

Single Point Monitor (SPM)

Single Point Monitor (SPM) Gas Detector March 2010

NOTE: Guides are to be used by trained personnel only and DO NOT replace the manufacturer's operations or technical manuals. These guides were developed by field personnel for utilization by EPA and their contractors and are helpful in quick start-up and operations. Various limitations have been identified through the experience of the development group. Different makes, models, and updates to this equipment may change the limitations. It is recommended that calibration, maintenance, and use be recorded in a log book. If you have any changes or revisions please email one of the following: stevenson.peter@epa.gov, boykin.michael@epa.gov, chong.margaret@epa.gov, kroone.janice@epa.gov, zintak.leonard@epa.gov.



Uses:

The SPM provides long term monitoring of specific target gasses or gas families and is used to sample the airborne concentration of various volatile chemicals. See attached table for list of possible chemicals and available chemKeys and tapes. Monitoring is possible for either 15 or 30 days depending on tape size used. Typical application include outdoor locations, hazardous locations, corrosive areas, remote sample points, gas storage areas, perimeter / fence lines, survey work, emergency response, high-level ranges of gas, and ventilation and exhaust systems

Limitations:

- Install H₂S scrubber filter (PIN97-9458) to eliminate H₂S interference of hydrides, XP hydrides, or hydrogen cyanide.
- The gas to be monitored must be known and the appropriate tape must be installed. A given type of Chemcassette may be used to monitor several gas types by using the appropriate ChemKey. See the manual for more details.
- Some tapes are light sensitive and must be protected from light. Tapes require some humidity, early morning dew can cause reactions, tears, or rips.
- Heavy and bulky. Shock sensitive.
- Each compound has a different sampling time and can last as long as 15 minutes in one location.
- Exhaust line length may be up to 10 feet long only.
- Some tapes require refrigeration or freezer storage.
- Tapes have limited shelf life.
- There are fuses within the instrumentation.
- Must replace both internal filters annually.
- Running 24 hours, SP tapes will last 14 days and EP tapes will last 28 days.
- Acid scrubbing filters (P/N 710235) are not to be used with SPM sample lines.

Target Gas	Maximum Sample	End of	End of
------------	----------------	--------	--------

	Line		Line Particulate Filter for Noncorrosive Gas OK?	Line Particulate Teflon Filter for Corrosive Gas Required?
	Standard SPM	SPM fitted with Extended Sample Option		
Aromatic Amines (PPD, MDA, TDA)	15 cm (6 inches)	Not approved	No	No
Diisocyanates			No	No
Hydrazines (N ₂ H ₄ , N ₂ H ₄ -low, MMH, MMH-low, UDMH)			No	No
n-Butyl Amine	3 meters (10 feet)	8 meters (25 feet)	Yes	No
Chlorine Dioxide	3 meters (10 feet)	15 meters (50 feet)	Yes	No
Hydrogen Peroxide			No	Yes
Hydrogen Bromide	3 meters (10 feet)	*	No	Yes
Hydrogen Iodide			No	No
Nitric Acid	1 meter (3 feet)	Not approved	No	Yes
Sulfuric Acid			No	Yes
Ammonia	3 meters (10 feet)	30 meters (100 feet)	Yes	No
Bromine			No	Yes
Chlorine			No	Yes
Chlorine – low			No	Yes
Dimethyl Amine			No	Yes
Tetrakis titanium (TDMAT)			No	Yes
Hydrides			Yes	No
Hydrogen Chloride			No	Yes
Hydrogen Cyanide			Yes	No
Hydrogen Fluoride			No	Yes
Hydrogen Selenide			Yes	No
Hydrogen Sulfide			Yes	No
Hydrogen Sulfide-dry			Yes	No
Hydrogen Sulfide (low)			No	No
Nitrogen Dioxide			No	No
Ozone			No	No
Phosgene			Yes	No
Sulfur Dioxide			No	No
Fluorine	3 meters (10 feet)	6 meters (20 feet)	No	Yes
Fluorine-Low Level			No	Yes
Boron Trifluoride			No	Yes

* Hydrogen Bromide and Hydrogen Iodide are very water soluble. A high relative humidity (RH) will cause sample loss due to absorption onto the sample lines.

