NNT) allows the FlameGard 5 MSIR Flame Detector to see fire first, sense fire for the longest duration and see the smallest fire.

- NNT 4-IR sensor combination is highly immune to false alarms
- No other flame detector can match NNT weighted system; competitors use pass/fail algorithm
- Multi-spectrum IR (MSIR) sensor array provides increased range and wide field of view
- Continuous Optical Path Monitoring (COPM) checks optical path integrity and detector's electronic circuitry

Flame Detector Test Parameters

- 150′ distance between detectors and 1′ x 1′ gasoline fire
- All units set to high sensitivity, all confirmed to be in working order



Section 3:
MSA Controllers

SUPREMATouch Modular Fire & Gas Detection System

Modular flexibility for individual solutions

The SUPREMATouch Fire and Gas Detection System's modular design meets requirements of a diverse range of industries and applications and complies with all relevant global safety standards.

The system builds upon the success of the original innovative SUPREMA Control System design and features a large color touchscreen display, enhanced processing capabilities and optional integration of addressable fire and smoke detectors. This system can be used with a wide range of detectors, including combustible and toxic gas, oxygen, smoke, fire, and heat. Output options include relay and analog and digital communication between racks, allowing interface to external systems using Modbus or Profibus.

The SUPREMATouch System's modularity enables many fire and gas detection configurations that meet requirements of virtually any application, including redundant systems with up to Safety Integrity Level (SIL) 3 rating (IEC 61508).

Features and Benefits

- Compact modular design requires fewer cabinets, saving space
- Decentralized configuration; use of satellites minimizes wiring
- Plug-in ribbon cables for easy installation and system extension
- Future-oriented technology reduces upgrade costs
- Digital bus technology provides reliable communication to external bus systems
- System configuration by checkbox selection; no programming skills required
- Connections for three system power supplies enables automatic switchover to backup supply

SUMPREMATouch Modular Fire & Gas Detection System Specifications	
ENCLOSURE	Standard 19" rack (up to 8 racks per system) Optional NEMA 4 wall-mount cabinet
SYSTEM	Satellites for decentralized input and outputs up to a distance of 1.2 km Optional redundant configuration Event and fault diagnosis logging
INPUTS	Up to 256 per system Up to 64 per rack
OUTPUTS	Up to 512 per system Up to 80 per rack Switched open-collector driver (24 V, 300 mA) Relays – SPCO or SPST redundant (230 V, 3 A) Optional solid state relays for low-current applications Software control of switched outputs/relays: • Group creation • N out of m alarms • Alarm multiplication
POWER SUPPLY	Operating voltage: 18 to 32 VDC Optional rack power supply – 85 to 265 VAC, 150 W, 50/60 Hz Power supply connections for internal, external and battery backup (24 VDC) with automatic switch-over
DISPLAY	Color LCD touchscreen with backlight 5.7" TFT with 320 x 240 resolution
CONTROLS & INDICATORS	Alarm reset and acknowledge keys Front panel LEDs for alarms 1, 2, 3, and 4, signal fail, inhibit, power, and system fail 3-level password or keyswitch for secure access control
SENSORS	Catalytic or IR for combustible 4–20 mA transmitters Electrochemical for toxic and oxygen Conventional smoke, heat and fire detectors Addressable smoke, heat and fire detectors via external fire panel
APPROVALS	ATEX (EN 50104, EN 50271, EN 61779-1, EN 61779-4, EN 61779-5) CSA / CSA us SIL 3 (EN 50402, EN 61508) GB16808-2008 Combustible Gas Alarm Control Units (China)
INTERFACES	Optional interfaces to external bus systems (Modbus RTU and TCP, Profibus) 2 x RS-232 and 1 x USB electrically isolated interfaces for data transfer Printer report of system events (standard ASCII, 80 CHR)

ModCon 75 Controller

Pre-programmed, self-configuring controller for monitoring up to 25 Ultima X Gas Monitors with X³ Technology

MSA's ModCon75 Controller is designed for use with your Ultima X Gas Monitor with X³ Technology, enabling self-configuration and saving time and money. This economical choice is suitable for all industrial, municipal, oil, gas, petrochemical, and HVAC applications.

- Compact unit provides remote control of many features
- Modbus RTU input and Modbus-over-Ethernet interface capability
- Self-configuring to Ultima X Gas Monitors with X³ Technology
- View and control of up to 25 Ultima X Gas Monitors with X³ Technology (75 total sensors)
- All pertinent data displays on main data screen
- 12/24 VDC power supply
- Panel input power is 12/24 VDC; wall-mount power is 115 VAC
- Seven-year battery backup provides memory and real-time clock
- Logs up to 2000 events
- Nine zone control relays
- Password-protected
- cUL listed (panel only)

