

# MX4

## iQUAD™

### Multi-Gas Monitor

ACTIVATION • OPERATION • CONFIGURATION



Part Number: 17140724-1  
Revision: 2.0  
Release Date: April 26, 2009

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**Table of Contents**

|   |           |
|---|-----------|
| <b>WARNINGS AND CAUTIONARY STATEMENTS</b> -----       | <b>4</b>  |
| <b>INTRODUCTION</b> -----                             | <b>7</b>  |
| <b>HARDWARE OVERVIEW</b> -----                        | <b>8</b>  |
| <b>UNPACKING THE INSTRUMENT</b> -----                 | <b>9</b>  |
| <b>DISPLAY OVERVIEW</b> -----                         | <b>9</b>  |
| <b>TURNING THE MX4 ON AND OFF</b> -----               | <b>10</b> |
| <b>GENERAL OPERATION</b> -----                        | <b>11</b> |
| DAYS SINCE CALIBRATION SCREEN-----                    | 12        |
| BUMP TEST SCREEN (IF ENABLED)-----                    | 12        |
| ZERO SCREEN (IF ENABLED)-----                         | 13        |
| PEAK READINGS SCREEN-----                             | 13        |
| TIME WEIGHTED AVERAGE (TWA) READINGS SCREEN-----      | 14        |
| SHORT TERM EXPOSURE LIMIT (STEL) READINGS SCREEN----- | 14        |
| CHARGING SCREEN (FROM ON STATUS)-----                 | 15        |
| CHARGING SCREEN (FROM OFF STATUS)-----                | 15        |
| IRDA COMMUNICATIONS SCREEN-----                       | 15        |
| MISSING SENSOR/NO SENSORS INSTALLED SCREEN-----       | 16        |
| LOW BATTERY LIFE SCREEN-----                          | 16        |
| OVERRANGE ALARM SCREEN-----                           | 16        |
| CAL DUE ALARM SCREEN-----                             | 17        |
| LOW ALARM SCREEN-----                                 | 17        |
| HIGH ALARM SCREEN-----                                | 17        |
| TWA ALARM SCREEN-----                                 | 17        |
| STEL ALARM SCREEN-----                                | 18        |
| <b>CALIBRATION</b> -----                              | <b>19</b> |
| <b>CONFIGURATION MODE</b> -----                       | <b>22</b> |
| INTRODUCTION-----                                     | 22        |
| SECURITY CODE-----                                    | 22        |
| COMBUSTIBLE GAS OPERATING MODE SCREEN-----            | 23        |
| ENTER ZERO SCREEN-----                                | 24        |
| CALIBRATION MODE SCREEN-----                          | 24        |
| LOW ALARM SET POINT-----                              | 24        |
| HIGH ALARM SET POINT-----                             | 25        |

**Operation Guide**

---

|                                       |           |
|---------------------------------------|-----------|
| TWA ALARM SET POINT (OPTIONAL) -----  | 25        |
| TWA TIME BASE SCREEN (OPTIONAL) ----- | 26        |
| STEL ALARM SET POINT (OPTIONAL) ----- | 26        |
| CAL GAS SETPOINT SCREEN -----         | 27        |
| CLOCK SETTING SCREEN -----            | 27        |
| DATE SETTING SCREEN -----             | 28        |
| DISPLAY MODE SETTING SCREEN -----     | 28        |
| CONFIDENCE INDICATOR SCREEN -----     | 29        |
| FIELD BUMP TEST OPTION -----          | 29        |
| BUMP OVERDUE ALARM ENABLE -----       | 29        |
| BUMP TEST INTERVAL SCREEN -----       | 30        |
| BUMP TEST THRESHOLD SCREEN -----      | 30        |
| BUMP TEST TIMEOUT SCREEN -----        | 31        |
| ALARM LATCH SET SCREEN -----          | 31        |
| ZERO ENABLE SCREEN -----              | 32        |
| CAL ENABLE SCREEN -----               | 32        |
| CAL DUE ALARM OPTION SCREEN -----     | 32        |
| CAL DUE SETPOINT SCREEN -----         | 33        |
| CODE SET SCREEN -----                 | 33        |
| DATA LOGGING -----                    | 34        |
| <b>MAINTENANCE -----</b>              | <b>35</b> |
| CLEANING -----                        | 35        |
| CHARGING THE BATTERIES -----          | 35        |
| BATTERY REPLACEMENT -----             | 35        |
| SENSOR AND FILTER REPLACEMENT -----   | 36        |
| <b>SPECIFICATIONS -----</b>           | <b>37</b> |
| PHYSICAL SPECIFICATIONS -----         | 37        |
| SENSOR SPECIFICATIONS -----           | 37        |
| ENVIRONMENTAL SPECIFICATIONS -----    | 38        |
| BATTERY SPECIFICATIONS -----          | 38        |
| <b>REPLACEMENT PARTS -----</b>        | <b>39</b> |
| <b>EXPLODED VIEW DIAGRAM -----</b>    | <b>40</b> |
| <b>WARRANTY -----</b>                 | <b>41</b> |
| LIMITATION OF LIABILITY -----         | 41        |

## Warnings and Cautionary Statements

**IMPORTANT:** Failure to perform certain procedures or note certain conditions may impair the performance of this product. For maximum safety and optimal performance, please read and follow the procedures and conditions listed below.



**IMPORTANT:** Read and understand this manual before operating.

**AVERTISSEMENT:** Lire attentivement les instructions avant de mettre en marche.



**WARNING:** SERVICING THE UNIT, REPLACING THE RECHARGEABLE BATTERY PACK, OR CHANGING THE ALKALINE BATTERIES MUST ONLY BE DONE IN AN AREA KNOWN TO BE NONHAZARDOUS.



**WARNING:** INSERT THE ALKALINE BATTERIES WITH THE CORRECT POSITIVE “+” AND NEGATIVE “-“ ORIENTATION. FAILURE TO FOLLOW PROPER BATTERY ORIENTATION WILL RESULT IN DAMAGE TO THE INSTRUMENT.



**WARNING:** THE MX4 IS ONLY APPROVED FOR USE WITH AAA BATTERY TYPES ENERGIZER EN92 AND DURACELL MN2400. DO NOT MIX BATTERY TYPES.



A functional bump test of the instrument should be performed before each day's use. If the instrument does not pass the bump test, a full instrument calibration should be performed prior to use.



The MX4 is CSA certified according to the Canadian Electrical Code for use in Class I, Division 1 and Class I, Zone 1 Hazardous Locations within an ambient temperature range of  $T_{amb}$ : -20°C to +50°C. CSA has assessed only the %LEL combustible gas detection portion of this instrument for performance according to CSA Standard C22.2 No. 152, applicable only when the instrument is used in the diffusion mode and has been calibrated to 50% LEL CH<sub>4</sub>.



Oxygen deficient atmospheres may cause combustible gas readings to be lower than actual concentrations.



Oxygen enriched atmospheres may cause combustible gas readings to be higher than actual concentrations.

## Operation Guide

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Verify the calibration of the combustible gas sensor after any incident where the combustible gas content has caused the instrument to display an over-range condition.



Silicone compound vapors or other known contaminants may affect the combustible gas sensor and cause readings of combustible gas to be lower than actual gas concentrations. If the instrument has been used in an area where silicone vapors were present, always calibrate the instrument before next use to ensure accurate measurements.



Sensor openings and water barriers must be kept clean. Obstruction of the sensor openings and/or contamination of the water barriers may cause readings to be lower than actual gas concentrations.



Sudden changes in atmospheric pressure may cause temporary fluctuations in the oxygen reading.