Quick Start-up and Operation:

- Attach sample tubing and exhaust tubing. To insert sample tubing into the sample inlet fitting, loosen the sample fitting. Insert tubing until it is firmly seated against the fitting body and tighten finger tight, then $\frac{3}{4}$ turn with a wrench. **DO NOT OVER TIGHTEN.**
- Sample inlet tubing length may be limited for some target gasses. See the table under **Limitations.**
- Connect auxiliary devices such as remote alarms. Supply 110 volt power to the instrument if available or desired.
- Select a ChemKey and either the matching Chemcassette or the matching gas family Chemcassette. **Note that there may be separate Chemcassettes and ChemKeys for a specific type of gas (chlorine is an example) set to monitor for different concentration levels and providing different alarm levels. Be sure to select both items correctly.**
- Insert the ChemKey and activate it by turning it $\frac{1}{4}$ turn in a clockwise direction. **Please note that the SPM will not operate unless a ChemKey is inserted in the SPM unit.**
- Press the main power switch on the front panel to turn the instrument on.
- The digital display will scroll through the following information: gas type, alarm levels, and Chemcassette type. Observe this display information as a check on the correct match with the ChemKey and Chemcassette.
- To load the Chemcassette, open the tape load lever. The green system status LED will flash slowly. The LED will display “Batt OK.” Remove the center retaining screw and remove and discard the old Chemcassette. Install a fresh Chemcassette with raised lettering facing up. Pull 12 inches of tape out of the fresh Chemcassette. Place the end of the tape in the slot on the Chemcassette take-up reel cover. Thread the Chemcassette tape through the detector head, capstan assembly, and over the guide posts. Install the take-up reel cover. Rotate the assembled take-up reel clockwise to take up any slack. Install the Chemcassette center retaining screw. Close the tape load lever.
- Plug the end of the sample line. A fault #17 will be generated, indicating that there are no leaks. Upon completion of this test, unplug the sample line. If a leak is indicated, inspect the sample line connector for dust and dirt, clean as needed, reconnect and perform another leak test.
- The SPM will automatically begin monitoring. The green system status LED will be lighted.

Calibration/Operations Test:

No field calibration is required. However, a system response verification is recommended to ensure proper function of the unit. The verification routine checks the operational condition of the SPM optical system through use of the optical test card supplied with the instrument. The instrument must be in Monitor Mode to start this test and must have a ChemKey installed.

Perform the verification test as follows:

- Open the tape load lever and remove the Chemcassette from the detector head.
- Press alarm test. The green system status LED will flash rapidly and the display will show “VERIFY.”
- Insert the test card with position #1 centered in the detector head. Be sure that the colored chip on the test card faces up and that the card is inserted fully into the detector

- head.
- Close the tape load lever and press alarm test key. The audible alarm will emit one short signal.
- Open the tape load lever and reverse the test card, centering position #2 in the detector head.
- Close the tape load lever and press alarm test key.
- If all electronics and optical systems are operating properly, the instrument will simulate an alarm condition and activate both the audible and visual alarms. The 4-20 mA circuit will output a signal of 10.1 mA to 13.2 mA.

NOTE: Alarm relays will not activate during the verification test.

- Open the tape load lever and press alarm reset. Replace the Chemcassette and re-thread the tape. After pressing the alarm reset button, the alarm lamp does not extinguish.
- Close the tape load lever. The SPM will automatically begin monitoring.
- Press the alarm reset button to turn off the alarm lamp.
- Perform a leak test by placing your finger over the end of the sample line and listen for the pump loading that indicates there are no leaks in the system. Do not allow a fault #17 to be generated, indicating that there are no leaks between the sampling point and SPM.
- If the system is not operating properly, the audible alarm will signal two times and the red system status LED will light. If this occurs, open the tape load lever, press the alarm reset, and repeat the verification procedure. If the system still indicates a malfunction, contact Honeywell for assistance.

