

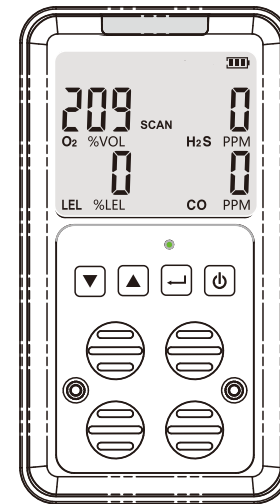
137.5mm

99.5mm

199mm



**MULTI-GAS MONITOR
USER MANUAL**



INTRODUCTION

- > Thank you for purchase of our multi-gas monitor
- > This instruction manual provided the necessary information for how to use it, what need to be careful, what is important notice. To get the maximum performance of this product, please read this user manual in detail before use this instrument, also please keep it in easy finding place, for later reference
- > Before use this instrument, please make some simple test to make sure the function is normal.

Appendix for Hydrogen Sulfide (H₂S) Gas and Combustible (LEL) Gas

Hydrogen Sulfide (H ₂ S) Gas Hazardous to the human body		
Concentration range and poisoning symptoms		poisoning symptoms
Unit : ppm	Unit: mg/m ³	
0.025~0.1	0.035~0.14	Can be perceived Hydrogen Sulfide gas
50~100	70~140	Within 1~2 hour will have mild poisoning symptom.
100~150	140~210	Will have olfactory nerve paralysis, obvious symptoms of poisoning
200~250	210~350	If stayed at his environment with 0.5~1 hour, sequelae may found.
200~350	350~490	poisoning within 6~8 minutes, may be dead within 4~8 hours
850~500	490~700	seriously poisoning within 0.5~1 hour, may be dead within 1~4 hours.
500~600	700~835	seriously poisoning within 1 minute, may be dead within 0.5~4 hours.
600~700	835~980	May be dead within 2-15 minutes.
700~1000	980~1400	Dead immediately.

Commonly used combustible gas explosion limit Table (partial)			
Name	Chemical formulas	The explosion limit in air (V%)	
		LEL	UEL
Methane	CH ₄	5	15
Ethane	C ₂ H ₆	3	15.5
Propane	C ₃ H ₈	2.1	9.5
Butane	C ₄ H ₁₀	1.9	8.5
Gasoline (Liquid)	C ₄ -C ₁₂	1.1	5.9
Kerosene (Liquid)	C ₁₀ -C ₁₆	0.6	5
City Gas		4	
Petroleum gas		1	12
Turpentine (Liquid)	C ₁₀ -H ₁₆	0.8	

* Above table is for reference only

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Appendix for Oxygen(O₂) and Carbon Monoxide (CO) Gas

Too much Oxygen and lack of Oxygen effective of human body	
Oxygen content (%vol.)	Symptom of Human body (Under normal Atmospheric pressure)
100%	dead after 6 minutes (in fully sealed environment, e.g. High Pressure Oxygen compartment)
50%	dead after 45 minutes (in fully sealed environment, e.g. High Pressure Oxygen compartment)
>23.5%	enough oxygen
20.9%	oxygen content in normal clear air environments
19.5%	oxygen less than normal required value
15~19%	Person breathes quicker and deeper and limbs cannot be moved properly.
10~12%	Shortness of breath, person may be tired and lost attention, purple lips
8~10%	Person may be dizzy, nauseas, lose consciousness and go into a coma.
6~8%	within 8 minute, breath very slow, mouth open to breath and very quickly to stop breath.
4~6%	Person may stop breath and die within 40 seconds.

Carbon Monoxide (CO) Hazardous to the human body	
Carbon Monoxide concentration (PPM)	Breathing in time and poisoning show symptoms
50ppm	The maximum allowable concentration for adults.
200ppm	after 2 to 3 hours, will have headaches, dizzy, nausea.
400ppm	Forehead pain within two hours, after 3 hours even death
800ppm	45 minute will have headaches, nausea, within 2-3 hours will death
1600ppm	20 minute will have headaches, nausea, within 1 hour will death.

