WatchGas
Detection

User Manual

NEO Photoionization Detector

Contents

Description

The NEO is one of the most advanced handheld monitors available for ppb (parts per billion) VOC (Volatile Organic Compound) detection. The NEO offers several models from the most sensitive 1 ppb to a high range up to 15000 ppm for different applications and user selections. New designs of the photo-ionization detector (PID) and ultraviolet (UV) lamp provide outstanding sensitivity, stability and reproducibility. Options include real time data monitoring with a built-in wireless modem using WatchGas Suite application software.

⚠ Warning

- This manual must be carefully read by all individuals who have or will have the responsibility of using, maintaining, or servicing the product. The product performs as designed only if it is used, maintained, and serviced in accordance with the manufacturer's instructions.
- 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 the instrument.
- Service work performed by unauthorized personnel voids all warranties, especially those concerning intrinsic safety.

- The user should understand how to set the correct parameters and interpret the obtained results.
- Do not use the product if a part is damaged or defective. Replace a damaged or defective instrument immediately.
- Substitution of components with non-original parts voids all warranties, especially those concerning intrinsic safety.
- Batteries may only be replaced by WatchGas service centers.
- Use only WatchGas battery pack M011-3002-W00.
- Recharge batteries only in non-hazardous locations only.
- Do not mix old and new batteries or batteries from different manufacturers.
- Use USB/PC communication in a non-hazardous location only.
- Static Discharge Hazard: only clean the outside with a damp cloth in non-hazardous locations only.

- The correct functioning of the instrument should be tested before each day's use, including testing the sensor by exposing the instrument to a bump test gas that triggers the alarm.
- Check that a clean inlet filter is in place. A contaminated filter can alter the detected concentrations and impair correct functioning of the instrument. Damage caused by dirt and water entering through the inlet is not covered by the warranty.
- Check that gas inlet and outlet ports are clean and free of obstructions.
- Check that the buzzer port is free of obstructions

⚠ Caution

- Never operate the instrument when the cover is removed.
- Remove instrument cover and sensor module in non-hazardous locations only.

1. Product Overview

The instrument's user interface consists of the LCD display, Alarm LEDs, an alarm transducer, and four keys. The keys are:

INLET FILTER

SENSOR CAP

ALARM LEDS

LCD DISPLAY

GAS OUTLET

OK / UP KEY

RIGHT KEY
ENTER KEY

BUZZER PORT

ESC / LEFT KEY

DOWN/MODE KEY

RUBBER BOOT

MICRO USB PORT

Esc/Left key

Enter/Right Key

OK/Up Key

Down/Mode Key
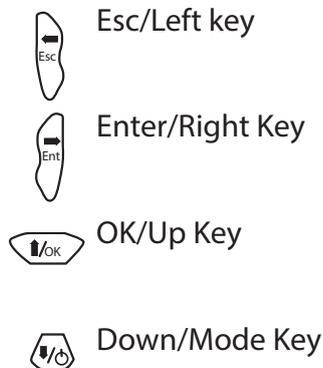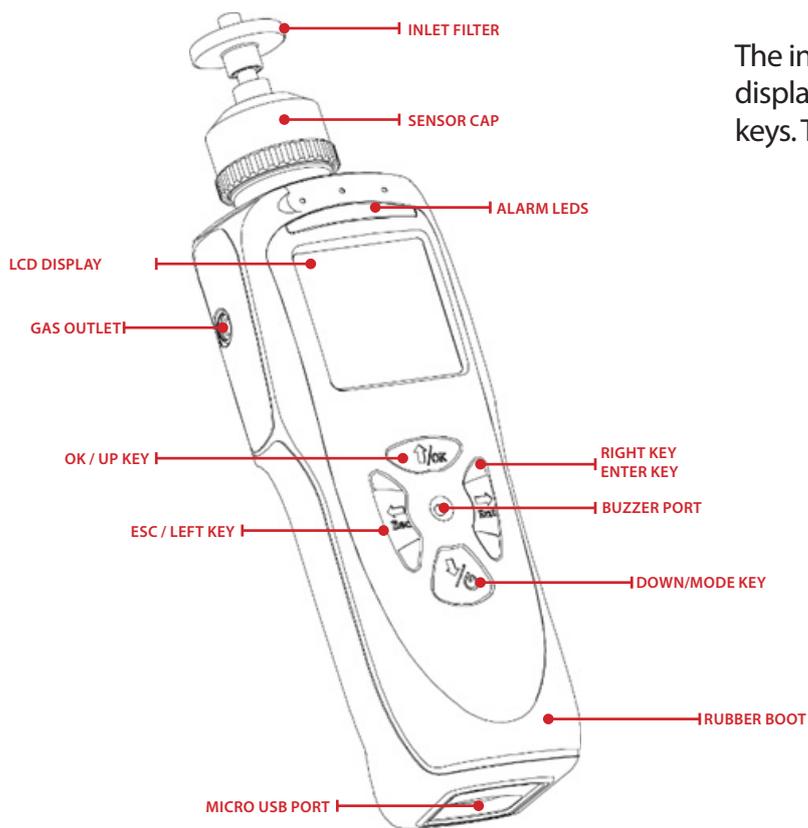
2. Display

The LCD display provides visual feedback that includes the reading, pump, Man Down, time, battery condition, and other functions. The display shows the following information:

CALIBRATION//
BUMP DUE

MAN DOWN
STATUS

LAMP STATUS

PUMP STATUS

BATTERY STATUS

DATALOG STATUS

TIME

12:00

0.068

READING AND MEASURING UNIT

TEMPERATURE

25°C

ppm

Isobutylene

x1.0

GAS NAME AND
CORRECTION FACTOR

LCD DISPLAY
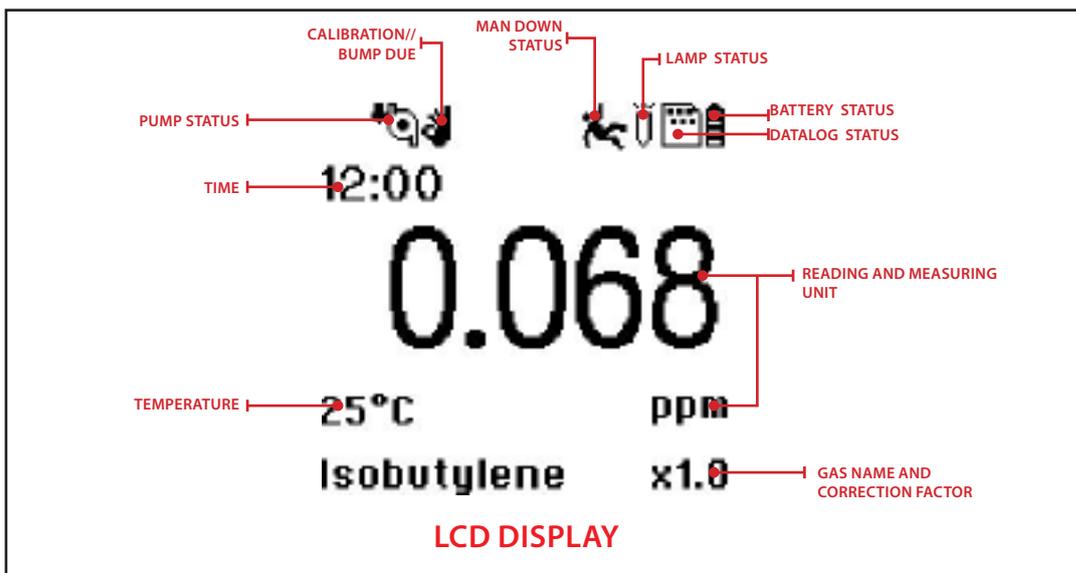
Item	Description
Gas information	Shows the measurement gas and its correction factor
Reading	Concentration of gas measured by the instrument
Calibration/Bump Due	Indicates if calibration or bump status is OK or not
Pump Status	Indicates whether the pump is working or blocked
Man Down Status	Indicates if Man Down alarm is on
Lamp Status	Indicates if the lamp is on or not
Datalog Status	Indicates whether datalog is on or off
Battery Status	Indicates battery capacity in 3 bars
Time	Indicates current time
Temperature	Indicates current temperature

3.Charging a Lithium-Ion Battery

The screen displays a battery icon from empty (no bars) to fully charged (3 bars).
To charge the instrument:
1. Insert the Micro-USB connector into the charging port at the bottom of the instrument.
2. Insert the USB connector into:
    a) A free USB port in a laptop or computer.
    b) The supplied AC/DC adapter.
3. Make sure the computer provides power to the USB port, or connect the AC/DC adapter to a power outlet.
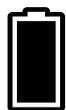
The 3 bars of the battery icon on the instrument's display are animated, indicating charging progress.
When the battery is fully charged:
•   The battery icon is no longer animated and shows a full battery
•   The message 'Fully Charged' is displayed.
USB cable P/N M-011-3003-W00 is required for a PC to recognize the instrument and communicate with WatchGas Suite.

Notes:
Always fully charge the battery before using the instrument.
Please use the original WatchGas charger.
For PC communication with WatchGas Suite, WatchGas USB cable P/N M-011-3003-W00 is required.

Warning
To reduce the risk of ignition of hazardous atmospheres, recharge and replace batteries only in areas known to be non-hazardous. Use only WatchGas rechargeable lithium battery part number: M011-3002-W00.

3.1 LOW VOLTAGE WARNING

When the battery's charge falls below a pre-set voltage, the instrument warns you by beeping once and flashing once every minute, and the battery icon blinks on and off once per second. Turn off the instrument within 10 minutes and recharge the battery.

3.2 CLOCK BATTERY

An internal clock battery is mounted on one of the instrument's printed circuit boards. This long-life battery keeps settings in memory from being lost whenever the Li-ion battery or alkaline batteries are removed. The backup battery lasts approximately five years, and must be replaced by an authorized WatchGas service technician. It is not user-replaceable.

3.3 DATA PROTECTION WHILE POWER IS OFF

When the instrument is turned off, all the current real-time data, including TWA, STEL and peak concentrations are erased. Logged data are stored in non-volatile memory. Logged data is secure, even when the battery is disconnected.

4. Instrument Operation

The NEO gives real-time measurements and activates alarm signals whenever the detected concentrations exceed preset alarm limits.

The instrument starts up in Basic User Mode. In Basic User Mode, no changes can be made to its operation.

In Configuration Mode, settings can be changed. Configuration Mode is password protected. Via the WatchGas Suite software, Configuration Mode can be made inaccessible. ***See also 6.2.2.***

Notes:
- **Part of WatchGas Quality Assurance is a full factory calibration and pre-set alarm limits.**
- **Prior to factory shipment, the instrument is preset with default alarm limits and the sensor is pre-calibrated with standard calibration gas. However, the instrument should be tested and the calibration verified before the first use.**
- **Check the alarm limits before using the instrument.**
- **Place an inlet filter before using the instrument.**
- **Charge the battery fully before using the instrument.**

5. Basic User Mode

5.1 TURNING THE INSTRUMENT ON

Press and hold ⟨⏻⟩ until the display, buzzer and alarm LEDs turn on, then release.
After that:
- The display shows firmware version and serial number.
- The instrument performs a number of self-tests for the correct functioning of the pump, clock, datalog, motion sensor and PID sensor.
- The instrument shows sensor information and instrument configuration.
- The display shows the readout screen.