Charge battery, service unit, and use its communication port only in non-hazardous locations. Not for use in oxygen-enriched atmospheres.



**WARNING:** Substitution of components may impair intrinsic safety and may cause an unsafe condition.

**AVERTISSEMENT:** La substitution de composants peut compromettre la sécurité intrinsèque.



**CAUTION:** For safety reasons, this equipment must be operated and serviced by qualified personnel only. Read and understand the instruction manual completely before operating or servicing.

**ATTENTION:** Pour des raisons de sécurité, cet équipement doit être utilisé, entretenu et réparé uniquement par un personnel qualifié. Étudier le manuel d'instructions en entier avant d'utiliser, d'entretenir ou de réparer l'équipement.



**CAUTION:** High off-scale readings may indicate explosive concentration.

**ATTENTION:** Des lectures supérieures à l'échelle peuvent indiquer des concentrations explosives.



CAUTION: Any rapid up-scale reading followed by a declining or erratic reading may indicate a gas concentration beyond the upper scale limit which may be hazardous.



CAUTION: CSA C22.2 No. 152 requires before each day's usage, sensitivity must be tested on a known concentration of pentane or methane equivalent to 25% or 50% of full scale concentration. Accuracy must be within -0% to +20% of actual concentration. Accuracy may be corrected by referring to the zero/calibration section of the instruction manual.



The model MX4 complies with relevant provisions of European ATEX directive 94/9/EC and EMC directive 89/336/EEC, amended by directives 92/31/EEC and 93/68/EEC.



The EC type examination certificate is DEMKO 09 ATEX 0854530 ; with marking code Ex ia d I/IIC T4; for equipment group and category II 2G and I M2.



The MX4 iQuad Multi-Gas Monitor is constructed with reference to published standards of directive 72/23/EEC, to eliminate electrical risks and fulfill 1.2.7 of ANNEX II of directive 94/9/EC.



Contact your service representative immediately if you suspect that the MX4 is working abnormally.

Specifications subject to change without notice.

## Operation Guide

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### Introduction

The MX4 is a light-weight, portable gas monitor capable of continuously and simultaneously monitoring 4 gases:

- Oxygen (O<sub>2</sub>)
- Combustible (LEL and CH<sub>4</sub>)
- Two interchangeable toxics (CO, H<sub>2</sub>S, NO<sub>2</sub>)

The sensors are easily replaced. Gas readings from the installed sensors are displayed on a custom graphic LCD. Peak readings are also available for each sensor, and can be cleared by the user.

The instrument provides alarms for the following conditions:

- low limit (user adjustable)
- high limit (user adjustable)
- STEL (user adjustable)
- TWA (user adjustable)
- overdue for calibration (user selectable).
- Overdue for bump test (user selectable)

When alarm conditions are exceeded, the MX4 has an audible, visual and standard vibrating alarm to alert the user.

The MX4 is compatible with the MX•Cal™ calibration station, the DS2 Docking Station™, and its own cradle-style charger. It communicates to the Charger/Datalink via infrared communications (IrDA). MX4 is also compatible with Industrial Scientific's automated and comprehensive gas monitor management solution, iNet™.

The MX4 performs continuous data logging at 10 second intervals and can hold approximately three month's of data for the four-sensor configuration. Readings are time-stamped and are stored in a first-in-first-out (FIFO) queue that is overwritten when full. In addition to data logging, the MX4 has an event log that records the last 15 alarm events.

**Hardware Overview**



## Operation Guide

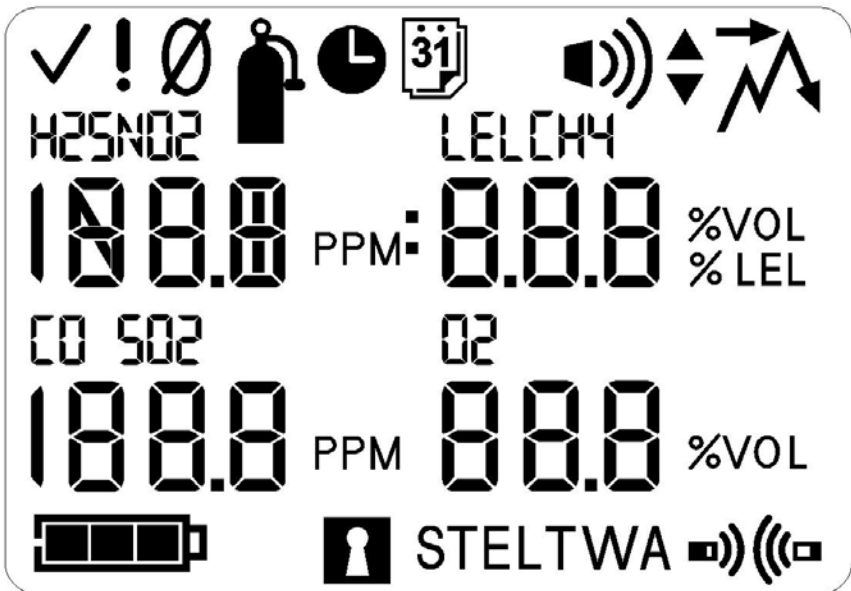
### Unpacking the Instrument

The shipping box should contain the following items. Account for each item before discarding the box.

| Quantity | Description                          |
|----------|--------------------------------------|
| 1        | MX4 iQuad Multi-Gas Monitor          |
| 1        | Manual                               |
| 1        | Battery Pack (installed as ordered)  |
| 1        | Cradle-style Charger with Power Cord |
| 1        | Calibration Cup and Tubing           |

After unpacking, if any listed item is missing, contact either your local distributor of Industrial Scientific products or call Industrial Scientific Corporation at 1-800-DETECTS (338-3287) in the United States and Canada, or 412-788-4353.

### Display Overview



LCD Display Panel Overview

## Turning the MX4 ON and OFF

To turn on the MX4, press and hold the On/Off/Mode button (⏻) until the unit emits a single beep (approximately 3 seconds). All icons and segments on the LCD display as shown in the graphic above. Next, the software version is displayed. After this, the instrument performs a 20 second countdown, during which the user has the option to enter the configuration mode (by pressing and holding both the On/Off/Mode (⏻) and Enter (⏏) buttons simultaneously). If this configuration mode option is bypassed, the MX4 enters the normal operating mode and displays the normal monitoring screen. Sequential presses of the On/Off/Mode button will cycle the user through the Days Since Calibration Screen, Zero Screen (if enabled), Peak Readings Screen, Time Weighted Average (TWA) Screen (if toxic sensors are installed) and the Short Term Exposure Limit (STEL) Screen (if toxic sensors are installed). Another press of the On/Off/Mode button returns the user to the normal monitoring screen. Each screen is explained individually in the sections that follow.

To turn off the MX4, press and hold the On/Off/Mode button for 5 seconds. During the shutdown process, the displayed value will change from “5” to “1” and the MX4 will beep five times.



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**NOTE:** Any button press activates the backlight for a period of 30 seconds.

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## Operation Guide

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### General Operation

The normal monitoring screen in numeric mode contains the abbreviated names and concentrations of all 4 gases. In text mode, the sensor names are displayed instead of the numerical values. The gases are continuously monitored and the readings updated on the LCD. If any of the gas concentrations exceed the low or high alarm limits (as well as STEL/TWA), the MX4 will go into alarm. When in alarm, the audible and visual alarms will beep and flash at set frequencies, and the vibrating alarm will be pulsed.



When the gas concentrations return to normal values (for example, drop out of the range that will cause an alarm condition), and the alarm latching feature is not set, the MX4 will go back to the normal monitoring screen.

