Instruction Manual
GasWatch
Portable Two-Gas Monitor

Part Number: 71-0031RK

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Warranty

RKI Instruments, Inc., warranties gas alarm equipment manufactured by RKI and sold by RKI to be free from defects in materials and workmanship for a period of one year from date of shipment from RKI Instruments, Inc. Any parts found defective within that period will be repaired or replaced, at our option, free of charge. This warranty does not apply to items that are subject to deterioration or consumption in normal service, and which must be cleaned, repaired, or replaced routinely. Those items include, but are not limited to:

absorbent cartridges	filter elements
pump diaphragms and valves	batteries
lamp bulbs and fuses	

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We do not assume indemnification for any accident or damage caused by the operation of this gas monitor. Our warranty is limited to replacement of parts or our complete goods.

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Introduction

The GasWatch is a portable gas monitoring device. It is offered in single-gas and two-gas versions. This instruction manual describes the two-gas version. The GasWatch is compact, convenient, and offers a full range of features, including:

- detection of oxygen deficiency **and** carbon monoxide **or** hydrogen sulfide
- LCD display for complete, understandable information at a glance
- distinctive audible alarms for dangerous gas conditions and malfunctions
- designed for intrinsic safety for Class I, Groups A, B, C, and D hazardous atmospheres
- microprocessor control for reliability, ease of use, and advanced capabilities
- small size and light weight for user comfort
- wrist strap or **optional** arm strap for hands-free gas monitoring

WARNING: ***The GasWatch is designed to detect oxygen deficiency*** *and* ***carbon monoxide*** *or* ***hydrogen sulfide, which can be life threatening. Users must follow the instructions and warnings in this manual to assure proper and safe operation of the GasWatch.***

Specifications

Table 1: Specifications

	CX-GW	HX-GW
Target Gases	Carbon monoxide (CO); Oxygen (O2)	Hydrogen sulfide (H2S); Oxygen (O2)
Detection Range	**CO:** 0 to 500 ppm; **O2:** 0 to 40.0% vol.	**H2S:** 0 to 150.0 ppm; **O2:** 0 to 40.0% vol.
Alarm Point	**CO:** 25 ppm; **O2:** 19.5% vol. (dec.);23.5% vol. (inc.)	**H2S:** 10 ppm; **O2:** 19.5% vol. (dec.);23.5% vol. (inc.)
Display Increment	**CO:** 1 ppm; **O2:** 0.1% vol.	**H2S:** 0.5 ppm; **O2:** 0.1% vol.
Sampling Method	Diffusion	Diffusion
Response Time	**CO:** T90 in 30 sec.; **O2:** T90 in 20 sec.	**H2S:** T90 in 30 sec.; **O2:** T90 in 20 sec.
Accuracy	**CO:** ±5 ppm (up to 150 ppm); **O2:** ± 0.5% vol.	**H2S:** ±1.5 ppm (up to 30 ppm); **O2:** ± 0.5% vol.
Dimensions	3.1 in. x 3.3 in. x 1.2 in. (7.9 cm x 8.4 cm x 3.0 cm)	
Weight	6 ounces (170.1 grams)	
Battery life[1]	720 hours	
Oper. Temperature	14° F to 104°F (-10°C to 40°C)	
Humidity (max.)	85% RH (non-condensing)	

[1] (based on continuous operation without alarms or use of back light feature)

Description

This section describes components of the GasWatch.

Sensors

The two-gas version of the GasWatch includes two of the following sensors (see Table 1). The sensors are above the display screen. Labels indicate the target gas of each sensor (CO, H_2S, or O_2). A dust cover protects each sensor from harmful objects in the monitoring environment. The sensor and dust cover are secured by the sensor retainer.

Carbon monoxide and hydrogen sulfide sensor

The CO and H_2S sensors are electrochemical cells that consist of three precious metal electrodes in an acid electrolyte. A gas permeable membrane covers the cell and allows gas in the monitoring environment to diffuse into the electrolyte at a rate proportional to its partial pressure. The gas reacts in the cell and produces a current proportional to the concentration of the target gas. The current is amplified by the GasWatch's circuitry, converted to a measurement of gas concentration, and displayed on the display screen.

