Instrumentation

Something you can rely on

Understanding Environmental Surveillance

Battery-powered, direct-reading instruments are classified as two groups - single-gas instruments or multiple-gas instruments - typically monitoring one or a combination of the following atmospheric conditions:

1. oxygen deficiency or enrichment;
2. the presence of combustible gas; and
3. the presence of certain toxic gases.

Depending on the capabilities of the instrument, monitoring can be conducted simultaneously for oxygen and combustible gas, or for oxygen, combustible gas and toxic gases. These devices are commonly referred to as 2-in-1, 3-in-1, 4-in-1 or 5-in-1 alarms.

No matter which type of instrument is used to check environmental gas concentrations, regular monitoring should be performed because a contaminant's level of combustibility or toxicity might increase even if it initially appears to be low or non-existent. In addition, oxygen deficiency can occur unexpectedly.

Atmospheric Composition

To determine the composition of an atmosphere, reliable instruments should be used to draw air samples. If possible, do not open the entry portal to the confined space before this step has been completed. Sudden changes in atmospheric composition within the confined space could cause violent reactions, or dilute the contaminants in the confined space, giving a false low initial gas concentration.

When testing permit-required spaces for acceptable entry conditions, always test in the following order:

1. oxygen content
2. flammable gases and vapors
3. potential toxic air contaminants

Figure 1

Comprehensive testing should be conducted in various locations within the work area. Some gases are heavier than air, and tend to collect at the bottom of a confined space. Others are lighter, and are usually in higher concentrations near the top of the confined space. Still others are the same molecular weight as air, so they can be found in varying concentrations throughout the space. This is why test samples should be drawn at the top, middle and bottom of the space to pinpoint varying concentrations of gases or vapors (see ***Figure 1***). The results of the atmospheric testing will have a direct impact on the selection of protective equipment necessary for the tasks in the area. It may also dictate the duration of worker exposure to the environment of the space, or whether an entry will be made at all. Substance-specific detectors should be used whenever actual contaminants have been identified.

Figure 2

Figure 3

Combustible Gases

In order for combustion to occur, there must be three elements:

1. fuel
2. oxygen to support combustion
3. heat or a source of ignition

This is known as the fire triangle, but if you remove any one of the legs, combustion will not occur (see ***Figure 2***).

The percentage of combustible gas in the air is important, too. For example, a manhole filled with fresh air is gradually filled by a leak of combustible gas such as methane or natural gas, mixing with the fresh air. As the ratio of gas to air changes, the sample passes through three ranges: lean, explosive and rich (see Figure 3). In the lean range, there isn't enough gas in the air to burn. On the other hand, the rich range has too much gas and not enough air. However, the explosive range has just the right combination of gas and air to form an explosive mixture. Care must be taken, however, when a mixture is too rich, because dilution with fresh air could bring the mixture into the flammable or explosive range. An analogy is the automobile that won't start on a cold morning (a lean atmosphere because the liquid gasoline has not vaporized sufficiently), but can be flooded with too much gasoline (a rich atmosphere with too much vaporization). Eventually, when the right mixture of gas and air finally exists (explosive), the car starts.

How Combustible Gas Monitors Work

To understand how portable combustible gas detection instruments work, it is first important to understand what is meant by the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL). When certain proportions of combustible vapors are mixed with air and a source of ignition is present, an explosion can occur. The range of concentrations over which this reaction can occur is called the explosive range. This range includes all concentrations in which a flash will occur or a flame will travel if the mixture is ignited (see ***Figure 3***). The lowest percentage at which this can happen is the LEL; the highest percentage is the UEL.

Most combustible instruments display gas concentrations as a percentage of the LEL. Some models have gas readouts as a percentage by volume and others display both percent of LEL and percent combustible gas by volume. What's the difference? For example, the LEL of methane (the major component in natural gas) is 5 percent by volume, and the UEL is 15 percent by volume. If we slowly fill a room with methane, when the concentration reaches 2.5 percent by volume, it is 50 percent of the LEL; at 5 percent by volume it is 100 percent of the LEL. Between 5 and 15 percent by volume, a spark could set off an explosion.

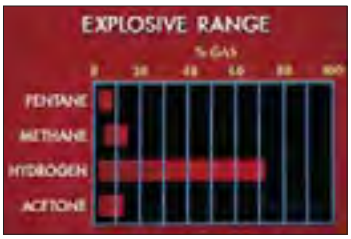

Figure 4

Different gases need different percent by volume concentrations to reach 100 percent of the LEL (see ***Figure 4***). Pentane, for example, has an LEL of 1.5 percent. Instruments that measure in percent of the LEL are easy to use because, regardless of the gas, you are most concerned with how close the concentration is to the LEL.

Single-Gas Monitors for Oxygen Deficiency

Oxygen indicators measure atmospheric concentrations of oxygen. Concentrations are generally measured over a range of 0 to 25 percent oxygen in air, with readings being displayed on either digital readout or an analog meter. Oxygen indicators are calibrated with uncontaminated fresh air containing a minimum of 20.8 percent oxygen. With some models, an alarm is activated when oxygen levels drop below 19.5 percent.

Single-Gas Monitors for Combustible Gases

Figure 5

Single-gas instruments for monitoring combustible gases and vapors are generally calibrated on pentane and are designed for general-purpose monitoring of hydrocarbon vapors. Such instruments operate by the catalytic action of a heated platinum filament in contact with combustible gases (see ***Figure 5***). The filament is heated to operating temperature by an electric current. When the gas sample contacts the heated filament, combustion on its surface raises the temperature in proportion to the quantity of combustibles in the sample. A Wheatstone bridge circuit, incorporating the filament as one arm, measures the change in electrical resistance due to the temperature increases. This change indicates the percentage of combustible gas present in the sample.

Single-Gas Monitors for Toxic Gases

Compact, battery-powered devices can be used to measure levels of such gases as carbon monoxide (CO) or hydrogen sulfide (H_2S), depending on the model selected. Toxic gas monitors use electrochemical cells (see ***Figure 6***). If the gas of interest enters the cell, the reaction produces a current output proportional to the amount of gas in the sample. With these instruments, audible and visible alarms sound if the gas concentration exceeds a preset level. These devices are well suited for use in confined spaces containing motors or engines, which can generate large quantities of CO, as well as in sewers, waste treatment plants and "sour crude" processing stations which tend to have hazardous volumes of H_2S.

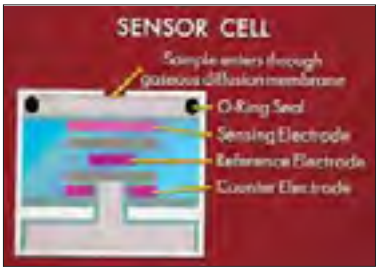

Figure 6

Multiple-Gas Monitors for Oxygen and Combustible Gas

In applications where it is necessary to determine oxygen and combustible gas levels simultaneously, 2-in-1 diffusion-type devices can be used. Sensors measure 0 to 100 percent of the LEL and oxygen from 0 to 25 percent. Remote sampling requires either a pump module or an aspirator bulb adapter.

Multiple-Gas Monitors for Oxygen, Combustible and Toxic Gases

Toxic gases and vapors, which can be inhaled or absorbed through the skin, are frequently found in confined spaces. Sometimes, these atmospheric hazards can also displace oxygen and may incapacitate the body's ability to maintain respiration. Some toxic gases and vapors can also cause long-term physical damage to the body in cases of repeated exposure.

A number of instruments are available to assist in detecting toxic gas. Pocket-size monitors operate by diffusion or an aspirator bulb. Larger instruments with built-in pumps draw samples from the immediate area or from outside the confined space work area when used with sampling lines.

Diffusion-type instruments are available for simultaneously measuring the LEL of combustible gases, oxygen levels and toxic levels (in parts per million) of H2S, CO and other toxic gases. Alarms also alert the user to low and high oxygen levels. Remote sampling pump adapters are available to convert these diffusion-type instruments into pump-style instruments.

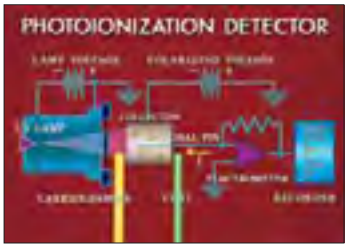

Figure 7

Photoionization Devices for Toxic Gases and Vapors

A photoionization detector, featuring micro-processor technology, uses ultraviolet light to ionize molecules of chemical substances in a gaseous or vaporous state (see ***Figure 7***). A real-time digital readout allows the user to make an immediate determination of gas and vapor concentrations. Depending upon calibration input, gas and vapors are measured over a 0.1 to 10,000 ppm scale. Some instruments automatically compensate for signal loss due to humidity, which is inherent in all PID detectors.

Detector Tube Sampling Systems

Detector tube-type devices are recommended for conducting quick evaluations of potential hazards that cannot otherwise be measured. With detector tubes, a known volume of air is drawn through the tube, using a manually operated or battery-powered sampling pump.

If gas or vapor is present in the air, chemically treated granules in the tube are stained a different color. By measuring the length of the color stain within the tube, users can determine concentration levels.

Most tubes available today are made of glass, have break-off tips, and are filled with treated chemical granules. They generally have a shelf life of 24 to 30 months.

One type of pump frequently used with a detector tube is a compact, bellows-type device. Accurate and repeatable sample flows can be assured by a shaft that guides the bellows during compression. Some models feature an end-of-stroke indicator that lets the user know when a full air sample has been drawn. Models with an integral stroke counter eliminate the tedious recording of multiple pump strokes.

Personal Sampling

Personal sampling is used to determine the concentration of airborne contaminants. Personal sampling pumps are designed to measure individual workers' exposures, so they typically are lightweight, belt-mounted, battery-powered devices.

The process of sampling entails drawing a predetermined volume of air through a filter designed to trap contaminants. The filter is contained in a plastic cassette, which is attached by plastic tubing to a sampling pump calibrated to draw a specific, known volume of air into the filter. After air samples are drawn, the filters are sent to a laboratory where they are examined to determine the level of exposure.

Personal sampling determines the concentration found in the "breathing zone" or the area near the worker's face, which is usually measured at or near the collar or lapel.

Calibration

To ensure the accuracy of all monitoring and detection equipment, calibration should be performed regularly. If the instrument reading differs significantly from the values of the known standard, the instrument should not be used until it has been adjusted or, if necessary, repaired.

ALTAIR® Maintenance-Free Single-Gas Detector

The ALTAIR® Single-Gas Detector features sensor options for carbon monoxide, hydrogen sulfide and oxygen and will operate for **over** two years maintenance free. This long lifespan, coupled with the unit's high performance, results in one of the most cost-effective single-gas detectors on the market. Advanced design offers superior dust and water protection and high resistance to RFI. Rubberized housing and one-button operation provide the durability and ease of use users expect from MSA instruments.

Alarm System

The triple-alarm system featuring two bright flashing LEDs, a piercing audible alarm, and a vibrating alarm ensures that no alarm condition goes unnoticed.