The normal monitoring screen may appear differently based on which sensors are installed and which display mode is selected.

A battery life indicator is displayed in the lower left corner of the LCD. As battery life decreases, the shaded area of the battery icon decreases.

Pressing the On/Off/Mode button from the Normal Monitoring screen displays the Days Since Calibration screen.

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**NOTE:** In an over-range condition, the display will show a blinking “OR”, in a negative over-range condition “-OR” will be shown. Any over-range values in the event log or peaks will be truncated at the measurement range of the sensor.

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## Days Since Calibration Screen

The Days Since Calibration screen displays the calibration bottle icon, the calendar icon, the names of the four installed sensors, and the corresponding number of days since each sensor was last calibrated.



Pressing the On/Off/Mode button from the Days Since Calibration screen displays the Bump Test screen (if enabled in the configuration mode).

## Bump Test Screen (if enabled)

The bump test screen allows the user to initiate and perform a manual bump test of the instrument using calibration gas. (This screen will only be seen if the bump test option is enabled in the configuration mode.)



After initiating the bump test by pressing the Enter button at this screen, the user will apply the calibration gas to the instrument as described under Calibration. If the sensor responds to the percentage of the calibration gas value programmed in the configuration mode within the timeout specified in the configuration mode, the instrument will pass the bump test. If the sensor does not respond to the programmed percentage of the gas concentration within the timeout period, the instrument will fail the bump test and require calibration. A failed sensor will show "b F" on the display instead of the gas reading for that particular sensor. If the bump overdue alarm is enabled in the configuration mode, "b" will be shown for the gas reading and the sensor name will flash when the bump test is overdue. This screen will appear when the instrument is turned on and remain until a bump test of the instrument is completed successfully.

Pressing the On/Off/Mode button from the Bump Test screen displays the Zero screen (if enabled in the configuration mode).

## Operation Guide

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**IMPORTANT:** A function or “bump” test, using a known concentration of calibration gas, should be performed periodically based on instrument use, exposure to gas, and environmental conditions. The frequency is best determined by company policy or local regulatory agencies. If an instrument fails a function or “bump” test, or, if it is dropped, submerged, or appears damaged, a full calibration is recommended. The safest approach is to perform a function or “bump” test prior to each day’s use. Industrial Scientific is not responsible for establishing customer safety practices and policies.

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### Zero Screen (if enabled)

If zeroing is enabled (via the Zero Enable screen in the Configuration section), then the Zero screen is displayed. From this screen the user initiates the zeroing process of the sensors by pressing the Enter button. The zeroing process should only be initiated when the instrument is in clean ambient air. If clean air is not available, a cylinder of zero grade air should be used. (Refer to the Zeroing and Calibration processes later in this manual).



Pressing the On/Off/Mode button from the Zero screen displays the Peak Readings screen.

### Peak Readings Screen

The Peak Readings screen displays the peak icon, the names of the four installed sensors, and the corresponding peak values for each since the last time the peak value(s) were cleared.



Pressing the Enter button resets all of the peak values to the current reading.

If one or more toxic gas sensors are installed, then pressing the On/Off/Mode button from the Peak Readings screen displays the TWA Readings screen.

If no toxic gas sensors are installed, then pressing the On/Off/Mode button from the Peak Readings screen returns the user to the Normal Monitoring screen.

## Time Weighted Average (TWA) Readings Screen

The TWA Readings screen is only displayed if one or more toxic gas sensors are installed.

The TWA Readings screen displays the TWA icon, the names of the installed toxic sensor(s), and the corresponding time weighted average gas concentration for each.



Pressing the Enter button while on this screen resets the TWA and STEL values. The time base for TWA calculation may be set in the configuration mode. The default time base is set for 8 hours.

Pressing the On/Off/Mode button from the TWA Readings screen displays the STEL Readings screen.

## Short Term Exposure Limit (STEL) Readings Screen

The STEL Readings screen is only displayed if one or more toxic gas sensors are installed.

The STEL Readings screen displays the STEL icon, the names of the installed toxic sensor(s), and the corresponding short-term exposure limit for each.



The STEL (Short Term Exposure Limit) for the toxic sensors is reset every time the unit is powered down. In addition, pressing the Enter button while on this screen resets the STEL values, but not the TWA values. The STEL readings are calculated as a running average of readings over the last 15 minutes.

Pressing the On/Off/Mode button from the STEL Readings returns the display to the Normal Monitoring screen.

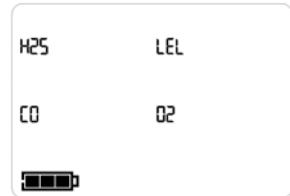
## Operation Guide

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While in the normal operating mode, the MX4 display will vary depending on current monitoring conditions. Variations of the display indicating the charging, battery, calibration, sensor, communication and alarm status are shown below.

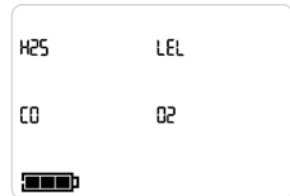
### Charging Screen (From ON Status)

When the MX4 is turned on and the Normal Monitoring screen is displayed, docking the instrument to charge it will cause the instrument to turn off, and move to the normal charging state. The battery icon will cycle from empty to full to empty to indicate that charging is taking place. The names of any installed sensors are also shown. (The battery indicator will show full when the instrument battery is fully charged.) If the unit is using an alkaline battery, the battery icon will reflect the amount of battery life left.



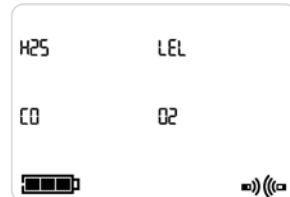
### Charging Screen (From OFF Status)

When the MX4 is turned off, and then docked, the battery life icon will be displayed and will cycle from empty to full to empty if the unit is being recharged. The names of any installed sensors are also shown. If the unit is using an alkaline battery, the battery icon will reflect the amount of battery life left.



### IrDA Communications Screen

During IrDA communications, the IrDA communications icon is displayed. This happens only when the instrument is docked.



## Missing Sensor/No Sensors Installed Screen

If a sensor is not detected or is missing from the instrument, the corresponding sensor position on the display will be blank. If no sensors are installed in the instrument the display will be blank as shown and the warning icon will flash.



## Low Battery Life Screen

When battery power is nearly exhausted, the battery icon will begin to flash. It will continue to flash until the unit shuts down due to insufficient power.



## Over Range Alarm Screen

An over range condition occurs when the gas concentration value read by the sensor is above its specified measuring range. During an over range condition, the “Or” (Over Range) icon flashes in place of the numerical value for the sensor that is in over range.



For toxic sensors and/or the oxygen sensor, the over range alarm will normally reset itself when the gas concentration returns to a level within the sensor measuring range. However, if the LEL sensor reaches an over range condition, the alarm will latch and the instrument must be turned off and then on again to clear the over range condition.

The instrument should always be recalibrated after any over range condition occurs.

## Operation Guide

### Cal Due Alarm Screen

When a sensor calibration is due, the gas bottle icon and the associated sensor icon flash. In addition, the MX4 beeps every five seconds to alert the user that calibration is past due.



### Low Alarm Screen

When a low alarm condition occurs (based on the low alarm limit settings in the configuration menus), the alarm icon and the down arrow (low limit) icon are displayed. Depending on the display mode that is selected, either the gas reading value will flash or the alarming gas type text will flash (Text display mode).



### High Alarm Screen

When a high alarm condition occurs (based on the high alarm limit settings in the configuration menus), the alarm icon and the up arrow (high limit) icon are displayed. Depending on the display mode that is selected, either the gas reading value will flash or the alarming gas type text will flash (Text display mode).