* The above for reference only

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1. Notice before use this monitor

WARNING AND PRECAUTION

Not suitable operation and use in a bad environmental, will reduced the performance and accuracy of this monitor, to safety and effective to use this monitor, please read the following operation procedure and used it in suitable environmental .

- ▲ Please read the instruction manual carefully before use the monitor.
- ▲ The gas sensor window and gas filter must be keep cleaned.
- ▲ If window was block or gas filter dirty, will cause gas sensor reading less than the actual measured concentration.
- ▲ Measure combustible gas at lack of Oxygen environment may cause reading value less than the actual value.
- ▲ Measure combustible gas at full of Oxygen environment may cause reading value higher than actual value.
- ▲ Every time if LEL concentration had over range happened, the unit must be re-calibration again, to guarantee the accuracy of the gas meter.
- ▲ The water vapor of Silicon copper compound or other known miscellaneous increased, if affect the normal operation of the LEL gas sensor, cause the reading value less than actual value.
- ▲ If window was block or gas filter dirty, will cause gas sensor reading less than the actual measured concentration.
- ▲ Suddenly changes in atmospheric pressure may cause temporary fluctuation of the concentration reading.
Charge the battery or repair the unit, must be in a safety environment to operate this action.
Prohibited charge the unit battery under a well.
- ▲ Replacement parts or Sensor is not recommended, it will cause seriously safety problem.
- ▲ Repair the unit must be handled by an authority person or agent, non-approved parts replaced to the unit will caused mal-function of the unit or wrong measure of the unit. Also reading the user manual before repair is highly recommended.
- ▲ Notice: If the gas reading over the highest unit and then suddenly drop down or reading unstable, that means the tested gas is over the exploded range, it is very danger situation.
- ▲ The operation range of this unit is from -10 °C to 50 °C.
- ▲ All parts can't to change or replace with other un-authority parts, highly recommended ship it back to a authority agent for repair. Don't connect the unit to other instrument.
- ▲ If you need to use sample pump, you must buy our sample pump, it design to fit in this unit.
- ▲ This unit must be work with the built in lithium battery, don't be replacement with other lithium battery. Under the exploded environment, don't dis-assembly the battery.
- ▲ Before the battery fully discharge, please charge it on time, otherwise the battery life will be shorten due to fully discharge it.
- ▲ If unit don't used for a long period, please fully charged it before storage, it can prevent the battery fully discharge to shorten the battery life.

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Under any circumstances, our company has no any liability for any information included in this manual that caused any charges and cost. No any notice for the change of this manual.

DECLARATION

A) You, as the end user, are legally bound (Battery ordinance) to return all used batteries and accumulator: disposal in the household garbage is prohibited"

You can hand over your used batteries / accumulators at the collection points in your community or wherever batteries / accumulator are sold!
Disposal: Follow the valid legal stipulations in respect of the disposal of the device at the end of its life cycle.

B) Our company to reserve the right to modify and update the content of this manual and design specification without further notice.

QUALITY WARRANTY

We warranty, AS89 Series gas meter , no any defects in material and workmanships for a period of one year after purchase.

This warranty included the sensor, battery pack and gas sample pump (gas pump is optional parts for). We warranty, no any defected in material and workmanships within 15 months after ship out the good. Smart Sensor Holding Co. Ltd. no any clear or hint for quality warranty, included any method for sales promotion or for special required.

If this product incompatible the above quality warranty, the remedy that customer can get and Smart Sensor Holding Co., Ltd. only have the obligation is to replace or repair the incompatible product, or refund the money to the customer with same amount of purchase value.

For the sales, manufacture or use any one of the products within this warranty, that cause any specially, accidental or resulting due to use this product, including any lost of time and money, no matter it is contract or Infringement, Smart Sensor holding Co. Ltd. have no any responsibility for above items.