- 95 dB audible alarm (distinct sounds for High and Low alarms)
- Dual LEDs positioned to be seen from all angles
- Standard vibrating alarm and standard event logging

Durability Features

- Hard polycarbonate case, encapsulated in a thick rubberized shell
- Extremely resistant to drops and impacts
- Rated to IP67 protection levels for dust/water ingress

Warranty

Two years or 18 hours of alarm (1080 minutes)

ALTAIR® Single-Gas Detectors

Instrument Type	Part No.	Low Alarm	High Alarm
Carbon Monoxide (CO)	10092522	25 ppm	100 ppm
Hydrogen Sulfide (H_2S)	10092521	10 ppm	15 ppm
Oxygen (O_2)	10092523	19.5% Vol	23% Vol
Alternate Set Point Models	**Part No.**	**Low Alarm**	**High Alarm**
Carbon Monoxide (CO)	10071334	30 ppm	60 ppm
Carbon Monoxide (CO)	10071335	35 ppm	100 ppm
Carbon Monoxide (CO)	10071336	35 ppm	400 ppm
Carbon Monoxide (CO)	10071337	50 ppm	200 ppm
Carbon Monoxide (CO)	10071338	100 ppm	300 ppm
Hydrogen Sulfide (H_2S)	10071340	10 ppm	200 ppm
Hydrogen Sulfide (H_2S)	10071361	5 ppm	10 ppm
Hydrogen Sulfide (H_2S)	10071362	8 ppm	12 ppm
Hydrogen Sulfide (H_2S)	10071363	7 ppm	14 ppm
Oxygen (O_2)	10071364	19.5% Vol	18% Vol

Accessories and Parts

710882	Cylinder, 60 ppm CO
473180	Cylinder, 300 ppm CO
467897	Cylinder, 40 ppm H_2S, RP
711062	Cylinder, 40 ppm H_2S, Econo-Cal
467895	Regulator, 0.25 lpm
10040002	Clip, suspender (standard)
10069894	Clip, stainless steel
10041105	Cellphone clip
10041107	Lanyard kit
710946	FiveStar® Link® with IR (for event log)
10030325	Tubing, 16"
10073346	Hardhat clip

ALTAIR® QuickCheck™ Station

- Fast, easy bump tests
- Maintenance free
- Checks instrument's visual, audible, and vibrating alarms
- Easy-to-understand LEDs show tests in progress and pass/fail status
- Compatible with most ALTAIR® and ALTAIR® Pro Detectors

ALTAIR® QuickCheck™ Station

Manual Regulator	Automatic Regulator	Gas Type
10076694	10076706	O_2/CO/H_2S/SO_2/NO_2
10076703	10076715	Cl_2/ClO_2
10076697	10079709	NH_3
10076700	10076712	HCN

Replacement and Accessory Parts

10058037	Aust Power Supply
10049410	Vehicle Power Supply
10077384	Regulator Tubing
10077385	Front Housing Assembly
10075893	Automatic Gas Regulator
467895	Manual Regulator
710386	Single Cylinder Holder

Instrumentation

ALTAIR® Pro Single-Gas Detector

The ALTAIR® Pro Single-Gas Detector has a wide range of features, including simple intuitive operation, small rugged design, and dependable technology that is there when you need it. These innovative toxic gas and oxygen detectors are based upon the design of the popular ALTAIR® Single-Gas Detector, but with added features and functionality.

- Tough rubberized housing
- One-button operation
- Accurately measures the gas concentration or percent oxygen
- Displays information on a large, clear, backlit LCD.
- Superior dust and water protection (rated IP67 except O_2-R)
- Event-logging and data-logging
- Excellent impact resistance
- Versions available for CO, H_2S, O_2, NH_3, Cl_2, ClO_2, NO_2, SO_2, HCN and PH_3
- Great RFI performance
- Adjustable alarm set points are offered for LOW, HIGH, TWA and STEL
- Alarms are indicated by flashing LEDs, an audible alarm, and an internal vibrating alarm.
- Replaceable battery and sensor

The ALTAIR® Pro Single-Gas Detector will provide worry-free performance and stand up to the toughest handling in even the toughest industrial environments. The sensors and battery can easily be replaced to keep the unit performing for years. The ALTAIR® Pro Single-Gas Detector is designed and built with MSA's superior quality and is part of the MSA STELLAR® Series, which features a varied selection of single-gas and multigas instruments.

Some of the available ALTAIR® Gas Detectors

ALTAIR® Pro Single-Gas Detectors

Instrument Type	Part No.	Low Alarm	High Alarm	STEL	TWA
Oxygen (O_2)	10074137	19.50%	23.00%	N/A	N/A
Carbon Monoxide (CO)	10074135	25 ppm	100 ppm	100 ppm	25 ppm
Carbon Monoxide (CO) Steel	10076724	75 ppm	200 ppm	200 ppm	75 ppm
Hydrogen Sulfide (H_2S)	10074136	10 ppm	15 ppm	15 ppm	10 ppm
Hydrogen Cyanide (HCN)	10076729	4.7 ppm	10 ppm	10 ppm	4.7 ppm
Chlorine (CL_2)	10076716	0.5 ppm	1.0 ppm	1.0 ppm	0.5 ppm
Chlorine Dioxide (CLO_2)	10076717	0.1 ppm	0.3 ppm	0.3 ppm	0.1 ppm
Sulfur Dioxide (SO_2)	10076736	2.0 ppm	5.0 ppm	5.0 ppm	2.0 ppm
Nitrogen Dioxide (NO_2)	10076731	2.0 ppm	5.0 ppm	5.0 ppm	2.0 ppm
Ammonia (NH_3)	10076730	25 ppm	50 ppm	35 ppm	25 ppm
Phosphine (PH_3)	10076735	0.3 ppm	1.0 ppm	1.0 ppm	0.3 ppm
Oxygen Remote (O_2-R)	10076733	19.50%	23.00%	N/A	N/A
Alternate Set Point Models	**Part No.**	**Low Alarm**	**High Alarm**	**STEL**	**TWA**
Carbon Monoxide (CO)	10076718	30 ppm	60 ppm	60 ppm	30 ppm
Carbon Monoxide (CO)	10076719	35 ppm	100 ppm	100 ppm	35 ppm
Carbon Monoxide (CO)	10076720	35 ppm	400 ppm	400 ppm	35 ppm
Carbon Monoxide (CO)	10076721	50 ppm	200 ppm	200 ppm	50 ppm
Carbon Monoxide (CO)	10076722	100 ppm	300 ppm	300 ppm	100 ppm
Carbon Monoxide (CO) Steel	10080532	199 ppm	200 ppm	200 ppm	35 ppm
Hydrogen Sulfide (H_2S)	10076728	10 ppm	20 ppm	20 ppm	10 ppm
Hydrogen Sulfide (H_2S)	10076725	5 ppm	10 ppm	10 ppm	5 ppm
Hydrogen Sulfide (H_2S)	10076727	8 ppm	12 ppm	12 ppm	8 ppm
Hydrogen Sulfide (H_2S)	10076726	7 ppm	14 ppm	14 ppm	7 ppm

Accessories and Parts

467895	Regulator, 0.25 lpm	10041105	Cellphone clip
10030325	Tubing, 16" (do not use with NH_3, Cl_2, and ClO_2)	10041107	Lanyard clip
10080534	Tubing, 16" Teflon-lined (NH_3, Cl_2, and ClO_2)	10073346	Hardhat clip
10074132	3V CR2 battery	10040002	Clip, suspender (standard)
10069894	Clip, stainless steel	710946	MSA Link with IR

ALTAIR® 4 Multigas Detector

The ALTAIR® 4 Multigas Detector for LEL, CO, H_2S, and O_2 is a super-durable, competitively priced, personal multigas detector. The ALTAIR® 4 Multigas Detector is the only portable gas detector with MotionAlert™ feature if a user should become disabled due to unforeseen hazards. When enabled, the MotionAlert™ feature will activate if the instrument does not detect motion for 30 seconds, and is ideal for confined space entry applications. This unique gas detector function is easily turned off by the user if desired.

Features

- MotionAlert™ feature plus audible, visual, and vibrating alarms
- Most rugged instrument available
- Large buttons for easy operation
- 20-hour battery run time when fully charged
- Tested to IP67
- Galaxy® System compatible
- Global approvals
- Economically priced
- MSA Link™ Software-ready
- QuickCheck™ Test Station available for fast, easy bump testing

ALTAIR® 4 Multigas Detector

ALTAIR® 4 Multigas Detector (UL approved), with data logging feature, charger, calibration cap & tubing, CD manual

SAA Certification	Description
10089081	ALTAIR® 4 Multigas Detector with MotionAlert™ & 2 Year Warranty (LEL, O_2, CO, H_2S)
10089088E	ALTAIR® 4 Multigas Detector with MotionAlert™ feature (LEL, O_2, CO, H_2S) & 4 Yr Warranty
10089088EK	ALTAIR® 4 Multigas Detector with MotionAlert™ (LEL, O2, CO, H_2S) Kit included & 4 Yr Warranty
10089082	ALTAIR® 4 Multigas Detector (LEL, O_2, CO)
10089082E	ALTAIR® 4 Multigas Detector with MotionAlert™ feature (LEL, O_2, CO)
10089084	ALTAIR® 4 Multigas Detector (LEL, O_2)
10089090E	ALTAIR® 4 Multigas Detector with MotionAlert™ feature (LEL, O_2)

Specifications

Gas	Range	Resolution
LEL	0–100%	1%
O_2	0–25% vol	0.1% vol
CO	0–999 ppm	1 ppm
H_2S	0–200 ppm	1 ppm

Accessories

10069894	Stainless Steel Suspender clip
10089322	Belt clip
10048280	34L quad gas mix (1.45% CH_4, 15% O_2, 60 ppm CO, 20 ppm H_2S)
10045035	58L quad gas mix (1.45% CH_4, 15% O_2, 60 ppm CO, 20 ppm H_2S)
10047594	Universal pump probe (Aust)
10089321	Calibration assembly (cap, tube, connector)
10082834	JetEye IR adapter with USB connector
10088099	MSA Link Software CD-ROMm
10089487	Aust Power Supply & Cradle
10088976	Filter Kit
10095774	Vehicle Charger
10089120	Display Kit

Sensors

10089116	Combustible sensor
10046946	O_2 sensor
10089117	CO/H_2S duo-tox sensor
10089118	Sensor replacement kit (duo-tox, O_2, combustible)

ALTAIR® 4X eXtreme Multigas Detector

Altiar® 4X offers MSA's unique eXtreme sensors offering great performance, long service life and reliability. The ALTAIR® 4X Multigas Detector for LEL, CO, H_2S, and O_2 is a super-durable, competitively-priced, personal multigas detector. The ALTAIR® 4X Multigas Detector is the only portable gas detector with MotionAlert™ feature if a user should become disabled due to unforeseen hazards. When enabled, the MotionAlert™ feature will activate if the instrument does not detect motion for 30 seconds, and is ideal for confined space entry applications. This unique gas detector function is easily turned off by the user if desired. Altair® 4X also offers MSA's unique "Glow" case option for easy location and observation in the dark.

Features

- MotionAlert™ feature plus audible, visual, and vibrating alarms
- Most rugged instrument available
- Altair® 4X Oxygen expected life 5+ years under normal operating conditions
- Large buttons for easy operation
- 20-hour battery run time when fully charged
- Tested to IP67
- Phosphorescent "Glow" case option
- Galaxy® System compatible
- Global approvals
- Economically priced
- MSA Link™ Software-ready
- QuickCheck™ Test Station available for fast, easy bump testing

ALTAIR® 4X eXtreme Multigas Detector	
ALTAIR® 4X Multigas Detector (UL approved), with data logging feature, charger, calibration cap & tubing, CD manual	
SAA Certification	**Description**
10110447	Altair® 4X (LEL, O_2, CO, H_2S) Charcoal, 3 Yr Warranty
10110450	Altair® 4X eXtreme Glow (LEL, O_2, CO, H_2S) 5 Yr Warranty
10110448	Altair® 4X (LEL, O_2, CO) Charcoal, 3 Yr Warranty
10110451	Altair® 4X eXtreme Glow (LEL, O_2, CO) 5 Yr Warranty
10110449	Altair® 4X (LEL, O_2) Charcoal, 3 Yr Warranty
10110452	Altair® 4X eXtreme Glow (LEL, O_2) 5 Yr Warranty

Specifications		
Gas	**Range**	**Resolution**
LEL	0–100%	1%
O_2	0–25% vol	0.1% vol
CO	0–999 ppm	1 ppm
H_2S	0–200 ppm	1 ppm

Accessories	
10069894	Stainless Steel Suspender clip
10089322	Belt clip
10048280	34L quad gas mix (1.45% CH_4, 15% O_2, 60 ppm CO, 20 ppm H_2S)
10045035	58L quad gas mix (1.45% CH_4, 15% O_2, 60 ppm CO, 20 ppm H_2S)
10047594	Universal pump probe (Aust)
10089321	Calibration assembly (cap, tube, connector)
10082834	JetEye IR adapter with USB connector
10088099	MSA Link Software CD-ROM
10089487	Aust Power Supply & Cradle
10088976	Filter Kit
10095774	Vehicle Charger
10089120	Display Kit
Sensors	
10089116	Combustible sensor
10046946	O_2 sensor
10089117	CO/H_2S duo-tox sensor
10089118	Sensor replacement kit (duo-tox, O_2, combustible)