Oxygen sensor

The O_2 sensor is an electrochemical cell that consists of gold and lead electrodes in an alkaline electrolyte. A fluorocarbon membrane covers the cell and allows gas in the monitoring environment to diffuse into the electrolyte at a rate proportional to the partial pressure of oxygen. The oxygen reacts in the cell and produces a current proportional to the concentration of oxygen. The current develops a voltage across a temperature-compensating thermistor / resistor network. The voltage is measured by the GasWatch's circuitry, converted to a measurement of gas concentration, and displayed on the display screen.

Display Screen

During normal operation the display screen displays the current concentration of one of the target gases and the time of day. To display the second target gas, press the DISP button.

You can also display and / or adjust peak readings, time-weighted averages, alarm points, date, and time. See "Operation" on page 5 for more information. The GasWatch includes a back light feature so you can see the display screen in dimly-lit environments.

Alarm Light

The alarm light is above and to the right of the display screen. The alarm light is a red LED that alerts you to gas, low battery, and sensor failure alarms.

Control Buttons

The control buttons are below the display screen.Table 2 lists the function of each button.

Table 2: GasWatch Button Functions

Button	Function
MODE / POWER	• turns GasWatch on and off • turns display back light on and off • displays peaks readings • resets alarm circuit (gas alarms) • enters calibration mode (with AIR button) • enters alarm adjustment mode (with AIR button) • enters time / date adjustment mode (with DISP button)
DISP	• displays “second” target gas • enters time / date adjustment mode (with MODE / POWER button)
AIR	• adjusts the display reading to 0 (20.9 for O_2) • enters calibration mode (with MODE / POWER button) • enters alarm adjustment mode (with MODE / POWER button)

Batteries

The GasWatch is powered by two zinc air batteries. The button-type batteries are installed in the battery compartment. You can access the battery compartment through a removable door in the back of the GasWatch. The batteries will run the GasWatch for approximately 720 hours of continuous operation without alarms or use of the display back light.

NOTE: Frequent alarms and use of the back light feature reduce the life span of the batteries.

Zinc air batteries work by reacting with air. RKI Instruments, Inc., ships replacement batteries with a protective sticker, which covers the battery’s air diffusion holes. When the protective sticker is removed, the battery will last three months whether or not it is used. If the battery is used, it may last less than three months from the time you remove the sticker.

Wrist Strap

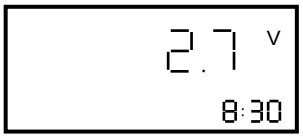
The wrist strap allows you to wear the GasWatch and leaves your hands free to perform other tasks. The wrist strap is attached to the back of the GasWatch and includes a velcro section to secure the GasWach during operation.

NOTE: You can replace the wrist strap with an **optional** arm strap that you wear on your upper arm. See “Accessories” on page 13 to install the arm strap.

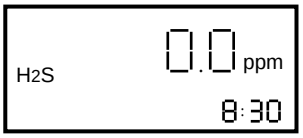
Start Up

1. Press the POWER button until the alarm light turns on (approximately 3 seconds).

   The GasWatch temporarily tests all elements of the display screen, then displays the battery voltage.



   After several seconds, the GasWatch automatically displays the toxic gas normal screen (CO or H_2S),



   then the GasWatch displays the oxygen normal screen. The GasWatch is in normal operation.

Tip: You can test the oxygen sensor and alarm circuit by exhaling into the sensor. When the display reading drops below the decreasing oxygen alarm point, the buzzer should sound, the display reading should flash, and the alarm light should turn on.

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2. Press the AIR button for approximately 3 seconds to set the zero reading (span for O_2). The buzzer sounds a pulsing tone while it is adjusting the readings (0 for H_2S or CO; 20.9 for O_2). Continue pressing the AIR button until the pulsing tone stops.
3. Use the wrist strap to attach the GasWatch to your wrist. The wrist strap has a velcro section to ensure that the GasWatch remains secured to your wrist during operation. (See “Accessories” on page 13 to install the **optional** arm strap.

