



USER MANUAL

PDM+

Single sustainable gas detector

we watch gas where you can't

CONTENTS

DESCRIPTION	3
WARNING	3
CAUTION	3
1. PRODUCT OVERVIEW	4
2. ACTIVATION & DEACTIVATION	5
3. MODE	5
3.1 Detection Mode	5
3.2 Display Mode	5
3.3 Alarms / Battery / Test Failure display	6
3.4 Default Alarm Set Points	6
4. EVENT LOG	6
5. CALIBRATION	7
5.1 Fresh Air Calibration	7
5.2 Standard Gas Calibration	7
5.3 Remaining Calibration Day	8
5.4 Return to the Detection Mode	9
6. SELF TEST & BUMP TEST	9
6.1 Self Test	9
6.2 Bump Test	9
7. SENSOR & BATTERY REPLACEMENT	10
7.1 Sensor Replacement	10
7.2 Battery Replacement	10
8. SPECIFICATIONS	11
8.1 General Specifications	11
8.2 Sensor Specifications	12
9. IR LINK SETTINGS	12
10. CERTIFICATES	14
11. LIMITED WARRANTY	15

DESCRIPTION

PDM+ is a single sustainable gas detector designed to detect oxygen deficiency and presence of toxic gas in the ambient environment. The PDM+ is sustainable, hence its battery and sensor can be replaced. When turned on, PDM+ continuously monitors ambient air for the presence of a specific gas and alerts the user to potentially unsafe exposure with LED, vibrating, and audible alarms in the event that gas concentration exceeds alarm set points. The alarm set point, calibration range, and display configuration can be changed via WatchGas IR Link (Optional). After use, the instrument can be turned off.

WARNING

- Any unauthorized attempt to repair or modify the product, or any other cause of damage beyond the range of the intended use, including damage by fire, lightning, or other hazard, voids liability of the manufacturer;
- Activate this product only if sensor, visual, detection, and audible cover are clear from contaminants such as dirt and debris that could block the area where gas is to be detected;
- Do not clean and rub the LCD screen of the products with a dry cloth or hands in hazardous environment to prevent the static electricity;
- Perform cleaning and maintenance of the products in fresh air that is free of hazardous gases;
- Test the response of a sensor regularly by the gas concentration exceeding alarm set point;
- Test LED, audio and vibration manually;
- Gas concentration measurements by the sensor can vary based on the environment (pressure and humidity). Therefore, calibration of PDM+ should be performed in the same (or similar) environment of the device's actual use;
- If the temperature changes sharply during use of the device (e.g. indoors vs outdoors), the value of the measured gas concentration can suddenly change. Please use the PDM+ after the gas concentration value has stabilized;
- Severe vibration or shock to the device may cause a sudden reading change. Please use PDM+ after the value of gas concentration has stabilized. Excessive shock to PDM+ can cause the device and / or sensor to malfunction;
- All alarm value is set based on the alarm standard that is required by international standard;
- Therefore, alarm values should be changed only under the responsibility and approval of the administration of the work site where the instrument is used;
- Use IR communications in the safety zone which is free of hazardous gases;
- Replace the battery and sensor in clean environment, which is free of hazardous gas.

CAUTION

- Before operating this device, please read the manual carefully;
- This device is not a measurement device, but a gas detector;
- If calibration and self-test fails continuously, please do not use the device;
- For the O₂ detector, perform calibration every 30 days in the fresh air environment;
- Clean detectors with a soft cloth and do not use chemical substances for cleaning;
- To maintain 24 months battery life time, avoid the below activities except the necessary cases to check events (Max / Min), lifetime / concentration, and alarm set points. Otherwise, the frequent use of the button will deplete the battery lifetime less than 24 months:
 1. Push the button frequently without valid reasons;
 2. Frequent alarm operation or alarms are remained for a long time. *Normal Alarm Use: 1 time and 2 minutes per day.

WatchGas recommends to bump test the sensors before each day's use to confirm their ability to respond to gas by exposing the detector to a known concentration of target gas that exceeds the alarm setpoints. Manually verify that the audible and visual alarms are activated. Calibrate the instrument if the readings are not within the specified limits.