ModCon75 Controller Specifications	
PANEL MOUNT	
WEIGHT	3 lbs (1.4 kg)
DIMENSIONS	6.1" H x 10.24"W x 2.8" D (155 x 260 x 71 mm)
ENCLOSURE TYPE	none
MAXIMUM NUMBER OF SENSORS	75
FRONT PANEL	IP65/NEMA 4X (when mounted)
MOUNTING PROVISIONS	Installation designed for panel mount
WALL MOUNT	
WEIGHT	18 lbs (8.2 kg)
DIMENSIONS	17.3" H x 15.3"W x 6.7" D (439 x 389 x 170 mm)
ENCLOSURE TYPE	NEMA 4X fiberglass enclosure with panel mount display and controls
MAXIMUM NUMBER OF SENSORS	75 (25 transmitter heads with maximum of 75 sensors)
MOUNTING PROVISIONS	4 mounting holes located on top and bottom (2 each) for flat surface attachment
GRAPHICAL DISPLAY SCREEN	
TYPE	Negative blue STN LCD graphical display
ILLUMINATION BACKLIGHT	CCFL (fluorescent lamp)
DISPLAY RESOLUTION	240 x 64 pixels
HMI DISPLAYS	Up to 255
BATTERY BACKUP	7-year typical battery backup for all memory sections and real-time clock
ENVIRONMENTAL	
OPERATING TEMPERATURE RANGE	32°F to 122°F (0°C to 50°C)
OPERATING HUMIDITY RANGE	5-95% RH, non-condensing

GasGard 100 Control System

The GasGard 100 Control System is a scalable, high performance data acquisition/data-logging platform. Open Ethernet connectivity with Web-based configuration and data monitoring functions allows GasGard 100 Controllers to handle a wide range of monitoring and historical logging functions. See real time trends with your Web browser from any PC without the need for specialized software!

Flexible, modular architecture of the GasGard 100 Control System's main module can manage from one to six I/O modules on the backplane. Up to six GasGard Controllers can be networked to create a complete system. With this capability, each GasGard 100 Controller can serve as a measurement node, monitoring a subgroup of sensors; all communicate back back to a master GasGard Controller. This process can minimize the length of wire and conduit typically necessary for adequately monitoring a facility.

The GasGard 100 Control System provides fully integrated measurement, display and recording platforms, that when equipped with MSA's extensive line of transmitters and sensors, form a complete gas detection solution.

Highly Flexible System Configurations

- Main module serves as data acquisition engine and LAN connectivity, and manages from one to six I/O modules on the backplane
- By linking two or more strategically-placed GasGard 100 Controllers to the central controller, wiring and conduit expenses are decreased

Communications

- Communicate with both analog and Modbus field devices.
- Interface with PLCs and other control devices through Modbus/TCP and Modbus/RTU

Data Monitoring

Customize your layout configuration. Create your own viewing screen by choosing bar graphs, digital read outs, trending analyses and more

Event and Data Functions

Built-in trigger function allows data recording to start based upon alarm values, time, external contact input or other parameters

Data Reporting Capabilities

Create customized hourly, daily, weekly, and monthly reports that can be saved and uploaded for further processing and review

Email Alert Feature

React immediately with email messaging feature; you are instantly alerted to out-of-the-ordinary occurrences—as they occur

GasGard 100 Control System Specifications*	
POWER SUPPLY	90 to 250 VAC 50/60 Hz
OPERATING TEMPERATURE RACK ENCLOSURE	 -20°C to 50°C (-4°F to 140°F) 24 x 24 fiberglass enclosure (accepts up to 6 I/O) shall not exceed 45°C; no internal power supply. With a 240 W internal power supply the reading shall not exceed 35°C 6x20 small enclosure (accepts up to 3 I/O) shall not exceed 45°C; no internal power supply.
TYPES OF MEASUREMENTS	mA (standard), DC Voltage, DI (non-voltage contact), level (5 V logic)
CONNECTION MODES	2 wire or 3 wire, mA; RS485 (Modbus)
TERMINAL CONNECTIONS	Max 2.5m^2 (12AWG) stranded wire
MAXIMUM NUMBER OF ANALOG INPUTS PER UNIT	50
COMMUNICATION SPECIFICATION	Standard Interfaces: 100Base-TX/10Base-T (auto detect), Ethernet FTP function, E-mail function, DHCP client function, SNTP function, HTTP function, Modbus TCP (server/client), Modbus RTU (master/slave), EtherNet/IP
MAXIMUM NUMBER OF RELAYS PER UNIT	60, programmable
RELAY CONTACT MODE	SPST (Form A), normally energized/de-energized
RELAY CONTACT CAPACITY	250 VDC/0.1 A, 250VAC/2 A, or 30 VDC/2 A (resistance load)
MAXIMUM NUMBER OF ANALOG OUTPUTS	40
ANALOG OUTPUT TYPE	DC voltage, DC current
MAXIMUM RANGE OF ANALOG OUTPUTS	-11 to 11 V or 0 to 22 mA
ENCLOSURE DIMENSIONS	24.0" L x 23.5" W x 8.70" D or 20.2" L x 16.2" W x 8.2" D
INGRESS PROTECTION	Designed to meet NEMA 4X

** Specification is based on standard configuration*

GasGard 100 Control System Approvals (Rack Only)	
CSA	CSA22.2 No 61010-1, overvoltage category II, measurement category II, pollution degree 2
UL	Conforms to UL61010B-1 (CSA NRTL/C)
CE EMC DIRECTIVE LOW VOLTAGE DIRECTIVE	 EN61326 Class A EN61000-3-2 EN61000-3-3 EN61010-1; overvoltage category II, measurement category II, pollution degree 2
FM	Class I Division 2 Groups A, B, C, D

GasGard XL Controller

Versatile, compact, cost-effective gas monitors

MSA GasGard Series products include GasGard XL Controllers. Designed to work with any 2- or 3-wire 4-20 mA input signal, controllers offer expanded features and options, selectable through user-friendly software. Microprocessor-based technology provides effective and reliable monitoring of toxic and combustible gases, and oxygen deficiency. Measuring range includes ppm, % LEL and % volume.

