

# Portable Instrument **Application Guide**

Choose the Right Gas Detector for Your Application



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

## Advanced Technology

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*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.*



*The numerous MSA XCell Sensors have a typical life of more than double the industry average. MSA XCell sensors are engineered using MSA's proprietary application-specific integrated circuit (ASIC) design. By miniaturizing the sensor controlling electronics and placing them inside the sensor itself, MSA XCell Sensors offer superior stability, accuracy and repeatability. MSA XCell Sensors are a breakthrough in chemical and mechanical sensor design, enabling faster response and span calibration times. The best and latest example of Advanced Technology is our XCell Pulse Sensor Technology, now available on select versions of the ALTAIR 2X gas detector, which enables the first stand-alone bump test and eliminates the need for bottled gas! With less time spent on calibration and bump tests, you save calibration gas, maintenance costs and in turn, save money.*

*But most importantly, in our industry, saving seconds on response time can also mean saving lives.*

*MSA's integrated Bluetooth connectivity enables scalable solutions that eliminate the need for costly investments in wireless infrastructure. Android-based Bluetooth connectivity is the basis for these solutions. By incorporating Bluetooth as a standard feature in selected portable gas detectors, MSA offers wireless safety benefits to everyone. By downloading the MSA ALTAIR Connect App from Google Play and pairing with any compatible Android device, your gas detector can be turned into an enhanced safety and productivity tool.*

## Durability

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All MSA detectors are built for durability and designed to survive the work that is being done. All instruments are built to withstand extreme impact, dust and water ingress, RF interference and must pass rigorous drop and environmental testing. Most instruments and our highest use XCell sensors are backed with a 3 or 4 year warranty.

**This combination of advanced technology and extreme product durability delivers you with very low cost of ownership in your gas detection programs.**

## Our Focus on You

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MSA field sales representatives and distributors are thoroughly trained in product use and applications. Our sales departments provide technical and customer service assistance. After the sale, we support you with the best repair and service organization in the industry and unmatched product warranties.

## Purpose of Guide

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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.

Gases/Hazards & Industries	Gases/Hazards													
	Gases												VOCs	
	Combustible Gases	O <sub>2</sub> Deficiency/Enrichment	Ammonia	Carbon Dioxide	Carbon Monoxide	Chlorine	Chlorine Dioxide	Hydrogen Cyanide	Hydrogen Sulfide	Nitric Oxide	Nitrogen Dioxide	Phosphine		Sulfur Dioxide
Industry														
AGRICULTURE	■	■	■	■	■				■	■	■	■		
AVIATION	■	■			■									■
CHEMICAL	■	■	■		■	■		■	■				■	■
CONSTRUCTION	■	■			■				■					■
FIRE SERVICE	■	■		■	■	■		■	■					■
FOOD & BEVERAGE PROCESSING		■	■	■	■				■			■		■
FOUNDRIES	■	■			■				■				■	■
HEAVY MANUFACTURING	■				■									■
IRON & STEEL	■	■			■			■	■	■	■		■	■
MINING	■	■		■	■			■	■	■	■			
OIL & GAS/PETROCHEMICAL	■	■	■		■				■					■
PAPER & PULP						■	■		■				■	■
PHARMACEUTICAL	■	■	■			■			■				■	■
POWER PLANTS	■	■	■	■	■				■	■	■		■	■
SEMICONDUCTOR			■			■				■	■	■		■
SHIPYARD/MARINE	■	■		■	■				■					■
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>)

### OXYGEN (O<sub>2</sub>)

Chlorine dioxide (ClO<sub>2</sub>)  
 Hydrogen cyanide (HCN)  
 Hydrogen sulfide (H<sub>2</sub>S)  
 Nitric oxide (NO)

### Volatile Organic Compounds (VOCs)

Nitrogen dioxide (NO<sub>2</sub>)  
 Phosphine (PH<sub>3</sub>)  
 Sulfur dioxide (SO<sub>2</sub>)