Operation

This section describes the GasWatch in normal operation. This section also describes procedures to display peak readings, and set the alarm points and time and date.

Normal Operation

The GasWatch continuously monitors the atmosphere and displays the concentrations present of one of the target gases.

- Press the DISP button to display the second target gas.
- Press the POWER / MODE button to turn on the display back light in dimly-lit areas.

Displaying Peak Readings

NOTE: For CO and H_2S, peak readings represent the highest reading. For O_2, peak readings represent the lowest reading. The GasWatch displays peak readings for the target gas that is currently displayed on the normal screen.

1. From the normal screen, press the MODE button. The back light turns on.
2. Press the MODE button again. The peak reading displays. This is the peak reading since the last time the GasWatch was turned on.

NOTE: The GasWatch does not display STEL or TWA readings for the oxygen sensor.

3. Press the MODE button again. The STEL reading displays.

   The STEL (short term exposure limit) reading is the average gas reading over the past 15 minutes.

4. Press the MODE button again. The TWA reading displays.

   The TWA (time weighted average) reading is the average gas reading over the past 8 hours. If the GasWatch has been on less than 8 hours, it assumes the reading has been 0 during the period the GasWatch was turned off.

5. Press the MODE button again to return to the normal screen. The back light is off.

Adjusting the Alarm Points

NOTE: When adjusting alarms points, the AIR button increases the setting, and the DISP button decreases the setting.

1. Verify that the GasWatch is turned off.

   Only the time of day is displayed when the GasWatch is off. To turn off the GasWatch, press the POWER button until only the time of day is displayed (approximately 5 seconds).

2. Press the MODE and AIR buttons simultaneously.
3. Release the AIR button when the GasWatch displays all display elements (approximately 1 second).

   The GasWatch beeps, then the decreasing oxygen alarm point displays.

4. Release the MODE button.
5. Adjust the alarm setting with the AIR and DISP buttons, then press the MODE button. The increasing oxygen alarm point displays.
6. Adjust the alarm setting with the AIR and DISP buttons, then press the MODE button. The toxic gas (H_2S or CO) alarm point displays.
7. Adjust the alarm setting with the AIR and DISP buttons, then press the MODE button. The toxic gas STEL alarm point displays.
8. Adjust the alarm setting with the AIR and DISP buttons, then press the MODE button. The toxic gas TWA alarm point displays.
9. Adjust the alarm setting with the AIR and DISP buttons.
10. Press the MODE button to turn on the GasWatch. (See “Start Up” on page 4.)

Setting the Time and Date

1. Verify that the GasWatch is turned off.

   Only the time of day is displayed when the GasWatch is off. To turn off the GasWatch, press the POWER button until only the time of day is displayed (approximately 5 seconds).
2. Press the MODE and DISP buttons simultaneously until the buzzer sounds (approximately 3 seconds). The time displays ***000***, then the minutes setting flashes.
3. Press the DISP button to increase the minutes setting. You can only increase the setting. The setting returns to **0** after **59** displays.
4. Press the AIR button. The hours setting flashes.
5. Press the DISP button to increase the hours setting. You can only increase the setting. The setting returns to **1** after **12** displays.
6. Press the AIR button. The date setting flashes.
7. Press the DISP button to increase the date setting. You can only increase the setting. The setting returns to **1** after **31** displays.
8. Press the AIR button. The month setting flashes.
9. Press the DISP button to increase the month setting. You can only increase the setting. The setting returns to **1** after **12** displays.
10. Press the AIR button to verify the date setting.
11. Press the AIR button again to verify the time setting.

NOTE: To adjust either setting, press and release the AIR button until the minutes setting flashes, then repeat steps 3 through 9.

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12. Press the MODE button to turn on the GasWatch. (See “Start Up” on page 4.)