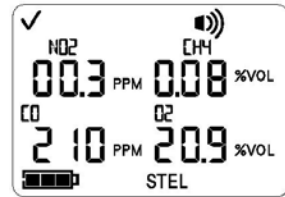
### TWA Alarm Screen

When a TWA alarm condition occurs (based on the TWA alarm limit settings in the configuration menus), the alarm icon and the TWA icon are displayed. Depending on the display mode that is selected, either the gas reading value will flash or the alarming gas type text will flash (Text display mode).



## STEL Alarm Screen

When a STEL alarm condition occurs (based on the STEL alarm limit settings in the configuration menus), the alarm icon and the STEL icon are displayed. Depending on the display mode that is selected, either the gas reading value will flash or the alarming gas type text will flash.



### Calibration

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**IMPORTANT:** Industrial Scientific Corporation recommends that a functional (“bump”) test be performed on every instrument prior to each day’s use. A functional test is defined as a brief exposure of the monitor to a concentration of gas(es) in excess of the lowest alarm set-point for each sensor for the purpose of verifying sensor and alarm operation and is not intended to be a measure of the accuracy of the instrument. If an instrument fails to operate properly following any functional “bump” test, full instrument calibration should be performed prior to use. If conditions do not permit daily testing, bump tests may be done less frequently based on instrument use, exposure to gas, and environmental conditions. The frequency of testing is best determined by company policy or local regulatory agencies.

Industrial Scientific further recommends that full instrument calibration be performed using a certified concentration(s) of Industrial Scientific calibration gas(es) monthly to ensure accuracy.

**NOTE:** CSA International requires the %LEL sensitivity to be tested before each use. Any inaccuracy may be adjusted by calibration to 50% LEL Methane.

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**NOTE:** If the option to zero or calibrate in field is not enabled, the user will not be able to calibrate the instrument in the field.

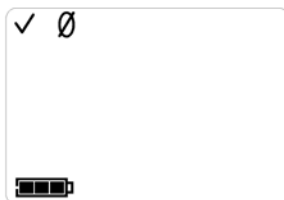
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**NOTE:** If a security code is set, the user will not be able to enter the configuration screens in the field. Please refer to Security Code Setting section for more information.

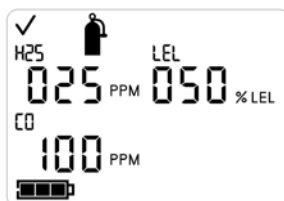
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The MX4 may be calibrated in the normal operating mode if field calibration is enabled or in the configuration mode if field calibration is disabled. Calibration is first initiated by advancing to the Zero screen if calibration is to be performed in the normal operating mode or entering the Configuration mode and then initiating the zero process. The MX4 has two calibration options that may be selected in the Configuration mode. The first is the Quick-Cal option in which all sensors will be calibrated simultaneously using the appropriate blended cylinder of calibration gas. The second option is the Standard-Cal option where sensors may be calibrated individually using either blended or individual calibration gases.

The zeroing process is initiated by pressing the Enter button when this zero screen is displayed. The zeroing process should only be initiated when the instrument is in clean ambient air. If clean air is not available, a cylinder of zero grade air should be used. During the zeroing process, the toxic and combustible gas sensors are zeroed and the oxygen sensor is calibrated to ambient air.

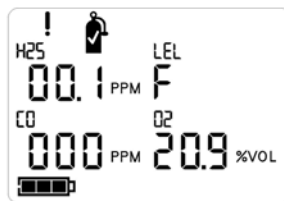


When the zeroing process is completed, calibration can be initiated by pressing the On/Off/Mode button. The instrument display will flash the calibration gas concentration for the first sensor to be calibrated. The calibration cup should be attached to the instrument and the calibration gas applied at a flow rate of 0.5 liters per minute.



The instrument will recognize the presence of calibration gas and begin the calibration process. When the sensor has completed calibration, the instrument will emit a short beep and the display will step to the next sensor to be calibrated. If the Standard-Cal option is enabled, a sensor may be skipped by pressing the On/Off/Mode button. If the oxygen sensor calibration gas value is set to 20.9%, the oxygen sensor will not be available for calibration in this mode because it was calibrated during the zeroing process and the oxygen sensor display position will be blank.

When the calibration is complete, the instrument will display the Pass/Fail status of the calibration and the full span value for each sensor. The full span value provides an indication of the sensors operation condition.



A full span value greater than 70% of the applied calibration gas value indicates a healthy sensor. A full span value between 50% and 70% of the applied gas concentration are considered to have marginal sensitivity and limited life remaining. Sensors will fail calibration if the full span value is less than 50% of the applied calibration gas concentration. If a sensor fails calibration, the display reading for that sensor will be replaced by the letter

## **Operation Guide**

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F and the instrument will emit a short beep every 5 seconds. The calibration and warning icons will be activated on the display.

## Configuration Mode

### Introduction

The configuration mode is used to change or set several options, as well as to zero and calibrate the instrument if those options are not selected for the normal operating mode. Gas alarm indications will occur normally in the configuration mode, with two exceptions: no alarms will occur during the zeroing/calibration process and gas alarms will not cause the menu flow to jump to the Gas Monitoring screen. The configuration screen is reached by holding both buttons simultaneously for three seconds during the warm-up count down screen. Once in configuration mode, if the On/Off/Mode and Enter buttons are both held for 3 seconds, the instrument will exit the configuration screen and go to the Gas Monitoring screen. In addition, from anywhere within the configuration screens (except during zeroing and calibration), the instrument will go to the Gas Monitoring screen if no buttons are pressed for 30 seconds.

### Security Code

The Security Code screen is the first screen in the configuration mode. The default security code is 000. If this is the stored value of the security code, the instrument bypasses this screen and displays the Combustible Gas Operating Mode screen.

On entering the Enter Security Code screen, the primary character display will show the number '000'. All characters of the primary display will blink to indicate that they are ready to change. Enter the security code by pressing the Enter button. Momentary presses of the Enter button will increment the security code by one count. Holding the Enter button for an extended period will activate an accelerated number increment.



Enter Security Code  
Screen

## Operation Guide

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Once the correct code is reached, pressing the On/Off/Mode button will navigate to the next configuration screen which is the Combustible Gas Sensor Operating Mode screen. If the On/Off/Mode button is pressed while the wrong code is displayed, the instrument will leave the configuration screen and return to the Gas Monitoring screen.

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**IMPORTANT:** To reset the code to the default code of 000, enter 412 then press both On/Off/Mode and Enter buttons simultaneously.

**IMPORTANT:** Any change made while in the configuration mode will take affect immediately upon exiting the configuration mode.

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### Combustible Gas Operating Mode Screen

The Combustible Gas Operating Mode screen displays the up and down arrow icons, the GAS icon, and either the LEL (low explosive limit) or CH<sub>4</sub> (methane) text.



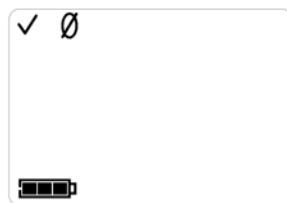
From this screen you set the combustible gas mode by toggling between the two options – lower explosive limit (LEL) or methane (CH<sub>4</sub>). Use the Enter button to toggle between these values. After the desired combustible gas operating mode selected, press the On/Off/Mode button to display the zero initiate screen. If the mode is changed, the sensor will be automatically put into the calibration fail mode to ensure correct calibration.

Be aware that if the combustible gas mode is changed and the user exits this screen, the last shown value is saved and the sensor will enter a calibration fail state (the calibration fail alarm will sound). A calibration will be required to clear the alarm state.