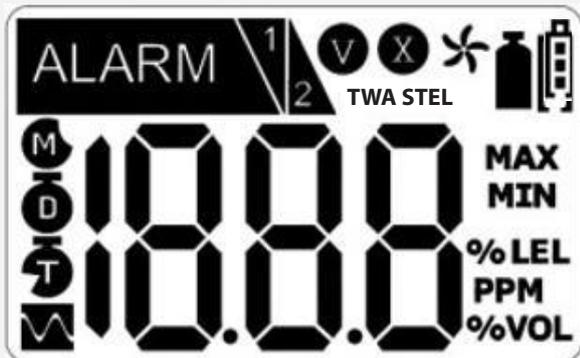
1. PRODUCT OVERVIEW



DETECTOR COMPONENTS

1. Gas sensor
2. Gas type sticker
3. LCD display
4. Button
5. Buzzer
6. Optical alarm LEDs
7. IR communication port

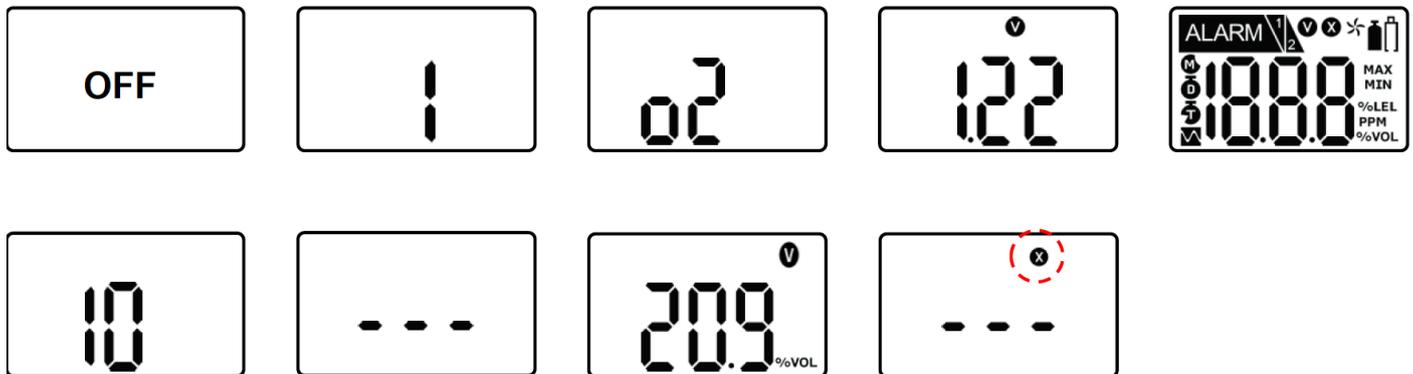
DISPLAY SYMBOLS



ALARM	Alarm
1	Low Alarm
2	High Alarm
V	Stabilization Success
X	Stabilization Fail
*	Fresh Air Calibration
⌚	Standard Gas Calibration
TWA	Time Weighted Average
STEL	Short Term Exposure Limit
M	Remaining Months
D	Remaining Days
T	Remaining Time (Hours)
MAX	Max Peak Value
MIN	Min Peak Value
%LEL PPM %VOL	Unit of Measurement
⌚	Remaining battery life

2. ACTIVATION & DEACTIVATION

In a safe environment, when pressing and holding the button () for 3 seconds, gas type and firmware version (ex. v2.2) will be displayed. For 10 seconds countdown, the device will be stabilized. After stabilization is completed, the device will move to Detection mode.



In the event that stabilization of the device fails,  will appear on the display and gas measurement mode will not be entered. In this case, perform calibration or contact authorized reseller for repair / return information.

To deactivate the device, please press and hold the key () for countdown.

CAUTION

Although the PDM+ is calibrated before it leaves the factory, a proper calibration is advisable before using it at the work site. The user should check whether the device is properly detecting hazardous concentrations and make sure that the detecting section of the device is not blocked with materials impairing the detection.