Additional Operation Information:

- When monitoring for certain gases or when monitoring for gases using low-level calibrations, there may be limits on the length of sample lines. See table in limitations second for more information on specific target gases. Consult Honeywell Analytics if necessary.
- Use only 1/8" ID x 1/4" OD FEP Teflon for sample lines. Other, non-FEP Teflon lines may absorb the target gases, causing incorrect concentration readings.
- For dusty conditions with particle size above 0.1 micron, particulate filters may be installed on sample lines for certain gases. For non-corrosive gases, use particulate filter P/N 780248 and replace every six months. For corrosive gases, use a Teflon-membrane particulate filter assembly, P/N 1830-0055 and replace it every 30 days. See table in Limitations section for more information on specific target gases.
- Acid scrubbing filters (P/N 710235) are not to be used on sample inlet lines with SPM instruments.
- Replace the three internal filters annually. See "*Replacing Internal Filters*" section below.

Instrument Fault or Error: Displays “FAULT” along with a two digit fault code.			
Fault Code	Fault or Error	Fault Code	Fault or Error
06	RAM Failure; Contact Honeywell Analytics	21	Motor Home Time-out; Contact Honeywell
08	EEPROM Fault; Contact Honeywell Analytics	25	Gate Fault (Mode Time-out); See §1.8.2
10	Look-Up Table Error; Contact Honeywell	30	High Background Counts; See Manual §3.7
11	ChemKey Error; See Manual §5.4.9	32	Reference Voltage #1 Fault; Contact Honeywell
17	Loss of Flow, See Manual §3.8	34	Over Temp (Heater Option Only); See §5.9.3

Replacing Internal Filters

The replacement procedure will take approximately one hour to perform. Follow these steps to replace internal filters properly:

1. Separate cover/collar from body. Refer to Figure 1 below.

Guidelines for opening / closing the SPM enclosure

- A. Make sure the electrical power is removed.
 - B. The cover (29) and the collar (30) must always remain connected to each other.
 - C. During disassembly and reassembly, the connection between the cover (29) and the collar (30) must be secured by at least three cover screws (20).
 - D. To open the hinged collar (30) from the SPM body (31), you must remove the collar fixing screws (22) are mounted behind the cover screws (20.)
 - E. In order to reach each collar fixing screw (22), you must temporarily remove the cover screw (20) and the retaining ring (21).
 - F. After removing each collar fixing screw (22) and retaining ring (21), replace each cover screw (20) in order to keep the collar (30) and the cover (29) securely connected.
 - G. To replace the cover (29), follow these same guidelines to install the collar fixing screws (22) and reassemble the enclosure. Make sure that the cover (29) and collar (30) stay connected throughout the entire procedure and that the connection is always secured with at least three cover screws (20). Check all wiring harnesses and tubing lines to make sure they are not pinched when the door is closed.
2. Open unit. Filters are located inside center area of cover/collar, below and partially behind printed circuit board (PCB). See Figure 2 below.
 3. Remove the three screws and six fiber washers securing the PCB. Note location of fiber washers for re-assembly.
 4. Leave all cables connected except J-11 (4 pin and J-3 (10 pin) located on top right of component side (rear view).
 5. Carefully lift outward on PCB to locate J-11 (also located to right on component side).
 6. Support PCB temporarily in a “raised” position using a rubber band.
 7. Remove acid scrubber filter, mounted vertically. The acid scrubber filter (66) is shown in Figure 2 below. Replace with new filter (P/N 780248).
 8. Remove particulate filter (65). Refer to Figure 2 below. Replace with new filter (P/N 780248).