ALTAIR® 5 Multigas Detector

The first portable 5-gas detector with MotionAlert™ and InstantAlert™ features

Features

- Logo display screen customization
- MotionAlert™ and InstantAlert™ features standard
- MSA Link Software with multi-language capability
- Galaxy Test System-compatible
- Triple alarms at 95 dB+
- Durable rubber/synthetic over-molding
- Intuitive 3-button operation
- Unit passes 6-foot drop test; IP65-rated for water/dust ingress
- Real-time on-line monitoring capability with MSA Link Software
- 2-year comprehensive warranty for standard models

Options

- High-resolution colour or monochrome display screen
- Many e-chem sensor options
- Integral pump or diffusion option
- Rechargeable lithium-ion or alkaline battery options
- 17-language display capability

Instrument Table*

Part Number	Mono (M) Colour (C)	Li-Ion (L) Alkaline (A)	Diffusion (D) Pump (P)	KIT	CH4	LEL	O2	CO	H2S	SO2	NO2	HCN	NH3	CL2	CO2 (5%) (IR)	CO2 50% (IR)	CH4 100% (IR)	PROPANE 100% (IR)
766619	M	L	P			✓	✓											
766619C	C	L	P			✓	✓											
766852	M	L	P				✓								✓			
766622B	M	L	D			✓	✓	✓	✓									
766622	M	L	P			✓	✓	✓	✓									
766622C	C	L	P			✓	✓	✓	✓									
766622CK	C	L	P	✓		✓	✓	✓	✓									
766622D	C	L	D			✓	✓	✓	✓									
766631	M	L	P			✓	✓	✓	✓						✓			
766631C	C	L	P			✓	✓	✓	✓						✓			
766631CK	C	L	P	✓		✓	✓	✓	✓						✓			
766632	M	L	P			✓	✓	✓	✓							✓		
766632C	C	L	P			✓	✓	✓	✓							✓		
766633	M	L	P			✓	✓	✓	✓								✓	
766633C	C	L	P			✓	✓	✓	✓								✓	
766634	M	L	P			✓	✓	✓	✓									✓
766634C	C	L	P			✓	✓	✓	✓									✓
766625B	M	L	D			✓	✓	✓	✓	✓								
766625	M	L	P			✓	✓	✓	✓	✓								
766625C	C	L	P			✓	✓	✓	✓	✓								
766625D	C	L	D			✓	✓	✓	✓	✓								

Instrumentation

ALTAIR® 5 Multigas Detector

Instrument Table cont.

Part Number	Mono (M) Colour (C)	Li-Ion (L) Alkaline (A)	Diffusion (D) Pump (P)	KIT	CH4	LEL	O2	CO	H2S	SO2	NO2	HCN	NH3	CL2	CO2 (5%) (IR)	CO2 50% (IR)	CH4 100% (IR)	PROPANE 100% (IR)
766626B	M	L	D			✓	✓	✓	✓		✓							
766626	M	L	P			✓	✓	✓	✓		✓							
766626C	C	L	P			✓	✓	✓	✓		✓							
766626CM	C	L	P		✓		✓	✓	✓		✓							
766635	M	L	P			✓	✓	✓	✓		✓				✓			
766635C	C	L	P			✓	✓	✓	✓		✓				✓			
766635CM	C	L	P		✓		✓	✓	✓		✓				✓			
766638	M	L	P			✓	✓	✓	✓		✓						✓	
766638C	C	L	P			✓	✓	✓	✓		✓						✓	
766627	M	L	P			✓	✓	✓	✓			✓						
766627C	C	L	P			✓	✓	✓	✓			✓						
766628	M	L	P			✓	✓	✓	✓				✓					
766628C	C	L	P			✓	✓	✓	✓				✓					
766636	M	L	P			✓	✓	✓	✓				✓		✓			
766636C	C	L	P			✓	✓	✓	✓				✓		✓			
766629	M	L	P			✓	✓	✓	✓					✓				
766629C	C	L	P			✓	✓	✓	✓					✓				

* Other combinations available

See next page for accessories.

Gas Cylinder List

# Gases	Gas Mix	Part No. Econocal (34 L)	Part No. RP (58 L)	Recommended Cal Gas for:
1	10% CO_2 in N_2		10081603	
1	8% Butane in N_2 (6L)	10075802		25% vol Butane IR
1	8% Propane in N_2 (27L)	10075803		25% vol Propane IR
1	50% vol Methane in N_2		10075804	100% vol Methane IR
1	100% vol Methane		711014	
1	0.6% vol Propane (100 L)		493579	LEL Propane IR sensor
1	10 ppm NO_2 in Air	711068	808977	NO2 sensor
1	10 ppm SO_2 in Air	711070	808978	SO2 sensor
1	25 ppm NH_3 in N_2	711078	814866	NH3 sensor
1	10 ppm Cl_2 in N_2	711066	806740	Cl2 sensor
1	2 ppm Cl_2 in N_2	711082	10028080	ClO2 IR
1	10 ppm HCN in N_2	711072	809351	HCN sensor
1	0.5 ppm PH_3 in N_2	711088	710533	PH3 sensor
1	15% CO_2 in N_2		807387	50% CO2 IR
3	1.45% CH_4, 15.0% O_2, 20 ppm H_2S	10048790	10048788	
3	2.50% CH_4, 15.0% O_2, 20 ppm H_2S	10048888	10048889	
3	1.45% CH_4, 15.0% O_2, 60 ppm CO	10048789	478191	
3	2.50% CH_4, 15.0% O_2, 60 ppm CO	10049056	813718	
4	1.45% CH_4, 15.0% O_2, 60 ppm CO, 10 ppm NO_2		10058034	
4	1.45% CH_4, 15.0% O_2, 60 ppm CO, 20 ppm H_2S	10048280	10045035	Big 4
4	2.50% CH_4, 15.0% O_2, 60 ppm CO, 20 ppm H_2S	10048981	10048890	
4	1.45% CH_4, 15.0% O_2, 60 ppm CO, 10 ppm NO_2	10058036	10058171	
4	2.50% CH_4, 15.0% O_2, 60 ppm CO, 10 ppm NO_2	10058172		
5	1.45% CH_4, 15.0% O_2, 60 ppm CO, 20 ppm H_2S, 2.5% CO_2		10103262	Big 4 + 5% or 10% CO_2 IR

ALTAIR® 5 Multigas Detector

Cal Kit	Description	Suits Detector
766790	Cal Kit CW Gas & Demand Regulator	766626, 766626C
766805	Cal Kit CW Gas & Demand Regulator	766629, 766629C
766792	Cal Kit CW Gas & Demand Regulator	766631, 766631C
766794	Cal Kit CW Gas & Demand Regulator	766636, 766636C
766806	Cal Kit CW Gas & Demand Regulator	766628, 766628C
766796	Cal Kit CW Gas & Demand Regulator	766635, 766635C
766791	Cal Kit CW Gas & Demand Regulator	766622, 766622C

ALTAIR® 5 Multigas Detector Accessories

Altair 5 Accessories	
10083508	BATTERY PACK, RECHARGEABLE
10093415	BATTERY PACK, ALKALINE
10093416	BATTERY PACK, RECHARGEABLE, IR
10094830	BELT CLIP A5
10083591	FILTER COVER ASS A5
10094829	KIT FILTERS, SCREWS, O-RINGS A5
10099533	KIT FILTER, SCREWS, O-RINGS, CL2, CLO2, NH3
10050976	RETRACTABLE LINE CW BELT CLIP
10099648	LEATHER HOLSTER
10099397	VEHICLE CHARGER A5
10040667	SAMPLE LINE 1M PU COIL A5
10040665	SAMPLE LINE 3M PU A5
10040664	SAMPLE LINE 7.5M PU A5
10049058	SAMPLE LINE 3M TEFLON A5
10049057	SAMPLE LINE 7.5M TEFLON A5
10105210	KIT SAMPLE LINE & PROBE 5FT COILED FOR CL2, CLO2, NH3
10105251	KIT SAMPLE LINE & PROBE 5FT FOR CL2, CLO2, NH3
10105839	KIT SAMPLE LINE & PROBE 10FT FOR CL2, CLO2, NH3
10103191	PROBE A5 FOR CL2, CLO2, NH3 ANTI-STATIC
10089116	SENSOR COMBUSTIBLE A5
10089163	SENSOR OXYGEN A5
10089117	SENSOR CO/H2S DUO A5
10095052	SENSOR KIT 4 GAS A5
10080220	SENSOR HCN A5
10080221	SENSOR CL2 A5
10080222	SENSOR CLO2
10080223	SENSOR SO2 A5
10080224	SENSOR NO2 A5
10080225	SENSOR NH3 A5
10080226	SENSOR PH3 A5
10095051	KIT PUMP COVER
10083589	DISPLAY ASSBLY MONO
10099650	DISPLAY ASSBLY COLOUR
10082834	USB IR receiver
10088099	MSA Link Software CD

Sirius® PID Multigas Detector

The Sirius® Multigas Detector unit with PID Sensor gives users all they are looking for in a reliable, easy-to-use, durable package to detect volatile organic compounds, while measuring for combustible, toxic and oxygen deficient atmospheres.

Tremendous Flexibility - One PID and four gases in one instrument allows for detection of hundreds of chemicals.

Reliable PID Performance - MSA's own proprietary PID sensor design (patent-pending) provides users with excellent PID performance including humidity resistance, stable zero readings, and fast response and clear times to enable users to get their jobs done dependably.

User-Friendly Software - Easy-to-use software allows users to focus on their tasks at hand!

Superior, Proprietary PID Sensor Design - Reduces maintenance time and cost.

Flexible Configurations - This design combines two instruments into one the Sirius® unit can be used with or without the PID sensor mode.

Loud, Attention-Grabbing Alarm - The Sirius® Multigas Detector provides outstanding alarms to clearly warn users of a hazardous situation. A piercing alarm horn, resonating through a specially designed horn chamber, is designed into the Sirius® unit to give users an audible warning in the event of an alarm condition. Multidirectional bright LED lights give users visible warning of alarm conditions that can be easily seen from any direction the Sirius® unit is facing. A "Safe LED" light gives users confidence the unit is actively detecting gas by flashing every 15 seconds.

Interchangeable Lithium-ion and Alkaline Battery Packs - Allows for quick battery turn to keep users continually charged and ready to take action.

Easy Calibration and Compatibility with Galaxy Automated Test System - One-button calibration makes calibration simple for any user. Intelligent software frees users from complicated calibration adjustments.

Item	Standard	Data Logging
LEL O_2 CO H_2S PID LI/ALK * Internal Pump	765031	765030
PID Only Internal Pump	765029	765028

* Includes Li-ION and alkaline packs, lanyard, rubber protective boot, shoulder harness, protective carry case, calibration certificate.

Item	Part No
LEL (COMB) Sensor	10049808
Oxygen Sensor	10049806
Carbon Monoxide Sensor	10049804
Hydrogen Sulphide Sensor	10049805
PID Lamp 10.6 EV1004 9692	10049692
PID Lamp 9.8 EV	10052298
Sensor Kit (LEL, O_2, CO_2, H_2S)	10051717
PID Lamp Cleaning Kit	10049691
ION Chamber	10049768
MSA Link Datalog Software and Reader	10082834

Solaris® Multigas Detectors

The Solaris® Multigas Detector is an affordable, durable, reliable, easy-to-use portable instrument for detecting the presence of O_2, H_2S, CO and combustible gas. The Solaris® Detector is designed to withstand rough handling in harsh environments. Best of all, it delivers MSA's commitment to quality at the smallest size and, even smaller price.

