

# Portable Instrument **Selection Guide**

Gas Detection from MSA



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

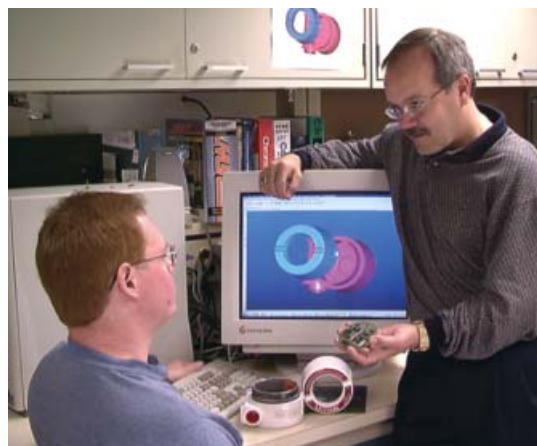
## Advanced Technology

Advanced technology employed in research, development and manufacturing helps us to improve creativity, respond quickly to your changing needs and combine traditional value with continuous product enhancement. Our innovative New Product Development process focuses upon designing and developing instruments based upon customer input. By listening to the voice of the customer throughout the product development process, we are able to ensure that MSA instruments meet user needs.

Our products are tested at every manufacturing step to ensure the highest quality possible. MSA field sales representatives and distributors are thoroughly trained in product use and applications. Our applications and inside sales departments provide technical and customer service assistance. After the sale, we support our customers with the best repair and service organization in the industry and unmatched product warranties.

## Award-Winning Customer Service

Finding the right instrument for your needs doesn't have to be difficult if your first decision is to choose MSA, as this selection guide will simplify your gas detection decision-making process. With MSA, you also have access to a dedicated, highly-trained staff of portable detector selection experts. We encourage you to use these resources. For additional information, simply call MSA Customer Service at 1-800-MSA-2222 (for International Customer Service call 1-412-967-3354). In addition to technical expertise, they can also provide you with comprehensive product bulletins or contact information for your local MSA distributor.



## MSA Mission Statement

That men and women may work in safety and that they, their families and their communities may live in health throughout the world. Our vision is to be the leading innovator and provider of quality safety and instrument products and services that protect and improve people's health, safety and the environment.

We strive to achieve this vision by satisfying customer needs through the efforts of motivated, involved, highly-trained employees dedicated to continuous improvement in quality, service, cost, value, technology, and delivery.

## Purpose of Guide

This guide will quickly and easily help you to identify portable gas detection solutions for your specific needs. To assist in this process, this guide identifies some atmospheric hazards that are commonly found within many industries.

### ⚠ WARNING

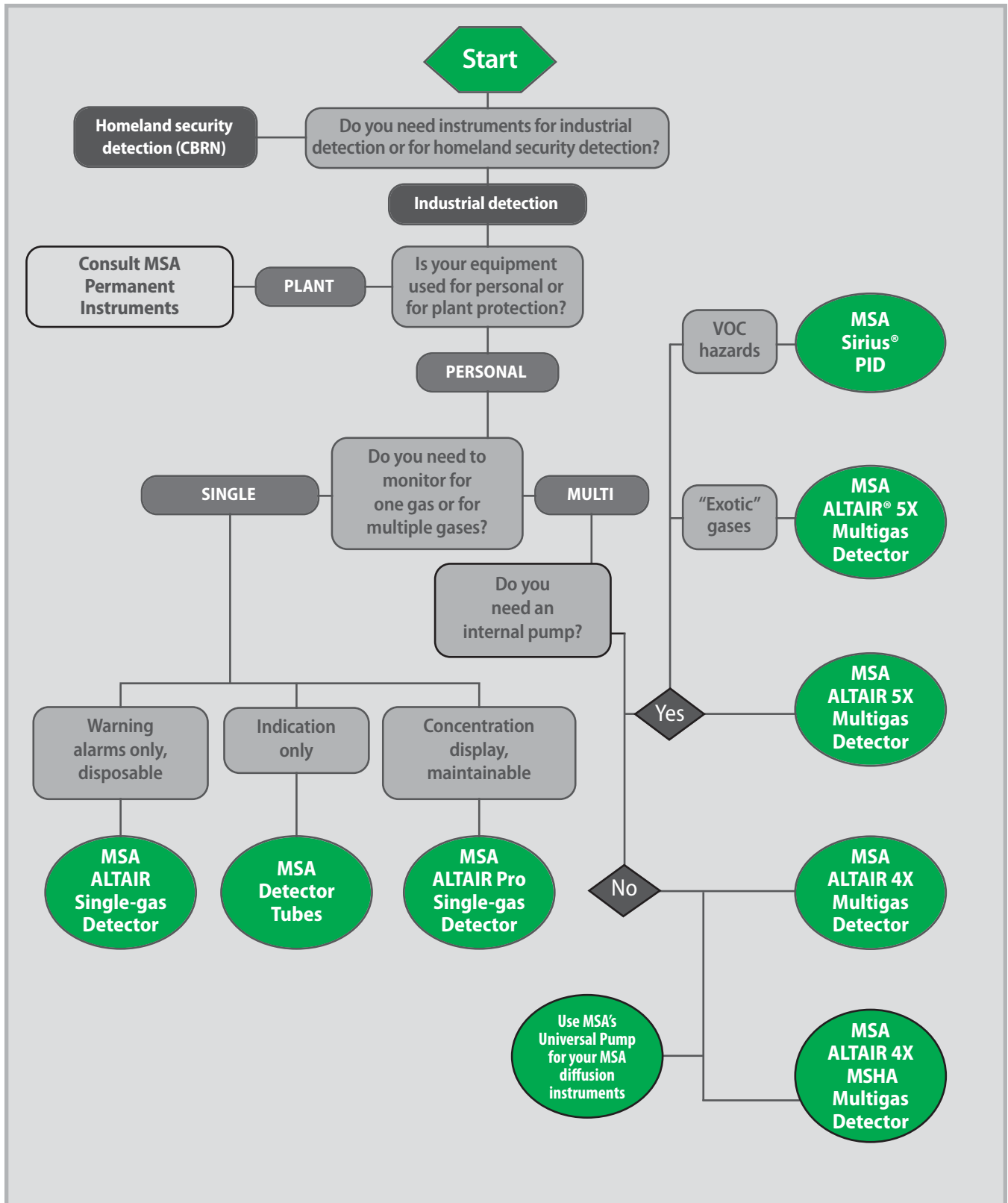
The information in this guide is not intended to be all-inclusive in scope or content and is not to be used as a substitute for a comprehensive hazards assessment. Contact MSA for more detailed information. Failure to follow this warning can result in serious personal injury or death.