Note:

Arrow on body of filter must point in right direction. ➔

9. Remove filter assembly (65). Refer to Figure 2 below, if installed. Replace with new filter (P/N 871134).
10. Verify that there are no kinks in tubing.
11. Remove temporary support from PCB.
12. Reconnect cables. When reconnecting J-3, make sure opposite end of cable is still connected. Check all other cable connections on and near PCB.
13. Secure PCB with screws and fiber washers. Fiber washers should be on both sides of PCB at each screw location.
14. Before securing cover to body, verify SPM will go into Monitor Mode by power-up the unit.
Note: If SPM goes into Monitor Mode, proceed with next step. If not, power down SPM, check cable connections and try again. If problem persists, call Zellweger Analytics Service.
15. Power down SPM.
16. Secure cover to body. Refer to “*Guidelines for opening / closing the SPM enclosure*” above.
17. Power up unit and verify system response as outlined above in “Calibration/Operations Test” section. Figure 3 below may also be helpful.

Setting Date and Time (Refer to Figure 3 below)

1. Make sure the main power switch (8) is on.
2. Open take load lever (18).
3. The digital display (19) will show either (AC LINE) (for line systems) or (BATTERY CONDITION) (for battery backup/portable systems).
4. Press and hold alarm test key (10) until the date shows on the display. The format is MM/DD/YY. The field that is blinking is to be changed.
5. Press alarm reset (11) to change the number in the blinking field. When the field is correct, press alarm test (1) to move to the next field.
6. Continue by alternating alarm test (10) and alarm reset (11) to move to new fields and to change numbers in the blinking field. After setting the correct date, the display changes to time of day in the format HH:MM.
7. Press and hold alarm test (10. the display (19) will show (TIME SET) to confirm the new entry. If the display reads (ERROR), you made an invalid entry in one of the fields. Repeat steps 3 through 7 to find and correct the error.
8. Close the tape load lever (18) to begin monitoring.

Heater Option

The heater option allows the SPM to operate from -20°C to +40°C (-4°F to +104°F) ambient. The thermostatically controlled heater functions automatically whenever the unit is connected to an AC source. The heater operates directly from the line cord independent of the main unit power switch. When the heater option is installed, the front panel has two amber neon lights mounted on the left side below the Chemcassette holder. The Power In LED (80) glows when the unit is receiving power. It shows that power is available to be automatically applied to the heater

if required. The Power IN LED (80) does not indicate that the SPM is monitoring. The main power switch (8) must be on to activate the SPM for monitoring which will be indicated by the green system status LED (9). The Heater On LED (81) glows when the heater is operating and the internal temperature is less than +10°C (+50°F).

Installation and Operation

The SPM should be plugged into an AC voltage source at all times to allow a constant temperature to be maintained in the unit. For initial installation, a warm-up time of up to one hour may be required before monitoring. This warm-up time will vary with the ambient temperature. Refer to Figure 4 below. Set the main power switch (8) off and observe that the Power In LED (80) is lighted. If the Heater On LED (81) is not lighted, the main power switch can be switched on to begin monitoring. If the SPM is disconnected from an AC source for more than 30 minutes, the SPM must be allowed to warm up for up to one hour before setting the main power switch (8) on.

Caution: The surface of the front panel may be HOT. Use care when replacing fuse and/or Chemcassette. The main power switch (8) does not turn off power to the heater. Power to the heater is applied whenever the internal unit temperature is +10°C (+50°F) or below with the main power switch (8) in either “on” or “off” position. Disconnect the power source when wiring the alarm contacts and during servicing as required.

Condensation

A sudden extreme temperature change may cause moisture in the SPM to condense. The optics block may fog, causing the SPM to show a gas concentration. Allow ample time for the SPM to warm up before attempting to monitor.