Features

- **Ergonomic Design** - For maximum comfort.
- **Alarm System** - World-class triple alarm system with 100+ decibel audible alarm, multiple high-intensity visual alarm and strong vibrating alarm.
- **Display Features** - Superior display features simultaneous gas concentration display, backlighting for easy reading and alphanumeric message bar for easy use.
- **Lightweight** - Under 8 oz., compact size that makes it easy to wear.
- **Durable** - Case with rubberized armor provides superior protection against liquid and dust ingress (IP 65 rated).
- **Long-life Battery** - Rechargeable lithium ion battery provides 14+ hours of continuous run time and delivers best-in-class performance in extreme conditions.
- **Galaxy Compatible** - Compatibility for computer automated calibration and record-keeping.
- **Sampling Pump Option** - Optional powered sampling pump with extensive contaminant filtering system.
- **Warranty** - Outstanding 2-year, all-inclusive warranty.

4 Gas Solaris® CW Datalogging

	Li-Ion	Li-Ion Kit	Alk	Alk Kit
4-Gas Instrument	765023	764906K	764906A	764906AK
3-Gas (LEL, O_2, CO)	764904	764904K	764904A	764904AK
2-Gas (LEL, O_2)	764902	764902K	764902A	7649026AK

All of the above kits include a SAA approved Solaris®, battery charger, calibration cap assembly and instruction manual in CD-rom.

Replacement Sensors

Type	Part No
LEL (COMB)	10046947
O_2	10046946
CO	10046944
H_2S	10046945
Service Kit (4 Sensors)	10049406

Spares/Accessories

Item	Part No
Universal Pump Probe	10047594
Power Supply	10058037
Power Cradle	10048185
Calibration Kit	765044
DL Reader CW Software	10082834
Instrument Pouch	10049053

Refer page 199 for calibration device

Solaris® Multigas Detector with Nitrogen Dioxide Detection

MSHA-Approved Solaris® Kits

All kits include a MSHA Approved Solaris® with datalogging option included, calibration cap assembly and instruction manual on CD-rom.

CH_4, O_2, CO, NO_2	764908	764908K	764908D	764908DK
O_2, CO, NO_2	764909	764909K	764909D	764909DK

Calibration Cylinders

Pentane Standard 1.45%	Methane Standard 2.5%	15% Oxygen	60 ppm CO	20 ppm H_2S	10 ppm NO_2	100 ppm Isobutylene	Econo-Cal (34 Litre)	RP (58 Litre)
•		•	•	•			10048280	10045035
	•	•	•	•			10048981	10048890
	•	•		•			10048888	10048889
	•	•	•				10049056	813718 (100 Litre)
	•	•	•		•		10058172	10058171
						•	10048279	494450

Instrumentation - Retiring

Orion® Multigas Detector - Retiring see Altair 5

For Instruments (whilst available) call customer service

Spares/Accessories

Ordering Information	
LEL Sensor	10024247
O_2 Sensor	10025940
CO Sensor	711306
H_2S Sensor	711307
Service Kit (4 Sensors)	764900
Service Kit (4 Sensors & Battery)	764899
NiMH Battery	10073663
MSA Link Datalog Software & Reader	10082834
Black Rubber Protective Boot	10022036
Red Rubber Protective Boot	10025665
Cradle Charger	10073666
Power Lead for Charger	225579
Charger (old style) no lead	10020551

Orion®*plus* - The hand-held five gas detector for the toughest requirements - Retiring

The innovative and highly versatile 1 to 5 sensor gas detector can be used both as a personal monitor and for pre-entry checks. Audible and visual alarms make ORION^{plus} the perfect partner in hazardous environments. With an increased choice of toxic sensors this compact and innovative 5 gas detector sets new standards.

Ordering Information	
ORION® protective rubber boot, black	10022036
ORION® protective rubber boot, red	10025665
ORION® case, leather	10020485
Carrying belt	474555
Vehicle charger	10034276
Sampling line, 1.5 m, PU conductive	10065831
Sampling line, 3 m, PU conductive	10065832
Sampling line, 5 m, PU conductive	10065833
Floating probe	D6071039
Sampling probe, flexible 30 cm	D6203723
ORION® NiMH charger, complete	10041970
NiMH battery pack	10031091
Alkaline battery pack	10031092

Quickcheck

Altair® Quickcheck Station

The new ALTAIR® QuickCheck™ Station from MSA is designed to test ALTAIR® and ALTAIR® Pro Single-Gas Detectors, verifying instrument gas response (bump check) and alarm functionality.

This cost-effective test station checks the instrument's visual, audible, and vibrating alarms with test results displayed on the "Alarm Test" LED. The unit also tests instrument response to a known gas concentration and indicates results on the "Gas Test" LED. The Pass/Fail LED denotes overall results. All test LEDs display green for a passed test, red for a failed test and amber to indicate that a test is in progress. Passing results are also indicated by a checkmark added to the instrument's display for 24 hours.

Additional ALTAIR® QuickCheck Station versions will also be available for most of the upcoming exotic gas variations of the ALTAIR® Pro Single-Gas Detector. Both automatic (uses an automatic gas delivery system) and manual (uses a manual regulator) test station versions are available. Please note that the automatic version comes complete with regulator and tubing, whereas the manual version requires that the regulator (p/n 467895) and tubing (p/n 10077384) be purchased separately if the user does not already have these items. The test station is run from an AC power supply provided (car power supply accessory available).

- 5 Fast, easy bump tests
- 5 Maintenance free
- 5 Checks instrument's visual, audible, and vibrating alarms
- 5 Easy-to-understand LEDs show tests in progress and pass/fail status
- 5 Compatible with most ALTAIR® and ALTAIR® Pro Detectors

Ordering Information

Regulator	Gas Type	Part No.
Manual	O_2 / CO / H_2S / SO_2 / NO_2	10076692
Automatic	O_2 / CO / H_2S / SO_2 / NO_2	10076704
Manual	CL_2 / CLO_2	10076701
Automatic	CL_2 / CLO_2	10076713
Manual	NH_3	10076695
Automatic	NH_3	10076707
Manual	HCN	10076698
Automatic	HCN	10076710

Replacement and Accessory Parts	
North American Power Supply	10047342
Global Power Supply	10047343
Australian Power Supply	10058037
Vehicle Power Supply	10049410
Regulator Tubing	10077384
Front Housing Assembly	10077385
Automatic Gas Regulator	10075893
Manual Regulator	467895
Single Cylinder Holder	710386

Instrumentation

Calibration

Galaxy® Automated Test System

Extremely Easy to Use

- Standard web browser accessibility for data retrieval and reporting
- Industry-standard memory card available for simple data retention
- System does not require a computer or network interface
- Works without the touch of a single button
- Minimal training needed

Versatile and Expandable

- Up to 10 systems can be interconnected
- Instrument charging option available
- Optional battery pack available for remote use

Durable, Innovative Design

- Wireless- or wired-network interface available
- Inventive system door also functions as dust cover
- Guaranteed to work in the harshest environments
- In-line gas cylinder holster available; keeps the work area clean and orderly

Value-Driven Performance

- All-inclusive, 2-year warranty
- High quality, cost-effective solution
- Very low total cost of ownership

Galaxy® System Kits

	Solaris Galaxy®	Sirius Galaxy®	Orion Galaxy®	Altair Galaxy®	Altair 4 Galaxy®	Altair 5 Diffusion Galaxy®	Altair 5 Pumped Galaxy®
Basic Standalone							
Basic System	765027	765026	765025	765626	766348	766723	766724

Accessories

710288	Demand Flow Regulator
10047343	Global Power Supply

Replacement Parts and Accessories

ITEM	PART NO.
AC Power Supply, Global	10065716
End Cap	10061219
O-Ring Replacement, Orion Galaxy (package of 12)	711464
Fresh Air Filter	10050789
Fresh Air Filter, High Capacity	10062363
Memory Card	10061059
Memory Card Reader	10061058
Spare Parts Kit (feet, barb fittings, plugs)	10062301
Battery Pack	10062273
Cylinder Holder	10062235
Mounting Rail Set, .5m (wall-mount up to three units)	10062364
Mounting Rail Set, 1m (wall-mount up to six units)	10062365
Mounting Rail Set, 2m (wall-mount up to thirteen units)	10062366
Demand Regulator	710288
Inlet Seal Replacement Kit (Sirius Instrument)	10062638
Network Interface Wired	10062274
Network Interface Wireless	10062275
Receipt Printer	10066386
Printer Cable	10067705
Inlet Seal Replacement Kit (ORIONplus Instrument)	10083594

Detector Tube Pumps

Toximeter™ II Automatic Detector Tube Pump

The Toximeter™ II Automatic Detector Tube Pump makes the sampling process easier, allowing the user to preset the number of pump strokes from 1 to 250. Intrinsically safe, the automatic pump works with all MSA detector tubes. It can also be used as a sampling pump.

Toximeter™ II Automatic Detector Tube Pump	
5142701T	Toximeter™ II Automatic Detector Tube Pump

Kwik-Draw® Detector Tube Pumps

MSA's Kwik-Draw® and Kwik-Draw® Deluxe Pumps can be used with an assortment of MSA's detector tubes to spot-test atmospheres for a wide variety of toxic substances. They are designed for one-hand operation and consistent delivery of a sample draw volume of 100 milliliters (ml).

Kwik-Draw® Detector Tube Pumps	
140904	Kwik-Draw® Basic Pump, with remote sampling adapter and carrying pouch
487500	Kwik-Draw® Deluxe Pump, with remote sampling adapter, carrying pouch and end-of-stroke indicator
Accessories	
73067	Sampling line, 10 ft
73068	Sampling line, 25 ft
73069	Sampling line, 50 ft
87970	Remote Sampling Adapter, required for above sampling line
488780	Solvent-Resistant Sampling Line, 25 ft, with reel
488872	Tube Holder, required for 488780 line above
470321	Flue Gas Kit

Gas-Tester™ II H Detector Tube Pump

The Gas-Tester™ II H Pump is set for action by compressing the bellows. A pump stroke is started by pressing the release button. When the sample (100ml) is drawn through the tube, the end-of-stroke indicator changes color. An accurate measurement is obtained because the sample draw procedure itself is controlled only by the specifications of the pump and the flow resistance of the detector tube.

Gas-Tester™ II H Detector Tube Pump	
5146760	Gas-Tester™ II H Detector Tube Pump
5146906	Gas -Tester™ II H Detector Tube Pump Service Kit

Detector Tube Handbook

Detector Tube Handbook	
813929	Detector Tube Handbook

Detector Tubes

Detector tubes are the simplest solution if the application requires the measurement of many different substances.
Due to their long storage time detector tubes are most suitable for occasional measurements.
The handling of detector tubes is very simple and easy.

Detector, Action, Trainer and Sampling Tubes

Detector tubes are used to measure hazardous substances in the workplace and in the environment.

Action tubes have a shortened sampling procedure (only 2 strokes) for the rapid evalution of dangerous situations, e.g. for fire services (with warning marks).

Trainer tubes are for demonstration and training. They contain a gaseous test substance which reacts with detector tubes when connected to them by a hose.

Sampling tubes contain various absorptive materials as sample carriers for active sampling of hazardous materials in the air using two component tubes with sampling and backup layers. The samples are analyzed in a laboratory. MSA recommended laboratory services are available on request.

Detector Tube Sets

Various detector tubes have accessories especially designed for a range of different applications, e.g. Indoor Air Set, Biogas-Reactor Set and Promile Test.

Indoor Air Set

Designed to check the air quality in offices, restaurants, schools, hospitals, etc. These are designed to measure levels of humidity, carbon monoxide, carbon dioxide, formaldehyde and ozone concentrations as well as temperature.

Biogas-Reactor Set

Simple and economic method to monitor the fermentation in biogas reactors, by determining the carbon dioxide in the range of 5 to 40 vol.%.

Smoke Tubes

Smoke tubes are designed to detect and determine the velocity and direction of air currents in ventilation systems, to detect leakages in pipelines, furnaces and windows, and to check the ventilation systems in mines.