The instrument is now fully functional and ready for use.

Note:
If the WatchGas logo does not appear first on start-up, a problem might have occurred.
Contact WatchGas Technical Support.

5.2 TURNING THE INSTRUMENT OFF

1. Press and hold
A 5-second countdown is displayed, followed by "Unit off...".
2. Release.

5.3 USER MODE SUMMARY

The instrument starts up into Basic User Mode. The readout screen shows the detected concentration in real time and various information about the current status of the instrument.

Use and to cycle through the main menu screens. If you do not press a key for 60 seconds, the display returns to the readout screen automatically.
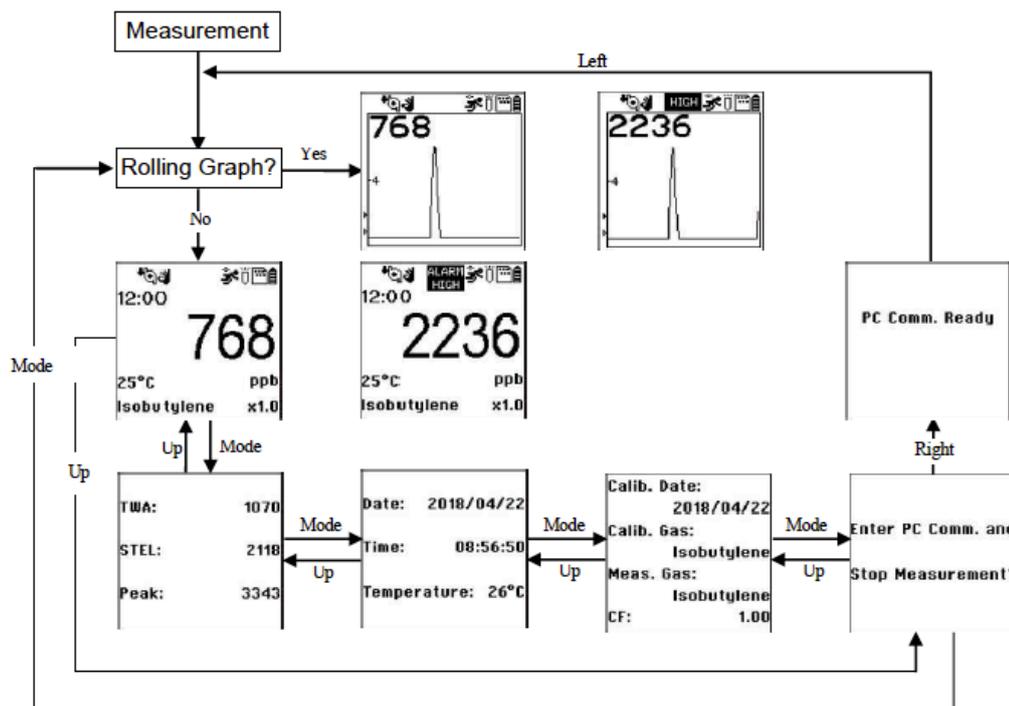
FLOW CHART FOR BASIC USER MODE

The example shown in this illustration is a flow chart of the NEO ppb.

5.4 INTEGRATED SAMPLING PUMP

The instrument is equipped with an integrated diaphragm sampling pump. It has three flow rate settings, with flow ranging from 250 ml/min to 400 ml/min with an inlet filter attached.
As contamination builds up in the filter, the flow rate decreases.

Note:
• **Always use the instrument with a clean inlet filter in place. Contamination can build up in and clog up the pump, decreasing flow rate and increasing the risk of pump failure.**
• **Always change the inlet filter when it is visibly dirty.**
• **Make sure the inlet and outlet are free of obstructions before and during use.**

Note:
Response time of the instrument drops with approximately 1 second for every 0.9 meters (3 ft) of tubing.

5.4.1 PUMP STATUS

During normal operation, the pump icon alternately shows inflow and outflow. When a pump failure or obstruction occurs, the pump alarm activates and the pump stall icon blinks on and off. Clear the obstruction and press [Ent] to restart the pump.

Pump OK

Pump Stall

5.5 EXTERNAL WATER-TRAP FILTERS

An external filter is mandatory to prevent moisture and dirt entering the instrument. Moisture and dirt in the instrument can result in wear on the pump, false readings, and/or pump stalling.

To install the external filter:
1.   Unscrew the old or contaminated filter.
2.   Take a new inlet filter from the packaging.
3.   Screw the new filter to the instrument's inlet probe using the Luer connection.