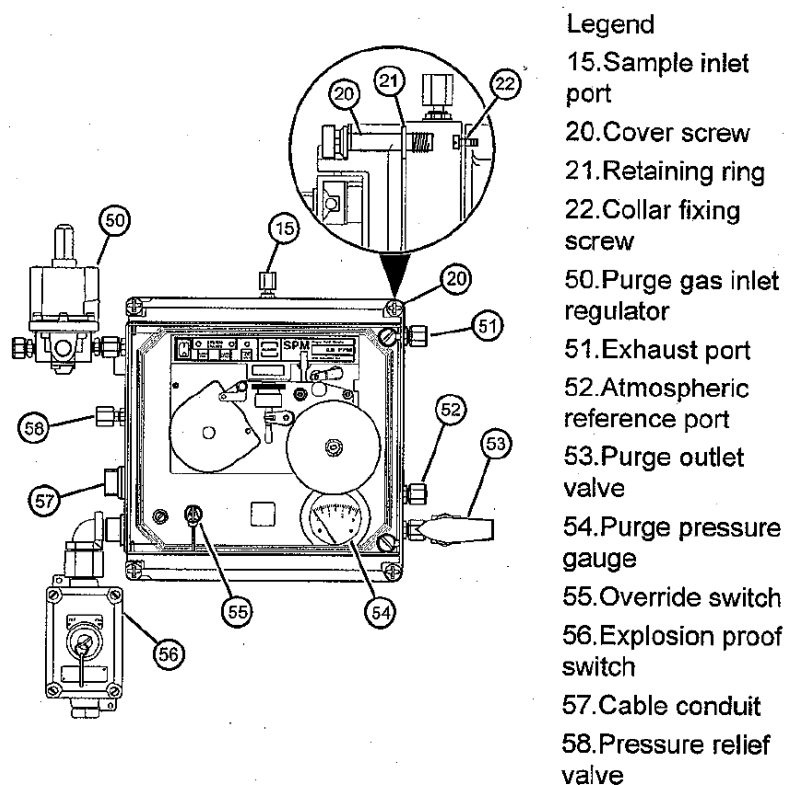


Figure 1

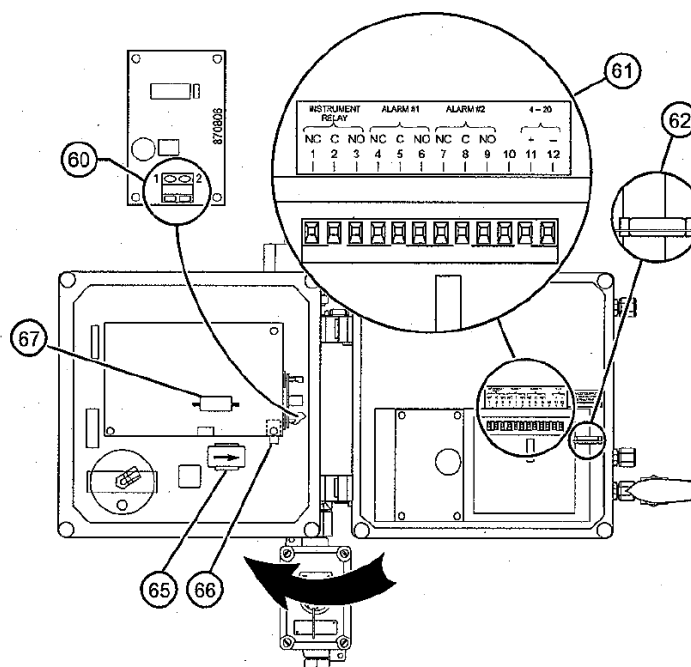


Figure 2

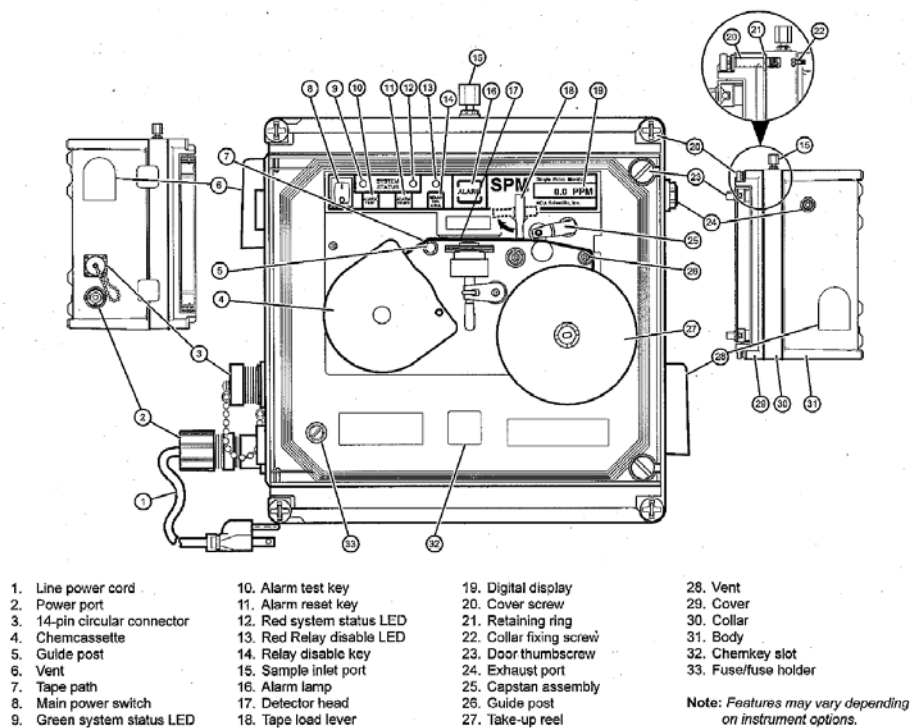
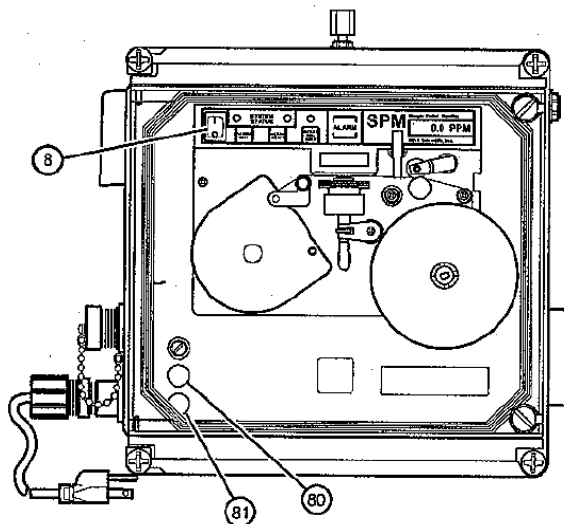


Figure 3



Legend

- 8. Main power switch
- 80. Power In LED
- 81. Heater On LED

Figure 4

Routine Maintenance:

Frequency	Action	Manual Reference
Each Use	• Verify System Response	§1.6, 1.7, 1.8
Bi-Weekly	• Replace SP size (15 day) Chemcassettes	§ 1.5
Monthly	• Replace EP size (30 day) Chemcassettes	§ 1.5
	• Replace corrosive gas particulate filters	§ 4.11
Every 6 Months	• Replace non-corrosive gas particulate filter	§ 4.11
Annually	• Replace the two internal filters	§ 3.4

Action Levels:

Action levels for each gas monitored must be established and procedures must be in place to protect all personnel from potential health threats. Instrument alarms are set at the factory. The low alarm is set to ½ of the TLV. The high alarm level is set to the TLV.

Principle of Operation:

Chemcassettes use a dry reagent impregnated into a paper tape to collect and analyze air or detect gas leaks. When the Chemcassette is exposed to a target gas, a chemical reaction occurs resulting in a color change in direct proportion to the concentration of gas present. The SPM sense the color intensity change and determines the gas concentration by comparison to a known gas response pre-programmed into the instrument via the memory chip sealed within the ChemKey. To the best of our knowledge, each Chemcassette is very specific to the gas being measured. No detailed information on the methodology is available and the method appears to be proprietary.

Battery Information:

- When fully charged, the internal batteries provide up to eight hours of continuous monitoring, but frequent alarms will reduce operating time. To extend the battery life to a maximum of nine hours, disable the instrument fault relay by pressing the relay disable key.

NOTE: If the relays are disabled, the external alarm(s) will not activate.

- The portable SPM should be connected to an AC power source via its battery charger at all times to maintain a full charge, even when not in use. The instrument will automatically switch to battery backup mode when there is an interruption on the AC line.
- The unit will display a “BATT OK” message when the battery voltage is in the normal range for portable or battery backup operation. The message “BATT LOW” appears when there is 60 to 90 minutes of running time left on the batteries. After this, “RECHARGE BATTERY NOW” will be displayed and monitoring will stop.