Need to be clear, the warranty of Smart Sensor Holding Co., Ltd. base on the below conditions: After customer purchased our product, he have carefully check it up to sure it is perfect, no any damage, and according to his special requirement to do a suitable calibration for this products, and precisely according to user manual instruction to operate, maintenance and repair the product. If maintenance or repaired by un-authorized person, or use any un-certified components or parts to cause any quality issue, it is not related or covered with this quality warranty.

We need to point out that the quality warranty is base on, any person that he operated any precision instrument products, he must be well known the user manual and fully understand how to use it's function and limitation in correct and safety way.

The user must be committed to what you purchased products can meet your target and suitable for you. Both Buying and selling party much be confirmed and agreed with, Smart Sensor Holding Co. , Ltd.

no any liability and responsibility, it should be response by the user, so that any suggestion that Smart Sensor Holding Co. , Ltd provided to user are no any liability and obligation.

▲ATTENTION: The alarm of this unit is no hold function, when the concentration of gas is over the setup value, it will be alarm to alert the end user, after the concentration back to normal, it will stop automatically.

▲ATTENTION: Every time before use this meter, please check the unit's accuracy with 25% LEL or 50% LEL with Pentane or Methane Cal. Gas cylinder.

▲ATTENTION: This meter is a precise measurement apparatus, suitable to be use at the temperature between -10 °C to 50- °C .

▲ATTENTION: Charging battery, repair & replace the unit parts, must be operated in safety environment.

▲Attention: replace parts or sensor with un-authority third party components, will damage the accuracy and void the warranty of this unit and cause any un-expected safety problems.

▲Attention: For safety, this unit must be operate or repair by authorized person, before operation, please read this manual in detail and all the contents.

Attention: When the measured value is less or higher than the alarm level that you preset (the buzzer alarms), please take care to protect people's lives and property in case of explosion.

In case of repair, don't replace parts with different part number and characteristic parts. This unit can't be connected to other products without authorization.

▲Attention: If you need sample pump, please connected to our AS8930 sample gas pump, it is powered by the unit itself.

▲Attention: Prohibited use third party battery that is not specified by this manual.

▲Attention: Prohibited disassembly the battery at exploded environment.

▲Attention: Please recharge the battery before it is fully discharged, otherwise will shorten the battery life or damage the battery.

▲Attention: If you don't plan to use the meter for a long time, please fully charge the battery to prevent the battery too much discharge by itself to damage the battery.

▲Attention: Prohibited to open the cabinet at dangerous environment

▲Attention: Certificate: This product compiled with following standard and regulation

PACKING LIST

The gift box should contain the following items, if you find any items missing or missing page of the instruction manual, please contact our sole agent that they sell this product to you.

- Multi-Gas meter -- 1pcs
- Instruction manual -- 1 pcs
- USB cable -- 1 pcs
- Screw --2pcs

3. OTHERS

WARRANTY AND MAINTENANCE

The following guidelines should be followed to achieve good maintenance for unit.

CLEANING:

- If necessary, wipe the outside surface of the unit, please use the soft, clean cloth.
- Never use any solvents or cleaning solutions.
- Make sure the rubber buttons are free of dirt.
- To clean the sensor opening, please use the clean, soft cloth or soft brush.

CHARGING THE BATTERY

- The lithium-ion battery suggested to be fully charged before using the .
- To charge the battery, plug the connecting lead wire of the battery charger into the charging port located at the right hand side of the unit. The port is protected by a rubber flap, so need to release the flap before charging.
- The battery should be fully charged within 6 hours
- Once fully charged, the unit will be good enough to work for 6 hours operation.
- The shaded area of the battery indicator shows full once the battery is fully charged.
- If all shaded are only have one bar is left, the battery need to be charged at once.
- When the battery is low, the unit might emit a periodic alarm sound to alert you to charge the unit.

LEL OVER RANGE

At any time if this meter had over range detected with LEL gas, the unit will go to over range state, at this state the unit will keep alarm all the time. To cancel this over range, you must turn the unit off and then place it in an air clean environment.

Every time if over range happened, the unit must be re-calibration again, to guarantee the accuracy of the gas monitor.

