



Portable Instrument Application Guide

Choose the Right Gas Detector for Your Application



WE KNOW WHAT'S AT STAKE.

Gas Detection Instruments



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

Advanced Technology

Having advanced technology throughout research, development and manufacturing stages helps us to improve creative application to product design and respond quickly to your changing needs, as well as combine traditional values with continuous product enhancement.

XCell® sensors have a typical life of more than double the industry average and are engineered using MSA Safety's proprietary application-specific integrated circuit (ASIC) design. MSA XCell Sensors are a breakthrough in chemical and mechanical sensor design. By miniaturising the sensor controlling electronics and placing them inside the sensor itself, XCell Sensors offer superior stability, accuracy and repeatability - enabling faster response and span calibration times.

The latest example of advanced technology is our XCell Pulse Sensor Technology, now available on select versions of the ALTAIR® 2XP gas detector, which enables stand-alone bump testing and eliminates the need for bottled gas. With less time spent on calibration and bump tests, you can save calibration gas, maintenance costs and save money. But, most importantly in our industry, saving seconds on response time can also mean helping to save lives.

Durability

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

Combining advanced technology with extreme product durability means that your total cost of ownership is kept low in your gas detection programs.

Our Focus on You

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.



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.

Industry	Gases/Hazards													VOCs
	Combustible Gases	O ₂ Deficiency/Enrichment	Ammonia	Carbon Dioxide	Carbon Monoxide	Chlorine	Chlorine Dioxide	Hydrogen Cyanide	Hydrogen Sulfide	Nitric Oxide	Nitrogen Dioxide	Phosphine	Sulfur Dioxide	
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	TOXIC GASES	OXYGEN (O ₂)
Acetone (C ₃ H ₆ O)	Hydrogen (H ₂)	Volatile Organic Compounds (VOCs)
Benzene (C ₆ H ₆)	Isobutane (C ₄ H ₁₀)	
Butane (C ₄ H ₁₀)	Methane (CH ₄)	
Ethylene (C ₂ H ₄)	Pentane (C ₅ H ₁₂)	
Heptane (C ₇ H ₁₆)	Toluene (C ₇ H ₈)	
Hexane (C ₆ H ₁₄)	Propane (C ₃ H ₈)	
	Ammonia (NH ₃)	
	Carbon dioxide (CO ₂)	
	Carbon monoxide (CO)	
	Chlorine (Cl ₂)	
	Chlorine dioxide (ClO ₂)	
	Hydrogen cyanide (HCN)	
	Hydrogen sulfide (H ₂ S)	
	Nitric oxide (NO)	
	Nitrogen dioxide (NO ₂)	
	Phosphine (PH ₃)	
	Sulfur dioxide (SO ₂)	

Instruments & Industries			ALTAIR® Single-Gas Detector	ALTAIR® Pro Single-Gas Detector	ALTAIR® 2X Gas Detector	ALTAIR® 4XR Multigas Detector	ALTAIR io® 4 Connected Gas Detector	ALTAIR® 5X/5X PID
Number of Detected Gases			1	1	up to 2	up to 4	up to 4	up to 6
	Application/Task	Gas/Hazard						
AGRICULTURE	Chillers	NH ₃			■			■
	Silos/confined space	CO ₂						■
	Forklift operation	CO	■		■	■	■	■
	Fumigant	H ₂ S	■		■	■	■	■
	Silos/confined space	NO						■
		NO ₂			■	■	■**	■
		O ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
		Combustible gases				■	■	■
	Insecticide for fumigation	PH ₃		■				■
	AVIATION	Engine repair & maintenance	CO	■		■	■	■
CO <i>high concentration</i>					■			■
Combustible gases						■	■	■
Confined space		O ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
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 ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
		CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
		CO <i>w/presence of H₂</i>			●	●	●	●
		Cl ₂			■			■
		NH ₃			■			■
		H ₂ S	■		■	■	■	■
		ClO ₂		■				■
		NO						■
		NO ₂			■	■	■**	■
		Combustible gases				■	■	■
		SO ₂			■	■	■**	■
	Organic synthesis operations, liquid-solid separation, cleaning agents	VOCs						■