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## Portable Instrument Selection Quick Guide



Portable Gas Detection Instruments		SINGLE-GAS			MULTIGAS	
		ALTAIR Pro Single-Gas Detector	ALTAIR Single-Gas Detector	Detector Tubes*	ALTAIR 5X and 5X IR Multigas Detector	ALTAIR 4X Multigas Detector
<b>Features</b>						
Number of Gases Detected		1	1	1	6	4
Number of Sensors Available		10	3	*	14	6
<b>SENSOR OPTIONS</b>	Combustible Gases				■	■
	High-range Methane Detection				■	
	Oxygen	■	■		■	■
	IR Combustible Gas				■	
	IR Carbon Dioxide				■	
	Toxic—IDLH	■	■	■		
	Toxic—Non-IDLH	■	■	■		
	Volatile Organic Compounds (VOCs)			■		
	Chemical Warfare Agents (CWAs)			■		
	Toxic Industrial Chemicals (TICs)			■		
	Phosgene			■		
					And up to 2 (or 3 for ALTAIR 5X Detector) of the following:	
	Ammonia				■	
	Carbon Monoxide				■	■
	Chlorine				■	
	Chlorine Dioxide				■	
	Hydrogen Cyanide				■	
	Hydrogen Sulfide				■	■
	Nitric Oxide					
	Nitrogen Dioxide				■	
Phosphine				■		
Sulfur Dioxide				■		
<b>FEATURES</b>	Bump Test Check Mark Indicator	■	■		■	■
	Digital Display	■	■		■	■
	Alarms (Audible & Visual)	■	■		■	■
	Vibrating Alarm	■	■		■	■
	Hand-held				■	■
	Pocket-sized	■	■			■
	Memory Storage/Data Logging & Data Downloading	■	■		■	■
	High RF Protection	■	■		■	■
	Multilingual Display				■	
	Lockalarm™ Circuit				■	■
	One-button Calibration	■	■		■	■
	Patented Button™ Sensors	■	■			
	Pressure-compensated O <sub>2</sub>				■	■

\* Detector tubes are available for the detection of more than 170 gases.

# Gas Detection Instruments

VOC Detection Instruments		Sirius Multigas Detector
<b>Features</b>		
	<b>Number of Gases Detected</b>	*
<b>GASES DETECTED</b>	Combustible Gases	■
	Toxic—IDLH	■
	Toxic—Non-IDLH	■
	Oxygen	■
	Chlorine	
	Chlorine Dioxide	
	Hydrogen Sulfide	■
	Phosphine	■
	Acetone	■
	Benzene	■
	Chlorobenzene	■
	Cyclohexane	■
	Heptane	■
	Hexane	■
	Methyl Isobutyl Ketone (MIBK)	■
	Methyl Tetrabutyl Ether (MTBE)	■
	Octane	■
	Propylene	■
	Toluene	■
	Trichloroethane	■
Many Other VOCs	■	
<b>FEATURES</b>	Digital Display	■
	Alarms (Audible & Visual)	■
	Hand-held	■
	Memory Storage/Data Logging & Data Downloading	■

\*Instrument is pre-programmed for direct readings of 100 VOCs. Over 400 VOCs are potentially detectable. For a complete list, contact MSA Customer Service.

Note: detector tubes and sorbent tubes can also be used to identify specific VOCs.

MSA Portable Instrument Approvals		MSHA	UL	Canada	Europe	Australia
<b>INSTRUMENTS</b>	ALTAIR Single-Gas Detector		■	■	■	■
	ALTAIR Pro Single-Gas Detector		■	■	■	■
	ALTAIR 4X Multigas Detector	■	■	■	■	■
	ALTAIR 5X Multigas Detector		■	■	■	■
	Sirius Multigas Detector		■	■	■	
	SOLARIS® Multigas Detector	■				

## Multigas Instruments

Multigas detectors are used primarily to monitor immediate hazards and can be used for both continuous and intermittent gas detection. MSA offers a full line of multigas instrument accessories including batteries, chargers, pumps, sample lines, and probes.