NOTE: It is recommended that due to the many types of rechargeable battery configurations, that Equipment Managers verify proper battery charging and operation through monthly equipment operation until battery is discharged prior to recharging.

Main Inventory Items/Accessories:

- SPM Unit
- Chemcassette tapes for various chemicals and chemical families
- ChemKeys for different chemicals
- Sample line
- Battery charger
- Custom made data logger / strip chart recorder output is available

Replacement of Auxiliary Equipment/Supplies:

Replacement supplies (Chem cassettes, filters, etc.) are to be purchased , as needed, to allow adherence to the maintenance schedule.

Shipping Information:

The SPM system can be shipped in a custom made pelican case with rollers. The chem cassettes are not considered dangerous goods and may be shipped by any readily available method.

Contact Information (Technical Support):

Honeywell Analytics Distribution Inc
405 Barclay Boulevard
Lincolnshire IL 60069
Tel: +1 847 955 8200
Toll free: +1 800 538 0363
Fax: +1 847 955 8208
Email: detectgas@honeywell.com www.honeywellanalytics.com

Note: To save time when calling for service, please have the S/N of your instrument available.

Available ChemKeys and Factory-set Dual Alarm Levels	
<u>Target Gas</u> NOTE: A separate SPM ChemKey is required for each target gas. A ChemKey must be inserted or the SPM will not operate	<u>Dual Alarm Levels</u> These alarm levels are programmed into the SPM upon ChemKey insertion
Amines	
(1)n-Butylamine (N-BA)	5.0/10.0 ppm alarms
(1)Dimethyl Amine (DMA) Low Level	1.0/3.0 ppm alarms
(1)Methylene Dianiline (MDA)	10/20 ppb alarms
(2) p-Phenylenediamine (PPD)	10/20 ppb alarms
(2)Toluene Diamine (TDA)	10/20 ppb alarms
(3)Trimethyl Amine (TMA)	10/20 ppm alarms
Ammonia (NH ₃)	12.5/25 ppm alarms
Ammonia (NH ₃)	25.0/50.0 ppm alarms
Bromine (Br ₂)	50/100 ppb alarms
Chlorine II (Cl ₂)	0.25/0.50 ppm alarms
Chlorine II (Cl ₂)	0.5/1.0 ppm alarms
Chlorine III/Oxidizers (Cl ₂)	0.25/0.50 ppm alarms
Chlorine (Cl ₂) Extended Play	0.25/0.50 ppm alarms
Chlorine Dioxide (ClO ₂)	50/100 ppb alarms
Diisocyanates	
Cyclohexane diisocyanate (CHDI)	5/20 ppb alarms
Hexamethylene diisocyanate (HDI)	5/20 ppb alarms
Dicyclohexylmethane diisocyanate (HMDI)	5/20 ppb alarms
Isophorone diisocyanate (IPDI)	5/20 ppb alarms
Methylene diphenyl diisocyanate (MDI)	5/20 ppb alarms
MDI-II (used for larger particles > 1 micron)	5/20 ppb alarms
Naphthalene diisocyanate (NDI)	5/20 ppb alarms
Paraphenylene diisocyanate (PPDI)	5/20 ppb alarms
Toluene diisocyanate (TDI)	5/20 ppb alarms
Trimethylhexamethylene diisocyanate (TMDI)	5/20 ppb alarms
Tetramethyl xylene diisocyanate (TMXDI)	5/20 ppb alarms
Xylene diisocyanate (XDI)	5/20 ppb alarms
Hydrazines	
Monomethyl hydrazine (MMH)	100/200 ppb alarms
Monomethyl hydrazine, Low level (MMH LL)	5/10 ppb alarms
Hydrazine (N ₂ H ₄)	50/100 ppb alarms