ST 8930 SAMPLING PUMP (OPTIONAL PARTS)

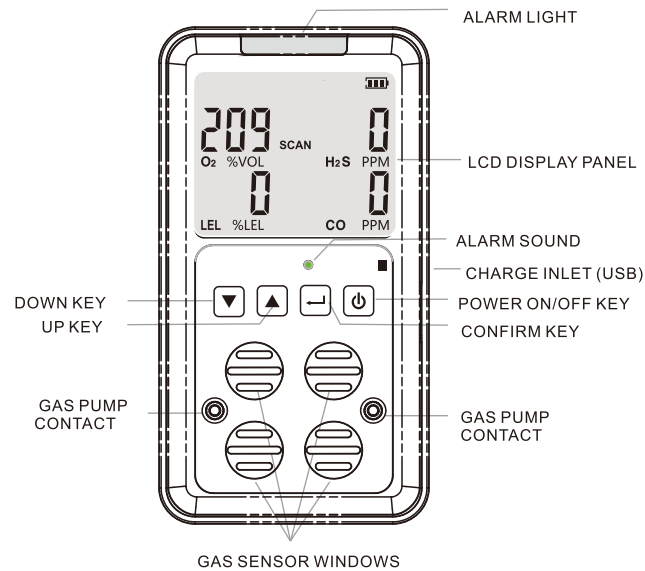
Sampling pump can be use with series gas monitoring meter. sampling pump can't be operate separately, must be work up series main unit, it get power from main unit by two contact pin located in top side of front panel. The gas flow is 0.5SCFH (0.25LPM), can be sampling gas maximum 50 feet by suitable gas tube.

PRODUCT SPECIFICATIONS

Sensor specification		
Gas	Range	Resolution
Carbon Monoxide(CO)	0-999ppm	1 ppm
Hydrogen Sulfide (H ₂ S)	0-500ppm	1 ppm
Oxygen (O ₂)	0-30%VOL	0.1%
Combustible Gas (LEL)	0-100%LEL	1%

Other specification			
Operation current	230 mA	Short circuit current	≤3A
Operation voltage	3.7V	maximum open circuit voltage	≤4.2V
Battery type	BL-9C	Display Type	Segment type LCD
Operation humidity	15% ~95%RH	Operation temperature	-10°C~ 50°C
Storage temperature	0~40°C	Weight	360 gram
Dimension	75X138X43MM	Battery working runtime	6 hours (no alarm)

OUTLOOK OF THIS INSTRUMENT

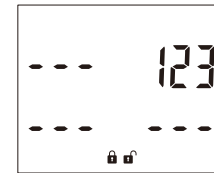


INTRODUCTION

Multi-Gas Meter is a portable and handheld instrument that is capable of use continuously monitoring four different gas : O₂, LEL, CO, H₂S, when detected these gases, all the concentration will displayed on the LCD. The unit also provided user to configure high and low alarms, also have STEL/TWA alarm function . The unit has audio and vibration visual alarm once the alarm condition is exceeded.

SECURITY CODE SETTING MODE

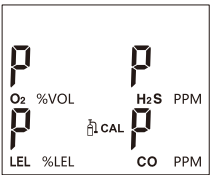
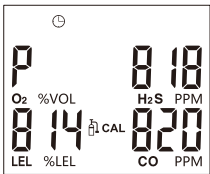
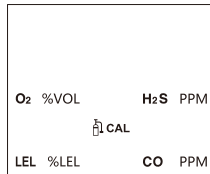
At the normal gas monitor mode, user can change it by depress "▲" key once, unit go to security code setting mode screen, the display show "123" is the factory pre-set security code. If you need to change the security code, press [←] button, at this time the first digit of security code will flash, press [▼] and [▲] to change to desired digit, if finished press [←] button to confirm the enter. Then will move to second digit, second digit keep flash, then repeat the setup again for second and third digit. Completed this setup the display will show the new security code, this moment if you press [←] key again will go back to setup the security code



mode again, you can enter a new code again as before. If you press [⏻] when digit flashing, unit will come back to normal gas monitor mode, but no change for all security code. If the unit already setup a security code, but user can't input the correct code, can't change any calibration point at all. If you need to calibrate the unit, please power on the unit again, then go to setup mode, input the correct security code, once completed the security code input, user can do the calibration for this unit.