### Features

MSA's multigas detectors are equipped with the following features:

- Audible and visual alarms
- One-button calibration
- Peak readings
- STEL and TWA



ALTAIR 5X Multigas Detector

**Driven by the most advanced technology available in any portable gas detector.**

- Rugged detector tests levels of LEL, O<sub>2</sub>, CO, H<sub>2</sub>S, SO<sub>2</sub>, and other toxic gases
- Rapid bump test gives results in less than 15 seconds
- Versatile MSA Link™ Software allows user to transmit data to a computer
- MotionAlert™ feature tells others that user has become immobile
- InstantAlert™ feature provides manual alarm to alert others as to a potentially hazardous situation
- Large buttons and bright display provide easy operation, even when user is wearing gloves
- Durable XCell Sensors last longer than three years
- Rugged housing protects detector from drops of up to 10 feet
- Exclusive end-of-sensor warning cautions user when unit's sensor must be changed
- Polycarbonate housing is both dust-tight and water-tight
- GALAXY® GX2 System and MSA Link Pro Software provide automated calibration, bump tests and fleet management capabilities.



ALTAIR 4X Multigas Detector

**Tough, functional personal multigas detector with typical four-year sensor life.**

- Dependable multigas detector tests for LEL, O<sub>2</sub>, CO, H<sub>2</sub>S, SO<sub>2</sub> and NO<sub>2</sub>
- Advanced sensor design saves users more than 50% on calibration gas, replacement sensors and maintenance
- Four-year sensor life means detector lasts 60% longer than the industry average
- Unit uses 50% less calibration gas per minute than average detectors within the industry
- Two-tox CO/H<sub>2</sub>S sensor removes most cross-channel interference
- Large buttons and high-contrast screen make operation easy in low-light conditions
- Ribbed rubber housing provides secure grip and high durability
- Unit features 95+ db alarm and ultra-bright LEDs
- Exclusive end-of-sensor warning cautions user when unit's sensor must be changed
- MotionAlert feature tells others that user has become immobile
- InstantAlert feature provides manual alarm to alert others as to a potentially hazardous situation
- GALAXY GX2 System and MSA Link Pro Software provide automated calibration, bump tests and fleet management capabilities.

## Multigas Instruments



ALTAIR 4X MSHA Multigas Detector

### Optimized for Mining Applications

- Methane-optimized catalytic bead sensor provides increased stability over time
- Sensor response and clear times in less than 15 seconds reduce gas gas usage for bump testing and calibration
- Greater accuracy and repeatability within changing environmental conditions (temperature, humidity and pressure)
- Digital sensors offer increased RF (radio frequency) immunity, eliminating false alarms from radios
- Accurate CO readings from 0-2000 ppm
- Industry-first CO/NO<sub>2</sub> combination sensor with wide range and fast response times
- Increased methane sensor poison resistance decreases down time and frequency of sensor replacements
- End-of-sensor life warning gives advanced notice of failing sensors



Sirius Multigas Detector

### One PID, four gases...detects hundreds of chemicals

- Reliable detection in an easy-to-use and durable unit
- Simultaneously monitor for volatile organic compounds (VOCs) with low vapor pressures while measuring for combustible, toxic or oxygen-deficient atmospheres
- Stable zero readings with fast response/clear times





## Single-Gas Instruments

Single-gas detectors are an economical way to monitor for a specific single gas. MSA single-gas detectors can be used for continuous monitoring of CO, O<sub>2</sub> or H<sub>2</sub>S. MSA combustible gas detectors can be used to measure methane, pentane and many other combustible gases.



### ALTAIR Pro Single-Gas Detector

**Provides worry-free performance and stands up to the roughest handling in the toughest industrial environments.**

- Gas concentration (NH<sub>3</sub>, CO, Cl<sub>2</sub>, ClO<sub>2</sub>, HCN, H<sub>2</sub>S, NO<sub>2</sub>, PH<sub>3</sub>, and SO<sub>2</sub>) or percent oxygen displayed on large, clear, backlit LCD
- Unit detects CO, H<sub>2</sub>S, O<sub>2</sub>, NH<sub>3</sub>, Cl<sub>2</sub>, ClO<sub>2</sub>, NO<sub>2</sub>, SO<sub>2</sub>, HCN, and PH<sub>3</sub>
- Automatically records last 50 alarm/test events while simultaneously recording peak gas readings or low O<sub>2</sub> readings every three minutes in periodic data log
- User can read data or change alarm set points by connecting unit to MSA Link Software via built-in IR communication port
- Adjustable alarm set points
- No-miss quad alarm system includes bright flashing LEDs, piercing audible alarm, LCD notification, and internal vibrating alarm
- Rubberized armor housing and one-button operation for maximum durability and simplicity
- Easy alarm check, bump check, fresh air zero, and calibration
- Easily replaceable batteries and sensors
- GALAXY GX2 System and MSA Link Pro Software provide automated calibration, bump tests and fleet management capabilities.