5.6 ALARM SIGNALS

During operation, the gas concentration is continuously compared with the alarm limits. If the concentration exceeds any of the pre- set limits, the buzzer and red flashing LED are activated to warn of the alarm condition. In addition, the instrument alarms when the:
•   Battery voltage falls below a preset voltage level
•   UV lamp is off
•   Pump stalls

5.6.1 ALARM SIGNAL SUMMARY

Message	Condition	Alarm Signal
HIGH	Gas exceeds 'High Alarm' limit	3 beeps/flashes per second
OVR	Gas exceeds measurement range	3 beeps/flashes per second
MAX	Gas exceeds electronics' maximum range	3 beeps/flashes per second
LOW	Gas exceeds 'Low Alarm' limit	2 beeps/flashes per second
TWA	Gas exceeds 'TWA' limit	1 beep/flash per second
STEL	Gas exceeds 'STEL' limit	1 beep/flash per second
Pump icon flashes	Pump stall	3 beeps/flashes per second
Lamp	PID lamp off	3 beeps/flashes per second plus 'Lamp' message
Battery icon flashes	Low battery	1 flash, 1 beep per minute plus battery icon flashes
CAL	Calibration failed, or is overdue	1 beep/flash per second
NEG	Calibration error results in a negative reading	1 beep/flash per second

5.6.2 PRE-SET ALARM LIMITS & CALIBRATION CONCENTRATIONS

The instrument is factory calibrated with standard calibration gas, and is programmed with default alarm limits. For example, on the NEO PPM, the default values are:

Cal Gas	Cal Span	Unit	Low	High	TWA	STEL
Isobutylene	10	ppm	50	100	10	25

A 3-point calibration is done:
1. At 0 ppm in 99.99% vol N_2
2. At concentration 10 ppm isobutylene
3. At concentration 100 ppm isobutylene

5.6.3 TESTING THE ALARMS

The alarm can be tested whenever the readout screen is shown. Press [Ent], and the audible and visible alarms are tested.

5.7 DISPLAY BACKLIGHT

The LCD display is fitted with LED illumination to improve readability in poor lighting conditions. Illumination turns on automatically in poor light. The settings for display illumination can be changed in Config Mode or through WatchGas Suite.

5.8 DATA LOGGING

By default, the instrument stores the detected concentration every 60 seconds.
The datalog icon is displayed when datalogging is on.

A 60 second interval allows for up to a year of data storage. The data is stored in non-volatile memory for download to a PC. The data is retained, even when the instrument is turned off or the battery is removed.

Data is organised in events, with a new event created each time the instrument is turned on, a configuration parameter is changed or datalogging is interrupted. Every event includes User ID, Site ID, serial number, last calibration date and the alarm limits.

5.9 MAN DOWN ALARM

The Man Down Alarm is a potentially lifesaving safety feature of the NEO. The Man Down Alarm function assumes that when the instrument is motionless, something could be wrong with its user.

When the instrument is motionless for a pre-set time, the instrument warns the user that Man Down Alarm is triggered. The user can cancel the alarm. When the user does not cancel the alarm, the Man Down Alarm is activated after a pre-set period. The Man Down Alarm activates the buzzer and LEDs to enable rescuers to track the user.

1. If the instrument is connected to a wireless network, a remote alarm is triggered, so help can be dispatched as quickly as possible. Because instrument readings are sent remotely, rescuers are aware of the circumstances they will find the victim in, making rescue operations faster and safer.

The Man Down Alarm can be switched on or off.

5.10 WIRELESS

When the instrument is equipped with wireless capability, it is set up through the wireless sub-menu.

6. Configuration Mode

In Config (short for Configuration) Mode, you can modify instrument configuration settings.

6.1 ENTERING AND EXITING CONFIG MODE

1. From the main reading display, press and hold ⬚ and ⬚ simultaneously until the instrument asks for the password.
2. Input the 4-digit password, move the cursor to the checkmark, then press ⬚ to enter Configuration Mode.

Note: The default password is 0000. You can change the password through a PC running WatchGas Suite software.

In Config Mode, the screen on the right is be displayed.
The Calibration label is shown and its icon is highlighted.

- Use ⬚ or ⬚ to scroll through the menu until the desired item is reached.

- Use ⬚ to select the highlighted menu item.

To Exit Config Mode:

- Press ⬚ to go back.
- Repeat until the display shows the readout screen.

6.2 MAKING CHANGES IN CONFIG MODE

There are two types of menus in Config mode:
1. Menus that ask for selection from a list.
2. Menus that ask for a numerical value to be entered.
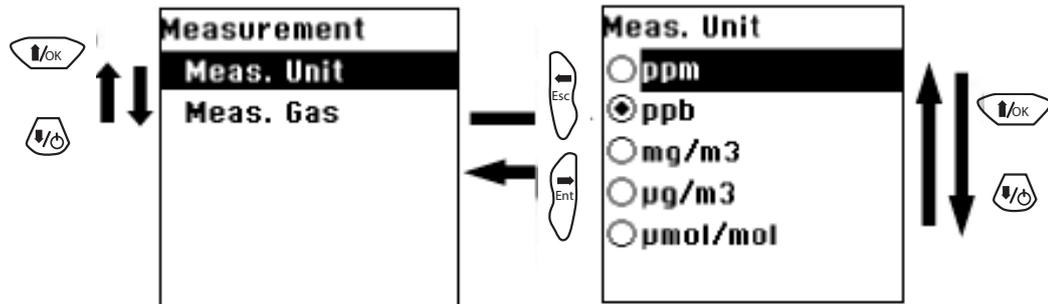
The example shown in this illustration is a flow chart of the NEO ppb.

6.2.1 SELECTION FROM A LIST

For example, the Measurement sub-menu contains both a text-format list and a radio button list.

1. Use ⬆/OK and ⬇/⏻ to scroll through the list. For high speed scrolling in long lists, press and hold ⬆/OK or ⬇/⏻ .

2. Press [Ent] to enter the selected submenu.

3. Press [Esc] to go back to the previous menu.

6.2.2 ENTERING NUMERICAL VALUES

For example, to enter a password:

1. Use ⬆/OK and ⬇/⏻ to increase or decrease the selected number.

2. Use [Ent] and [Esc] to move to the next/previous number.

3. After entering values, use [Ent] or [Esc] to go to the checkmark to accept changes.

4. After entering values, use [Ent] or [Esc] to go to the cross to cancel changes.

5. With checkmark or cross selected, press ⬆/OK to accept or cancel respectively, and move to the next menu.

6.3 CONFIG MODE MENUS

This table summarizes the Config Mode menus and sub-menus. Not all of these menus will be displayed if the option is not set up using WatchGas Suite software.