WARM HINTS: If you forgot the security code, you can press down the [▼] [▲] and [←] key at the same time at the security screen, then you can go to the security setup mode to setup a new security code.

GAS CALIBRATION MODE



At the zero point calibration screen, press [▲] key, unit go to gas calibration mode. Press [←] key once will go to Oxygen gas calibration mode, you can get the screen as left hand photo show, once the digit of the screen become stable, press [←] key to perform the calibration, if success [P] icon will show, after finished it will automatic jump to another three gas calibration screen. (the left hand figure show digit "870" calibrate value is not fixed), at this step, please place the calibration cup firmly on top of the gas sensor, connected calibration cup with a silicone tube to the passive flow adjustment valve of the Cal gas cylinder, then adjust the flow valve to supply the gas with speed of 0.5litre/minute to he gas sensor, once you find the value of the three gas stable, then press [←] button, If the calibration is succeeded, the display will shows "P" icon for this four gas to represent the unit passed this calibration. If display shows 'F' icon, represent the unit failed this calibration, need to re-calibrate again. If pass the calibration press [⏏] key, unit go back to normal gas monitor mode.

Oxygen calibration should be under normal fresh air environment, but the other three gas calibration must be fixed. You must be used the mixed cal. gas cylinder with following concentration: 25umol/mol (PPM) H₂S, 100umol/mol (PPM) CO, 50% LEL Methane.

Attention: CSA international Rule compulsion, the calibrate gas must be 50% Methane.

Attention: If the security code is changed, user must be follow the setup of security code setting, can't be direct go to calibration mode. More detail information, please refer to security code setting mode.

WARNING: If you don't have enough calibration equipment, don't go into this calibration mode, otherwise the calibration may be changed and effective gas measure not correct. **be careful.**

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2. OPERATION INSTRUCTION

2.1 INSTRUMENT OPERATION

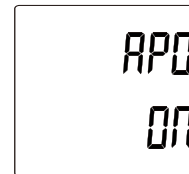
Turn on the instrument: please depress and hold the [⏏] button over 2 seconds, the unit will be turn on with a beep sound and vibration, then the LCD will light up all icons and segments. Then the LCD will display the software version code. Then the unit will go to 18 second countdown timer, when countdown completed, unit will enter normal gas monitoring mode.

Turn off the instrument: please depress and hold the [⏏] button over 3 seconds, then the unit will be power off after 3 beep sounds.

Turn on the power auto off function: at normal gas monitor mode, depress [▼] button until LCD display shown "APO" and "ON or "OFF", then press [▼] button to select "ON" or "OFF": "ON" means the unit will turn off after 10 minute if in this period no any button activated. "OFF" means no auto power off function. Press [←] to confirm this selection then unit back to normal gas monitor mode (as Figure shown).

When unit set to auto power off mode, at normal gas monitor mode, LCD have a [☺] icon shown, if unit set to no auto power off, no [☺] icon display on LCD screen.

Auto Power off



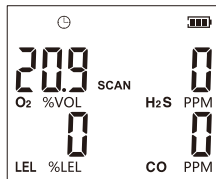
No Auto Power off



GASES MONITORING MODE

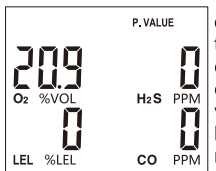
After unit turn on, it will go to normal gas monitor mode, it will real time monitor four gases (O₂, LEL, CO, H₂S) changes without stop, and show up the update value on the LCD display,

-06-



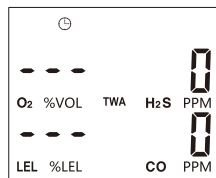
On the left hand side corner of LCD screen, have a battery icon to show the battery power condition, if the power reduced, the bar inside the battery icon will decrease. If any one of the gas concentration lower or higher the user preset value (included STEL/TWA alarm setup value), the unit will activated the alarm signal. At the alarm mode, unit will alarm with a low frequency voice (low concentration alarm), or high frequency voice (high concentration alarm), light alert and vibration alert also active at the same time. At the normal gas monitor mode, user can change it by depress [▲] key go to next three detection mode.