**Also available:**

- ALTAIR Pro CO Fire Detector for the fire service
- ALTAIR Pro CO Steel Detector with hydrogen-resistant sensor and software that prevents disabling of alarms by users
- ALTAIR Pro O<sub>2</sub>-R Oxygen Remote Detector for remote sampling



### ALTAIR Maintenance-Free Single-Gas Detector

**A two-year lifespan coupled with the unit's high performance results in one of the more cost-effective monitors on the market.**

- Sensor options for CO, H<sub>2</sub>S and O<sub>2</sub>
- Patented electrochemical sensors and MSA-built button sensors
- Stainless steel and solid electrolyte construction virtually eliminate sensor leakage
- Automatically records last 25 alarm/test events and can communicate data by connecting to MSA Link Software via built-in IR communication port
- No-miss triple alarm system includes bright flashing LEDs, piercing audible alarm and internal vibrating alarm
- Rubberized armor housing and one-button operation for maximum durability and simplicity
- GALAXY GX2 System and MSA Link Pro Software provide automated calibration, bump tests and fleet management capabilities.

## Instrument Calibration



GALAXY® GX2 Automated Test System

**This easy-to-use automated test stand offers high performance as either a stand-alone unit or an integrated portable detector management system.**

- Color touchscreen for ease of setup and viewing; no touch operation is needed for calibration or bump test
- Visual indicators on GALAXY GX2 System and software
- RFID automated calibration gas setup, status alerts and traceability
- MSA Link Pro and MSA Link Software
- Global platform—many language options
- Significant cost of ownership reduction when used with MSA XCell Sensors
- Simultaneous testing of up to 10 gas detectors
- Securely configure gas detectors at the touch of a button
- Your MSA ALTAIR Multigas Detectors are always ready for use\*



ALTAIR QuickCheck® Station

**The ALTAIR QuickCheck Station tells a user which test is being administered and whether the detector passed or failed.**

- Station administers a bump test and uses a microphone and electronic check to ensure that your detector is ready for action
- Station is compatible with all 3 ALTAIR Detector versions (CO, H<sub>2</sub>S and O<sub>2</sub>) and with ALTAIR Pro O<sub>2</sub>, H<sub>2</sub>S, CO, CO Fire, and CO Steel detectors
- Station offers manual and automatic versions
- Easy-to-see LEDs give simple-to-understand test results



**MSA calibration cylinders are recyclable.  
Contact MSA Customer Service for details.**

## Chemical, Biological, Radiological, or Nuclear (CBRN) Detection



HAZMATCAD® and  
HAZMATCAD Plus  
Chemical Agent Detectors

**Detect both chemical warfare agents and selected toxic industrial chemicals (TICs). Ruggedly constructed, compact and lightweight, each detector is designed for ease of use and requires no prior training.**

- HAZMATCAD Detector uses surface acoustic wave (SAW) microsensors
- HAZMATCAD Plus Detector uses both SAW technology and electromechanical cells
- Single-key automatic sampling and analysis
- Alphanumeric system display with both audible and LED alarms
- Operates for 8–12 hours using lithium-ion rechargeable batteries
- Rapid warm-up with self-diagnostic check
- RS 232 and IrDA communication ports store up to eight hours of data
- Includes battery charger, belt clip, two long-life lithium-ion rechargeable batteries, waterproof carrying case, vapor check source, and operating manual



SafeMTX® Multi-Threat Detector

SafeCOM™ Command Center

HAZMATCAD Plus Detector  
with SAFECOM Belt-Bridge

## SAFESITE® Multi-Threat Detection System

**These advanced detection systems provide critical information and data for rapid decision-making in the face of chemical, gas, radiation, and other hazard-inducing conditions.**

### SAFESITE Multi-Threat Detectors

- State-of-the-art, 24/7 threat detection and advanced communication capabilities
- Detects a variety of threats, including chemical warfare agents, gamma radiation, volatile organic compounds, combustible gas, and more
- Ideal for numerous applications, including homeland security, emergency response, public events, mass transportation, and perimeter monitoring
- Multiple-system integration and management
- Wired or wireless network access
- Delivers precise results with fewer false positives

### SAFECOM Belt-Bridge with Sirius Wireless Interface

- Belt-Bridge converts data from Sirius Multigas Detector and transmits to SAFECOM Command Center up to two miles away
- Belt-Bridge uses a one-watt, spread spectrum, frequency-hopping 900 MHz radio to ensure results are received
- GPS tracking provides real-time updating

# Gas Detection Instruments

## Detector Tubes

DETECTOR TUBE INDUSTRY ACTION SETS	655864	Agricultural, set of 12 tubes
	655868	Pulp and Paper, set of 12 tubes
	710981	Indoor Air Quality, set of 12 tubes
	655869	Pharmaceutical, set of 12 tubes
	655865	Petroleum, set of 12 tubes
	655866	Synthetics Manufacturing, set of 12 tubes
	655933	Chemical Vapor Deposition Process, set of 12 tubes
	655934	Etching Process, set of 12 tubes
	655935	Epitaxy Process, set of 12 tubes
	655931	Crystal Growth Process, set of 12 tubes
CHEMICAL WARFARE AGENT DETECTOR TUBES	10007654	Nerve (Sarin, VX, GA, GD, etc.)
	10007653	Blister (mustard gas)
	10007650	Blister (Lewisite)
	10007652	Blister (variety, including mustard gas)
	10007651	Blood and Choking (CG, DP, AC, CK)
	10044998	Chemical Warfare Agent Detector Tube Kit, Single CWA Tube Sampler with Kwik-Draw Pump
CARBON MONOXIDE DETECTOR TUBE CARDS	481954	CO Detector Tube Cards, box of 20