Calibration	Measurement	Alarm Setting	Datalog	Monitor Setup	Wireless
Zero Calibration	Measurement Unit	Alarm Limits	Clear Datalog	Date & Time	Radio On/Off
Span Calibration	Measurement Gas	Alarm Mode	Interval	Display	Factory Reset
Set Cal. Gas		Alarm Settings		Pump Speed	
Set Span Value		Comfort Beep		Set Pump Stall	
Set Span 2 Value		Man-Down Alarm		Rolling Graph	
3-point Calibration				Real time data	
				Language	
				Self-Zeroing	
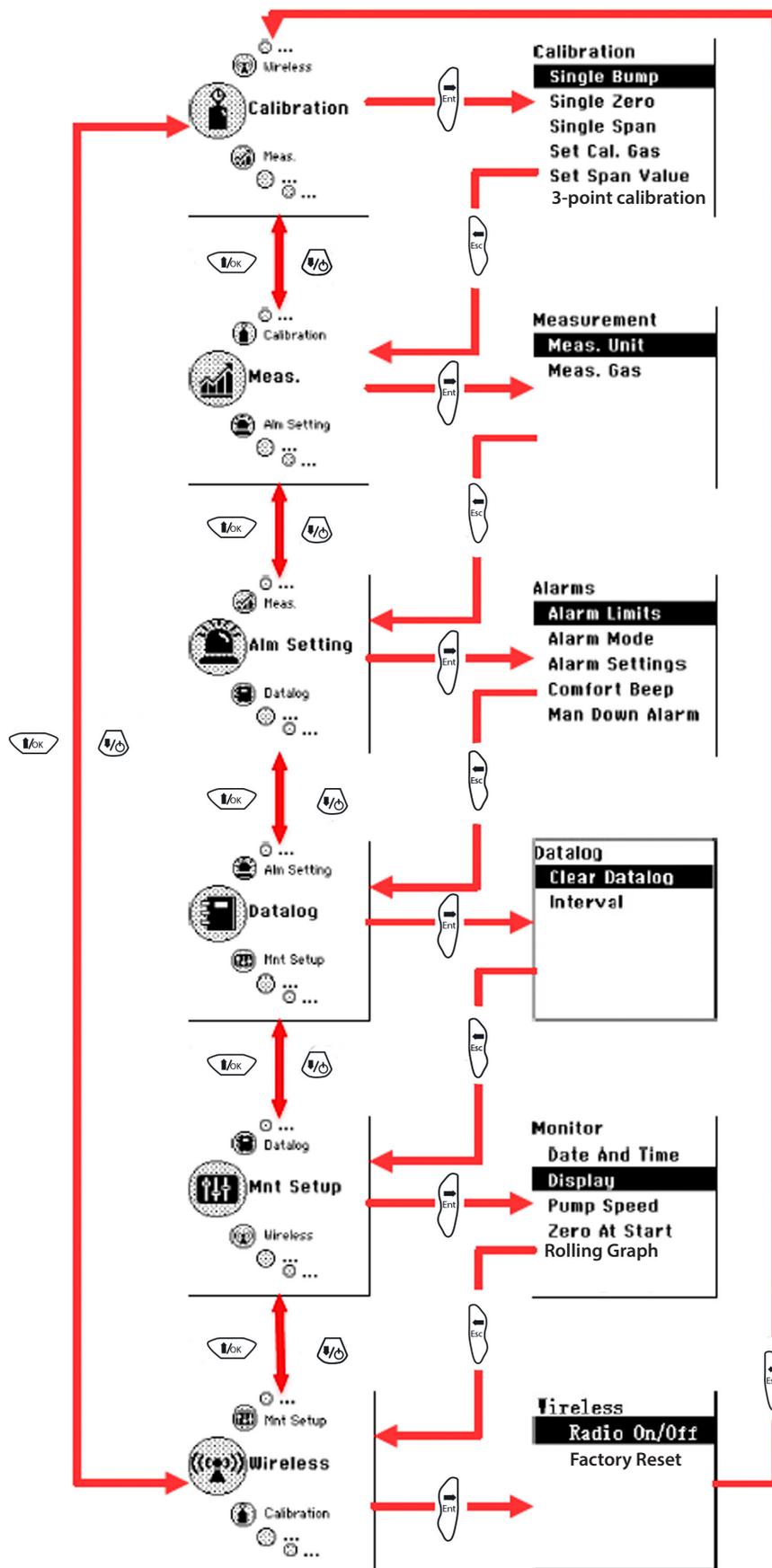
FLOW CHART FOR CONFIGURATION MODE

Detection

7. Using Config Mode Menus

7.1 CALIBRATION

Perform a calibration regularly. The instrument will hold its calibration, but over time, detection circumstances change and instrument components get contaminated, which can change the response of the instrument to detectable gases.

Perform a bump test before each day's use. This ensures that the instrument is fully working, especially when the NEO is used to alert users to hazardous concentrations of gas.

When feasible, perform calibration with the gas you are going to measure most often. A calibration performed with isobutylene is a good alternative because it shows good response on PID instruments, is inexpensive, stable and non-toxic.