GasGard XL Controller

The GasGard XL Controller offers reliability in a compact, durable, wall-mounted housing constructed of fire-retardant ABS plastic. Large and clear multi-language LCD display provides real-time target gas readings and events, offers full system diagnosis and is supported by individual LEDs per channel with common relays and internal buzzer. The GasGard XL Controller is easily configured to accept up to eight remote gas sensors, depending upon the number of individual plug-in input cards installed. With two alarm levels per channel, the GasGard XL Controller operates in conjunction with MSA's remote gas sensors (combustible, toxic or oxygen 4 –20 mA). Ideal for use with MSA Ultima X Series Gas Monitors and FlameGard 5 Flame Detectors, this controller's ergonomic design offers for efficient wiring and installation.

Features

- Fully configurable via USB or RS485 Modbus connection
- Event log upload through isolated Ethernet RS 485 or USB
- Multi-language display selectable via controller menu
- Expandable up to eight independent channels using plug-in boards
- Dedicated keys make all functions accessible from front panel
- Common relay board for Alarm Level 1 and 2, Horn 1 and 2 or Failure
- Large graphic display with intuitive icons; all channels shown at a glance
- Internal buzzer 85 dB

GasGard XL Controller Specifications	
TEMPERATURE RANGE OPERATING STORAGE	 14°F to 122°F (-10°C to 50°C) -4°F to 167°F (-20°C to 75°C)
POWER SUPPLY	85 VAC–256 VAC 50/60 Hz, 24 VDC nominal range 18 – 32 VDC
RELAY	5 amps @ 30 VDC or 250 VAC
ENCLOSURE	IP56 flame-retardant grade UL-94-0 ABS plastic
DIMENSIONS	11" H x 20" W x 5" D (279 x 508 x 127 mm)
CASE WEIGHT	11 lbs to 17.6 lbs (5 kg to 8 kg) (with battery)
APPROVALS	cCSAus, UL/CSA 61010-1 CSA 22.2 No.152 and ISA 12.13 ATEX 94/9/EC EN 50270 (EMC) EN 50402 EN 61010-1 (Low Voltage Directive) EN 61779-1 EN 61779-4

9010/9020 Controller Units

Flexible options for reliable system control

9010/9020 Controller Units operate with a complete selection of gas sensors and transmitters including toxic, combustible and oxygen sensors. Units offer maximum flexibility to work in conjunction with a variety of remote sensors to provide reliable gas detection for many industries and applications. Advanced design includes SMD components throughout. 9010 LCD operates with one independent sensor (single-channel); 9020 LCD operates with two independent sensors (dual-channel) per control module, offering considerable cost savings while maintaining high reliability and performance. Modular design combined with dual-channel capability allows for many configurations to meet most applications.

Simplicity/Ease of Use

- Simple three-key operation for configuration, calibration and routine operation
- Selectable unit of measure (LEL, LELm, ppm, % Vol, g/m3 or blank)
- Flexible options for one to 20 channels
- Enhanced system reliability through individual terminal blocks for each module
- Adjustable calibration timer for calibration reminders
- 4-20 mA current loop accepted with no control unit calibration required
- Control modules offer independent LCD display specific to each channel

Flexibility

- Each montrol module features:
  - Independent AC/DC power supply transformer for increased system reliability
  - Two (SPDT) relays with change-over contacts for verification of warning and alarm conditions (common to both 9020 Module channels)
- Full internal diagnostics and inherent reliability minimize false alarms and unexpected down-time
- Large, four-digit, seven-segment, backlit LCD and bright LED provide gas concentration, alarm status, measurement units, flags indicating status, and settings such as calibration interval, time-out function, alarm ON delay, and alarm inhibit
- When operating in connection with toxic sensors, the 9010/20 LCD can be set to alarm when relevant STEL and TWA values are exceeded

Durability

- Four enclosure options: NEMA 4X plastic, metal or stainless steel, and explosion-proof metal

9010/9020 Controller Units Specifications	
POWER SUPPLY	115/230 V± 15% 50/60 Hz, 24 VDC + 15%-20%
INPUT SIGNALS	10-200 mV; 4-20 mA
OUTPUT SIGNALS ANALOG (NORMAL) ANALOG (FAULT)	 0-20/4-20 mA (selectable) isolated 0/2/4/20 mA/frozen (selectable)
ALARM LEVELS	3 (Caution - Warning - Alarm)
ALARM RATINGS VIA RELAY CONTACTS (SPDT)	5 A @ 24 VDC/250 VAC (resistive load)
SPAN AND ZERO DRIFT	<±0.5% full scale
REPEATABILITY	±1% full scale
OPERATING TEMPERATURE	14°F to 104°F (-10°C to 40°C)
STORAGE TEMPERATURE	-4°F to 167°F (-20°C to 75°C)
HUMIDITY	90% R.H. non-condensing
LCD DISPLAY	Backlit liquid crystal display; 4-digit, 7 segments
PROTECTIONS ACCIDENTAL TAMPERING SOFTWARE SELF-DIAGNOSIS	 AC/DC automatic switching in case of AC power failure through electronic switch By specific access codes and password By watch-dog and check-sum
APPROVALS	Complies with UL/CSA 61010-1 per MET