## Enter Zero Screen

The Enter Zero screen displays the zero icon. This screen is used to launch the zeroing process (explained earlier in this manual, refer to calibration).

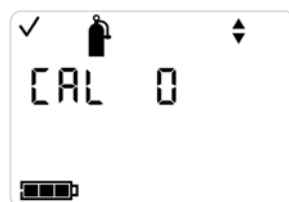
To begin the zeroing process, press the Enter button. Press the On/Off/Mode button to step to the calibration configuration screen.



## Calibration Mode Screen

The Calibration Mode screen displays the gas bottle icon, the up and down arrow icons, and the “CAL” text with either a “0” (Standard-Cal mode) or a “1” (Quick-Cal mode).

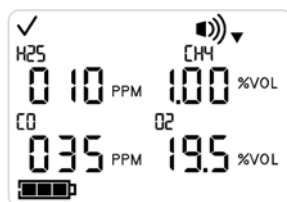
Use the Enter button to toggle between values 0 and 1. After the desired calibration mode (0 or 1) is selected, press the On/Off/Mode button to display the Low Alarm Setpoint screen.



## Low Alarm Set Point

The Low Alarm Set Point screen displays the four low alarm set points, the alarm icon, and the down arrow (low limit) icon.

If no changes are needed, press the On/Off/Mode button to move to the next screen (the High Alarm Set Point screen).



If changes are desired, press the Enter button. The first low alarm value flashes. To adjust this value, use the Enter button. Once the desired value is met, press the On/Off/Mode button to submit the value and select the next low alarm value. Continue this process until all four low alarm set points have been set.

Once all four values are set, press the On/Off/Mode button to submit the values. Pressing the On/Off/Mode button again displays the High Alarm Set Point screen.

## Operation Guide

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### High Alarm Set Point

The High Alarm Set Point screen displays the four high alarm set points, the alarm icon, and the up arrow (high limit) icon.

If no changes are needed, press the On/Off/Mode button to move to the next screen (the TWA Alarm Set Point screen).



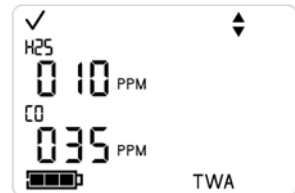
If changes are desired, press the Enter button. The first high alarm value flashes. To adjust this value, use the Enter button. Once the desired value is met, press the On/Off/Mode button to select the next high alarm set. Continue this process until all four high alarm set points have been set.

Once all four values are set, press the On/Off/Mode button to submit the values. Pressing the On/Off/Mode button again displays the TWA Alarm Set Point screen.

### TWA Alarm Set Point (Optional)

The TWA Alarm Set Point screen displays the TWA alarm set points (for MX4s configured with toxic gas sensors), the TWA icon, and the up and down arrow icons.

If no changes are needed, press the On/Off/Mode button to move to the next screen (the TWA Interval screen).

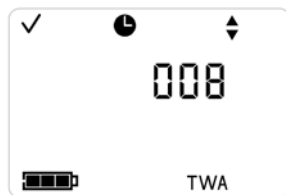


If changes are desired, press the Enter button. The first TWA alarm value flashes. To adjust this value, use the Enter button. Once the desired value is met, press the On/Off/Mode button to select the next TWA alarm value.

Once the values are set, press the On/Off/Mode button to submit the values. Pressing the On/Off/Mode button again displays the TWA Interval screen.

### TWA Time Base Screen (Optional)

The TWA Time Base screen displays the TWA icon, the up and down arrow icons, the clock icon, and the current TWA time base.



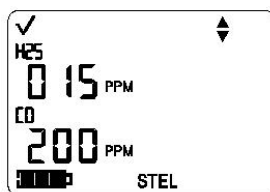
The TWA time base is a time (in hours) that is used in calculating the TWA values. The default value is 8 hours. Valid values for the TWA interval are from 1 to 40 hours.

If no change is needed, press the On/Off/Mode button to move to the next screen (the STEL Alarm Set Point screen).

If a change is desired, press the Enter button to increment the value from 1 to 40 hours (and wrapping back to 1). Once the desired value is met, press the On/Off/Mode button to submit the value. Pressing the On/Off/Mode button again displays the STEL Alarm Set Point screen.

### STEL Alarm Set Point (Optional)

The STEL Alarm Set Point screen displays the STEL alarm set points (for appropriately-configured MX4s), the STEL icon, and the up and down arrow icons.



If no changes are needed, press the On/Off/Mode button to move to the next screen (the Cal Gas Set Point screen).

If changes are desired, press the Enter button. The first STEL alarm value flashes. To adjust this value, use the Enter button. Once the desired value is met, press the On/Off/Mode button to select the next STEL alarm value.

Once the values are set, press the On/Off/Mode button to submit the values. Pressing the On/Off/Mode button again displays the Cal Gas Set Point screen.

## Operation Guide

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### Cal Gas Setpoint Screen

The Cal Gas Set Point screen displays the calibration gas set points for the installed sensors, the gas bottle icon, and the up and down arrow icons.

If no changes are needed, press the On/Off/Mode button to move to the next screen (the Clock Setting screen).



If changes are desired, press the Enter button to begin editing values. The first Cal Gas Set Point value flashes. To adjust this value, use the Enter button. Once the desired value is met, press the On/Off/Mode button to select the next Cal Gas Set Point value.

Once the values are set, press the On/Off/Mode button to submit the values. Pressing the On/Off/Mode button again displays the Clock Setting screen.

### Clock Setting Screen

The Clock Setting screen displays the clock icon, the up and down arrow icons, and the current time in military (24-hour) format.

If no changes are needed, press the On/Off/Mode button to move to the Date Setting screen.



If changes are desired, press the Enter button. The first value to flash is the hours setting of the clock. To adjust this value, use the Enter button. Once the desired value is met, press the On/Off/Mode button to submit the value and move to the minute value.

Set the correct minute portion of the time in the same manner, pressing the On/Off/Mode button to submit the final value. Pressing the On/Off/Mode button again displays the Date Setting screen.

## Date Setting Screen

The Date Setting screen displays the calendar icon, the up and down arrows, and the current month, day, and two-digit year.

If the displayed date is correct, press the On/Off/Mode button to move to the next screen (the Display Mode Setting screen).



If changes are desired, press the Enter button. The first value to flash is the numerical month setting. To adjust this value, use the Enter button. Once the desired value is met, press the On/Off/Mode button to submit the value and move to the day value.

Set the correct day portion and year portion of the date in the same manner, pressing the On/Off/Mode button to submit each value. Pressing the On/Off/Mode button one final time displays the Display Mode Setting screen.

**NOTE:** The displayed calendar year only shows the two least significant digits of the year, with a “20” prefix implied. For example, the year “06” in the example above represents the year 2006.

## Display Mode Setting Screen

The Display Mode Setting screen displays the up and down arrow icons, the DIS (display mode) text, and the current display mode used in Normal Readings Mode.

From this screen you set the desired display mode between the two options – option 0 (numeric display) or option 1 (text display).



Use the Enter button to toggle between these values. After the desired display mode setting is selected, press the On/Off/Mode button to display the Confidence Indicator screen.

## Operation Guide

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### Confidence Indicator Screen

The Confidence Indicator screen displays the up and down arrow icons, the “C” icon (for confidence), and the current confidence indicator setting of either 0 (confidence indicator is disabled) or 1 (confidence indicator is enabled, and the instrument beeps once every 90 seconds).

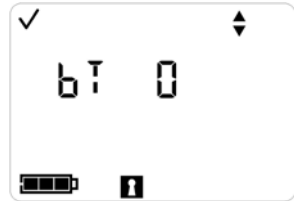


From this screen you enable (=1) or disable (=0) the confidence indicator of the MX4.