Gases/Hazards & Industries	Gases/Hazards																	
	Toxic Gases															VOCs		
	Combustible Gases	O <sub>2</sub> Deficiency/Enrichment	Ammonia	Carbon Dioxide	Carbon Monoxide	Chlorine	Chlorine Dioxide	Formaldehyde	Gamma Radiation	Hydrogen Cyanide	Hydrogen Sulfide	Nerve/Blister Agents	Nitric Oxide	Nitrogen Dioxide	Ozone		Phosgene	Phosphine
Industry																		
AGRICULTURE		■	■	■	■						■		■	■		■	■	
AVIATION	■	■			■													■
CHEMICAL	■	■	■		■	■				■	■					■		■
CONSTRUCTION	■	■			■						■							■
FIRE SERVICE	■	■		■	■	■				■	■							■
FOOD & BEVERAGE PROCESSING		■	■	■	■						■						■	
FOUNDRIES	■	■			■						■							■
HAZMAT	■	■	■		■	■		■			■						■	■
HEAVY MANUFACTURING	■				■													■
HOMELAND SECURITY	■	■	■			■	■		■	■	■	■	■	■		■	■	■
IRON & STEEL	■	■			■					■	■		■	■		■		■
MINING	■	■		■	■					■	■		■	■				
NUCLEAR	■	■			■													
OIL & GAS/PETROCHEMICAL	■	■	■		■						■							■
PAPER & PULP						■	■				■							■
PHARMACEUTICAL	■	■	■			■		■			■					■		■
SAND BLASTING																		
SEMICONDUCTOR			■			■							■	■			■	■
SHIPYARD/MARINE	■	■		■	■						■							
SPRAY PAINTING	■							■										■
UTILITIES	■	■		■	■						■		■	■				■
WATER & WASTEWATER TREATMENT	■	■	■		■	■					■				■			■
WELDING	■	■			■								■	■	■			

### Monitoring Categories

#### COMBUSTIBLE GASES

- Acetone (C<sub>3</sub>H<sub>6</sub>O)
- Benzene (C<sub>6</sub>H<sub>6</sub>)
- Butane (C<sub>4</sub>H<sub>10</sub>)
- Ethylene (C<sub>2</sub>H<sub>4</sub>)
- Heptane (C<sub>7</sub>H<sub>16</sub>)
- Hexane (C<sub>6</sub>H<sub>14</sub>)
- Hydrogen (H<sub>2</sub>)
- Isobutane (C<sub>4</sub>H<sub>10</sub>)
- Methane (CH<sub>4</sub>)
- Pentane (C<sub>5</sub>H<sub>12</sub>)
- Toluene (C<sub>7</sub>H<sub>8</sub>)
- Propane (C<sub>3</sub>H<sub>8</sub>)

#### TOXIC GASES

- Ammonia (NH<sub>3</sub>)
- Carbon dioxide (CO<sub>2</sub>)
- Carbon monoxide (CO)
- Chlorine (Cl<sub>2</sub>)
- Chlorine dioxide (ClO<sub>2</sub>)
- Hydrogen cyanide (HCN)
- Hydrogen sulfide (H<sub>2</sub>S)
- Nitric oxide (NO)
- Nitrogen dioxide (NO<sub>2</sub>)
- Ozone (O<sub>3</sub>)
- Phosphine (PH<sub>3</sub>)
- Sulfur dioxide (SO<sub>2</sub>)
- Phosgene (COCl<sub>2</sub>)

# Gas Detection Instruments

Instruments & Industries			Single-Gas Instruments		Multigas Instruments			Detector Tubes & Calibration	
			ALTAIR Single-Gas Detector	ALTAIR Pro Single-Gas Detector	ALTAIR 5X Multigas Detector	ALTAIR 4X Multigas Detector	Sirius Multigas Detector	Calibration Check Gas	Detector Tubes
	Application/Task	Gas/Hazard							
AGRICULTURE	Chillers	NH <sub>3</sub>		■	■			■	■
	Silos/confined space	CO <sub>2</sub>		■	■		■	■	■
	Forklift operation	CO	■	■	■	■	■	■	■
	Fumigant	H <sub>2</sub> S	■	■	■	■	■	■	■
	Silos/confined space	NO						■	■
	Silos/confined space	NO <sub>2</sub>		■	■			■	■
	Silos/confined space	O <sub>2</sub> <i>Deficiency/ enrichment</i>	■	■	■	■	■	■	
	Insecticide for fumigation	PH <sub>3</sub>		■	■			■	■
AVIATION	Engine repair & maintenance	CO	■	■	■	■	■	■	■
		Combustible Gases			■	■	■	■	
	Confined space	O <sub>2</sub> <i>Deficiency/ enrichment</i>	■	■	■	■	■	■	
	Jet fuel vapors, solvents	VOCs					■	■	
CHEMICAL	General leak detection	CO	■	■	■	■	■	■	■
		Cl <sub>2</sub>		■	■			■	■
		NH <sub>3</sub>			■			■	■
		H <sub>2</sub> S	■	■	■	■	■	■	■
		NO						■	■
		NO <sub>2</sub>		■	■			■	■
	Confined space, liquid nitrogen carriers/storage, reactor work, tank maintenance, inspection tunnels	O <sub>2</sub> <i>Deficiency/ enrichment</i>	■	■	■	■	■	■	
		SO <sub>2</sub>		■	■			■	■
Organic synthesis operations, liquid-solid separation, cleaning agents	VOCs					■	■	■	
CONSTRUCTION	Vehicle emissions (diesel exhaust), generators, digging operations, trenching	CO	■	■	■	■	■	■	■
	Trenching, underground construction	Combustible Gases			■	■	■	■	
	Digging operations, underground construction	H <sub>2</sub> S	■	■	■	■	■	■	■