Detector Tubes

Substance Measured	Detector Tube applicable	Part No. (1 box of 10 tubes)	Measuring range (ppm)	Threshold Limit Value 1998 ACGIH (ppm)
Acetaldehyde	Formaldehyde-0.1	5086813	5–50	25 (ceiling)
Acetic Acid	Acetic Acid-1	5086821	1–80	10
Acetone	Acetone-100	5086829	100-10,000	500
	Qualitest QL	5085810	n/a	
Acetylene dichloride, cis and trans	Trichloroethane-5	5086834	10–500	200
(1,2 Dichloroethylene)	Qualitest QL	5085810	n/a	
Acetylene tetrabromide (1,1,2,2-Tetrabromoethane)	Trichloroethane-5	5086834	5–200	1
	Qualitest QL	5085810	n/a	
Acetylene tetrachloride (1,1,2,2-Tetrachloroethane)	Trichloroethane-5	5086834	50–1000	1
	Qualitest QL	5085810	n/a	
Ammonia	NH3–2	5085845	2–500	25
	NH3–20	5085814	20–1000	
	NH3–0.1%	5085815	0.1–10 Vol.-%	
n-Amyl chloride (1-Chloropentane)	Trichloroethane-5	5086834	5–550	–
Benzene	Aromatic HC	5086811	5–500	.5
	C6H6-1	5086835	1–100	
	C6H6-5	5085816	5–100	
	Qualitest QL	5085810	n/a	
Bromine	$C1_2$-0.2	5085801	0.2–3	0.1
Bromobenzene	Aromatic HC	5086811	30–720	–
Bromoethane (Ethyl bromide)	Trichloroethane-5	5086834	15–400	5
Bromoform (Tribromomethane)	Trichloroethane-5	5086834	7–200	0.5
Bromomethane (Methyl bromide)	Trichloroethane-5	5086834	20–270	1
1,3-Butadiene	Ethylene-50	5086833	100–1200	2
	Qualitest QL	5085810	n/a	
n-Butane	Propane-200	5086831	200–3800	800
	Qualitest QL	5085810	n/a	
n-Butanol (Butyl Alcohol)	Ethanol-100	5086818	100–3900	50 (ceiling)
sec. Butanol (sec-Butyl Alcohol)	Ethanol-100	5086818	300–5100	100
1-Butene (1-Butylene)	Ethylene-50	5086833	100–5000	–
	Qualitest QL	5085810	n/a	
2-Butylene, cis and trans	Ethylene-50	5086833	200–5000	–
(2-Butylene)	Qualitest QL	5085810	n/a	
Butyl Alcohol (n-Butanol)	Ethanol-100	5086818	100–3900	50 (ceiling)
sec-Butyl Alcohol (sec-Butanol)	Ethanol-100	5086818	300–5100	100
n-Butylamine	Triethylamine-5	5086816	2–28	5 (ceiling)
iso-Butylamine	Triethylamine-5	5086816	3–36	–
sec-Butylamine	Triethylamine-5	5086816	2–18	–
t-Butylamine	Triethylamine-5	5086816	2–14	–
n-Butylchloride (1-Chlorobutane)	Trichloroethane-5	5086834	5–170	–
	Qualitest QL	5085810	n/a	
1-Butylene (1-Butene)	Ethylene-50	5086833	100–5000	–
	Qualitest QL	5085810	n/a	
2-Butylene (2-Butene, cis and trans)	Ethylene-50	5086833	200–5000	–
	Qualitest QL	5085810	n/a	
n-Butyl mercaptan	Ethylmercaptan-0.5	5086815	1.5–15	0.5
t-Butyl mercaptan	Ethylmercaptan-0.5	5086815	0.8–5	–
Carbon Dioxide	CO2-100	5086814	100–3000	5000
	CO2-0.1%	5085817	0.1–7.0 Vol.-%	
	CO2-1%	5085841	1–20 Vol.-%	
Carbon Disulfide	CS2-2	5085834	2–300	10
	Qualitest QL	5085810	n/a	
Carbon Monoxide	CO-5	5085836	5–1000	25
	CO-10	5085821	10–3000	
	CO-0.1%	5085822	0.1–1.0 Vol.-%	
	CO-0.5%	5085835	0.5–7.0 Vol.-%	
	CO-10/color	5086810	10–1000	
	(special orifice assembly for CO-10/color)			
	Qualitest QL	n/a	n/a	
Chlorine	Cl2-0.2	5085801	0.2–30	0.5
	ClO2-0.05	5086812	1–46	

Substance Measured	Detector Tube applicable	Part No. (1 box of 10 tubes)	Measuring range (ppm)	Threshold Limit Value 1998 ACGIH (ppm)
Chlorine dioxide	ClO2-0.05	5086812	0.05–15	0.1
Chlorobenzene	Aromatic HC	5086811	40–610	10
Chlorobromomethane	Trichloroethane-5	5086834	5–180	200
1-Chlorobutane (n-Butylchloride)	Trichloroethane-5 Qualitest QL	5086834 5085810	5–170 n/a	–
Chloroethane(Ethyl chloride)	Trichloroethane-5	5086834	50–800	100
Chloroethylene (Vinyl chloride)	VC-1 Trichloroethane-5	5085837 5086834	1–70 20–550	5
Chloroform (Trichloromethane)	Trichloroethane-5	5086834	8–100	10
1-Chloropentane (n-Amylchloride)	Trichloroethane-5	5086834	5–550	–
1-Chloropropane (l-Propylchloride)	Trichloroethane-5	5086834	5–220	–
2-Chloropropane (2-Propylchloride)	Trichloroethane-5	5086834	8–1700	–
Cycloheptane	Hexane-20	5086832	80–3300	–
Cyclohexane	Hexane-20 Qualitest QL	5086832 5085810	20–3400 n/a	300
Cyclohexylamine	Triethylamine-5	5086816	7–38	10
Cyclooctane	Hexane-20	5086832	20–2100	–
Cyclopentane	Hexane-20	5086832	80–2700	600
n-Decane	Hexane-20	5086832	50–500	–
1,2-Dibromoethane (Ethylene dibromide)	Trichloroethane-5	5086834	25–700	–
Dibromomethane (Methylene dibromide)	Trichloroethane-5	5086834	9–200	–
1,1-Dichloroethane (Ethylidene chloride)	Trichloroethane-5	5086834	8–300	100
1,2-Dichloroethane (Ethylene dichloride)	CH_2Cl_2-50	5085823	30–720	10
1,1-Dichloroethylene (Vinylidene chloride)	Trichloroethane-5	5086834	10–600	5
1,2-Dichloroethylene (Acetylene dichloride, cis and trans)	Trichloroethane-5	5086834	10–500	200
Dichloromethane (Methylene chloride)	CH_2Cl_2-50	5085823	50–1000	50
1,2-Dichloropropane (Propylene dichloride)	Trichloroethane-5	5086834	5–440	75
1,3-Dichloropropane (Trimethylene dichloride)	Trichloroethane-5	5086834	5–220	–
Diesel Oil	Qualitest QL	5085810	n/a	
Diethylamine	Triethylamine-5	5086816	3–27	5
Dimethylamine	Triethylamine-5	5086816	3–27	5
2,2-Dimethylbutane	Hexane-20	5086832	100–4900	–
Ethanol (Ethyl Alcohol)	Ethanol-100 Qualitest QL	5086818 5085810	100–6000 n/a	1000
Ethene (Ethylene)	Ethylene-50 Qualitest QL	5086833 5085810	50–5000 n/a	–
Ethyl Alcohol (Ethanol)	Ethanol-100 Qualitest QL	5086818 5085810	100–6000 n/a	1000
Ethylamine	Triethylamine-5	5086816	4–55	5
Ethyl benzene	Tol.-5	5085828	5–1800	100
Ethyl bromide (Bromoethane)	Trichloroethane-5	5086834	15–400	5
Ethyl chloride (Chloroethane)	Trichloroethane-5	5086834	50–8000	100
Ethylenediamine	Triethylamine-5	5086816	5–27	10
Ethylene dibromide (1,2-Dibromoethane)	Trichloroethane-5	5086834	25–700	–
Ethylene dichloride (1,2-Dichloroethane)	CH_2Cl_2-50	5085823	30–720	10
Ethylidene chloride (1,1-Dichloroethane)	Trichloroethane-5	5086834	8–300	100
Ethyl mercaptan	Ethylmercaptan-0.5	5086815	0.5–80	0.5
Formaldehyde	Formaldehyde-0.1	5086813	0.1–55	0.3 (ceiling)
Formic Acid	Qualitest QL Acetic Acid-1	5085810 5086821	n/a 2–160	5
Furfuryl alcohol	Phenol-1	on request		10
Gasoline	Gasoline-30 Qualitest QL	5085898 5085810	30–6000 n/a	300
n-Heptane	Hexane-20	5086832	20–2600	400
n-Hexane	Hexane-20	5086832	20–3200	50
Hydrogen Chloride	HCl-1 Qualitest QL	5085846 5085810	1–30 n/a	5 (ceiling)
Hydrogen Cyanide	HCN-2	5085824	2–50	4.7 (ceiling)
Hydrogen Fluoride	HF-1	5086830	1–50	3 (ceiling)

Substance Measured	Detector Tube applicable	Part No. (1 box of 10 tubes)	Measuring range (ppm)	Threshold Limit Value 1998 ACGIH (ppm)
Hydrogen Sulphide	H_2S-1	5085826	1–200	10
	H_2S-100	5085827	0100–4000	
	H_2S-0.1%		0.1–4 Vol. %	
	Qualitest QL	5085810	n/a	
Isobutane (Methylpropane)	Propane-200	5086831	200–4200	–
Isobutanol (Isobutyl Alcohol, 2-Methylpropyl Alcohol)	Ethanol-100	5086818	100–2900	50
Isobutene (Isobutylene, Methylpropene)	Ethylene-50	5086833	400–2600	–
Iso-Butylamine	Triethylamine-5	5086816	3–36	–
Isobutylene (Isobutene, Methylpropene)	Ethylene-50	5086833	400–2600	–
Isobutyl Alcohol (Isobutanol, 2-Methylpropyl Alcohol)	Ethanol-100	5086818	150–2900	50
Isobutyl Methyl Ketone	MEK-50	5086818	50–6500	–
Iso Octane	Hexane-20		100–3000	–
Isopropanol (Isopropyl Alcohol, 2-Propanol)	Ethanol-100	5086818	200–5000	400
	Qualitest QL	5085810	n/a	
Isopropyl Alcohol (Isopropanol, 2-Propanol)	Ethanol-100	5086818	200–5000	400
	Qualitest QL	5085810	n/a	
Isopropylamine	Triethylamine-5	5086816	5–30	5
Isopropyl mercaptan	Ethylmercaptan-0.5	5086815	0.5–5.5	–
Kerosene	Qualitest QL	5085810	n/a	–
Ketones	Qualitest QL		n/a	–
Liquified Petroleum Gases	Gasoline-30	5085898	Semiquantitative	–
	Qualitest QL	5085810	n/a	
Mercury	Hg–0.1 mg/m³	5085843	0.1–0.8 mg/m³ (0.01–0.08 ppm)	0.025 mg/m³ (inorganic)
Methane	Natural Gas		Semiquant. 5000+	–
Methanol (Methyl Alcoho1)	Ethanol-100	5086818	100–2350	200
Methyl Alcohol (Methanol)	Ethanol-100	5086818	100–2350	200
Methylamine	Triethylamine-5	5086816	4–55	5
Methyl benzene (Toluene)	Tol.-5	5085828	5–1000	50
Methyl bromide (Bromomethane)	Trichloroethane-5	5086834	9–200	5
	MeBr-200		200–8000 ppm	
	MeBr-2		2–100 ppm	
2-Methyl butane	Hexane-20	5086832	50–3000	–
Methyl chloroform (1,1,1-Trichloroethane)	Trichloroethane-5	5086834	5–1500	350
	Qualitest QL	5085810	n/a	
Methylcyclohexane	Hexane-20	5086832	80–4900	400
Methylcyclopentane	Hexane-20	5086832	150–3700	–
Methylene chloride (Dichloromethane)	CH_2Cl_2-50	5085823	50–1000	50
Methylene dibromide (Dibromomethane)	Trichloroethane-5	5086834	9–200	–
Methyl Ethyl Ketone (MEK)	MEK-50	5086837	50–4000	200
	Qualitest QL	5085810	n/a	
Methyl mercaptan	Ethylmercaptan-0.5	5086815	0.5–5	0.5
2-Methyl pentane	Hexane-20	5086832	150–4500	–
3-Methyl pentane	Hexane-20	5086832	100–3700	–
Methylpropane (Isobutane)	Propane-200	5086831	200–4200	–
Methylpropene (Isobutylene, Isobutene)	Ethylene-50	5086833	400–2600	–
2-Methylpropyl Alcohol (Isobutanol, Isobutyl Alcohol)	Ethanol-100	5086818	150–2900	50
Nitrogen Dioxide	NO_2-0.5	5085805	0.5–50	3
	NO_2-2	5085867	2 –140	
Nitrous Fumes	Nitr.-0.5	5085818	0.5–50	–
	Nitr.-2	5085844	2–140	
	Nitr.-10	5085808	10–300	
	Nitr.-50	5085809	50–3000	
n-Nonane	Hexane-20	5086832	50–2800	200
n-Octane	Hexane-20	5086832	50–3000	300
Ozone	Ozone-0.05	5086828	0.05–5	0.05 (ceiling)
Pentachloroethane	Trichloroethane-5	5086834	10–300	–
n-Pentane	Hexane-20	5086832	50–3900	600
	Qualitest QL	5085810	n/a	