3. MODE

3.1 MEASURING MODE



In measuring mode, gas concentration will appear on the screen. Oxygen concentration in percent by volume (%vol) and toxic concentration is displayed in parts

3.2 DISPLAY MODE

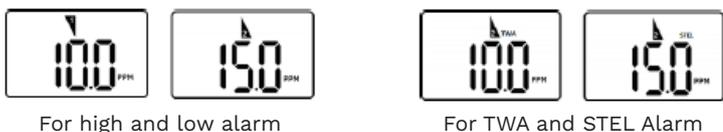
In the Measuring Mode, by pressing key () for one second, the following icons will appear in order: **MIN** (only for oxygen) -> **MAX** -> STEL value -> TWA value -> Clr Max -> Clr TWA/STEL -> 1st alarm set point --> 2nd alarm set point -> STEL setpoint -> TWA Set point -> Firmware version -> Remaining Calibration Day -> Calibration

CAUTION

Before changing alarm setpoints, please ensure the alarm set points are in compliance with your local guidelines.
Option to manually change alarm setpoints can be unlocked using the IR-link.

3.3. MENU OVERVIEW

When a gas concentration exceeds alarm set points, 1 or 2 will be displayed and the device will vibrate, flash its LEDs, and beep. To stop alarms, evacuate immediately to a clean air location.



To configure the alarm setpoints, please follow the steps below:

- Press the button until the above alarm setpoint is displayed;
- Press and hold the button for three seconds and the first digit of alarm setpoint starts to blink;
- To increase the value, press the button for one second;
- To save the alarm setpoints, press the key for 3 seconds.

*Ensure that the second alarm setpoint must be greater than first alarm setpoint.

3.4. DEFAULT ALARM SET POINTS

Gas	O ₂	CO	H ₂ S	H ₂	SO ₂	NH ₃	NO ₂	H ₂ O ₂
Low alarm	19%	25 ppm	5 ppm	100 ppm	1 ppm	20 ppm	5 ppm	1 ppm
High Alarm	23%	25 ppm	5 ppm	100 ppm	1 ppm	20 ppm	5 ppm	1 ppm
STEL	-	100 ppm	3.2 ppm	-	0.3 ppm	50 ppm	1	3 ppm
TWA	-	20 ppm	1.6 ppm	-	0.3 ppm	20 ppm	0.5 ppm	1 ppm

Disclaimer: The default Set Points of these gases: H₂, SO₂, NH₃ and NO₂, are subject to change without notice.

4. EVENT LOG

Last 30 events are stored on the PDM+. Once 30 events are stored, the oldest log events get overwritten. Stored log events can be transferred via WatchGas-IR Link.

Each alarm event is recorded as follows:

- Types of alarms
- Alarm concentration in ppm or %
- Peak concentration
- Alarm duration

5. CALIBRATION

CAUTION

Initial calibration is performed on all devices prior to shipment. Once received, calibration should be regularly depending on frequency of use.

1. Enter calibration menu.



Fresh Air Calibration



Standard Gas Calibration

5.1. FRESH AIR CALIBRATION

2. Press and hold the key for 5 seconds to enter the calibration mode (🔋), ✨ icon and 'CAL' mark will appear on the LCD.
3. Press the key for three seconds to initiate calibration. When calibration begins, a countdown (starting at 10) will appear on the screen.



Once completed, 🟢 will appear on the LCD. The device will return to the calibration menu.

If calibration fails, ✖ will appear on the LCD. Check that the air is clean and that no contaminants are blocking the sensor opening and try again. If fresh air calibration fails repeatedly, contact WatchGas.

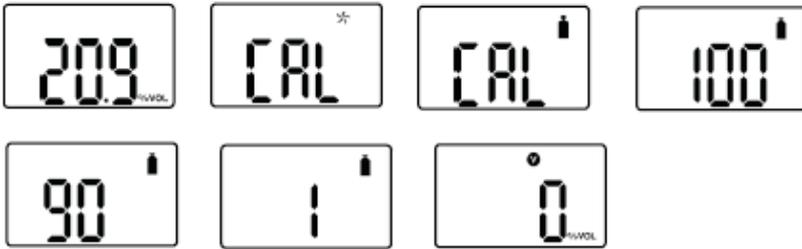
5.2. STANDARD GAS CALIBRATION

Attach the calibration adapter to the PDM+ and to a gas cylinder with a concentration matching the calibration concentration. Check 3.1. Display Mode to check the calibration concentration.