Available ChemKeys and Factory-set Dual Alarm Levels	
<u>Target Gas</u> NOTE: A separate SPM ChemKey is required for each target gas. A ChemKey must be inserted or the SPM will not operate	<u>Dual Alarm Levels</u> These alarm levels are programmed into the SPM upon ChemKey insertion
Hydrazine, Low level (N ₂ H ₄ LL)	5/10 ppb alarms
Unsymmetrical dimethyl hydrazine (UDMH)	247/500 ppb alarms
Unsymmetrical dimethyl hydrazine, Low level (UDMH LL)	5/10 ppb alarms
Hydrides	
Arsine (AsH ₃)	25/50 ppb alarms
Diborane (B ₂ H ₆)	50/100 ppb alarms
Disilane (Si ₂ H ₆)	2.5/5.0 ppm alarms
Germane (GeH ₄)	150/200 ppb alarms
Hydrogen Selenide (H ₂ Se)	25/50 ppb alarms
Phosphine (PH ₃)	150/300 ppb alarms
Silane (SiH ₄)	2.5/5.0 ppm alarms
Stibine (SbH ₃)	50/100 ppb alarms
Tertiary Butyl Arsine (TBA)	25/50 ppb alarms
Tertiary Butyl Phosphine (TBP)	150/300 ppb alarms
Hydrides Extended Play Note: SPM upgrade required to use this ChemKey.	
Arsine (AsH ₃)	25/50 ppb alarms
Arsine (AsH ₃) LL	2/4 ppb alarms
Diborane (B ₂ H ₆)	50/100 ppb alarms
Phosphine (PH ₃)	150/300 ppb alarms
Silane (SiH ₄)	2.5/5.0 ppm alarms
Tertiary Butyl Arsine (TBA)	25/50 ppb alarms
Tertiary Butyl Phosphine (TBP)	150/300 ppb alarms
Hydrogen Cyanide (HCN)	2.3/4.7 ppm alarms
Hydrogen Peroxide (H ₂ O ₂)	0.5/1.0 ppm alarms
Hydrogen Sulfide (H ₂ S)	5/10 ppm alarms
Hydrogen Sulfide (H ₂ S) LL	15/30 ppb alarms
Mineral Acids	
Boron Trifluoride (BF ₃) Low Level	500/750 ppb alarms
Hydrogen Bromide (HBr)	1.5/3.0 ppm alarms
Hydrogen Chloride (HCl)	2.5/5.0 ppm alarms
Hydrogen Chloride (HCl) Low Level	120/240 ppb alarms

Available ChemKeys and Factory-set Dual Alarm Levels	
<u>Target Gas</u> NOTE: A separate SPM ChemKey is required for each target gas. A ChemKey must be inserted or the SPM will not operate	<u>Dual Alarm Levels</u> These alarm levels are programmed into the SPM upon ChemKey insertion
Hydrogen Fluoride (HF)	1.5/3.0 ppm alarms
Nitric Acid (HNO ₃)	1.0/2.0 ppm alarms
Sulfuric Acid (H ₂ SO ₄)	125/250 ppb alarms
* Fluorine (F ₂)	0.5/1.0 ppm alarms
* Fluorine (F ₂) Low Level	0.1/0.2 ppm alarms
*Note: Fluorine ChemKey calibration p/n(s) require prom software to be at Version 1.20 or higher.	
Nitrogen Dioxide (NO ₂)	0.5/1.0 ppm alarms
Nitrogen Dioxide (NO ₂)	1.5/3.0 ppm alarms
Nitrogen Dioxide (NO ₂)	2.5/5.0 ppm alarms
Ozone (O ₃)	50/100 ppb alarms
Phosgene (COCl ₂)	50/100 ppb alarms
Phosgene (COCl ₂) Extended Play Note: SPM upgrade required to use this ChemKey.	50/100 ppb alarms
Sulfur Dioxide (SO ₂)	1.0/2.0 ppm alarms

Source: email from Clarissa Moya , Sales Support Engineer, Zellweger Analytics Inc, 800-538-0363 ext. 2769, clarissa.moya@zelana.com, November 19, 2003