Substance Measured	Detector Tube applicable	Part No. (1 box of 10 tubes)	Measuring range (ppm)	Threshold Limit Value 1998 ACGIH (ppm)
Perchloroethylene (Tetrachloroethylene)	Per-5	5085865	5–200	25
	Per-10	5085840	10–500	
	Qualitest QL	5085810	n/a	
Phenol	Phenol-1	5086838	1–25	5
	Qualitest QL	5085810	n/a	
Phosgene	Phosgene-0.1	5085854	0.1–20	0.1
Phosphine	PH_3-0.05	5085829	0.05–3	0.3
	PH_3-0 1	5085830	0.1–100	
	PH_3-50	5085831	50–2000	
Propane	Propane-200	5086831	200–4000	2500
	Qualitest QL	5085810	n/a	
n-Propanol (Propyl Alcohol)	Ethanol-100	5086818	100–3000	200
	Qualitest QL	5085810	n/a	
2-Propanol (Isopropanol, Isopropyl Alcohol)	Ethanol-100	5086818	200–5000	400
	Qualitest QL	5085810	n/a	
Propene (Propylene)	Ethylene-50	5086833	20–5000	–
	Qualitest QL	5085810	n/a	
Propyl Alcohol (n-Propanol)	Ethanol-100	5086818	100-3000	200
	Qualitest QL	5085810	n/a	
n-Propylamine	Triethylamine-5	5086816	2–28	–
1-Propylchloride (1-Chloropropane)	Trichloroethane-5	5086834	5–220	–
2-Propylchloride (2-Chloropropane)	Trichloroethane-5	5086834	8–1700	–
Propylene (Propene)	Ethylene-50	5086833	20–5000	–
	Qualitest QL	5085810	n/a	
Propylene dichloride (1,2-Dichloropropane)	Trichloroethane-5	5086834	5–440	75
n-Propyl mercaptan	Ethylmercaptan-0.5	5086815	0.7–8.0	–
Styrene	Styrene-10	5086819	10–300	20
	Qualitest QL	5085810	n/a	
Sulfur Dioxide	SO_2-1	5085803	0.5–25	2
	SO_2-5	5085813	5–120	
	SO_2-100	5085825	100–4000	
Sulfur Hexaflouride decomposition products	SF_6 Decomposition Products	5085838	0.5–15	1000
1,1,2,2-Tetrabromoethane (Acetylene tetrabromide)	Trichloroethane-5	5086834	5–200	1
1,1,2,2-Tetrachloroethane	Trichloroethane-5	5086834	50–1000	1
Tetrachloroethylene (Perchloroethylene)	Per-5	5085865	5–200	25
	Per-10	5085840	10–500	
	Qualitest QL	5085810	n/a	
Tetrahydrofuran	Ethanol-100		Semi-quant	200
Toluene (Methyl benzene)	Tol.-5	5085828	5–1000	50
	Qualitest QL	5085810	n/a	
Tribromomethane (Bromoform)	Trichloroethane-5	5086834	7–200	0.5
1,1,1-Trichloroethane (Methyl chloroform)	Trichloroethane-5	5086834	5–1500	350
	Qualitest QL	5085810	n/a	
1,1,2-Trichloroethane (Vinyltrichloride)	Trichloroethane-5	5086834	10–170	10
Trichloroethene (Trichloroethylene)	Tri-5	5085842	5–250	50
Trichloroethylene (Trichloroethene)	Tri-5	5085842	5–250	50
Trichloromethane (Chloroform)	Trichloroethane-5	5086834	8–100	10
1,2,3-Trichloropropane	Trichloroethane-5	5086834	10–1200	10
Triethylamine	Triethylamine-5	5086816	5–30	1
Trimethylamine	Triethylamine-5	5086816	5–30	5
Trimethylene dichloride (1,3-Dichloropropane)	Trichloroethane-5	5086834	5–220	–
2,2,4-Trimethylpentane	Hexane-20	5086832	100–3000	–
Vinyl Chloride (Chloroethylene)	VC-1	5085837	1–70	5
	Qualitest QL	5085810	n/a	
Vinylidene chloride (1,1-Dichloroethylene)	Trichloroethane-5	5086834	10–600	5
Vinyltrichloride (1,1,2-Trichloroethane)	Trichloroethane-5	5086834	10–170	10
Water Vapor	H_2O-10		10–100% RH	–
0-Xylene (1,2-Xylene)	Tol.-5	5085828	5–2500	100
	Qualitest QL	5085810	n/a	
m-Xylene (1,3-Xylene)	Tol.-5	5085828	5–2500	100

Escort ELF® and Escort® LC Sampling Pumps

Escort ELF® Sampling Pumps

The patented Escort ELF® Sampling Pump can be used for personal and area sampling. The state-of-the-art electronic laminar flow sensor, consisting of a laminar flow element and pressure sensor, provides constant flow (volume) control, with ± 2.5% regulation of flow rate (from 1 to 3 lpm) and automatic compensation for changes in battery voltage, temperature, altitude, and sample load.

An internal secondary standard calibrates the pump continuously and needs to be checked against a primary standard only once a month (or every 200 hours for coal mine dust sampling).

Approvals

Escort ELF® Sampling Pumps are UL approved as intrinsically safe for use in hazardous locations - Class 1, Groups A, B, C, D; Class II, Groups E, F, and G; and Class III, Division I locations. NIOSH-certified for coal mine dust sampling (TC-74-030). MSHA certified as intrinsically safe for underground use (Approval No. 2G-3924-1).

MSA Sampling Pump Accessories

MSA sampling pump accessories and air sampling equiment allow monitoring of many different contaminants in various applications. Sampling pump accessories can be used in personal and area sampling for a wide variety of airborne contaminants such as asbestos fibers, toxic gases, vapors, particulates, mists, and fumes.

Accessories for MSA sampling pumps include filter media, a cyclone assembly, preweighed filter cassettes, filter holder assemblies, impingers, the Gemini® Twin-Port Sampler, sorbent tubes, and calibrators.

Escort ELF® Sampling Pump

Battery Chargers

Sampling Equipment

Leather Jacket

Escort ELF® and LC Kits	
Escort ELF® Pump with flow fault indicator, 240V single-unit charger, Gemini® Twin Port Sampler, and standard packaging	805562
Escort ELF® Pump with flow fault indicator, 240V single-unit charger, sampling line, and standard packaging	765828
Escort ELF® Pump (5 Pack) with flow fault indicator, 5 way charger and standard packaging	805563
Replacement Parts and Accessories	
Battery Pack with O-ring	497702
One Replacement Inlet Water Stop Filter	802897
Escort Pump Overhaul Kit - common components for routine maintenance	802922
Inlet Dust Filter (pkg of 5)	808935
Battery Chargers - MSA Omega® Chargers	
220 VAC 50/60 Hz	495965
120/240 VAC 50/60 Hz (five-unit)	801759
Sampling Equipment	
Sampling line only	456226
10mm Cyclone Assembly to separate respirable dust from non-respirable dust	456243
Gemini Twin-Port Sampler for sorbent tubes	497697
10mm Cyclone Assembly to separate respirable dust from non-respirable dust, for use with 37 mm non-MSA cassettes	10044015
Carrying Accessories - Jacket	
Leather jacket	811741

Sampling Pump Accessories

Gemini® Twin-Port Sampler

For low-flow control when sorbent tubes are used, the patented Gemini® Twin-Port Sampler is a valved mechanism that allows flow adjustment down to 1 mlpm (0.001 lpm to 500 mlpm total between both tubes). U.S. Patent No. 5,370,004. As an added benefit, the Gemini® accessory permits simultaneous sampling from sorbent tubes, with independently controlled flow rates of each. Dual sampling means two like sorbent tubes can be attached for simultaneous sampling at different flow rates, or two different tubes can be used to sample two types of substances at once.

Filter Media

Asbestos Sampling Filter Cassettes

Sorbent Tube Sampling

Gemini® Twin-Port Sampling Kit—includes Gemini® Sampler, tube protectors, Y-connector, clips and carrying case	497697
Charcoal Sampling Tubes (150mg), 50 tubes	697169
Charcoal Sampling Tubes (600mg), 50 tubes	697170
Silica Tubes (225 mg), 50 tubes	697171
Silica Tubes (600 mg), 50 tubes	697172
Amberlite XAD-2, 50 tubes	697175
Hopcalite, 50 tubes	697176
Carbotrap, 25 tubes	697174
Carbosieve, 25 tubes	697173
Tenax/CMS	491165

Cassette Sampling

General Purpose Filter Cassettes

Fifty complete 3-piece preloaded filter cassettes with MCE filters.	
With 25mm, 0.8-µ pore size	695677
With 37mm, 0.8-µ pore size	695676

Filter Discs for Nuisance Dust Sampling

Used with 37mm cassettes.	
PVC, 0.5-µ pore size, 100/pack	459733
PVC, 0.8-µ pore size, 50/pack	812805
PVC, 5.0-µ pore size, 50/pack	625413
Glass Fiber	463784

MCE Filter Discs for Asbestos and Nuisance Dust

25mm, 0.8-µ pore size, 100/pack	695674
37mm, 0.8-µ pore size, 50/pack	463797
37mm, 0.45-µ pore size, 50/pack	463796

Silver Membrane Filters for Silica, Coke Oven Emissions & Carbon Black

Silver Membrane, 0.8-µ pore size, 50/pack	464324

Asbestos Sampling Filter Cassette

All units include 50 complete filter cassettes preloaded with 25mm MCE filters.	
With 0.8-µ pore size and 50mm anti-static cowl	695679
With 0.45-µ pore size and 5.0-µ pore size and 50mm anti-static cowl	696172

Coal Dust and Silica Filter Cassette

Preweighed filter cassette with 5-µ pore size PVC filter and Mine Data Card - Coal Dust	803462
Preweighed filter cassette with 5-µ pore size PVC filter and Data Card - Silica	711361

Respirable Dust Sampling w/Cyclone Assembly

10mm Cyclone Assembly, used with MSHA pre-weighed cassettes	456243
10mm Cyclone Assembly, IH version used with 37mm cassettes	10044015

Gas Sampling Bags

Teflon Sample Bag Assembly	471677
Tedlar Sample Bag Assembly	472992

Miscellaneous Accessories

MSA's complete line allows users to load sampling cassette cases and select your own combinations of sampling media. Your MSA distributor can help you select the accessories that best suit your application requirements.