Alarms

This section describes the GasWatch's gas, battery, and malfunction alarms. Table 3 lists the visual and audible indications for each type of alarm. (See Table 1, "Specifications," on page 1 for the default gas alarm points.)

Table 3: GasWatch Alarm Indications

Alarm Type	Visual Indications	Audible Indication
Gas *(above alarm point; also below for O_2)*	• alarm light flashes • gas reading flashes • back light turns on	pulsing tone
Gas[1] *(above STEL or TWA alarm point)*	• alarm light flashes • **TWA** or **STEL** flashes on display screen • back light turns on	pulsing tone
Over Range	• gas reading replaced by ⌐¬⌐¬⌐¬ • over range / peak reading icon displays in lower left corner of screen	double pulsing tone
Low Battery	• battery icon displays • internal battery icon flashes	none
Battery Failure	• gas reading replaced by **FAIL** • battery icon flashes	double pulsing tone
Sensor Failure[2]	gas reading replaced by **FAIL**	double pulsing tone

[1] The oxygen sensor does not initiate STEL or TWA alarms.

[2] If the oxygen sensor fails, the gas reading flashes 0.0% and the buzzer sounds a pulsing tone.

NOTE: The GasWatch automatically displays the reading for the target gas that initiates an alarm. For example, if the oxygen normal screen is displayed, and the toxic gas sensor initiates an alarm, the GasWatch automatically switches to the toxic gas screen.

Responding to Alarms

This section describes response to gas, over range, battery, and sensor failure alarms.

Responding to gas alarms

1. Determine which sensor is initiating the gas alarm.
2. Follow your established procedure for an increasing gas condition or decreasing oxygen condition.
3. When the display reading decrease below (or rises above for O_2 sensor) the alarm point, press the MODE button to reset the alarm circuit. The alarm light turns off and the buzzer silences.

Responding to over range alarms

WARNING: ***An over range condition may indicate an extreme toxic gas or oxygen content condition. Confirm a normal condition with a different GasWatch or other gas detection device.***

1. Determine which sensor is initiating the over range alarm.
2. Calibrate the sensor as described on page 9.
3. If the over range condition continues, replace the sensor as described on page 12.
4. If the over range condition continues after you replace the sensor, contact RKI Instruments, Inc., for further instruction.

Responding to battery alarms

WARNING: ***The GasWatch is not operational as a gas monitoring device during a battery failure alarm. Take the GasWatch to a non-hazardous area, and replace the battery as described on page 12.***

The GasWatch is fully functional during a low battery alarm; however, the GasWatch has approximately 10 minutes of operating time remaining from the initial low battery alarm. Replace the battery as soon as possible as described on page 12.

NOTE: Other alarms and use of the back light feature reduce the amount of operating time remaining.

Responding to sensor failure alarms

1. Determine which sensor is initiating the sensor failure alarm.
2. Calibrate the sensor as described on page 9.
3. If the sensor failure continues, replace the sensor as described on page 12.
4. If the sensor failure continues after you replace the sensor, contact RKI Instruments, Inc., for further instruction.

Calibration

This section describes how to prepare for calibration, calibrate the GasWatch, and return to normal operation. This section also describes equipment that is necessary to perform the calibration procedure.

Supplies and Equipment

To calibrate the GasWatch, you will need the following supplies and equipment. RKI calibration kits are available for this purpose (see "Parts List" on page 14).

- For the toxic gas sensor (CO or H_2S), known calibrating samples of the target gas. The samples should have concentrations in approximately the middle of the range of detection.
- For the oxygen sensor, an oxygen-free source, such as pure nitrogen or CO in a nitrogen balance
- A fixed-flow regulator, non-absorbent tubing, and calibration cup

Assembling the Calibration Kit

WARNING: Calibrate the GasWatch in a non-hazardous environment.

1. Attach the calibration tubing to the calibration cup, then attach the opposite end of the tubing to the regulator.
2. Slide the calibration cup over the toxic gas (CO or H_2S) sensor.

NOTE: Do not attach the regulator to the gas cylinder at this time.