Use the Enter button to toggle between these values. After the desired setting is selected, press the On/Off/Mode button to display the Field Bump Test Option screen.

### Field Bump Test Option

The Field Bump Test option screen displays the bump test icon, the up and down arrow icons, the lock (keyhole) icon, and the current bump test option setting.



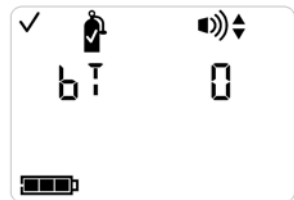
From this screen you enable (=1) or disable (=0) field bump testing on the MX4.

Use the Enter button to toggle between these values. A “0” value indicates field bump test is disabled. A “1” indicates that the field bump test is enabled.

After the desired setting is selected, press the On/Off/Mode button to display the bump overdue alarm enable screen.

### Bump Overdue Alarm Enable

If the bump test option has been enabled, this screen allows the user to enable an alarm that indicates when the instrument is overdue for bump testing. If the bump overdue alarm is enabled, the user will be notified by the appearance of the flashing bump test screen and an audible chirp every 30 seconds.

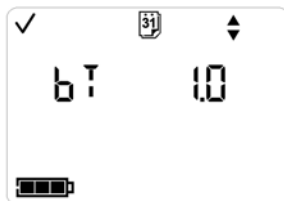


Use the Enter button to toggle between these values. A “0” value indicates that the bump overdue alarm is disabled. A “1” indicates that the bump overdue alarm is enabled.

After the desired setting is selected, press the On/Off/Mode button to display the bump test interval screen.

## Bump Test Interval Screen

At this screen, the user has the option to set the desired frequency of the bump test before the overdue alarm is activated. This default value is one day and may be set in ½ day increments from ½ day up to 7 days. This will allow the user to ensure that instruments are bump tested twice daily or before two shifts if desired. When the set value has been exceeded without a successful bump test occurring, the overdue alarm described above will be activated.



Use the Enter button to scroll between the values of 0.5 to 7.0 days. After the desired setting is selected, press the On/Off/Mode button to display the Bump Test Threshold screen.

## Bump Test Threshold Screen

The bump test threshold screen allows the user to set the percentage of gas response desired to indicate a successful bump test of the instruments sensors. This value may be set between a range of 50 to 99% response to the applied calibration gas. The default percentage value is set to 50%



Use the Enter button to increment the display to the desired value. After the desired setting is selected, press the On/Off/Mode button to display the Bump Test Timeout screen

## Operation Guide

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### Bump Test Timeout Screen

This Bump Test Timeout screen allows the user to set the desired length of time for the bump test to take place before failure. The default value of 45 seconds is used and indicates that the instrument will determine that the bump test has failed if a 50% response to the calibration gas concentration is not reached within 45 seconds.



This value may be selected in 5 second intervals from 30 seconds to 300 seconds. The bump test period will end when the selected timeout value is reached regardless of whether the test has passed or failed.

Use the Enter button to increment the display to the desired bump test timeout value. After the desired setting is selected, press the On/Off/Mode button to display the Alarm Latch Set screen.

### Alarm Latch Set Screen

The Alarm Latch screen displays the alarm icon, the up and down arrow icons, the lock (keyhole) icon, the LAT text (for LATCH), and the current alarm latch setting.

From this screen you enable (=1) or disable (=0) alarm latching on the MX4.

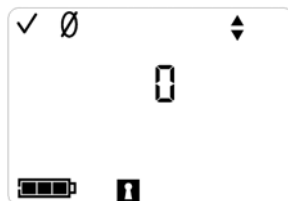


Use the Enter button to toggle between these values. A “0” value indicates “normal” alarming. A “1” indicates “latched” alarming. If the alarms are latched, to un-latch in normal reading mode, press and hold the Enter button for three seconds.

After the desired setting is selected, press the On/Off/Mode button to display the Zero Enable screen.

## Zero Enable Screen

The Zero Enable screen displays the zero icon, the up and down arrow icons, the lock icon, the current zero enable value (0=do not allow zeroing from the main monitoring mode and 1=allow zeroing from the main monitoring mode).

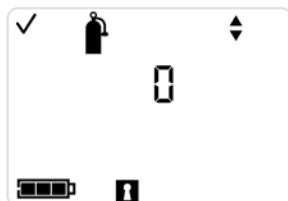


Use the Enter button to toggle between these values. A “0” value is disabled. A “1” value is enabled. If zero in field is not enabled, calibration in field is automatically also not enabled.

After the desired setting is selected, press the On/Off/Mode button to display the Cal Enable screen.

## Cal Enable Screen

The Cal Enable screen displays the gas bottle icon, the up and down arrow icons, the lock icon, the current cal enable value (0=do not allow calibration from the main monitoring mode and 1=allow calibration from the main monitoring mode).

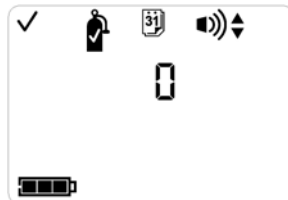


Use the Enter button to toggle between these values. A “0” value is disabled. A “1” value is enabled.

After the desired setting is selected, press the On/Off/Mode button to display the Cal Due Alarm Option screen.

## Cal Due Alarm Option Screen

The Cal Due Alarm Option screen displays the cal gas bottle icon, the calendar icon, the alarm icon, the up and down arrow icons, and the current setting for this parameter (0=disabled, 1=enabled: alarm occurs when calibration is due). Use the Enter button to toggle between these values.



After the desired setting is selected, press the On/Off/Mode button to display the Cal Due Setpoint screen.

## Operation Guide

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### Cal Due Setpoint Screen

The Cal Due Set Point screen displays the calibration interval set point applied to all four installed sensors (the number of days, from 1 to 365, before a calibration is due), the gas bottle icon, the calendar icon, and the up and down arrow icons.



If no changes are needed, press the On/Off/Mode button to move to the next screen (the Clock Setting screen).

If changes are desired, press the Enter button to begin editing values. The Cal Due Set Point value flashes. To adjust this value, use the Enter button. Acceptable values are from 1 to 365 days (the default value is 30 days). Once the desired value is met, press the On/Off/Mode button to submit the value. Pressing the On/Off/Mode button again displays the Code Set screen.

### Code Set Screen

The Code Set screen is used to set the security code of the MX4. This code is required to gain access to the Configuration screens of the instrument.

The Code Set screen displays the up and down arrows, the lock icon, and CODE text (Cod) and the current three-digit security code.



If no changes are needed, press the On/Off/Mode button to return to the Zero screen.

If changes are desired, press the Enter button. The first digit of the security code flashes. To adjust this digit, use the Enter button. Once the desired value is met for this digit, press the On/Off/Mode button to submit the value and move to the next digit.

Set the desired second and third digits in the same manner, pressing the On/Off/Mode button to submit the final value. Pressing the On/Off/Mode button again returns to the Zero screen.

## Data Logging

The MX4 performs continuous data logging at 10 second intervals and can hold approximately three month's of data for the four-sensor configuration. Readings are time-stamped and are stored in a first-in-first-out (FIFO) queue that is overwritten when full. In addition to data logging, the MX4 has an event log that records the last 15 alarm events.

Data can be downloaded to a PC via the software package and Charger/Datalink. Data is extracted from the MX4 via a Charger/Datalink. To purchase a Charger/Datalink, please contact your local distributor of Industrial Scientific products.