Filter Cassette Cases, 2-piece, 25mm, pack of 50	695681
Filter Cassette Cases, 2-piece, 37mm, pack of 12	625412
Filter Cassette Cases, 3-piece, 37mm, pack of 10	449347
50mm-long Cowl for 25mm Filter Cassette Case, pack of 5	695683
25mm Support Pad (felt backup disc), pack of 100	695684
37mm Support Pad (felt backup disc), pack of 25	449375
25mm Cellulose Bands, jar of 60	484683
37mm Cellulose Bands, jar of 60	625415
37mm Stainless Steel Coupler for 3-piece filter cassette case used with Cyclone Assembly	457392
Plastic Coupler for preweighed filter cassette sampling used with Cyclone Assembly	457391
Sampling Line Assembly (used with all pumps and filter cassette cases)	456226
25mm Filter Cassette Case Sampling Line Coupler, package of 10	695685
37mm Filter Cassette Case Sampling Line Coupler, package of 3	459743
Charcoal Filter Tubes - for use in in-line sampling to protect pumps from vapor damage	804403
Supplementary Parts Kit - includes 3 stainless steel support screens, small brush, tweezers, and press/pry tool	456246
All-Glass Impinger Assembly - includes fritted-glass flask, inlet cap, nozzle, and cap	10008396
Bubbler for Fritted-glass Flask	10008397
Flask Holster	10008398
Tubing for Flask	93495

General Purpose Filter Cassettes

Coal Dust Cassettes - P/N 803462

Gas Sampling Bag

Couplers and Supplementary Parts Kit

Impinger assemblies and accessories

Sampling Pump Calibration Check Devices

A primary calibration device, the DigiCal™ Calibrator provides instantaneous calibration for instruments like the MSA Escort LC or the secondary flow standard inside the Escort ELF® Sampling Pumps. Just press the plunger and the DigiCal Calibrator does the work. Its unique flow cell replaces conventional bubble tubes and makes calibration easier.

The DigiCal Calibrator makes sampling pump calibration a stress-free, one-step procedure.

The DigiCal Calibrator achieves extreme accuracy by utilizing a computerized flow meter that provides instantaneous flow readouts on a digital display. Accurate measurements are possible within ±0.5 percent at any altitude.

Sampling Pump Calibration Check Devices	
Primary Calibration Devices	
DigiCal Calibrator	655101
Air Inlet Caps, pkg of 2	655102
110V Charger with A/C Adapter	655112
Bubble Solution, 4-oz bottle	655273
Sub C Battery Pack	655169
Secondary Calibration Devices	
Flowmeter for use with Flow-Lite and Escort Sampling Pumps, 0.2 to 4 lpm	490197
Flowmeter for use with Flow-Lite and Escort Sampling Pump with Gemini® Twin-Port Sampler, 30 to 370 mlpm	490198

Ventilation Smoke Tube Kits

MSA's Ventilation Smoke Tube Kits are for use where controlled generation of a visible smoke is desired in order to determine the velocity of slow-moving air currents and establish their direction and flow patterns in shafts, mines and tunnels. They can also be used in commercial buildings and industrial processing plants to determine velocity and flow patterns of heating, ventilating, and air-conditioning systems.

Ventilation Smoke Tube Kits	
Ventilation Smoke Kit, including aspirator bulb, two rubber plugs, and six smoke-producing tubes contained in plastic carrying case	458481
Ventilation Smoke Kit, including aspirator bulb, six tube caps, and two glass smoke-producin tubes contained in plastic carrying case	5607
Ventilation smoke tubes, box of 12	458480
Glass smoke tubes, box of 10	5645

Airborne Compounds Sampling Chart

This MSA/SupelCo guide to sorbent tube sampling lists MSA part numbers. It is a very comprehensive guide to all types of air sampling using personal sampling pumps.

Airborne Compounds Sampling Chart	
MSA/SupelCo Sampling Chart	814473

Instrumentation - Homeland Security

HAZMATCAD™ and HAZMATCAD Plus Hazardous Material Chemical Agent Detectors

HAZMATCAD™ Detector

The HAZMATCAD™ Hazardous Material Chemical Agent Detector is a handheld instrument that detects and classifies Chemical Warfare Agents (CWA). When compared to other technologies, the HAZMATCAD™ Detector offers more capabilities and greater reliability at a lower cost.

Features

- Compact, light-weight and portable
- Self-diagnostic check during rapid warm-up
- Alphanumeric display with LED alarms
- Dual-Mode SAW Operation - Fast or High Sensitivity
- Operates between 8 and 12 hours on rechargeable Li-Ion batteries
- Vapor-diffusion check source verifies system performance
- Unit can be hand-carried or worn on belt
- RS-232 and IrDA communication ports; stores up to 8 hours of data
- Inlet design protects against dust and particulates

HAZMATCAD Plus Detector

The HAZMATCAD Plus Detector detects for Chemical Warfare Agents (CWA) and selected Toxic Industrial Chemicals (TICs). It is a portable instrument designed for one-hand operation. It is very easy to operate and requires limited training for effective use.

Features

- Self-diagnostic check during rapid warm-up
- Alphanumeric display with LED alarms
- Dual-Mode SAW Operation – Fast or High Sensitivity
- Electrochemical Cells – Real time analysis
- Operates between 8 and 12 hours on rechargeable Li-Ion batteries
- Vapor-diffusion check source verifies system performance
- RS-232 and IrDA communication ports; stores up to 8 hours of data
- Inlet design protects against dust and particulates

HAZMATCAD™ Detector Kits

Kits include: HAZMATCAD™ Detector; battery charger; belt clip; two Sony rechargeable batteries; hard, water-resistant carrying case; operating manual; vapor check source

Part No.	Instrument	Chemical Agents Detected
10055094	HAZMATCAD™ Detector	Nerve and Blister
10055095	HAZMATCAD™ Detector	Nerve, Blister and Hydrogen Cyanide
10055096	HAZMATCAD™ Detector	Nerve, Blister and Phosgene
10055097	HAZMATCAD Plus Detector	Nerve and Blister agents and TICs (phosgene, hydrogen cyanide, halogen and hydride gas)

HazMat Response Kit

The HazMat Response Detector Tube Kit can be used by firefighters, HazMat Response Teams and other workers to help classify unknown chemical gases and vapors at accident or spill sites. A Quad-Port Sampler allows four chemical classes to be tested simultaneously. The portable kit contains 12 types of Detector Tubes (each with sufficient tubes for 10 complete tests), a Kwik-Draw Pump to draw the sample through the tubes, the multiple tube holder and a convenient, easy-to-follow interpretation guide.

HazMat Response Kit	
807472	Includes 12 types of detector tubes, multiple tube holder, Kwik-Draw Pump and interpretation guide
485233	Extra Quad-Port Sampler

Note: US Export Licence Restrictions Apply

Features & Benefits

- Quickly classifies unknown chemical gases and vapors
- Quad-Port Sampler allows simultaneous testing with four detector tubes, meaning less time in IDLH atmosphere
- Flow-limiting orifices ensure even sample flow
- Portable and easy to handle
- Includes simple interpretation guide

SafeSite® Multi-Threat Detection System

The SAFESITE® Multi-Threat Detection System simultaneously monitors and wirelessly communicates six potential threats: CWAs, VOCs, TICs, gamma radiation, combustible gas and oxygen deficiency.

The SAFESITE® System combines state-of-the-art detection technology with advanced wireless communication capabilities to provide superior preventative and counter-measure solutions for:

- Homeland Security
- Emergency Response
- Public Events
- Building Protection
- Mass Transportation Centers
- Perimeter Monitoring
- Hazardous Response
- Port Surveillance
- Confined Space Monitoring

SAFESITE® System components consist of the SAFEMTX™ Multi-Threat Detector, the SAFECOM™ Command Center and the SAFECONNECT™ Belt-Bridge with Sirius wireless interface. The system can be installed permanently (wired or wireless) for continual monitoring or deployed as a portable system.

The SAFEMTX Multi-Threat Detector utilizes multi-sensing technologies to detect up to six potential threats; helping first responders, law enforcement and government agents reduce the risk of exposure and facilitate consequence management.

The SAFECOM™ Command Center receives mission-critical information from the SAFEMTX™ Detectors and permits this crucial and wide-ranging data to be converted quickly into practical information for rapid decision-making through an uncomplicated graphical user interface. The SAFECOM Command Center can manage up to four systems with 16 SAFEMTX Detectors per system, integrating SAFEMTX data, including:

- Gas readings
- Relative CWA threat level
- Radiation dose rate
- Alarm status
- GPS location
- Battery run time
- RF signal strength
- Fault conditions
- SAFEMTX min, max, and average values

Through SAFECOM Command Center, alarms are identified with both visual and audible alarms. Alarms can then be acknowledged and silenced, detectors can be enabled and disabled, event logs and event log history can be viewed, plus units can be customized to suit the specific deployment scenario.

Wireless Technology

The SAFESITE® System provides up to two miles of wireless communication between any SAFEMTX Detector, SAFECONNECT Belt-Bridge and SAFECOM Command Center. SAFECONFIG™ Software works with the SAFECOM Command Center or SAFECONNECT Belt-Bridge, enabling configuration of any SAFEMTX Detector as a repeater. This added capability maximizes deployment range and ensures maximum signal strength and reliable deployment without the need to move units.

SAFEPAC™ Perimeter Area Command Kit

SAFESITE® SAFEPAC™ Perimeter Area Command Kit provides a basic kit for quick deployment and monitoring of an event or a location. The kit includes two Pelican cases with an internal battery charger, 4 SAFEMTX™ Multi-Threat Detectors, 1 SAFECOM™ Command Center, all necessary PC interface software, and 4 extra batteries. A laptop PC is also available as an option, or an existing PC can be used.

1 **Threat Readings** – scrolling readings of up to 16 MTX Detectors per channel. Unit is identified by large iconto the left of the readings. In alarm condition, display snaps to unit in alarm.

2 **MTX Icons** – identify number of units enabled in current network. Users may view specific unit reading by double-clicking on icon.

3 **Map** – option for map view or uploaded image view.

4 **Signal Strength** – communication status from SAFEMTX™ Detector to SAFECOM™ Command Center.

5 **Power** – status of battery life of SAFEMTX Detecors.

6 **System Status** – alerts user to alarm, warning or fault within a particular system.

7 **Action Buttons** – allow user to select address, cycle units, acknowledge alarms and enable or disable units from the system.

Threat	Technology	Benefit
Chemical warfare agents	Surface acoustic wave (SAW)	Low false positives and false alarms, differentiates nerve & blister agents
Gamma radiation	Cadmium zinc telluride (CZT)	Sensitive with adjustable threshold and 2 ranges. (0-100 mR/hr, 0.1 mR/hr resolution & 0-1000 mR/hr, 1 mR/hr resolution)
Volatile organic compounds	Photo-ionization (PID)	10.6 eV lamp provides ppm readings for broadband toxics and VOC detection
Toxic industrial chemicals	Electrochemical	Detects many specific toxic gases such as chlorine, ammonia, hydrogen cyanide and hydrogen chloride
Oxygen deficiency/ enrichment	Electrochemical	Oxygen monitoring for confined space
Combustible gas	Catalytic bead	Wide range detection for hydrocarbons

Note: US Export Licence Restrictions Apply

BIOSENSOR™ 2200R Biological Agent Detector

The new BIOSENSOR™ 2200R Biological Agent Detector from MSA is a handheld, portable, on-site instrument for rapid detection, analysis, and identification of biological agents. Unique bioassay technology offers excellent sensitivity and low false positives while offering ease of use during white powder response calls. This highly accurate detection method provides rapid measurement of biohazards such as anthrax, ricin, botulism, SEB, and plague.

Exclusive five minute time-to-answer allows first responders to make informed critical decisions more rapidly than any other biological agent detector. The BIOSENSOR™ 2200R employs dynamic surface generation, a patent pending type of immunoassay detection technology. This technology offers significant advantages over other field-based assay methods by combining the benefits of both the free solution and lateral flow types. The result is more rapid analysis, a user-friendly format, and detector stability within a wide range of climates.

Both wet and dry samples may be tested and results are displayed with a simple red (target present) or green (no target present) indication. As tests are nondestructive, samples may be retained as evidence. Single-test, disposable cartridges with on-board reagents have a 12-month shelf life. This instrument is permanently housed in a sturdy, lightweight Pelican case.