A correction factor (CF) can be applied to make the NEO display the true concentration of the gas being measured, if you are absolutely sure that only that gas is measured. You can select the CF from the instrument's gas library of over 200 compounds, or enter a CF manually. See Technical Note 2: PID Correction Factors for more information.

7.1.1 CALIBRATION SET-UP

To perform a calibration, you need:
* A gas cylinder with calibration gas with an exactly determined concentration and a valid certificate that is traceable to international standards.
* A source of clean air with 20.9 %vol of Oxygen:
    * A gas cylinder with clean air in an exactly determined concentration and a valid certificate that is traceable to international standards.
    * Gas bag with clean air.
    * Ambient air filtered through a charcoal tube (VOC Zeroing Tube).
    * Outdoor ambient air usually contains a few ppb of VOC, and can only be used with instruments with a resolution from 10 ppb and up.
* A flow regulator to control the gas flow from the cylinder.
* Tubing with Luer connectors to connect the gas source to the instrument.

To match the flow to the pump speed exactly, you can use a demand flow regulator. Alternatively:
* Fill a gas bag with calibration gas and connect the instrument with the gas bag when performing span calibration.
* Use a flow regulator with a flow > 500 cc/min and let the excess flow escape through a T connector

7.1.2 ZERO CALIBRATION

The zero calibration sets the baseline for the sensor. To perform a zero calibration:
1. Connect the instrument to a source of clean air.
2. Enter Config Menu > Calibration Menu > Zero Calib Menu.
3. Confirm with ⬆/OK .

The instrument counts down to zero. When complete, the display shows "Zero Calibration Done!". The instrument proceeds to Span Calibration.

Note:

You can abort the calibration at any time by pressing Esc **during countdown. The display shows "Zero aborted!" and proceeds to Span Calibration.**
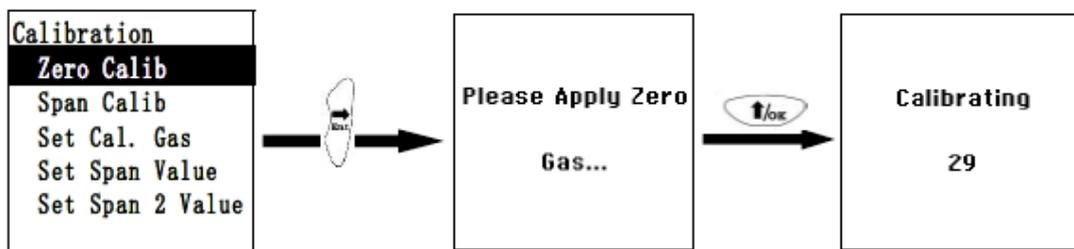
7.1.3 SPAN CALIBRATION
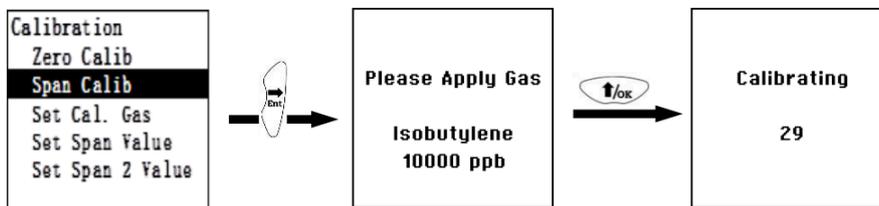
Note: To ensure greater accuracy please preform a 3-point calibration.

The span calibration sets the second (and third, if 3-Point Cal is selected in Monitor Setup) calibration point for the sensor. To perform a span calibration:
1. Check that 2-Point or 3-Point Calibration is set correctly (See 7.5.5 3-Point Calibration).
2. Check that the calibration gas is set correctly (See 7.1.4 Set Calibration Gas).
3. Check that the span values are set correctly (See 7.1.5 Set Span Value).
4. Connect the instrument to a source of calibration gas.
5. Enter Config Menu > Calibration Menu > Span Calib Menu item.
6. Confirm with ⬆/OK .

Span 1 is done!
Reading = 10.ppm

The instrument counts down to zero. When complete, the display shows "Span 1 is Done! Reading = xx ppm". The reading should be very close to the actual concentration.
If 3-Point Calibration is enabled, proceed to perform Span 2 in the same manner.

Note:

You can abort the calibration at any time by pressing Esc **during countdown. The display shows "Span aborted!" and returns to the menu.**
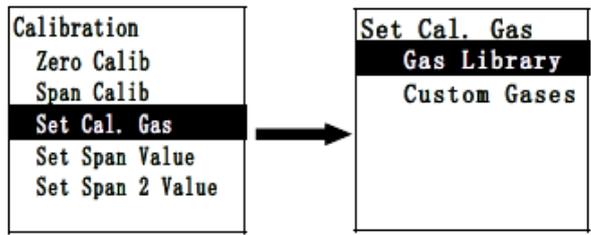
7.1.4 3-POINT CALIBRATION

Normally, a 2-point calibration gives adequate linearity in PID response. A 3-point calibration (Zero, Span 1 and Span 2) can be enabled for more accuracy, particularly in the high concentration range above about 500 ppm.

To set 3-point or 2-point calibration:

1. Press ⏍/OK or ⏏/🔆 to select the desired option.

2. Press Ent to continue.

3. Press Esc to save and exit
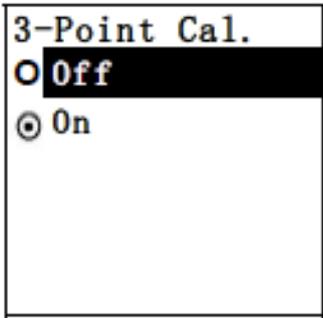
Below is the list of default 1st and 2nd Span points when using isobutylene for calibration. These settings

NEO Model	Span 1	Span 2
MP181	100 ppm	1000 ppm
MP182	100 ppm	5000 ppm
MP184	10 ppm	1000 ppm
MP185	10 ppm	1000 ppm
MP186	5 ppm (benzene)	N/A

7.1.5 SET CALIBRATION GAS

Calibration to the gas normally measured by the instrument increases accuracy.