To use the Charger/Datalink, you must first install the setup software located on the CD that is supplied with the Charger/Datalink. Connect the Charger/Datalink to a USB port on your PC, click on the "Connect" button to establish communications. Once communications are established, data can be downloaded or cleared from the interface menu. To view data, select "File Open". To view graphics, select "Graphics" from the spreadsheet menu. To disconnect at anytime, click on the "Disconnect" button and remove the MX4 from the Charger/Datalink.

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**NOTE:** When a sensor is in an over-range condition, the maximum range value will be logged into the datalog memory for that sensor.

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## Operation Guide

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### Maintenance

With normal routine maintenance the MX4 can be relied upon to provide years of dependable service. The following guidelines should be followed when performing maintenance on the MX4.

### Cleaning

When necessary, wipe the outside of the MX4 with a soft, clean cloth. Never use solvents or cleaning solutions of any type. Make sure the sensor diffusion membrane is free of debris. Clean sensor openings with a soft, clean cloth or soft brush.

### Charging the Li-ion Battery Pack

The lithium-ion (Li-ion) battery pack should be fully charged before using the MX4. A cradle type charger is provided to facilitate battery charging. To charge the internal battery, place the MX4 upright and facing forward in the charging cradle. The battery icon will start to cycle from empty to full to indicate that the battery is charging. The battery indicator will show full when the instrument battery is fully charged.

A full battery recharge can be completed in less than 7 hours.

### Battery Replacement

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**Important:** Before replacing the rechargeable battery pack, changing the alkaline batteries, or removing the back cover, always be sure to first turn off the MX4.

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The MX4 can be powered using a rechargeable battery pack or a replaceable alkaline battery pack. The battery pack is held in place with four (4) screws. For replacement parts and part numbers, refer to the replacement parts list later in this manual.

The battery pack is removed by loosening the four lower screws on the case back and removing the pack. The new pack should be reassembled to the instrument chassis in a likewise manner taking care to securely tighten the screws.

**Warning:** Be sure to insert the alkaline batteries with the correct positive "+" and negative "-" orientation. Failure to follow proper battery orientation will result in damage to the instrument. Replace only with approved battery types. Do not mix different types of batteries together.

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## **Sensor and Sensor Water Barrier Replacement**

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**Important:** Before replacing the sensors or sensor water barrier, or removing the back cover, always be sure to first turn off the MX4.

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Refer to the Exploded View Diagram on page 39 when performing maintenance and installing replacement parts on the MX4.

Sensors and the sensor water barrier are easily replaced by removing the front cover of the MX4 (MX4 Case Top). The cover is held in place with four (4) screws which are accessible at each corner on the rear of the instrument. The sensor water barrier should be replaced by replacing the MX4 Case Top. For a list of the replacement sensors and Case Top part numbers, refer to the replacement parts list later in this manual. Contact your local Industrial Scientific office for ordering information.

Sensors can be replaced by removing the front cover as described above. Grasp the desired sensor firmly with two fingers and remove it from the instrument assembly. Take care when replacing the sensor to be certain that the connector on the bottom of the sensor is aligned properly with the connector on the instrument printed circuit board and press the new sensor firmly into place.

A full instrument calibration should be performed following the replacement of any sensor or the sensor water barrier.

## Operation Guide

### Specifications

#### Physical Specifications

| Item    | Description  |  |
|---------|--|--|
| Display | Custom Graphic LCD with Backlight                              |  |
| Weight  | 6.4 oz. (180 grams)  |  |
| Size    | <b>With Li-Ion Battery Pack</b>                                | <b>With Alkaline Battery Pack</b>            |
|         | 4.1" x 2.3" x 1.2"<br>103 mm x 58 mm x 30 mm                   | 4.1" x 2.3" x 1.2"<br>103 mm x 58 mm x 31 mm |
| Case    | Composite with rubber overmold                                 |  |
| Buttons | Two (On/Off/Mode and Enter)                                    |  |
| Alarms  | Audible (>95 dB at 30 cm or 1 ft), visual (LED), and vibrating |  |

#### Sensor Specifications

| Gas Name         | Abbr.            | Detection Range | Resolution | Accuracy @ Temperature of Calibration | Response Time (Max) |     |
|------------------|------------------|-----------------|------------|---------------------------------------|---------------------|-----|
|                  |                  |                 |            |                                       | T50                 | T90 |
| Oxygen           | O <sub>2</sub>   | 0-30%           | 0.1%       | ± 0.5%                                | 10                  | 15  |
| Carbon Monoxide  | CO               | 0-1000 ppm      | 1 ppm      | ± 5%                                  | 15                  | 50  |
| Hydrogen Sulfide | H <sub>2</sub> S | 0-500 ppm       | 0.1 ppm    | ± 5%                                  | 15                  | 30  |
| Nitrogen Dioxide | NO <sub>2</sub>  | 0-150 ppm       | 0.1ppm     | ± 5%                                  | 20                  | 30  |
| Combustible      | LEL              | 0-100% LEL      | 1% LEL     | ± 5%                                  | 15                  | 40  |
| Methane          | CH <sub>4</sub>  | 0-5% volume     | 0.01%/vol  | ± 5%                                  | 15                  | 40  |

**Environmental Specifications**

| Item                  | Description                                 |
|-----------------------|---|
| Operating Temperature | -20°C to +50°C (-4°F to 122°F), all sensors |
| Operating Humidity    | 15 -95% non-condensing (continuous) typical |

**Battery Specifications**

| Item                | Description  |                                 |
|---------------------|--|---------------------------------|
| Battery Types       | Rechargeable Lithium-Ion battery, 3.6 Volts, 1.8 Amp/hr.<br>Replaceable Alkaline, 3- AAA   |                                 |
| Runtime             | <b>Rechargeable Battery Pack</b>   | <b>Replaceable battery pack</b> |
|                     | 12 hrs (typical @ 20C)   | 8 hrs, (typical @ 20C)          |
| Recharge Time (Max) | <7 hours   |                                 |
| <b>Warning:</b>     | Be sure to insert the alkaline batteries with the correct positive "+" and negative "-" orientation. Failure to follow proper battery orientation will result in damage to the instrument. Replace only with approved battery types. Do not mix different types of batteries together. |                                 |