● XCell CO H₂-RES sensor

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Instruments & Industries			ALTAIR® Single-Gas Detector	ALTAIR® Pro Single-Gas Detector	ALTAIR® 2X Gas Detector	ALTAIR® 4XR Multigas Detector	ALTAIR io®4 Connected Gas Detector	ALTAIR® 5X/5X PID
Number of Detected Gases			1	1	up to 2	up to 4	up to 4	up to 6
	Application/Task	Gas/Hazard						
CONSTRUCTION	Vehicle emissions (diesel exhaust), generators, digging operations, trenching	CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
	Trenching, underground construction	Combustible gases				■	■	■
	Digging operations, underground construction	H ₂ S	■		■	■	■	■
	Diesel exhaust	NO						■
		NO ₂			■	■	■**	■
	Confined spaces, trenching, underground construction	O ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
		CO ₂						■
	Use of paints, caulks, sealants, coatings, varnishes, stains, wall coverings	VOCs						■
FIRE BRIGADES	Confined space entry (rescue), underground construction	O ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
		CO ₂						■
	Overhaul, home calls (boilers, leaks), trenching	CO	■		■	■	■	■
	Underground construction, trenching	Combustible gases				■	■	■
		H ₂ S	■		■	■	■	■
	HazMat	NH ₃			■			■
		Cl ₂			■			■
		Combustible gases				■	■	■
		H ₂ S	■		■	■	■	■
		PH ₃		■				■
		SO ₂			■	■	■**	■
		VOCs						■
FOOD & BEVERAGE PROCESSING	Refrigeration facilities & cold storage	NH ₃						
	Breweries & wineries, carbonated beverage bottling, fermentation tanks, refrigeration and baking facilities	CO ₂						■
		CO	■		■	■	■	■
	Forklifts	CO <i>high concentration</i>			■			■
		H ₂ S	■		■	■	■	■
	Confined space, packaging or gassing foods	O ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
		PH ₃		■				■
	Production process	Cl ₂			■			■
		SO ₂			■	■	■**	■
		VOCs						■
	Silos	Combustible gases				■	■	■

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Instruments & Industries			ALTAIR® Single-Gas Detector	ALTAIR® Pro Single-Gas Detector	ALTAIR® 2X Gas Detector	ALTAIR® 4XR Multigas Detector	ALTAIR io ⁴ Connected Gas Detector	ALTAIR® 5X/5X PID
Number of Detected Gases			1	1	up to 2	up to 4	up to 4	up to 6
	Application/Task	Gas/Hazard						
FOUNDRIES	Furnace operation, coremaking, metal preparation & pouring	CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
		CO <i>w/presence of H₂</i>			●	●	●	●
		Combustible gases				■	■	■
		VOCs						■
	Coremaking	H ₂ S	■		■	■	■	■
		NO						■
		NO ₂			■	■	■**	■
		SO ₂			■	■	■**	■
	Confined space	O ₂ <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	■		■	■	■	■
		CO <i>high concentration</i>			■			■
		CO <i>w/presence of H₂</i>			●	●	●	●
		Combustible gases				■	■	■
	Coking operations	H ₂ S	■		■	■	■	■
		SO ₂			■	■	■**	■
	Welding	NO						■
		NO ₂			■	■	■**	■
	Confined space	O ₂	■	■		■	■	■
	Motor maintenance & cleaning, coke oven emissions	VOCs						■
MINING	Confined space	“Black damp” O ₂ deficiency		■		■	■*	■
	Mechanized coal cutting	“Fire damp” (Combustible gases)				■	■*	■
	Mining process	“Stink damp” H ₂ S	■*		■	■	■*	■
	Result of combustion (fire), diesel-powered machinery, confined space, blasting	“White damp” CO			■	■	■*	■
		CO <i>high concentration</i>			■			■
	Emergency rescue action	Combustible gases				■	■	■
		CO ₂						■
	Diesel exhaust	NO						■
	Diesel-powered machinery, blasting	NO ₂			■	■	■**	■

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*Not M1/M2 approved

**coming soon

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Number of Detected Gases			1	1	up to 2	up to 4	up to 4	up to 6
	Application/Task	Gas/Hazard						
OIL, GAS & PETROLEUM	Petroleum refining	NH ₃			■			■
	Incomplete combustion, conversion, coking, general processing, leak detection	CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
		CO <i>w/presence of H₂</i>			●	●	●	●
	Conversion processes, isomerization, leak detection, catalytic reforming, treatment processes	Combustible gases				■	■	■
	Refining process, general leak detection, treatment processes, crude separation, drilling rigs	H ₂ S	■		■	■	■	■
		SO ₂			■	■	■**	■
		CO ₂						■
	Confined space, tank-cleaning operations, enclosed buildings or structures	O ₂	■	■		■	■	■
	Refining process, process stream sample collection, general plant operations	VOCs						■
PAPER & PULP	Paper production (bleaching)	Cl ₂			■			■
		ClO ₂		■				■
	Chemical pulping, Kraft pulping	H ₂ S	■		■	■	■	■
		SO ₂			■	■	■**	■
	Paper production (coating & drying)	VOCs						■
PHARMACEUTICAL	Manufacturing	NH ₃			■			■
		Cl ₂			■			■
		Combustible gases				■	■	■
		H ₂ S	■		■	■	■	■
		SO ₂			■	■	■**	■
	Chemical synthesis, tank-cleaning, enclosed buildings or structures	O ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
	Organic synthesis, liquid-solid separation, compounding, granulating & tablet-coating operations, drying & packaging	VOCs						■
POWER PLANTS	Confined space throughout processes	O ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
		CO ₂						■
	Boiler leaks	CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
	Throughout processes	Combustible gases (CH ₄)				■	■	■
	Throughout processes	H ₂ S	■		■	■	■	■