# Gas Detection Instruments

Instruments & Industries			ALTAIR®	ALTAIR PRO	ALTAIR 2X	ALTAIR 4X/4XR	ALTAIR 5X/5X PID with internal pump	
Number of Detected Gases			1	1	up to 2	up to 4	up to 6	
	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					■
			NO <sub>2</sub>			■	■	■
			O <sub>2</sub> Deficiency/enrichment	■	■		■	■
			Combustible gases				■	■
	Insecticide for fumigation	PH <sub>3</sub>		■			■	
AVIATION	Engine repair & maintenance	CO	■		■	■	■	
		CO high concentration			■		■	
		Combustible gases				■	■	
	Confined space	O <sub>2</sub> Deficiency/enrichment	■	■		■	■	
Jet fuel vapors, solvents	VOCs					■		
CHEMICAL PLANT	Production process, general leak detection, confined space, liquid nitrogen carriers/storage, reactor work, tank maintenance, inspection tunnels	O <sub>2</sub> Deficiency/enrichment	■	■		■	■	
		CO	■		■	■	■	
		CO high concentration			■		■	
		CO w/presence of H <sub>2</sub>			●	●	●	
		Cl <sub>2</sub>			■		■	
		NH <sub>3</sub>			■		■	
		H <sub>2</sub> S	■		■	■	■	
		ClO <sub>2</sub>		■			■	
		NO					■	
		NO <sub>2</sub>			■	■	■	
	Combustible gases				■	■		
Organic synthesis operations, liquid-solid separation, cleaning agents	VOCs					■		

● XCell CO H<sub>2</sub>-RES sensor

# Instruments & Industries

Instruments & Industries			ALTAIR	ALTAIR PRO	ALTAIR 2X	ALTAIR 4X/4XR	ALTAIR 5X/5X PID with internal pump
Number of Detected Gases			1	1	up to 2	up to 4	up to 6
	Application/Task	Gas/Hazard					
CONSTRUCTION	Vehicle emissions (diesel exhaust), generators, digging operations, trenching	CO	■		■	■	■
		CO high concentration			■		■
	Trenching, underground construction	Combustible gases				■	■
	Digging operations, underground construction	H <sub>2</sub> S	■		■	■	■
	Diesel exhaust	NO					■
		NO <sub>2</sub>			■	■	■
	Confined spaces, trenching, underground construction	O <sub>2</sub> Deficiency/enrichment	■	■		■	■
		CO <sub>2</sub>					■
	Use of paints, caulks, sealants, coatings, paints, varnishes, stains, wall coverings	VOCs					■
	FIRE BRIGADES	Confined space entry (rescue), underground construction	O <sub>2</sub> Deficiency/enrichment	■	■		■
CO <sub>2</sub>							■
Overhaul, home calls (boilers, leaks), trenching		CO	■		■	■	■
Underground construction, trenching		Combustible gases				■	■
		H <sub>2</sub> S	■		■	■	■
HazMat		NH <sub>3</sub>			■		■
		Cl <sub>2</sub>			■		■
		Combustible gases				■	■
		H <sub>2</sub> S	■		■	■	■
		PH <sub>3</sub>		■			■
	SO <sub>2</sub>			■	■	■	
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>					■
		CO	■		■	■	■
	Forklifts	CO high concentration			■		■
		H <sub>2</sub> S	■		■	■	■
	Confined space, packaging or gassing foods	O <sub>2</sub> Deficiency/enrichment	■	■		■	■
		PH <sub>3</sub>		■			■
	Production process	Cl <sub>2</sub>			■		■
		SO <sub>2</sub>			■	■	■
		VOCs					■
Silos	Combustible gases				■	■	