Press and hold the key for 5 seconds to enter calibration mode (🔋), ✨ icon and 'CAL' mark will appear on the LCD. Press the key again for a second when CAL is displayed, to switch to standard gas calibration, 🟢 appears.

Start the flow of the gas cylinder by opening the valve.

Press the key for three seconds to initiate calibration. When calibration begins, a countdown will appear on the screen. The duration of the countdown depends on the sensor type and can be change by the IR link (configurable with WatchGas IR-Link). Confirm the calibration value by pressing the button once.



To set the calibration setpoints, please follow the steps below:

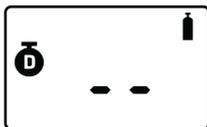


- Press the button until the above calibration setpoint is displayed.
- Press and hold the button for three seconds and the first digit of calibration setpoint starts to blink.
- To increase the value, press the button for one second .
- To save the calibration setpoints, press the button for 3 seconds.
- Calibration will start

Once completed,  icon will appear several seconds on the display. Then, the device will return to Detection mode.

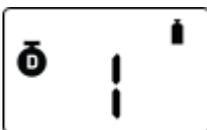
5.3 REMAINING CALIBRATION DAY

In Measuring mode, scroll through the menu by pressing the button until the following is displayed:



The default setting is “N/A”.

To activate the remaining calibration day, set an interval on the “Cal Interval(day)” via IR LINK.

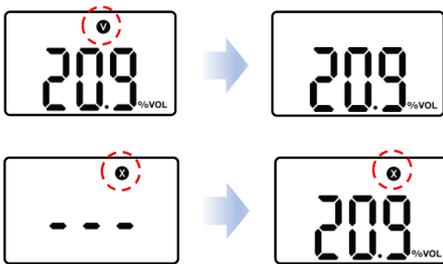


If you set the calibration interval via IR LINK, the remaining day will be displayed. To check the remaining day, press the button until the above image is displayed.

CAUTION

Calibration should be performed in a fresh-air environment that is free for any contaminants and other gases. Preferably, do not perform calibration in a confined space.

Gas	O ₂	CO	H ₂ S	H ₂	SO ₂	NH ₃	NO ₂	H ₂ O ₂
Concentration	0.0%Vol. (99,9% N ₂)	100 ppm	50 ppm	500 ppm	10 ppm	100 ppm	10 ppm	See our documenta- tion on “Bump Test H ₂ O ₂ ”



Once completed, **V** will appear on the LCD. After a few seconds, the PDM+ will return to Detection mode.

If calibration fails, **X** will appear on the LCD. Check that the gas cylinder is not empty and that it has not expired. Also make sure that no contaminants are blocking the sensor opening and try again. If standard gas calibration fails repeatedly, contact WatchGas.