To set calibration gas:

1.   Enter the Set Cal. Gas menu.
2.   Select from Gas Library or Custom Gases.
3.   Use ⬆/ok and ⬇/% to scroll through the list. Hold ⬆/ok or ⬇/% for high speed scrolling.
4.   Press [Ent] to select a gas.
5.   Press [Esc] to save and exit.

Warning

Calibrating the instrument to the gas you are measuring increases the accuracy of detection results for that gas.

Note that calibrating the instrument to a single gas will not make the instrument respond to that gas exclusively.

A PID instrument is a broad range detection device that shows calculated concentrations based on ionisation of all detectable gases in the ambient air.

7.1.6 SET SPAN VALUE

Sets the concentration value that the instrument expects when performing a calibration. The span value should exactly match the concentration of the gas you are using.

To set span value:

1.   Enter the Set Span Value menu
     The current span value is shown. The left most digit blinks.
2.   Check and modify the Span Value as needed and accept changes.
     The instrument returns to the Calibration menu.

If 3-Point Cal. Is selected, repeat this process for Span 2 Value.
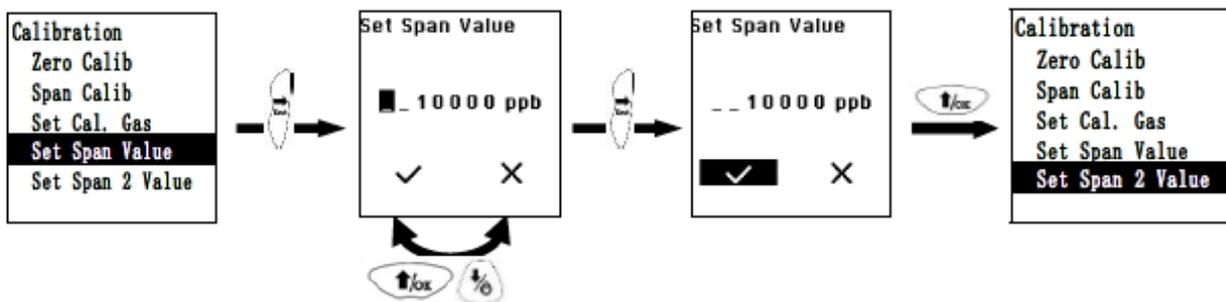
The example shown in this illustration is a flow chart of the NEO ppb.

7.2 MEASUREMENT
The sub-menus for Measurement are Measurement Unit and Measurement Gas.

7.2.1 MEASUREMENT UNIT
Choose the right measurement unit from the menu.
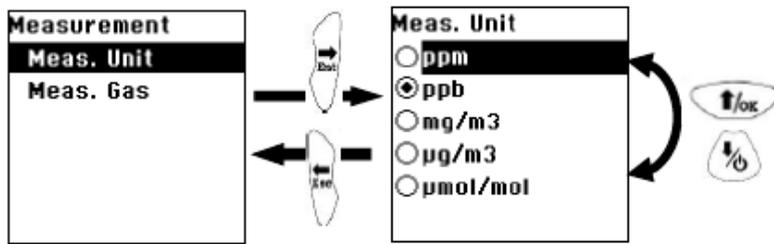
Unit	Description
ppm	Parts per million
ppb	Parts per billion
mg/m3	Milligrams per cubic meter
µg/m3	Micrograms per cubic meter
µmol/mol	Micromole per mol
10-6	Per million

The example shown in this illustration is a flow chart of the NEO ppb.

7.2.2 MEASUREMENT GAS

If you only expect one single gas, it is convenient to let the instrument apply the correction factor for that gas automatically.

To set measurement gas:

1. Enter the Measurement Gas menu.
2. Select from Gas Library or Custom Gases.
3. Use ⬆/OK and ⬇/⏻ to scroll through the list. Hold ⬆/OK or ⬇/⏻ for high speed scrolling.
4. Press Ent to select a gas.
5. Press Esc to save and exit.
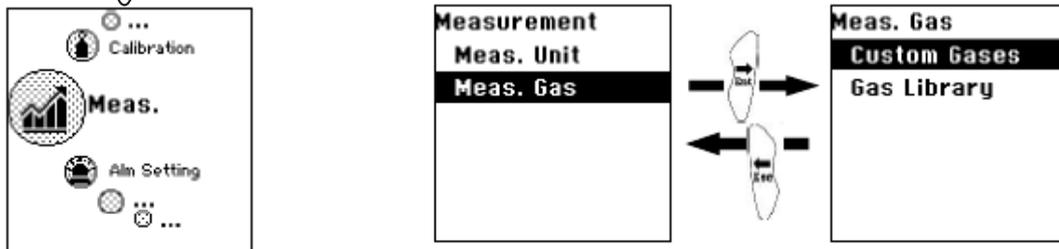
> **Warning**
>
> Setting a measurement gas is convenient when measuring one single gas, because the value shown in the display matches the detected concentration for that gas.
> **Setting a measurement gas does not make the instrument respond exclusively to that gas.**
> A PID instrument is a broad range detection device that shows a calculated concentration based on ionisation of all detectable gases in the air.