Instruments & Industries			Single-Gas Instruments		Multigas Instruments			Detector Tubes & Calibration	
			ALTAIR Single-Gas Detector	ALTAIR Pro Single-Gas Detector	ALTAIR 5X Multigas Detector	ALTAIR 4X Multigas Detector	Sirius Multigas Detector	Calibration Check Gas	Detector Tubes
	Application/Task	Gas/Hazard							
CONSTRUCTION	Diesel exhaust	NO						■	■
		NO <sub>2</sub>		■	■			■	■
	Confined spaces, trenching, underground construction	O <sub>2</sub> <i>Deficiency/enrichment</i>	■	■	■	■	■	■	
		CO <sub>2</sub>			■			■	■
FIRE SERVICE	Confined space entry (rescue)	CO <sub>2</sub>			■			■	■
	Overhaul, home calls (furnace leaks), trenching	CO	■	■	■	■	■	■	■
	Underground construction, trenching	Combustible Gases			■	■	■	■	
		H <sub>2</sub> S	■	■	■	■	■	■	■
	Confined space entry (rescue), underground construction	O <sub>2</sub> <i>Deficiency/enrichment</i>	■	■	■	■	■	■	
FOOD & BEVERAGE PROCESSING	Refrigeration facilities & cold storage	NH <sub>3</sub>		■	■			■	■
	Breweries & wineries, carbonated beverage bottling, fermentation tanks, refrigeration facilities, baking facilities	CO <sub>2</sub>			■			■	■
	Forklifts	CO	■	■	■	■	■	■	■
		H <sub>2</sub> S	■	■	■	■	■	■	■
	Confined space, packaging or gassing foods	O <sub>2</sub> <i>Deficiency/enrichment</i>	■	■	■	■	■	■	
		PH <sub>3</sub>		■	■			■	■
FOUNDRIES	Furnace operation, coremaking, metal preparation & pouring	CO	■	■	■	■	■	■	■
		Combustible Gases			■	■	■	■	
	Coremaking	H <sub>2</sub> S	■	■	■	■	■	■	■
		NO						■	■
		NO <sub>2</sub>		■	■			■	■
		SO <sub>2</sub>		■	■			■	■
	Confined space	O <sub>2</sub> <i>Deficiency/enrichment</i>	■	■	■	■	■	■	

# Gas Detection Instruments

Instruments & Industries			Single-Gas Instruments		Multigas Instruments			Detector Tubes & Calibration	
			ALTAIR Single-Gas Detector	ALTAIR Pro Single-Gas Detector	ALTAIR 5X Multigas Detector	ALTAIR 4X Multigas Detector	Sirius Multigas Detector	Calibration Check Gas	Detector Tubes
	Application/Task	Gas/Hazard							
HAZMAT	Hazmat Response	NH <sub>3</sub>		■	■			■	■
		CO	■	■	■	■		■	■
		Cl <sub>2</sub>		■	■			■	■
		Combustible Gases			■	■		■	
		Formaldehyde							■
		H <sub>2</sub> S	■	■	■	■		■	■
		PH <sub>3</sub>		■	■			■	■
		SO <sub>2</sub>		■	■			■	■
		VOCs						■	■
	Confined space, underground construction, trenching	O <sub>2</sub> <i>Deficiency/enrichment</i>	■	■	■	■		■	
HEAVY MANUFACTURING	Manufacturing process emissions, forklift & crane operations	Various Gases			■				■
IRON & STEEL	Blast furnace operation & maintenance, coke oven & converter operation, furnace & gas pipeline leaks, coking operations	CO	■	■	■	■		■	■
		Combustible Gases			■	■		■	
	Coking operations	H <sub>2</sub> S	■	■	■	■		■	■
		SO <sub>2</sub>		■	■			■	■
	Welding	NO						■	■
		NO <sub>2</sub>		■	■			■	■
	Confined space	O <sub>2</sub>	■	■	■	■		■	
	Motor maintenance & cleaning, coke oven emissions	VOCs							■
MINING	Confined space	"Black Damp" <i>O<sub>2</sub> deficiency</i>			■			■	
	Mechanized coal cutting	"Fire Damp" (Combustible Gases)			■			■	
	Mining process	"Stink Damp" H <sub>2</sub> S			■			■	■
	Result of combustion (fire), diesel-powered machinery, confined space, blasting	"White Damp" CO			■			■	■
		CO <sub>2</sub>			■			■	■