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Number of Detected Gases			1	1	up to 2	up to 4	up to 4	up to 6
	Application/Task	Gas/Hazard						
POWER PLANTS	Fossil fuel power plants	Combustible gases				■	■	■
		CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
		CO <i>w/presence of H₂</i>			●	●	●	●
		CO ₂						■
		NO						■
		NO ₂			■	■	■**	■
		SO ₂			■	■	■**	■
		NH ₃			■			■
		VOCs						■
	Nuclear power plants	O ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
		Combustible gases				■	■	■
		CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
		CO <i>w/presence of H₂</i>			●	●	●	●
		NH ₃			■			■
		NO ₂			■	■	■**	■
		SO ₂			■	■	■**	■
		VOCs						■
SEMICONDUCTOR	Manufacturing	NH ₃			■			■
		Cl ₂			■			■
		NO						■
		NO ₂			■	■	■**	■
	As doping agent in manufacturing, diffusion and ion implantation, chemical vapor deposition	PH ₃		■				■
	Lithography, etching, oxidation, metallization, assembly & testing	VOCs						■
SHIPYARD/MARINE	Combustion	CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
	Battery room	CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
		CO <i>w/presence of H₂</i>			●	●	●	●
	Oil trans-shipment (combustible gas sampling within inert environments)	Combustible gases				■	■	■
	Tank emissions	H ₂ S	■		■	■	■	■

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Number of Detected Gases			1	1	up to 2	up to 4	up to 4	up to 6
	Application/Task	Gas/Hazard						
SHIPYARD/MARINE	Diesel motors, fuel boilers	NO ₂			■	■	■**	■
	Confined space, storage tanks, cargo holds	O ₂ <i>Deficiency/enrichment</i>	■	■		■	■	■
		VOCs						■
	Confined space	CO ₂						■
WATER & WASTEWATER TREATMENT	Processing; storage tanks, rooms & pipe	Combustible gases				■	■	■
		H ₂ S	■		■	■	■	■
		NH ₃			■			■
		Cl ₂			■			■
		ClO ₂		■				■
		VOCs						■
	Digesters, digester gas storage	Combustible gases				■	■	■
		O ₂	■	■		■	■	■
		H ₂ S	■		■	■	■	■
		CO ₂						■
	Stagnant gas, incinerator	Combustible gases				■	■	■
		CO ₂						■
	General processes	Combustible gases				■	■	■
		O ₂	■	■		■	■	■
		H ₂ S	■		■	■	■	■
	Sewer work	Combustible gases				■	■	■
		O ₂	■	■		■	■	■
		CO	■		■	■	■	■
		H ₂ S	■		■	■	■	■
		NH ₃			■			■
		CO ₂						■
		VOCs						■
	Confined space	Combustible gases				■	■	■
		O ₂	■	■		■	■	■
		CO	■		■	■	■	■
		H ₂ S	■		■	■	■	■
		CO ₂						■
		NH ₃			■			■
		Cl ₂			■			■
		ClO ₂		■				■
		VOCs						■

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Number of Detected Gases			1	1	up to 2	up to 4	up to 4	up to 6
	Application/Task	Gas/Hazard						
WATER & WASTEWATER TREATMENT	Dechlorinization, storage tanks	Cl ₂			■			■
		ClO ₂		■				
		SO ₂			■	■	■ **	
	Wet well influent	Combustible gases				■	■	■
		CO	■		■	■	■	■
		H ₂ S	■		■	■	■	■
	Pump stations	Combustible gases				■	■	■
		O ₂	■	■		■	■	■
		CO	■		■	■	■	■
		H ₂ S	■		■	■	■	■
WELDING	Confined space welding, arc air cutting, gas-shielded arc welding, metal cutting & flame gouging, gas pressure welding	CO	■		■	■	■	■
		CO <i>high concentration</i>			■			■
	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 ₂			■	■	■ **	■
	Confined space welding, electron beam welding	O ₂	■	■		■	■	■
		Deficiency/enrichment						

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Note: This Bulletin contains only a general description of the products shown. While product uses and performance capabilities are generally described, the products shall not, under any circumstances, be used by untrained or unqualified individuals. The products shall not be used until the product instructions/user manual, which contains detailed information concerning the proper use and care of the products, including any warnings or cautions, have been thoroughly read and understood. Specifications are subject to change without prior notice. MSA is a registered trademark of MSA Technology, LLC in the US, Europe, and other Countries. For all other trademarks visit <https://us.msasafety.com/Trademarks>.

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