Instrument Features and Benefits

- 5 minute time-to-answer
- Uses positive and negative control cartridges
- Battery-operated with ability to run 50 tests on a single charge
- Fully deconable housing; IP67 rated
- Visual and audible alarms provide clear indication of status
- Extremely easy to use with a training time of one hour
- Integrated RFID (radio frequency identification) for automatic cartridge recognition

Targets

- Anthrax/ricin duplex—one test, two agents
- Anthrax
- Ricin
- SEB (staphylococcal enterotoxin B)
- Botulism*
- Plague*
- Smallpox*
- Tularemia*
- Cholera*
- West Nile virus*

*additional agents in development

BIOSENSOR™ 2200R Biological Agent Detector	
10084834	MSA BIOSENSOR™ 2200R Biological Agent Detector Kit*, includes carry case, charger, cartridge starter kit (10084758), instruction manual, and quick start guide.
BIOSENSOR Cartridge Plans	
10084758	MSA BIOSENSOR™ cartridge starter kit includes 3 Anthrax/Ricin dual kits**, 1 Anthrax, 1 Ricin, 3 positive control, 2 negative control cartridges, and 2 wet sample kits
10084753	MSA BIOSENSOR™ Low volume cartridge plan includes 6 Anthrax/Ricin dual kits**, 2 Anthrax, 2 Ricin, 6 positive control, 2 negative control cartridges, and 2 wet sample kits
10084754	MSA BIOSENSOR™ Medium volume cartridge plan includes 24 Anthrax/Ricin dual kits**, 6 Anthrax, 6 Ricin, 24 positive control, 6 negative control cartridges, and 4 wet sample kits
10084755	MSA BIOSENSOR™ High volume cartridge plan includes 60 Anthrax/Ricin dual kits**, 8 Anthrax, 8 Ricin, 60 positive control, 8 negative control cartridges, and 6 wet sample kits.

* Extended warranties available.

** Each biohazard cartridge test kit includes a dry sample kit. Please contact your MSA representative for more information.

Regulators

Gas Miser® Demand Regulator: The Intelligent Regulator

Gas Miser® Model RP

Gas Miser® Model BD-20

The Gas Miser® Regulator is the most advanced, yet simple-to-use calibration gas delivery system available. Made of nickel-plated brass and polished aluminum (especially important for reactive gases), the Gas Miser® Regulator can supply gas flow from 0.1 lpm to 3.0 lpm. But that's only the beginning. Designed for use with any MSA Model RP Calibration Cylinder except chlorine and ammonia*, the Gas Miser® Regulator features an automatic ON/OFF valve that releases gas only on demand. So only the amount of gas needed to calibrate your MSA instrument is delivered accurately. When the calibration is complete, the Gas Miser® Regulator shuts off automatically. And, for user convenience, the regulator can stay connected to the cylinder where it remains in a ready state - making it ideal for such fixed installations as work benches and calibration stations.

The Gas Miser® Regulator also eliminates the need to change regulators to accommodate different instruments or flow rates. It's not only intelligent, it's cost-efficient. Supplied with calibration tubing and special fitting.

* A Gas Miser® Regulator for chlorine and ammonia is available for Model RP cylinders —P/N 10034391

Regulators	
.25/1.5 LPM Flow Control	
Model RP .25 lpm*	467895
Model RP Cylinder 1.5 lmp	478358
Gas Miser® Demand Regulator:	
Model RP	710288
Model RP, Chlorine and Ammonia	10034391
Model BD-20, with CGA 590 fitting	710289
Model 7HP Regulators	
Model 7HP 0.25 lpm	459949
Model 7HP 1.5 lpm	459948
Gas Miser Manifold	
4-station Manifold	710274
Model RP Calibration Check Kits	
Check Kit, Model RP, with 0.25 lpm regulator - complete + must add gas	477149

* Can be used with chlorine and ammonia; replaces P/N 809945.

Model RP Regulators

Fixed flow rate standard regulators with or without taps. Used with Model RP and R type cylinders

.25/1.5 LPM Flow Control Model RP

Gas Miser® Manifold

The Gas Miser® Manifold is not only a cylinder holder but it also incorporates a 4-station "bump test" or calibration manifold. It works with Model RP and Econo-Cal cylinders and Gas Miser® regulator on any pumped or aspirated instrument.

The manifold will supply the correct amount of gas required and will bump test or calibrate up to four instruments simultaneously. Gas Miser® regulator sold separately.

Model RP Calibration Check Kits

Model RP Check Kits consist of a regulating valve which includes a gauge to measure container pressure, an adapter hose, sensor adapter (where applicable), instructions, and a case fitted with room for two Model RP cylinders of calibration check gas.

Instrumentation

Calibration Gases

Each MSA Calibration Gas Cylinder is shipped with an individual copy of a material safety data sheet (MSDS) and an individual copy of a certificate of analysis. MSA certifies that the gas mixture in calibration gas cylinders was prepared gravimetrically, using NIST traceable weights.

The lot number and nominal value of the gas constituents in percent by volume, percent by mass, PPM, or volume are specified on the cylinder. The uncertainty statement of the specified nominal value is also listed.

Model RP Calibration Cylinders—Non-Reactive Gases, Steel Cylinder, 100 Liters

			100 LTRS 1000 PSI	*Regulators*	*Regulators*	*Demand Flow*
Gas Fill	**Gas Mixture**	**Background**	**Model RP**	**0.25 lpm**	**1.5 lpm**	
Air	air zero (THC < 1 ppm)	—	801050	467895	478358	710288
Carbon Monoxide	400 ppm carbon monoxide	air	806255	467895	478358	710288
	300 ppm carbon monoxide	air	473180	467895	478358	710288
	200 ppm carbon monoxide	air	809243	467895	478358	710288
	100 ppm carbon monoxide	air	809242	467895	478358	710288
	50 ppm carbon monoxide	air	809241	467895	478358	710288
	100 ppm carbon monoxide	nitrogen	806734	467895	478358	710288
Hydrogen	0.8% hydrogen	air	803102	467895	478358	710288
Isobutylene	100 ppm isobutylene	air	494450	467895	478358	710288
Methane	1.45% methane, 15% O_2 bal N_2 (Pentane Sim)		478192	467895	478358	710288
	2.5% methane, 15% O_2 bal N_2		10028032	467895	478358	710288
	2.5% methane	air	491041	467895	478358	710288
	6.6% methane	nitrogen	801049	467895	478358	710288
Oxygen	20.8% oxygen	nitrogen	479857	467895	478358	710288
	5.0% oxygen	nitrogen	493580	467895	478358	710288
Nitrogen	100% nitrogen	—	481317	467895	478358	710288
Nitrous Oxide	10 ppm nitrous oxide	nitrogen	806736	467895	478358	710288
Pentane	0.75% pentane (50% LEL)	air	804532	467895	478358	710288
Propane	0.6% propane	air	493579	467895	478358	710288
Combination Gas Cylinders	0.35% pentane, 19.0% oxygen, 100 ppm carbon monoxide	nitrogen	10007047	467895	478358	710288
	0.6% propane, 15% oxygen, 60 ppm carbon monoxide	nitrogen	801051	467895	478358	710288
	1.45% methane, 300 ppm carbon monoxide, 15% oxygen	nitrogen	10010162	467895	478358	710288
	2.5% methane, 60 ppm carbon monoxide, 15% oxygen	nitrogen	813718	467895	478358	710288
	2.5% methane, 300 ppm carbon monoxide, 15% oxygen	nitrogen	10040791	467895	478358	710288
	1.45% methane, 15% oxygen	nitrogen	478192	467895	478358	710288

Model RP

Model RP Cylinder
Contents: Pressure 1000 psig; approximately 100 liters at atmospheric pressure
Size: 13-3/4" x 3"
Weight: 2 lb 13 oz
Material: Steel

Model RP and Econo-Cal Calibration Cylinders—Reactive Gases, Aluminum Cylinders, 58 & 34 Liters

			58 LTRS 500 PSI		Regulators	Regulators	Demand Flow
Gas Fill	**Gas Mixture**	**Background**	**Model RP**	**Econo-Cal**	**0.25 lpm**	**1.5 lpm**	
Ammonia	25 ppm ammonia	nitrogen	814866	711078	467895	478358	710288
Chlorine	10 ppm chlorine	nitrogen	806740	711066	467895	478358	710288
Hydrogen Sulfide	40 ppm hydrogen sulfide	nitrogen	467897	711062	467895	478358	710288
	15 ppm hydrogen sulfide	nitrogen	806253	711064	467895	478358	710288
	10 ppm hydrogen sulfide	nitrogen	467898	711060	467895	478358	710288
Nitric Oxide	50 ppm nitric oxide	air	812144	711074	467895	478358	710288
Nitrogen Dioxide	10 ppm nitrogen dioxide	air	808977	711068	467895	478358	710288
Phosphine	0.5 ppm phosphine	nitrogen	710533	711088	467895	478358	710288
Hydrogen Chloride	40 ppm hydrogen chloride	nitrogen	710210	711080	467895	478358	710288
Hydrogen Cyanide	10 ppm hydrogen cyanide	nitrogen	809351	711072	467895	478358	710288
Sulfur Dioxide	10 ppm sulfur dioxide	air	808978	711070	467895	478358	710288
Combination Gas Cylinders	1.45% methane, 15% oxygen, 300 ppm carbon monoxide, 10 ppm hydrogen sulfide	nitrogen	804770	711058	467895	478358	710288
	1.45% methane, 15% oxygen, 20 ppm hydrogen sulfide	nitrogen	10048788	10048790	467895	478358	710288
	1.45% methane, 15% oxygen, 300 ppm carbon monoxide, 2.5% carbon dioxide	nitrogen	—	10058023	467895	478358	710288
	1.45% methane, 15% oxygen, 60 ppm carbon monoxide, 20 ppm hydrogen sulfide	nitrogen	10045035	10048280	467895	478358	710288
	1.45% methane, 15% oxygen, 10 ppm hydrogen sulfide	nitrogen	804769	711056	467895	478358	710288
	2.5% methane, 15% oxygen, 300 ppm carbon monoxide, 10 ppm hydrogen sulfide	nitrogen	813720	711076	467895	478358	710288
	2.5% methane, 15% oxygen, 60 ppm carbon monoxide, 20 ppm hydrogen sulfide	nitrogen	10048890	10048981	467895	478358	710288
	1.45% methane, 15% oxygen, 20 ppm hydrogen sulfide	nitrogen	10048889	10048888	467895	478358	710288
	1.45% methane, 15% oxygen, 10 ppm hydrogen sulfide, 300 ppm carbon monoxide, 2.5% carbon dioxide	nitrogen	10050744	10058022	467895	478358	710288
	1.45% methane, 15% oxygen, 300 ppm carbon monoxide, 2.5% carbon dioxide	nitrogen	10058021		467895	478358	710288
	1.45% methane, 15% oxygen, 60 ppm carbon monoxide, 20 ppm H2S, 2.5% carbon dioxide	nitrogen	10103262	10104621			

Note: Reactive gases have an expiration date listed on each cylinder. This is to ensure the highest quality and accuracy for instrument calibration. Most cylinders have an expiration date of 12 months. Check with MSA Customer Service for the exact shelf life of a particular calibration cylinder.

Model 5E Calibration Cylinders

Contents:	**1200L**	**Material:** Steel		**Regulators**
Gas Fill	**Gas Mixture**	**Background**	**Part No.**	**0.25 lpm**
Methane	2.5% Methane, 15% Oxygen, 60 ppm Carbon Monoxide	Nitrogen	710566	710289
	1.45% Methane, 15% Oxygen, 60 ppm Carbon Monoxide	Nitrogen	710565	710289
Air, zero	Air, zero, THC<1 ppm	—	710776	710289

Model 5E Calibration Cylinders

Model 650AL Calibration Cylinders

Contents:	**950L**	**Material:** Aluminium		**Regulators**
Gas Fill	**Gas Mixture**	**Background**	**Part No.**	**0.25 lpm**
Combination Gas	1.45% Methane, 15% Oxygen, 60ppm Carbon Monoxide, 10 ppm Hydrogen Sulphide (Pentane Sin)	Nitrogen	766875	766876