# Instruments & Industries

			Single-Gas Instruments		Multigas Instruments			Detector Tubes & Calibration	
			ALTAIR Single-Gas Detector	ALTAIR Pro Single-Gas Detector	ALTAIR 5X Multigas Detector	ALTAIR 4X Multigas Detector	Sirius Multigas Detector	Calibration Check Gas	Detector Tubes
	Application/Task	Gas/Hazard							
MINING	Diesel exhaust	NO						■	■
	Diesel-powered machinery, blasting	NO <sub>2</sub>		■	■			■	■
NUCLEAR	Confined space	O <sub>2</sub> <i>Deficiency/ enrichment</i>	■	■	■	■	■	■	
OIL & GAS/ PETROLEUM	Petroleum refining	NH <sub>3</sub>		■	■			■	■
	Incomplete combustion, conversion, coking, general processing, leak detection	CO	■	■	■	■	■	■	■
	Conversion processes, isomerization, leak detection, catalytic reforming, treatment processes	Combustible Gases			■	■	■	■	
	Refining process, general leak detection, treatment processes, crude separation, drilling rigs	H <sub>2</sub> S	■	■	■	■	■	■	■
	Confined space, tank-cleaning operations, enclosed buildings or structures	O <sub>2</sub>	■	■	■	■	■	■	
	Refining process, process stream sample collection, general plant operations	VOCs					■		■
PAPER & PULP	Paper production (bleaching)	Cl <sub>2</sub>		■	■			■	■
		ClO <sub>2</sub>		■	■				■
	Wood preparation, pulping, wood dust sampling	Dust & Particulate							
	Chemical pulping, Kraft pulping	H <sub>2</sub> S	■	■	■				■
		SO <sub>2</sub>		■	■				■
	Paper production (coating & drying)	VOCs					■	■	■
PHARMACEUTICAL	Manufacturing	NH <sub>3</sub>		■	■			■	■
		Cl <sub>2</sub>		■	■			■	■
		Combustible Gases			■	■	■	■	
		Formaldehyde							■
		H <sub>2</sub> S	■	■	■	■	■	■	■
		SO <sub>2</sub>		■	■			■	■
	Drying, milling & blending operations	Dust & Particulate							
	Chemical synthesis, tank-cleaning, enclosed buildings or structures	O <sub>2</sub> <i>Deficiency/ enrichment</i>	■	■	■	■	■	■	
Organic synthesis, liquid-solid separation, compounding, granulating & tablet-coating operations, drying & packaging	VOCs						■	■	

# Gas Detection Instruments

Instruments & Industries			Single-Gas Instruments		Multigas Instruments			Detector Tubes & Calibration	
			ALTAIR Single-Gas Detector	ALTAIR Pro Single-Gas Detector	ALTAIR 5X Multigas Detector	ALTAIR 4X Multigas Detector	Sirius Multigas Detector	Calibration Check Gas	Detector Tubes
	Application/Task	Gas/Hazard							
SEMICONDUCTOR	Manufacturing	NH <sub>3</sub>		■	■			■	■
		Cl <sub>2</sub>		■	■			■	■
		NO						■	■
		NO <sub>2</sub>		■	■			■	■
	As doping agent in manufacturing, diffusion and ion implementation, chemical vapor deposition	PH <sub>3</sub>		■	■			■	■
	Lithography, etching, oxidation, metallization, assembly & testing	VOCs					■		
SHIPYARD/MARINE	Confined space	CO <sub>2</sub>			■			■	■
	Combustion	CO	■	■	■	■	■	■	■
	Oil trans-shipment (combustible gas sampling within inert environments)	Combustible Gases			■	■	■	■	
	Tank emissions	H <sub>2</sub> S	■	■	■	■	■	■	■
	Confined space, storage tanks, cargo holds	O <sub>2</sub> <i>Deficiency/enrichment</i>		■	■	■	■	■	
SPRAY PAINTING	Use of water-based paint	Formaldehyde							■
	Use of solvent-based paint	VOCs				■	■	■	■
UTILITIES	Home furnace leaks	CO	■	■	■	■	■	■	■
	Gas service safety survey and leak detection, throughout processes	Combustible Gases (CH <sub>4</sub> )			■	■	■	■	
	Throughout processes	H <sub>2</sub> S	■	■	■	■	■	■	■
	Fossil fuel power plants	NO						■	■
		NO <sub>2</sub>		■	■			■	■
		SO <sub>2</sub>		■	■			■	■
	Confined space throughout processes	O <sub>2</sub> <i>Deficiency/enrichment</i>		■	■	■	■	■	