Z-Gard Controllers

Reliable microprocessor-based controllers for commercial applications

Z-Gard Controllers microprocessor-based monitoring systems are designed to solve many alarm and control applications. Z-Gard Controllers interface with MSA Z-Gard Sensors, providing real-time target gas readings. All Z-Gard Controllers provide easy installation and configuration, audible and visual feedback and seamless integration with commercial and building automation systems. All Z-Gard Controllers accept either 4-20 mA or RS-485 serial input from remote sensors.

Many output options are available to integrate with common commercial equipment, including PLC, PCS or building automation systems. Controllers include audible and visual LED alarm status indication. A wide variety of relay configurations are offered for warning, alarm and sensor fail. All Z-Gard Controllers incorporate digital readout to display the active channel's corresponding gas value.

Z-Gard C Controller

- Accepts eight Z-Gard Sensor inputs
- 4-20 mA signal input

Z-Gard C 485 Controller

- Accepts up to eight, 16 or 24 Z-Gard Sensor inputs
- Digital RS-485 serial communication protocol

Z-Gard CX II Controller

- Hosts series of Z Gard S Gas Sensors with RS-485 digital output
- Communicates to building automation system through Modbus or BACnet
- Supports customized applications via programmable operating parameters organized via menu interface keyboard

Z-Gard C Controller Specifications	
INPUT POINTS	8
POWER REQUIREMENTS	Power / Current 110 VAC, 50/60 Hz ± 10% — 2.50 A 220 VAC, 50/60 Hz ± 10% — 1.25 A
ZONES	Single zone
SIGNAL INPUT	4-20 mA, 3-wire connection
NUMBER OF RELAYS	10; 8 programmable, 2 common
RELAY ACTION	10 A/125 VAC; 5 A/30 VDC Energized/non-energized; latching/non-latching
OPERATING TEMPERATURE RANGE	14°F to 104°F (-10°C to 40°C)
STORAGE TEMPERATURE	-4°F to 122°F (-20°C to 50°C)
DIGITAL READOUT	4-digital LED with sequential scanning features
ENCLOSURE	Standard – metal NEMA 12
WEIGHT	10.0 lb (4.5 kg)
DIMENSIONS	15″H x 12″W x 3.75″D (381 x 305 x 95 mm)
APPROVALS	cCSAus; C22.2 No.142-M1987, UL916

Z-Gard C 485 Controller Specifications	
POWER REQUIREMENTS 8- AND 16-POINT UNITS 24-POINT UNIT	 Standard, 110 VAC, 50/60 Hz ±10% at 0.5 amps Optional, 220 VAC, 50/60 Hz ±10% at 0.25 amps Standard, 110 VAC VAC, 50/60 Hz ±10% at 1.0 amps Optional, 220 VAC, 50/60 Hz ±10% at 0.5 amps
ZONES 8-POINT 16-POINT 24-POINT	 Only available as single zone Available as single or 2 zones Available with 2 zones
SENSOR SIGNAL INPUT	RS-485 serial network
RELAY CONTACTS RATING	10 A/125 VAC; 3 A/30 VDC Energized/non-energized; latching/non-latching
RELAY OUTPUTS PER ZONE	3; common warning, alarm and sensor fail
OPERATING TEMPERATURE	14°F to 104°F (-10°C to 40°C)
STORAGE TEMPERATURE	-4°F to 122°F (-20°C to 50°C)
DIGITAL READOUT	Point number plus 3½ digits
STATUS DISPLAY PER ZONE	Common LED for warning, alarm and sensor status
ALARM & WARNING SET-POINTS FIELD-ADJUSTABLE FACTORY-SET AT	 Warning – 35% full scale Alarm at 50% full scale
ENCLOSURE STANDARD OPTIONAL	 Metal NEMA 1 Fiberglass NEMA 4X design
WEIGHT 1-ZONE MODELS 2-ZONE MODELS	 10 lb (4.5 kg) 15 lb.(6.8 kg)
DIMENSIONS 1-ZONE MODELS 2-ZONE MODELS	 11.5" H x 10" W x 3.75" D (292 x 254 x 95 mm) 15" H x 12" W x 3.75" D (381 x 305 x 95 mm)
APPROVALS	cCSAus; C22.2 No.142-M1987, UL916