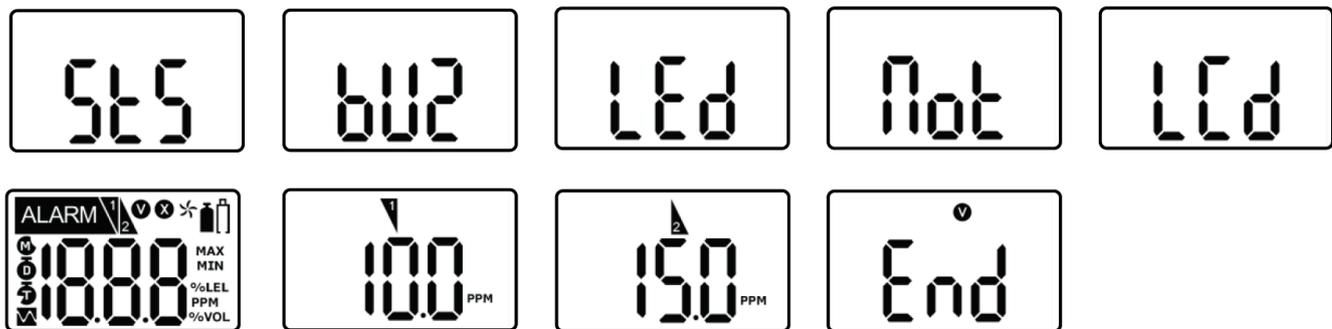
5.4 RETURN TO DETECTING MODE

In the standard calibration mode, press the key for a second to toggle fresh air calibration, standard calibration, and ESC. In the ESC mode, press the key for 3 seconds, the PDM+ will get out of the calibration mode and return to Detection mode.

NOTE: Span calibration value can be change in the device and IR link software.



6. SELF TEST & BUMP TEST



6.1 SELF TEST

The default interval of the Self-Test is 20hr, meaning the PDM+ will ask for a self test after each 20 hours of use. By default the Self-Test setting is turned off.

The interval is configurable via IR-Link between 8~20 hours. The self test can also be switched off via IR-Link.

When the interval is activated, STS message will flash. The message will flash until users perform the Self test.

Once you press the button, it will test buzzer, LED, Vibration, LCD, and show alarm thresholds. After the test is completed, END message with **V** icon will be displayed. (Users are required to check the test processes.)

6.2 BUMP TEST

The interval of Bump test is 1~365days, and the default is switched off. To initiate the bump test, set the bump test interval. Once the bump test interval expires, Bts message will flash.

Put the PDM+ in the docking station with a valid and full gas cylinder. Alternatively, attach the calibration adapter to PDM+ and a valid and full gas cylinder. Press and hold the key for 3 seconds, the TST message will be displayed for 45 seconds (To cancel, press the button for one second). Within the 45 seconds, start the flow from the gas cylinder. If no gas is applied, the bts message will flash again.

If the test is successful, SUC message with  will be displayed for 30 seconds. Stop the flow, remove the calibration adapter. If the test fails, FA message with , will be displayed and BTS message will be flashing until the test is successful. If the bump test repeatedly fails, contact WatchGas.



7. SENSOR & BATTERY REPLACEMENT

CAUTION

It is absolutely prohibited to replace battery at potential explosion or dangerous regions. Replace the battery in a clean environment, which has no hazardous gases. Replacement of components can invalidate the intrinsic safety function. Replacing the sensor and battery should be performed by authorized sellers, agents, distributors, or managers. Contact WatchGas if replacement is needed. Disassembly should be necessary only for sensors & battery replacement. After the sensor replacement, Fresh air and SPAN calibration should be done. Before disassembling, please turn off the power and remove screws.

Only use SB-AA02 3.6V battery.

7.1. SENSOR REPLACEMENT

1. Deactivate the detector;
2. Remove the 6 screws on the back case and carefully open the case;
3. Remove the 2 screws on the PCB board;
4. After removing the battery, replace with the new sensor matching with the gas type. For instance, if you have the PDM+ CO, the CO sensor should be used for the replacement;
5. Assemble the detector;
6. Have the sensor stabilized for 5 minutes before use;
7. After assembling, perform the fresh air calibration and standard calibration with the concentration in this manual;
8. Check the settings.

7.2. BATTERY REPLACEMENT

1. Deactivate the detector;
2. Remove the 6 screws on the back case;
3. Replace battery with original SB-AA02 3.6V battery only;
4. Assemble the detector;
5. After assembling, perform the fresh and standard calibration;