## Instruments & Industries

			Single-Gas Instruments		Multigas Instruments			Detector Tubes & Calibration	
			ALTAIR Single-Gas Detector	ALTAIR Pro Single-Gas Detector	ALTAIR 5X Multigas Detector	ALTAIR 4X Multigas Detector	Sirius Multigas Detector	Calibration Check Gas	Detector Tubes
	Application/Task	Gas/Hazard							
WATER & WASTEWATER TREATMENT	Processing	NH <sub>3</sub>		■	■			■	■
		CO	■	■	■	■	■	■	■
		Cl <sub>2</sub>		■	■			■	■
	Digester process, sewer work	CO <sub>2</sub>			■			■	■
	Incinerators, stagnant gas in urban sewer system	CO	■	■	■			■	■
	Processing								
	Digester process, throughout process	Combustible Gases (CH <sub>4</sub> )			■	■	■	■	
	Sewer work, throughout process	H <sub>2</sub> S	■	■	■	■	■	■	■
	Sewer treatment/maintenance, confined space, throughout process	O <sub>2</sub>	■	■	■	■	■	■	
	Dechlorination process	SO <sub>2</sub>		■	■			■	■
WELDING	Confined space welding, arc air cutting, digester process flux- & gas-shielded arc welding, metal cutting & flame gouging, gas pressure welding	CO	■	■	■	■	■	■	■
	Thermite arc & stud welding, laser welding & chilling, arc air cutting, digester process electric resistance welding, gas pressure welding, metal cutting & flame gouging	Combustible Gases			■	■	■	■	
		NO						■	■
	Arc welding & cutting, stud welding, arc air cutting, gas pressure welding, metal cutting & flame gouging	NO <sub>2</sub>		■	■			■	■
	Confined space welding, electron beam welding	O <sub>2</sub> <i>Deficiency/enrichment</i>	■	■	■	■	■	■	
	Arc welding & cutting, stud welding, arc air cutting, electric resistance welding	Ozone			■			■	■

## Exposure Limits Terms and Abbreviations

**IDLH (Immediately Dangerous to Life and Health)\*** – The maximum concentration of a substance (gas) from which a worker can escape within 30 minutes without developing immediate, severe or irreversible health effects or other escape-impairing symptoms. IDLH levels are measured in ppm (parts per million).\*

**PEL (Permissible Exposure Limit)** – An airborne contaminant concentration of contaminant to which most workers can be exposed repeatedly in a normal eight-hour day, in a 40-hour week, without adverse health effect. PEL levels are measured in ppm (parts per million) and are established by OSHA.

**PPM (Parts Per Million)** – The most common unit of measurement for toxic gases. “10,000 parts per million” gas concentration equals 1% by volume.

**TLV (Threshold Limit Value)\*** – The airborne concentration of substances to which most workers can be repeatedly exposed over a working lifetime without adverse effects.

\* As defined by ACGIH (American Conference of Governmental Industrial Hygienists).

### Three Categories of TLVs

**TLV – TWA (Time-Weighted Average)** – The average amount of gas to which workers can be repeatedly exposed in a normal eight-hour day, in a 40-hour week, without adverse health effects.

**TLV – STEL (Short-Term Exposure Limit)** – The gas concentration to which most workers can be continuously exposed for a 15-minute time period without suffering adverse health effects that would impair self-rescue or worker safety. This limit should not be repeated more than four times per day; at least 60 minutes should elapse between individual STEL exposure periods.

**TLV – C (Ceiling)** – The highest gas concentration to which workers may be exposed. Ceiling TLVs should never be exceeded and take precedence over all TWAs and STELs.

**LEL (Lower Explosive Limit)** – The lowest concentration of a gas or vapor that will ignite and sustain combustion. “Percent LEL” is a common unit of measurement for combustible gas detection.

**UEL (Upper Explosive Limit)** – The maximum concentration at which a gas will sustain combustion.

**Oxygen Deficient Atmosphere** – An atmosphere containing less than 19.5% oxygen by volume. (Possesses a risk of insufficient oxygen for breathing.)

**Oxygen Enriched Atmosphere** – An atmosphere containing more than 25% oxygen by volume. (Possesses an increased risk of explosion.)



## Cross-Sensitivity

As sensor output is driven by chemical reactions, circumstances exist where gases other than those being monitored will cause instrument display readings. Known as cross-sensitivity, users should be aware of this potential when selecting an instrument. For more information, consult your instrument technical manual or contact MSA Customer Service.

## Our Mission

MSA's mission is to see to it that men and women may work in safety and that they, their families and their communities may live in health throughout the world.

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

Note: This Bulletin contains only a general description of the products shown. While uses and performance capabilities are described, under no circumstances shall the products be used by untrained or unqualified individuals and not until the product instructions including any warnings or cautions provided have been thoroughly read and understood. Only they contain the complete and detailed information concerning proper use and care of these products.



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**MSA Corporate Center**  
1000 Cranberry Woods Drive  
Cranberry Township, PA 16066 USA  
Phone 724-776-8600  
[www.MSAafety.com](http://www.MSAafety.com)

**U.S. Customer Service Center**  
Phone 1-800-MSA-2222  
Fax 1-800-967-0398

**MSA Canada**  
Phone 1-800-672-2222  
Fax 1-800-967-0398

**MSA Mexico**  
Phone 01 800 672 7222  
Fax 52 - 44 2227 3943

**MSA International**  
Phone 724-776-8626  
Toll Free 1-800-672-7777  
Fax 724-741-1559

**Offices and representatives worldwide**  
For further information:

[www.MSAafety.com](http://www.MSAafety.com)