Z-Gard CX II Controller Specifications	
POWER REQUIREMENTS	17-27 VAC or 24-38 VDC, 0.3 A
ZONES	99 points; 8 configurable zones
SENSOR SIGNAL INPUT	RS-485 serial network
NUMBER OF RELAYS	4
RELAY ACTION	10 A/125 VAC ; 5 A/30 VDC Energized/non-energized; latching/non-latching
RELAY TIME DELAYS	Menu-selected OFF delays, adjustable from 0 to 600 seconds for warning and alarm, effectively common to all active channels
OPERATING TEMPERATURE	14°F to 131°F (-10°C to 55°C)
STORAGE TEMPERATURE	-4°F to 131°F (-20°C to 55°C)
USER INTERFACE	Front panel monitor keypad provides menu-driven operating parameters
DIGITAL DISPLAY SCREEN	4-line x 40-character backlit LCD screen displays operating, alarm, and fault diagnostic system status
STATUS DISPLAY OK WARNING ALARM SENSOR FAIL	Common system LEDs Green Amber Red Red
AUTO-CONFIGURATION FEATURE	Digitally-recognized remote sensors: each device residing on RS-485 serial data bus shall be automatically assigned as a network node.
ALARM & WARNING SET-POINTS	Adjustable from 1 to 99% of operating range for each system sensor type
STROBES OPTIONS	Optional flashing strobes factory-mounted on enclosure top (works only with AC power).
SIGNAL OUTPUT	Modbus RTU; optional BACnet MS/TP
ENCLOSURE	Polycarbonate, NEMA 4X
WEIGHT	2.5 lbs (1.2 kg)
DIMENSIONS	7" H x 10" W x 3.75" D (178 x 254 x 95 mm)
APPROVALS	cETLus; C22.2 No.601010-1, UL 9010-1

Section 4:
MSA Fire & Gas Systems

MODEL 10K Integrated Fire & Gas System

NFPA 72-approved fire and gas controller

[Bulletin #07-8402]

MODEL 10K Integrated Fire and Gas System represents the next generation in highly intelligent monitoring solutions that are designed to reduce hazard vulnerability and meet the world's most demanding safety standards.

MODEL 10K is an innovative, modular system that is highly scalable and delivers features and benefits:

- FM-approved for:
  - NFPA 72 compliance as a system
  - Proprietary central station monitoring
  - Both fire alarm panel and gas controller
  - Fault tolerant digital communications
  - Releasing control panel
- Remote I/O capability
- Optional fiber optic communications
- Color touchscreen operator interface
- Data and event logging
- Support of third-party device integration
- Gas calibration histories (combustible and H_2S gases)
- Simple, reliable and cost-effective field wiring topology
- Addressable detection loop for buildings

MODEL 10K System is designed with Rockwell Automation's industry-proven Allen-Bradley ControlLogix™ programmable logic controller (PLC) technology and MSA advanced gas and flame detection field devices. Offering intelligence, flexibility and reliability, the system's controller hardware configuration and software have been tested by Factory Mutual to verify NFPA 72 compliance.

MODEL 10K System principal elements include:

- Stand-alone local fire and gas alarm panel with touchscreen operator interface
- Power supply and battery back-up to support fire and gas system per NFPA 72
- Optional ControlNet dual media (coaxial cable or fiber optic) fault-tolerant communication network, supporting communication between local gas and flame panels and optional MODEL 10K Central Station
- Optional computer-based MODEL 10K Workstation (with AC-powered UPS) to provide FM-approved central station monitoring
- Scalable from small systems to large plants
- Link up to 13 local gas and fire alarm panels over network to 25 kilometers long
- Easy integration with third-party auxiliary devices such as horns, beacons and fire suppression systems
- FM-approved Modbus, Ethernet or ControlNet system communications to DCS or ESD Systems
- HART sensor communication support

System's local and network ommunications equipment is based upon ControlNet, a widely used high-speed, industrially hardened control and communication protocol.

MSA MODEL 10K Fire and Gas System is ideal for use in compressor stations, drilling and production platforms, refineries and pipelines, LNG/LPG facilities, storage facilities, chemical plants, electric power plants and wastewater treatment plants.


PERIGO
PROIBIDA A ENTRADA
RISCO DE MORTE

Section 5:

MSA Custom Products & Accessories

MSA Custom Products

Individually designed gas detection solutions to fit your application

Special solutions sometimes require greater versatility and unique equipment configurations. MSA's Custom Products group offers individually designed solutions for customer monitoring, control and data acquisition applications. Our custom gas detection and flow systems are built to customer specifications and combine advantages of various MSA instruments and sensors with our electrical and mechanical engineering expertise.

Our flexibility allows MSA Custom Products to meet virtually any gas monitoring need, as each custom system is individually designed to provide the very best solution to unique application requirements. MSA Custom Products provide customers with a distinctive combination of solutions, expertise and timeliness.

Expertise and experience in custom product design for 100 years

- MSA engineers, manufactures, services and repairs all of our instruments and sensors
- Gas detection and flow systems meet ISO 9001 quality assurance requirements

Timeliness and faster manufacturing turnaround

- Efficient and timely quotation and manufacturing process
- Integrated custom systems use both standard components and custom features

How the custom product process works

- Customer requirements are defined; team-based process includes sales representatives, engineers and manufacturing personnel
- Review performed by MSA professional sales or custom products engineer
- Quotation is issued, complete with drawing package and other documentation as needed