6. Before use, have the sensor stabilized for 5 minutes. Some sensor may require al longer stabilization time.

8. SPECIFICATIONS

8.1. GENERAL SPECIFICATIONS

SIZE	48mm(W) x 85mm(H) x 22mm(D)
WEIGHT	93g (Toxic), 104g (O ₂) (Battery, clip included)
SENSOR TECHNOLOGY	Electrochemical Cell
TEMPERATURE	-40°C ~ +50°C (for Toxic) / -35°C ~ +50°C (for O ₂)
HUMIDITY	5% ~ 95% RH (Non-condensing)
ALARM TYPE	High Alarm, Low Alarm, TWA Alarm, STEL Alarm, Over range Alarm, Battery low alarm, Bump test and calibration due notification
ALARM SIGNAL	Acoustic: 95dB @ 30cm Visual: Red flashing LED's Vibration: Vibration
DISPLAY	LCD Display
CALIBRATION	2-point calibration, zero and span
EVENT LOG	30 Most recent events
BATTERY	Lithium Primary Battery SB-AA02(P) 3.6V, 1.2Ah
MEASUREMENT	Diffusion
HOUSING	Polycarbonate and rubber
ACCURACY DEVIATION	2-3%
IP-RATING	IP67
SAFETY CERTIFICATIONS	ATEX: II 1G Ex ia IIC T4 Ga INMETRO: Ex ia IIC T4 Ga IECEX: Ex ia IIC T4 Ga CE: Conformité Européenne
WARRANTY	24 Months O ₂ , CO, H ₂ S, H ₂ ,SO ₂ , NH ₃ , and NO ₂ 12 months for H ₂ O ₂

8.2. SENSOR SPECIFICATIONS

MODEL	DETECTABLE GAS RANGES	RESOLUTION	ARTICLE NUMBERS
PDM+ O ₂	0 - 30 %vol	0.1 %vol	7192002
PDM+ CO	0 - 500 ppm	1 ppm	7192001
PDM+ CO High Range	0-2000 ppm	1 ppm	7192009
PDM+ H ₂ S	0 - 100 ppm	0.1 ppm	7192000
PDM+ H ₂	0 - 1000 ppm	1 ppm	7192005
PDM+ SO ₂	0 - 50 ppm	0.1ppm	7192004
PDM+ NH ₃	0 - 100 ppm	1 ppm	7192003
PDM+ H ₂ O ₂ NON-ATEX	0 - 99 ppm	0.1 ppm	7192007
PDM+ NO ₂	0 - 20 ppm	0.1 ppm	7192011

9. IR LINK SETTINGS

Users can change settings, upgrade firmware, download log events, and perform calibration with the WatchGas IR Link.

GETTING STARTED

To interact with WatchGas QGM or PDM, ensure to install the software and have the link cable plugged into the computer. And, place the topside of WatchGas QGM or PDM to the IR Link LCD.

WatchGas PDM QGM IR Link PC v1.7.3

File Tools Help

FILE

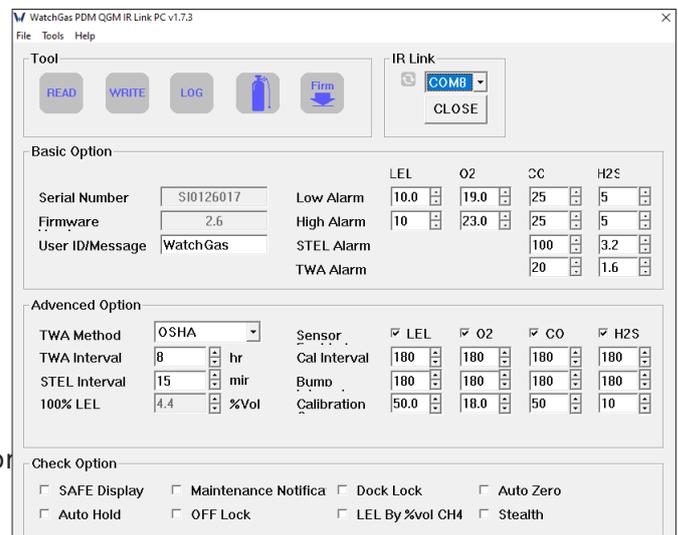
- **LOAD:** Open the installed settings. (*.cfg)
- **SAVE:** Save the current settings. (*.cfg)
- **EXIT:** Close the program.