VIEW PEAK VALUE DISPLAY MODE



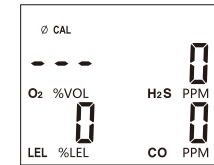
At normal gas monitor mode, depress [▲] key once go to "Peak value" display mode. Under this mode, the screen will shows the peak concentration value of the Toxic gases and combustible gas, also the lowest concentration value of O₂, (as the figure shown), press [←] button once with reset the peak value to normal monitor value.

View TWA Mode

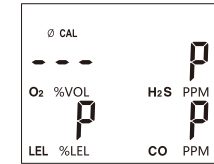


Pressing the [▲] key two times will put the unit in the View TWA mode. The TWA screen will show the "TWA" icon & [☺] icon along with the TWA (Time Weighted Average) value for the two toxic sensors. TWA values are reset every time the instrument is powered down, and the time base is set for 8 hours. TWA only available for toxic sensors, if the instrument not equipped with this sensors, no View TWA function.

ZERO CALIBRATION MODE



At zero setup mode screen, depress [←] key, screen will show all value is "Zero" except Oxygen, depress [←] key again will set the gases to zero point. If setup success the screen will show three [P] icon at the related locations. If found any [F] icon shown, means calibration failed, please press [▲] again to repeat the zero calibration as before.



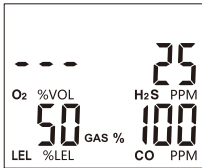
CAL GAS CALIBRATION MODE

After enter the correct security code, depress [←] key , unit go to Cal Gas Calibration mode, arrow user calibrate the instrument with different concentration cal. gas bottle, depress [←] key once go to calibrate Hydrogen Sulphide (H₂S)gas, to adjust this concentration value same as the cal. gas bottle marked value, use the [▲] and [▼] arrow keys. Once the desired value is met, press the [←] key to confirm and then unit will go to next gas calibration , use the same method to calibration LEL and carbon monoxide as before, depress [←] key to confirm it. Depress [▲] key go to zero point setup. When value flashing, that means it is in cal gas calibration mode, press [⏏] key will go back to normal gas monitoring mode, but all the change will not be save. The concentration of multi-gas calibration cylinder was fixed, also the factory preset calibrated concentration must be same as the following multi-gas calibration cylinder value. You must use the mixed gas cal. cylinder that fit the following requirement, It included:

25umol/mol (ppm) H₂S,
100umol/mol PPM) CO,
50% LEL of Methane

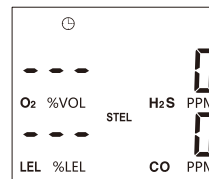
Remarks : the air flow rate is 0.5litre/minute from cylinder to unit under calibration.

Attention: CSA international Rule compulsion, the calibrate gas must be 50% Methane.



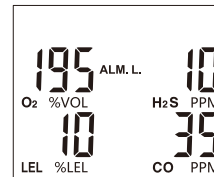
View STEL Mode

At normal gas monitor mode, depressing the [▲] key three times will put the unit in the View STEL mode. The STEL screen will show the [☺] icon along with the STEL (Short Term Exposure Limit) value for the two toxic sensors. STEL values for the sensor will be reset every time the instrument is powered down, and the time base for STEL is set for 15 minutes. STEL only effective with Toxic sensors, if the instrument have no this toxic sensors, this mode will not show.