Past MSA custom product designs

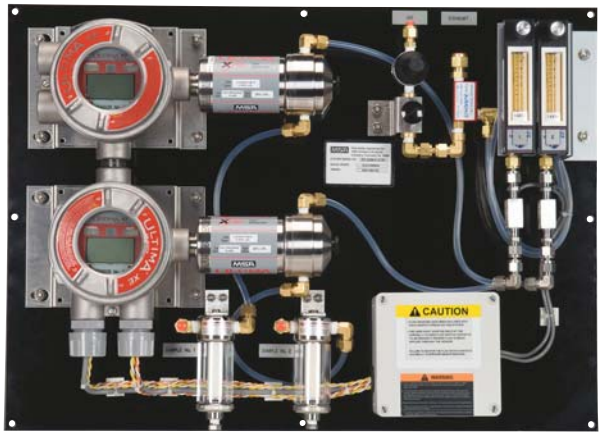
- Rack-mounted gas monitoring systems
- Multi-point sequencing monitoring systems
- Process monitoring systems
- Networked sensor systems
- Facility management monitoring systems
- Customer-defined packaging solutions
- Shipboard rugged systems
- OEM packaging and labeling

Sensing techniques for combustible gases, toxic gases and oxygen levels

- Electrochemical
- Catalytic bead
- Solid state
- Surface acoustic wave
- Photoacoustic and nondispersive infrared technologies
- Photoionization
- Thermal conductivity

Additional custom product features and options

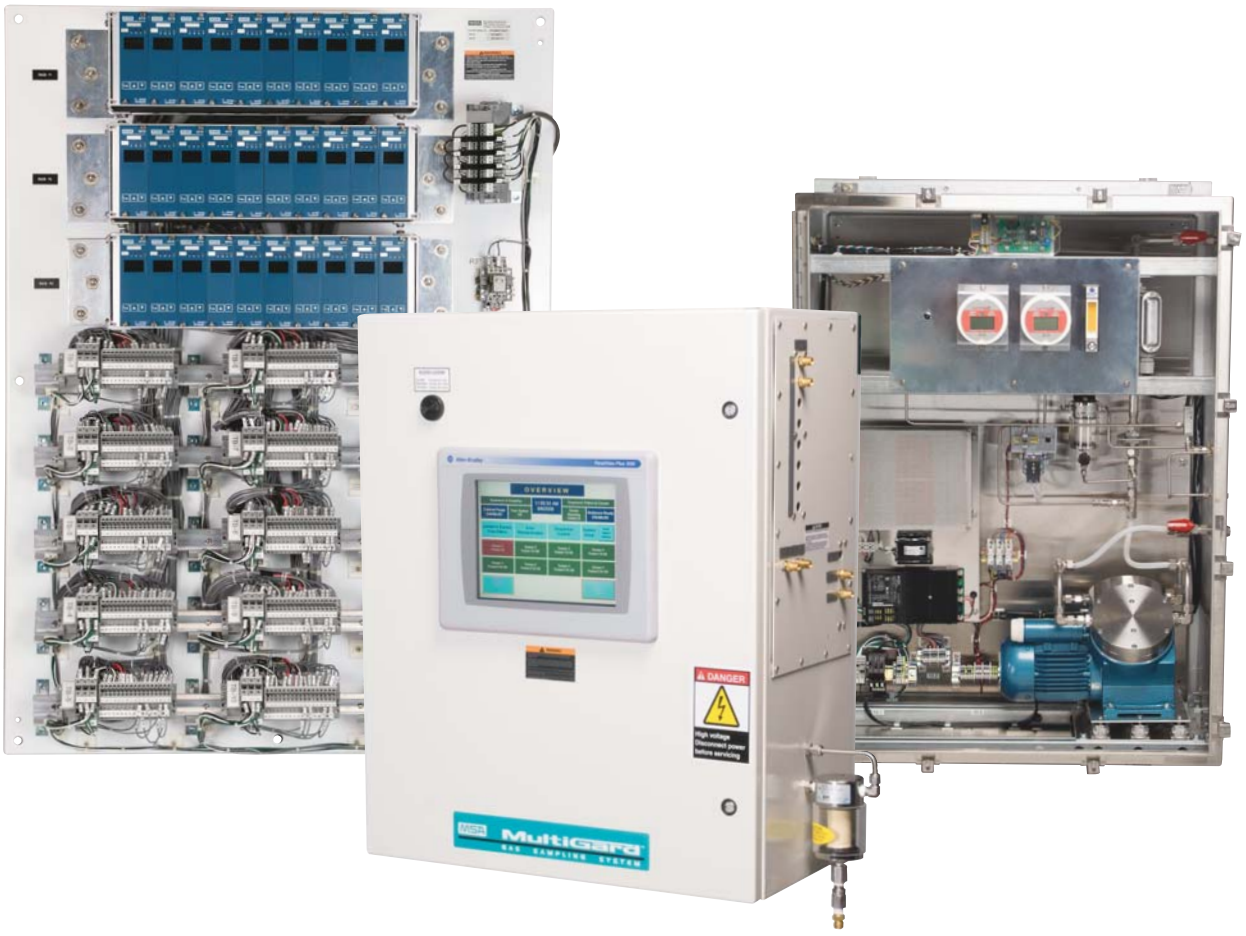
- Automatic time-weighted averaging
- Custom enclosures
- Data acquisition and control
- Emissions monitoring
- Flow panels
- Custom signaling
- Gas sensor auto-standardization
- Intrinsically safe multi-point sampling
- Multiplexed sensors
- Non-intrusively calibrated sensors
- Process analysis and control
- Productivity tracking
- Record-keeping
- Report generation
- Sequencing systems
- Toxic gas trending
- Total hydrocarbon detection
- Low- and sub-ppm analyzers



MSA Custom Products develops custom systems for customers in industries globally. Our sales representatives can assess your monitoring needs and are factory-trained in application and use of all MSA instrumentation. MSA also supports customers with comprehensive repair and service organizations. Contact your local MSA sales representative for a custom solution for your specific application.