## Operation Guide

### Replacement Parts

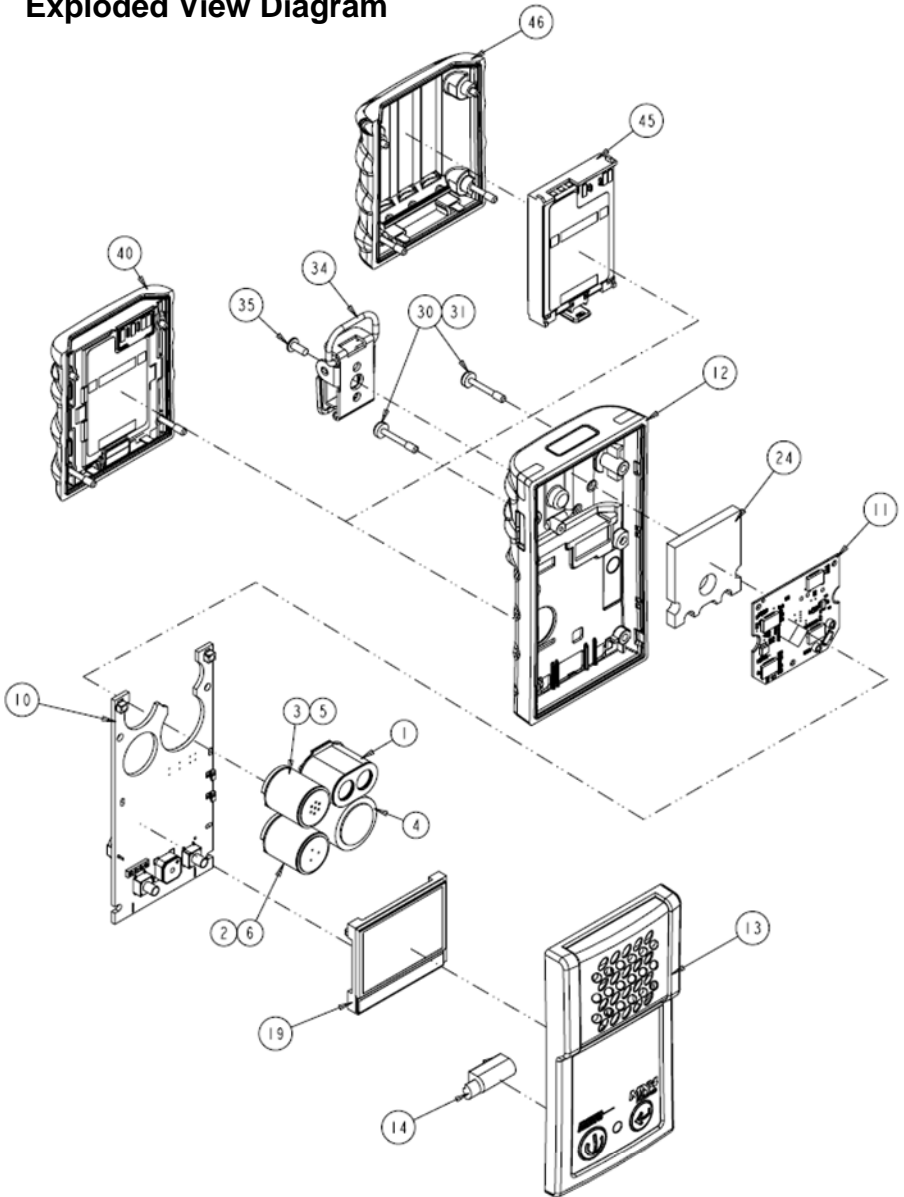
For replacement parts for your MX4, refer to the exploded view drawing shown on page 40.

| Item    | Part Number | Description   |
|---------|-------------|---|
| 1       | 17134495    | MX4 LEL/ CH <sub>4</sub> Sensor   |
| 2       | 17134487    | MX4 CO Sensor   |
| 3       | 17134479    | MX4 H <sub>2</sub> S Sensor   |
| 4       | 17134461    | MX4 Oxygen Sensor   |
| 5       | 17134503    | MX4 NO <sub>2</sub> Sensor  |
| 10      | 17134966    | MX4 Main PC Board   |
| 11      | 17134982    | MX4 Analog PC Board   |
| 12      | 17130972    | MX4 Case Bottom   |
| 13      | 17147653    | MX4 Case Top Assembly (includes Item 14)  |
| 14      | 17145285    | Vibrating Motor   |
| 19      | 17147661    | MX4 Display Assembly  |
| 24      | 17147174    | PC Board Pad  |
| 30      | 17147273    | Captive Case Phillips Screws (used on UL, CSA, ATEX, INMETRO instruments)                               |
| 31      | 17147281    | Captive Case Torx Screws (used on MSHA, ANZEx Instruments)  |
| 34      | 17120528    | Suspender Clip  |
| 35      | 17139262    | Suspender Clip Attachment Screw   |
| *40     | 17134453-X  | Lithium-ion Battery Pack  |
| 45      | 17138041    | Alkaline Battery Pack   |
| *46     | 17138058-X  | Alkaline Battery Cover  |
| *45, 46 | 17134446-X  | Alkaline Kit: Alkaline Pack, Alkaline Cover and three (3) AAA Alkaline Batteries                        |
|         | 17034265    | Alkaline AAA Battery (Note: Approved alkaline AAA battery types are Energizer EN92 and Duracell MN2400) |

\* Refer to following instrument approval table for proper extension.

| Instrument Approval |                                   |
|---------------------|-----------------------------------|
| -1                  | UL / CSA / ATEX / IECEx / INMETRO |
| -2                  | MSHA / ANZEx                      |
| -3                  | CHINA                             |

**Exploded View Diagram**



## Operation Guide

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### Warranty

Industrial Scientific Corporation's MX4 portable gas monitors are warranted to be free from defects in material and workmanship for a period of two years after purchase.

The above warranty includes sensors, battery pack, and sampling pump. Filters are warranted to be free from defects in material and workmanship for 18 months from date of shipment, or 1 year from date of first use, whichever occurs first, except where otherwise stated in writing in Industrial Scientific literature accompanying the product.

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It shall be an express condition to Industrial Scientific's warranty that all products be carefully inspected for damage by Buyer upon receipt, be properly calibrated for Buyer's particular use, and be used, repaired, and maintained in strict accordance with the instructions set forth in Industrial Scientific's product literature. Repair or maintenance by non-qualified personnel will invalidate the warranty, as will the use of non-approved consumables or spare parts. As with any other sophisticated product, it is essential and a condition of Industrial Scientific's warranty that all personnel using the products be fully acquainted with their use, capabilities and limitations as set forth in the applicable product literature.

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The company **Industrial Scientific Corporation**, Oakdale, Pennsylvania USA, declares that the following new material intended for use in Explosive Atmospheres:

*(La société Industrial Scientific Corporation, Oakdale, Pennsylvania USA, atteste que le matériel neuf destiné à être utilisé en Atmosphères Explosives désigné ci-après:)*

**Gas detector (Détecteur de gaz) MX4**

**comply with the requirements of the following European Directives :**

*(est conforme aux exigences des Directives Européennes suivantes:)*

**I) The European Directive ATEX 94/9/CE of 23/03/94: Explosive Atmospheres**

*Directive Européenne ATEX 94/9/CE du 23/03/94: Atmosphères Explosives*

**No. of EC type examination certificate:**

*(N° Attestation CE de Type du matériel:)*

**DEMKO 09 ATEX 0854530**

Issued by the Notified Body no. 0539:

*(Délivré par l' Organisme notifié sous le numéro 0539)*

UL International DEMKO A/S, LYSKEAR 8

P.O. Box 514, DK - 2730, HERLEV, DENMARK

**Reference European Standards (Normes européennes de référence):**

Rules of construction (*Règles de construction*):

EN 60079-0, EN 60079-1, EN 60079-11

Category (*Catégorie*):



II 2G / I M2

Ex d ia IIC T4 / Ex d ia I

Tamb -20°C to +50°C IP66/IP67

**Production Quality Assurance Notification No. of the Oakdale factory** SIRA 00 ATEX M0080

*(N° de la Notification Assurance Qualité de Production de l'usine de Oakdale)*

Issued by the Notified Body no. 0518:

*(Délivré par l'Organisme notifié sous le numéro 0518)*

SIRA Certification Services, Rake Lane

Eccleston, Chester CH4 9JN, UK

**II) The European Directive EMC 89/336/CEE of 3/05/89: Electromagnetic Compatibility**

*Directive Européenne CEM 89/336/CEE du 3/05/89 : Compatibilité Electromagnétique*

**Harmonised applied standards:**

*(Normes harmonisées appliquées)*

EN 50270

**On behalf of the manufacturer**

*Pour le fabricant*

**Industrial Scientific Corporation**

1001 Oakdale Road  
Oakdale PA, 15071 USA  
Tel +01 412 788 4353

www.indsci.com

**On behalf of the manufacturer representative in EC**

*Pour le représentant du fabricant dans l'UE*

**Industrial Scientific Oldham**

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3 April 2009

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