TOOLS

- **CALIBRATION:** Perform the zero/span calibration
- **LOG READ:** Retrieve the log events.
- **LOG ERASE:** Erase the log events.
- **SELF TEST:** Test if LED, LCD, Buzzer, vibration, battery and temperature works properly.
- **FW Upgrade** Users can upgrade firmware.
- The up- to-date firmware is available at our WatchGas website
- **Factory Fault:** Remove all data and restore the initial factory settings.

HELP

About: Display a brief company profile.





TOOL

- **READ:** Retrieve the settings.
- **WRITE:** Update the adjusted settings. **LOG:** Display the saved log events.
- **CALIBRATION:** Perform the zero and span calibration.
- **FIRMWARE UPGRADE:** Upgrade firmware.

IR LINK

- **OPEN:** In order to interact the IR Link with QGM and PDM click on 'OPEN. When the read is activated successfully. Users will see "Read Complete".

PDM - PDM+

Serial	S11024164	Sensor	CO
Firmware	1.2.5	Low	25
User		High	25
Display	Sensor Reading	STEL Alarm	n/a
Stealth	Off	TWA	n/a
Self Test(hour)	n/a	Cal	50
		Cal Time(sec)	90
		Cal Interval(day)	180
		Bump	180

PDM AND PDM+

- **SERIAL NUMBER:** Display a preset serial number.
- **FIRMWARE VERSION:** Display a firmware version (EX. 1.x.x) .
- **USER ID/MESSAGE:** Users can program a desired message/ID.
- **DISPLAY:** Users can choose to display either the real time "Sensor Reading" or "Sensor Life remaining".
- **STEALTH (OPTION):** Users can turn off the buzzer, LED, and vibration.
- **SELF TEST (HOUR):** Set an interval of the self-test alert.
- **SENSOR TYPE:** Display a sensor type of the device.
- **LOW ALARM:** Adjust the low alarm set point in compliance with international or local standards.
- **HIGH ALARM:** Adjust the high alarm set point in compliance with the international or local standards.

- **CAL CONCENTRATION:** Set a standard calibration value.
- **CAL TIME (SEC):** Set a standard calibration time.
- **CAL INTERVAL (DAY):** Set an interval of the calibration alert.
- **BUMP INTERVAL (DAY):** Set an interval of the bump test alert.
- **STEL ALARM:** Adjust the STEL alarm set point in compliance with international or local standards.
- **TWA:** Adjust the TWA alarm set point in compliance with international or local standard.

10. CERTIFICATES

Intrinsic Safety: The detector is in conformity of the following standards

IECEX: Ex ia IIC T4 Ga

IECEX KTL 19.0019X

ATEX:  2198  II 1 G Ex ia IIC T4 Ga IP67
KRH 19 ATEX 1022X
Directive 2014/34/EU

KCS: Ex ia IIC T4

KTL 19-KA2BO-0491X

INMETRO Ex ia IIC T4 Ga
BRA-22-GE-0019X

Compliance: Electromagnetic Compatibility Directive 2014/30/EU

Standards:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0: 2011 Ed. 6

IEC 60079-11: 2011 Ed 6

IEC 60079-26 : 2014-10 Ed 3

EN 60079-0: 2012+A11:2013

EN 60079-11: 2012

Manufacturing Approval:

The detector manufacturer is certified compliant with ISO 9001:2000 provisions

11. LIMITED WARRANTY

WATCHGAS warrants this product to be free of defects in workmanship and materials-under normal use and service-for two years from the date of purchase from the manufacturer or from the product's authorized reseller.

The manufacturer is not liable (under this warranty) if its testing and examination disclose that the alleged defect in the product does not exist or was caused by the purchaser's (or any third party's) misuse, neglect, or improper installation, testing, or calibrations. Any unauthorized attempt to repair or modify the product, or any other cause of damage beyond the range of the intended use, including damage by fire, lightening, water damage or other hazard, voids liability of the manufacturer.

In the event that a product should fail to perform up to manufacturer specifications during the applicable warranty period, please contact the product's authorized reseller or WATCHGAS service center at info@watchgas.com for repair/return information.

FOR MORE INFORMATION

www.watchgas.com
info@watchgas.com

WatchGas
Klaverbaan 121
2908 KD Capelle aan den IJssel
The Netherlands