Calibrating the GasWatch

This section describes calibration of the toxic gas and oxygen sensors.

Calibrating the toxic gas sensor

1. Verify that the GasWatch is turned off.

   Only the time of day is displayed when the GasWatch is off. To turn off the GasWatch, press the POWER button until only the time of day is displayed (approximately 5 seconds).

2. Press and hold the AIR and MODE buttons simultaneously until the GasWatch beeps and **CAL** displays (approximately 2 seconds).

   The toxic gas calibration screen automatically displays.

3. Attach the regulator to the toxic gas cylinder. The fixed-flow regulator automatically begins introducing the calibration sample to the toxic gas sensor.

4. Allow the display reading to stabilize (approximately 1 to 2 minutes), then use the AIR and DISP buttons to adjust the display reading to match the concentration of the calibration sample.

   The AIR button increases the reading; the DISP button decreases the reading.

NOTE: If you cannot adjust the display reading to match the calibrating sample, replace the toxic gas sensor as described on page 12.

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5. Unscrew the regulator from the toxic gas cylinder. The display reading decreases.
6. Remove the calibration cup from the toxic gas sensor, then slide the cup over the oxygen sensor.

Calibrating the oxygen sensor

1. Press the MODE button. The oxygen calibration screen displays.
2. Attach the regulator to the oxygen-free gas cylinder. The fixed-flow regulator automatically begins introducing the calibration sample to the oxygen sensor.
3. Allow the display reading to stabilize (approximately 1 to 2 minutes), then use the AIR and DISP buttons to adjust the display reading to match the oxygen concentration of the calibration sample.

   The AIR button increases the reading; the DISP button decreases the reading.

NOTE: If you cannot adjust the display reading to match the calibrating sample, replace the oxygen sensor as described on page 12.

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4. Unscrew the regulator from the gas cylinder. The display reading increases.
5. When the display reading increases above the oxygen alarm point, press the MODE button to turn on the GasWatch. (See “Start Up” on page 4.)

Disassembling the Calibration Kit

1. Remove the calibration cup from the sensor. Leave the calibration cup and regulator connected by the sample tubing for convenience.
2. Place the calibration kit components in the storage case, and store in a safe and convenient place.

Maintenance

Troubleshooting

The troubleshooting guide describes symptoms, probable causes, and recommended action for problems you may encounter with the GasWatch.

Fail condition

Symptoms

- **CO/H_2S:** the gas reading is replaced by **FAIL**.
- **CO/H_2S:** the buzzer is sounding a double pulsing tone.
- **O_2:** the gas reading is **0.0%** vol.
- **O_2:** the buzzer is sounding a pulsing tone.

Probable causes

- The sensor is missing or not plugged in properly.
- The sensor requires calibration.
- The sensor is defective.

Recommended action

1. Determine which sensor is initiating the fail condition.
2. Verify the sensor is plugged in properly.
3. Calibrate the sensor as described on page 9.
4. If the fail condition continues, replace the sensor as described later in this section.
5. If the fail condition continues after you replace the sensor, contact RKI Instruments, Inc., for further instruction.

Slow or no response/difficult or unable to calibrate

Symptoms

- Unable to accurately set the response reading during the calibration procedure.
- The GasWatch requires frequent calibration.

NOTE: Under “normal” circumstances, the GasWatch requires calibration every 3 months. Some applications may require a more frequent calibration schedule.

Probable causes

- The calibration cylinder is low, out-dated, or defective.
- The sensor dust cover is dirty or clogged.
- The sensor is defective or its sensitivity reduced due to age.

Recommended action

1. Verify that the calibration cylinder for the affected sensor contains an adequate supply of a fresh test sample.
2. Inspect the sensor dust cover for the affected sensor to make sure it is not dirty or clogged. If necessary, replace the cover as described on page 12.

3. If the calibration / response difficulties continue, replace the affected sensor as described later in this section.
4. If the calibration / response difficulties continue after you replace the sensor, contact RKI Instruments, Inc., for further instruction.