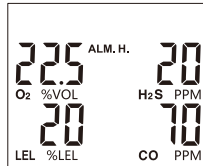


LOW ALARM SET POINTS

At normal gas monitor mode, depressing the [▲] key for 2 seconds, will put the unit in the low alarm set points screen. The display will show "ALM. L" icon along with four low alarm set points. If no change needed, press the [▲] arrow key to move to next screen. If changes are desired, press the [←] key. The first low alarm value will be flashing. To adjust this value, use the [▲] and [▼] arrow keys. Once the desired value is met, press the [←] key to select the next low alarm value. Continue this process until all four low alarm set points have been set. Once all four points are set, the display will again show the four low alarm set points. Pressing the [←] key will re-enter the mode and let you set the low alarm levels again: pressing the [▲] arrow key will move you to the High Alarm Set Points screen. Pressing the [⏏] key at any time will take you back to initial Low Alarm screen, and no changes will be saved. Pressing the [⏏] key a second time will take you to the normal gas reading screen. The low alarm is non-latching alarm.



HIGH ALARM SET POINTS

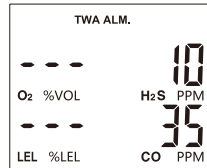


“ALM. H” icons along with four high alarm set points. If no change needed, press the [▲] arrow key to move to next screen. If changes are desired, press the [←] key. The first high alarm value will be flashing. To adjust this value, use the [▲] and [▼] arrow keys. Once the desired value is met, press the [←] key to select the next high

alarm value. Continue this process until all four high alarm set points have been set. Once all four points are set, the display will again show “ALM. H” and four high alarm set points value. Pressing the [←] key will re-enter the mode and let you set the high alarm levels again: pressing the [▲] arrow key will move you to the High Alarm Set Points screen. Pressing the [⏏] key at any time will take you back to initial high Alarm screen, and no changes will be saved. Pressing the [⏏] key a second time will take you to the normal gas reading screen. The high alarm is non-latching alarm.

TWA ALARM SET POINTS

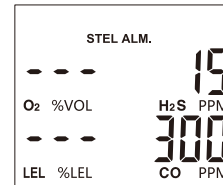
This is the TWA alarm set points screens. The display will show the “TWA ALM”, icons along with the two TWA alarm set points, If no changes are needed, press the [▲] arrow key to move to the next screen. If changes are desired, press the [←] key. The first TWA alarm value will be flashing. To adjust the value, use the [▲] and [▼] arrow keys. Once the desired value is met, press the [←] key to select the next



TWA alarm value. Continue this process until both TWA alarm set points have been set. When both values are set, the display will again show the “TWA ALM”, icons along with the two “TWA” alarm set points. Pressing the [←] key will re-enter the mode and let you set the TWA alarm levels again: pressing the [▲] arrow key will move you to the TWA alarm Set Points screen. Pressing the [⏏] key at any time will take you back to the initial TWA alarm screen, and no changes will be saved. Pressing the [⏏] key a second time it will take you to the normal gas reading screen.

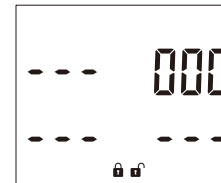
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STEL ALARM SET POINTS



The fourth of the configuration screens in the STEL alarm values. The display will show the “STEL ALM”, “Up/Down/Enter” icon along with the two STEL alarm set points. If no changes are needed, press the [▲] key to move to the next screen. If changes are desired, press the “Enter” key. The first STEL alarm value will be flashing. To adjust this value, use the [▲] and [▼] keys. Once the desired value is met, press the [←] key to select the next STEL alarm value. Continue this process until both STEL alarm set points have been set. When both values are set, the display will show the “STEL ALM”, icon along with the two STEL alarm points. Pressing the [←] key will re-enter the mode and let you set the STEL alarm level again: press the [⏏] key once will take you back to normal gas reading screen

SETUP MODE



At the normal gas monitor mode, press [▲] & [▼] key at the same time, unit go to security code setting mode screen, the display show “123” is the factory pre-set security code. Press [▼] and [▲] key to input the correct security code, then the instrument will go to cal. gas calibration mode. At this time the first digit of security code will flash, press [▲] and [▼] to change to desired digit, if finished press [←] button to confirm the enter. Then will move to second digit, second digit keep flash, then repeat the setup again for second and third digit. Completed this setup the display will show the new security code.

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