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# Gas Detection Instruments

Instruments & Industries			ALTAIR	ALTAIR PRO	ALTAIR 2X	ALTAIR 4X/4XR	ALTAIR 5X/5X PID with internal pump
Number of Detected Gases			1	1	up to 2	up to 4	up to 6
	Application/Task	Gas/Hazard					
FOUNDRIES	Furnace operation, coremaking, metal preparation & pouring	CO	■		■	■	■
		CO high concentration			■		■
		CO w/presence of H <sub>2</sub>			●	●	●
		Combustible gases				■	■
		VOCs					■
	Coremaking	H <sub>2</sub> S	■		■	■	■
		NO					■
		NO <sub>2</sub>			■	■	■
		SO <sub>2</sub>			■	■	■
	Confined space	O <sub>2</sub> Deficiency/enrichment	■	■		■	■
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	■		■	■	■
		CO high concentration			■		■
		CO w/presence of H <sub>2</sub>			●	●	●
		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" O <sub>2</sub> deficiency		■		■	■
	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 high concentration			■		■
	Emergency rescue action	Combustible gases				■	■
		CO <sub>2</sub>					■
	Diesel exhaust	NO					■
Diesel-powered machinery, blasting	NO <sub>2</sub>			■	■	■	

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\*Not M1/M2 approved

# Gas Detection Instruments

Instruments & Industries			ALTAIR	ALTAIR PRO	ALTAIR 2X	ALTAIR 4X/4XR	ALTAIR 5X/5X PID with internal pump
Number of Detected Gases			1	1	up to 2	up to 4	up to 6
	Application/Task	Gas/Hazard					
OIL, GAS & PETROLEUM	Petroleum refining	NH <sub>3</sub>			■		■
	Incomplete combustion, conversion, coking, general processing, leak detection	CO	■		■	■	■
		CO high concentration			■		■
		CO w/presence of H <sub>2</sub>			●	●	●
	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	■		■	■	■
		SO <sub>2</sub>			■	■	■
		CO <sub>2</sub>					■
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>		■			■
	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				■	■
		H <sub>2</sub> S	■		■	■	■
		SO <sub>2</sub>			■	■	■
	Chemical synthesis, tank-cleaning, enclosed buildings or structures	O <sub>2</sub> Deficiency/enrichment	■	■		■	■
	Organic synthesis, liquid-solid separation, compounding, granulating & tablet-coating operations, drying & packaging	VOCs					■
POWER PLANTS	Confined space throughout processes	O <sub>2</sub> Deficiency/enrichment	■	■		■	■
		CO <sub>2</sub>					■
	Boiler leaks	CO	■		■	■	■
		CO high concentration			■		■
	Throughout processes	Combustible gases (CH <sub>4</sub> )				■	■
	Throughout processes	H <sub>2</sub> S	■		■	■	■

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Instruments & Industries			ALTAIR	ALTAIR PRO	ALTAIR 2X	ALTAIR 4X/4XR	ALTAIR 5X/5X PID with internal pump
Number of Detected Gases			1	1	up to 2	up to 4	up to 6
	Application/Task	Gas/Hazard					
POWER PLANTS	Fossil fuel power plants	Combustible gases				■	■
		CO	■		■	■	■
		CO high concentration			■		■
		CO w/presence of H <sub>2</sub>			●	●	●
		CO <sub>2</sub>					■
		NO					■
		NO <sub>2</sub>			■	■	■
		SO <sub>2</sub>			■	■	■
		NH <sub>3</sub>			■		■
		VOCs					■
	Nuclear power plants	O <sub>2</sub> Deficiency/enrichment	■	■		■	■
		Combustible gases				■	■
		CO	■		■	■	■
		CO high concentration			■		■
		CO w/presence of H <sub>2</sub>			●	●	●
		NH <sub>3</sub>			■		■
		NO <sub>2</sub>			■	■	■
		SO <sub>2</sub>			■	■	■
	VOCs					■	
SEMICONDUCTOR	Manufacturing	NH <sub>3</sub>			■		■
		Cl <sub>2</sub>			■		■
		NO					■
		NO <sub>2</sub>			■	■	■
	As doping agent in manufacturing, diffusion and ion implantation, chemical vapor deposition	PH <sub>3</sub>		■			■
	Lithography, etching, oxidation, metallization, assembly & testing	VOCs					■
SHIPYARD/MARINE	Combustion	CO	■		■	■	■
		CO high concentration			■		■
	Battery room	CO	■		■	■	■
		CO high concentration			■		■
		CO w/presence of H <sub>2</sub>			●	●	●
	Oil trans-shipment (combustible gas sampling within inert environments)	Combustible gases				■	■
Tank emissions	H <sub>2</sub> S	■		■	■	■	