Replacing Components of the GasWatch

This section describes procedures to replace the sensor, sensor dust cover, and batteries.

WARNING: ***Perform the procedures described in this section in a non-hazardous environment.***

Replacing the sensor

1. Verify that the GasWatch is off.
2. Loosen the two screws that secure the sensor retainer to the GasWatch, then remove the sensor retainer.
3. Unplug the sensor from its socket.
4. Plug the replacement sensor into the socket.

CAUTION: *Verify that the sensor is properly aligned with the socket when plugging in the sensor. "Forcing" the sensor in place may damage the sensor or socket.*

5. Place the sensor retainer in its original position, then secure it to the GasWatch with the two screws you loosened in step 2.
6. Start-up the Gas Watch as described on page 4.
7. Calibrate the new sensor as described on page 9.

Replacing the sensor dust cover

1. Use a screwdriver or your fingernail to gently pry each side of the retaining strip away from the sensor dust cover.
2. Remove the sensor dust cover, then insert the replacement dust cover in its place.
3. Reattach the retaining strip in its original position.

   The GasWatch housing includes two recessed tabs on each side of the sensor dust cover that allow the retaining strip to "snap" into place.

Replacing the batteries

1. Verify that the GasWatch is off.
2. Turn the GasWatch over to expose the battery compartment.
3. Loosen the captive screw that secures the battery compartment door, then remove the door.
4. The batteries may be attached to the opposite side of the door, or they may remain in their sockets.
5. Remove the batteries, then place the replacement batteries in the battery sockets. Position the batteries so the positive (+) side of the batteries are facing up.
6. Place the battery door in its original position, then secure it with the captive screw.
7. Start-up the Gas Watch as described on page 4, and verify that it is operating correctly.

Accessories

Arm Strap

The GasWatch is supplied with a standard wrist strap. The arm strap is an **optional** accessory. You can use the arm strap to wear the GasWatch on your upper arm.

To install the arm strap:

NOTE: The wrist and arm straps are secured to the GasWatch by a bar. The bar is attached to the back of the GasWatch by two tabs.

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1. Pull the wrist strap out of the strap loop at the bottom of the GasWatch.
2. Loosen the two screws that secure the oxygen sensor retainer, then remove the sensor retainer.
3. Slide the retaining bar out, then remove the wrist strap.
4. Place the arm strap in the same position as the wrist strap.

NOTE: Make sure you position the arm strap so you can use the velcro section properly once the arm strap is installed.

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5. Slide the retaining bar into its original position.
6. Place the oxygen sensor retainer in its original position, then secure it to the GasWatch with the two screws you loosened in step 2.
7. Insert the opposite end of the arm strap through the strap loop at the bottom of the GasWatch.

Parts List

Table 4: Parts List

Part Number	Description
06-1248RK	Calibration kit tubing (specify length in feet)
13-0101RK	Wrist strap
13-0102RK	Arm strap
21-1830RK	Dust cover retainer
33-1004RK	Sensor dust cover
49-1010RK	Battery (1.4 V, zinc-air button type, Panasonic PR1662)
65-1058RK	Oxygen sensor
65-2008RK	Carbon monoxide sensor
65-2038RK	Hydrogen sulfide sensor
71-0031RK	GasWatch Instruction Manual (two-gas version)
81-0065RK-01	Calibration cylinder (100 PPM CO in nitrogen; 34 liter)
81-0076RK-01	Zero air calibration cylinder (34 liter)
81-0078RK-01	Calibration cylinder (100% nitrogen; 34 liter)
81-0151RK-02	Calibration cylinder (25 PPM H_2S in nitrogen; 58 liter)
81-1003RK	Regulator (fixed-flow, without gauge; 17 / 34 liter; 0.5 LPM
81-1004RK	Regulator (fixed-flow, with gauge; 58 / 103 liter; 0.5 LPM
81-CXGW-LV	Calibration kit (CO / O_2 version; 34 liter)
81-HXGW	Calibration kit (H_2S / O_2 version; 58 liter)