Applications

- General industries
- Shipboard
- Refineries
- Paper/pulp mills
- Refrigeration
- Manufacturing
- Confined spaces
- Chemicals
- Wastewater treatment
- Steel mills
- Stack vents
- Pipelines
- Mining
- Parking garages
- Indoor air quality
- Engine test facilities
- Heat treating
- HVAC
- Food processing
- Homeland security



Accessories

Power Supplies

External power supplies enable remote powering of sensors. Internal power supply options are also available.
One remote power supply module can power:

- Up to five electrochemical or oxygen sensors
- Up to three combustible sensors

Sampling Pump Modules

Sampling pumps are available to bring a remote sample to a sensor. Sampling modules are available in GP and XP versions of aspirated and pumped modules.

Duct Mount Kits

Duct mount kits allow users to monitor air within ductwork. A quick-disconnect fitting enables calibration gas to reach the sensor without having to remove the duct-mounted sensor.

Strobes and Horns

Strobes and horns offer prominent visual and audible indications of system alerts.

Remote Display Modules

Remote display modules provide the ability to remotely view gas monitor status.

Filters

Filters for sample conditioning remove particulate liquids from the sample stream.

Trigard Gas Monitor with custom configuration.

Suprema Controller with additional relays and custom configuration.

TriGas System for wet well monitoring in wastewater applications.

Multigard Gas Monitor with custom flow scheme and sensor options. Can sample up to 32 points.

Calibration **& Sensor Placement**

Section 6:
Calibration & Sensor Placement

Calibration Kits

For calibration of gas detection instruments and sensors

MSA calibration kits, when used with appropriate calibration gas, offer quick, convenient and economical response check of MSA gas sensors and gas detection instrumentation. 14 calibration kits are available, and one is sure to meet your particular need. Calibration kits contain all components necessary to calibrate your MSA equipment. Kits are housed in lightweight carrying cases for easy transportation to the job site or sensor location. MSA also offers a wide assortment of calibration gases.

Instrument Calibration

Whether an instrument warns and/or alarms at the proper time depends upon that instrument's ability to translate quantity of gas detected into accurate readings. Calibration refers to instrument measurement accuracy relative to a known concentration of gas. Gas detectors perform relative measurements; rather than independently assessing quantity of gas present, gas detectors measure air sample concentration; then, that concentration is compared to the known gas concentration that the instrument is configured to sample. This known concentration serves as the instrument's measurement scale, or reference point.

If the instrument's reference point has moved, then its reading will also move. This phenomenon, known as calibration drift, happens to most instruments over time. Common causes of calibration drift include normal sensor degradation, sensor exposure to poisons and harsh operating conditions.

When an instrument experiences calibration drift, that instrument can still measure gas quantity present, but cannot convert the measurement into an accurate numerical reading. Regular calibration using certified standard gas concentration updates the instrument's reference point, re-enabling production of accurate readings.

Two methods of verifying instrument calibration exist: via functional or bump test (or span check), or by performing full calibration. Each method is appropriate under certain conditions.

Bump (or Span) Check

Bump check is a means of verifying calibration by exposing the instrument to a known concentration of test gas. The instrument reading is then compared to actual gas quantity present (as indicated on the calibration gas cylinder). If instrument response is within acceptable range of actual concentration, then calibration is verified. When performing a bump test, test gas concentration should be high enough to trigger the instrument alarm. If bump test results are not within acceptable range, then full calibration must be performed.

Full Calibration

Full calibration is adjustment of instrument reading to coincide with known concentrations (generally a certified standard) of zero and span gases to compensate for calibration drift. In most cases, full calibration is necessary only when an instrument does not pass the bump test or after it has been serviced.

Zero Check

Zero check is performed to verify that instruments read true zero (also referred to as *baseline*) in environments in which no amount of target gas is present. Common situations in which zero check is performed include:

- After sensor exposure to a sensor contaminant
- After sensor exposure to very high target gas concentration
- As the sensor ages, as it may gradually drift
- After the unit has operated within varying background conditions (such as changeable humidity levels)
- After exposure to extreme conditions (such high temperatures or humidity).

If the instrument fails zero check, then zero adjustment—a process that sets instruments to true zero—should be performed

Calibration Frequency

Calibration frequency depends upon sensor operating time, conditions of use (including chemical exposure) and user experience with the instrument. New sensors should be calibrated frequently until calibration records prove sensor stability. Calibration frequency can then be reduced to the schedule set by safety officers or plant managers. Before calibrating sensors, it is good practice to apply power to units to allow sensors to adapt to new environments. Sensors should be powered for at least one full hour before calibration attempts are made.

MSA Guide to Gas Sensor Selection & Placement

STEP 1: To determine sensor placement, perform an analysis of your facility's potential gas hazards.