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Instruments & Industries			ALTAIR	ALTAIR PRO	ALTAIR 2X	ALTAIR 4X/4XR	ALTAIR 5X/5X PID with internal p pump
Number of Detected Gases			1	1	up to 2	up to 4	up to 6
	Application/Task	Gas/Hazard					
SHIPYARD/MARINE	Diesel motors, fuel boilers	NO <sub>2</sub>			■	■	■
	Confined space, storage tanks, cargo holds	O <sub>2</sub> Deficiency/enrichment	■	■		■	■
		VOCs					■
	Confined space	CO <sub>2</sub>					■
WATER & WASTEWATER TREATMENT	Processing; storage tanks, rooms & pipe	Combustible Gases				■	■
		H <sub>2</sub> S	■		■	■	■
		NH <sub>3</sub>			■		■
		Cl <sub>2</sub>			■		■
		ClO <sub>2</sub>		■			■
		VOCs					■
	Digesters, digester gas storage	Combustible Gases				■	■
		O <sub>2</sub>	■	■		■	■
		H <sub>2</sub> S	■		■	■	■
		CO <sub>2</sub>					■
	Stagnant gas, incinerator	Combustible Gases				■	■
		CO <sub>2</sub>					■
	General processes	Combustible Gases				■	■
		O <sub>2</sub>	■	■		■	■
		H <sub>2</sub> S	■		■	■	■
	Sewer work	Combustible Gases				■	■
		O <sub>2</sub>	■	■		■	■
		CO	■		■	■	■
		H <sub>2</sub> S	■		■	■	■
		NH <sub>3</sub>			■		■
		CO <sub>2</sub>					■
		VOCs					■
	Confined space	Combustible Gases				■	■
		O <sub>2</sub>	■	■		■	■
		CO	■		■	■	■
		H <sub>2</sub> S	■		■	■	■
		CO <sub>2</sub>					■
NH <sub>3</sub>				■		■	
Cl <sub>2</sub>				■		■	
ClO <sub>2</sub>			■			■	
VOCs					■		

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Instruments & Industries			ALTAIR	ALTAIR PRO	ALTAIR 2X	ALTAIR 4X/4XR	ALTAIR 5X/5X PID with internal pump
Number of Detected Gases			1	1	up to 2	up to 4	up to 6
	Application/Task	Gas/Hazard					
WATER & WASTEWATER TREATMENT	Dechlorination, storage tanks	Cl <sub>2</sub>			■		■
		ClO <sub>2</sub>		■			
		SO <sub>2</sub>			■	■	
	Wet well influent	Combustible Gases				■	■
		CO	■		■	■	■
		H <sub>2</sub> S	■		■	■	■
	Pump stations	Combustible Gases				■	■
		O <sub>2</sub>	■	■		■	■
CO		■		■	■	■	
H <sub>2</sub> S		■		■	■	■	
WELDING	Confined space welding, arc air cutting, gas-shielded arc welding, metal cutting & flame gouging, gas pressure welding	CO	■		■	■	■
		CO high concentration			■		■
	Thermite arc & stud welding, laser welding & chilling, arc air cutting, 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> Deficiency/enrichment	■	■		■	■

- XCell CO H<sub>2</sub>-RES sensor

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### Your direct contact

 

**Great Britain**  
 Hopton Park, Devizes  
 Wiltshire, SN10 2JP  
 United Kingdom  
 Phone +44 (0)800 066 2222  
[info.gb@MSAsafety.com](mailto:info.gb@MSAsafety.com)