STEP 2: Create drawings indicating all potential leak sites, as well as the severity of each site's hazard potential. Listed are two main hazardous location categories:

A. Potential gas discharge points; locations where hazardous gases may be released, such as valve stem seals, gaskets, compression fittings, and expansion joints.

B. Potential contact areas; locations where hazardous gases may endanger workers or damage equipment or property. Examples include populated areas, confined spaces, pits, stairwells, crawl spaces, shelters, and residential business and industrial environments located nearby.

STEP 3: As gases do not always behave consistently, assess air flow conditions and potential gas pockets before placing sensors. MSA smoke tubes (P/N 458481) can be useful in measuring air flow direction and rate in order to determine areas where gases may accumulate.

In general, when determining sensor placement, the following principles should be considered:

- Place sensors in areas where air currents are likely to produce the highest gas concentration, including areas where gas buildup is likely such as in corners, or by stopping points of moving devices that release gas.
- If you attempt to take a representative room sample, do not place sensors near entrances or fresh air vents, (as sample concentration will be diluted by incoming air) unless there is a need to sample that specific room area.
- Place sensors close to the possible gas/leak source.
- Place combustible gas sensors between the potential leak and the ignition source.
- Place toxic gas and oxygen sensors between the potential leak and populated areas, and in worker breathing zones.
- Consider sensor ease of access for maintenance requirements, such as periodic calibration. Use a remote sensor for high or inaccessible locations.
- Avoid mounting sensors near radio transmitters or other RFI-producing sources (such as welding activity and induction heaters) to reduce potential RF interference.
- Avoid locations where airborne particles may coat or contaminate sensors, such as paint booths.
- Install sensors in positions that prevent water or dust accumulation on sensor heads (that may impede diffusion of gas into sensors). Preferred placement is also acceptable.
- Facility air intakes are generally good sensor locations.
- Ensure that the entire area in question is sufficiently monitored, including little-used areas such as closets, warehouses and other storage areas.
- Factor in vapor density of monitored gases when compared to air.

Gas Density and Sensor Placement		
Gases	**Gas Density**	**Sensor Placement**
Carbon dioxide, heavy hydrocarbons	Greater than air	Closer to the ground
Hydrogen, methane	Less than air	Near the ceiling
Carbon monoxide, nitrogen	Similar to air	According to air current path, at or near breathing level (usually 4 to 6 ft. from floor)

Combustible Gas Sensors

- Hydrogen and methane are lighter than air, so place sensors near the ceiling, and in ceiling corners where pockets of air may collect.
- For electric motor monitoring, place sensors near the ignition source.
- Gasoline is heavier than air, so place sensors near—but not directly on—the floor.
- When monitoring multiple combustible gases, calibrate the instrument for the least sensitive gas.

Toxic & Oxygen Gas Sensors

- Place carbon monoxide and carbon dioxide sensors for indoor air quality monitoring near air intake ducts.
- In general, in occupied areas (such as confined spaces) monitor for oxygen and toxic gases in the workers' breathing zone (4-6 ft.). This zone will vary, depending upon whether the density of the gas is heavier, the same as or lighter than air or oxygen.

Toxic & Combustible Sensors

- Place sensors near the potential release source for process monitoring applications (such as pipelines, valves).
- Gas cylinder storage areas: if they are ventilated, place sensors near the return air vent.
- Acid/solvent drum storage areas: these gases are heavier than air such as heavy hydrocarbons), so place sensors close to the ground and in corners where air may collect in pockets.
- If the hazard is outside, place sensors near the air intake for both combustible and toxic gas monitoring; if the hazard is inside, place sensors near the exhaust.
- Some gases may collect in pockets in room corners, at both floor and ceiling levels. Place sensors in these areas if necessary.

Refrigerant Monitor Placement

- ASHRAE 15 states that a refrigerant monitor capable of detecting the TLV for a refrigerant gas must be installed in a mechanical equipment room.
- Place the end of the sample line in the location most likely to develop a refrigerant gas leak or spill. Such areas include valves, fittings and the chiller itself. Also, monitor any refrigerant storage location. It is good practice to keep all sampling lines as short as possible when an aspirated or pumped sampling system is used.
- Since most refrigerant gases are heavier than air, monitor these gases close to the floor. Any pits, stairwells or trenches are likely to fill with refrigerant gas before the main area. It may be necessary to monitor these locations for refrigerant gas.
- If ventilation exists in the chiller room, MSA smoke tubes (P/N 458481) will help to determine the most appropriate gas monitoring locations.
- Monitor displays can be placed just outside the doorway of the monitored area, enabling personnel to check status before entering the area.
- ASHRAE Standard 147P states that "4.8 Refrigerant Monitor. On large refrigerating systems for which a refrigerant monitor is required per ASHRAE 15, a refrigerant monitor capable of detecting refrigerant concentrations of 1 ppm by volume or less shall be used to provide early warning of leaks."

Note: *This is for informational purposes only and is intended for use as a general guide to important considerations in sensor placement. It is not intended to serve as an exhaustive review of all considerations. Due to the large number of variables present, each site should be considered individually by a trained professional. The services of an Industrial Hygienist (CIH) or Safety Professional (CSP) should be considered if an on-site survey is required.*

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