Notes
- **You can define Custom Gases using WatchGas Suite.**
- **When setting a measurement gas from Custom Gases, the associated span value(s), correction factor and default alarm limits are loaded into the instrument.**

7.3 ALARM SETTINGS

When using the instrument, the detected gas concentration is compared with pre-set alarm limits. If the detected concentration exceeds any of the pre-set limits, the alarms are activated.

You can:

- Change alarm limits.
- Enable or disable alarm latching. Alarms can be latched or can stop automatically when detected concentrations fall below the alarm limits.
- Enable or disable buzzer and alarm LEDs individually.
- Enable or disable the Comfort Beep, a function that reminds you that the instrument is functioning.
- Change various properties of the Man-Down Alarm.
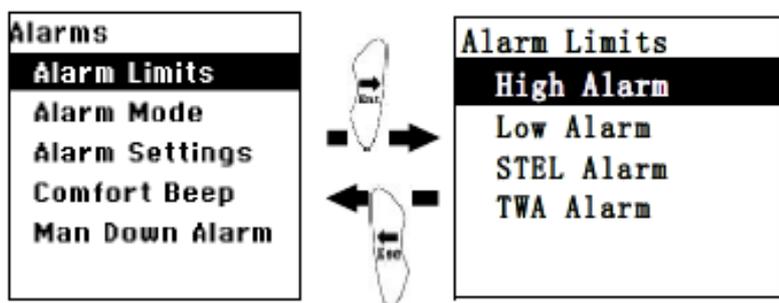
Note
- **Access to the alarm settings on the instrument can be restricted through WatchGas Suite software.**
- **The High alarm limit must be higher than the Low alarm limit.**

7.3.1 CHANGE ALARM LIMITS

There are 4 different alarm limits, Low, High, TWA and STEL:

- Low and High alarms activate immediately when the detected concentration exceeds their respective limit values.
- STEL alarm activates when the average detected concentration over the past 15 minutes exceeds its limit value.
- TWA alarm activates when the time weighted average of the detected concentrations exceeds the time weighted average for a working day of 8 hours.

To change an alarm limit:

1. Enter the Alarm Settings Menu.
2. Enter the Alarm Limits sub-menu.

3. Scroll to the alarm you want to check and proceed with .
The display shows the current alarm limit. The left most digit blinks.
4. Check and modify the alarm limit as needed and accept changes.
5. The instrument returns to the Alarm Limits sub-menu.

6. When you have checked all alarm limits, press Esc to return to the Alarms

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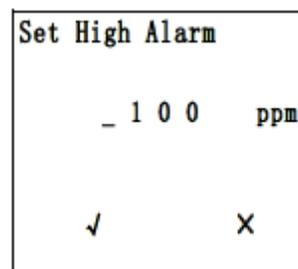
Warning
- Only change alarm settings if you are authorized to do so.
- Alarm limits should reflect local laws and regulations.

7.3.2 ALARM MODE

Choose if the alarm stops automatically when the detected concentration falls below the alarm limits

(Auto Reset). Latched means that the user must acknowledge an alarm with [Ent] before it stops after the detected concentration falls below the alarm limit.

1. Press [🔘/OK] or [🔘/⏻] to select the desired option.

2. Press [Ent] to continue.

3. Press [Esc] to save and return to the alarm settings sub-menu.

7.3.3 ALARM SETTINGS

The buzzer and alarm LEDs can be programmed to be on or off individually or in combination. Choose from:
• Both enabled
• LEDs only
• Buzzer only
• Both disabled

1. Press [🔘/OK] or [🔘/⏻] to select the desired option.

2. Press [Ent] to continue.

3. Press [Esc] to save and return to the alarm settings sub-menu.

including date and time, pump parameters, display parameters and 3-point calibration.

7.3.4 MAN-DOWN ALARM

The Man-Down Alarm, when enabled, warns nearby personnel if the instrument remains motionless for a pre-set time. If the instrument is fitted with the wireless modem option and connected to a network, it sends alarm notifications to the command centre, enabling a rescue operation.
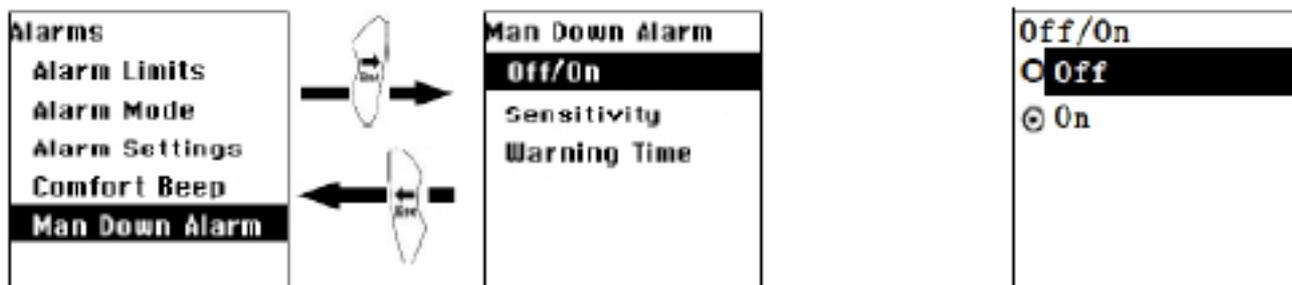
You can change various properties of the man-down alarm:
- You can turn the man-down alarm on or off.
- You can set the motionless time after which the instrument warns that it is going to activate the man-down alarms.
- You can set the warning time. During the warning time, the user can prevent the alarms from activating.
- You can set the sensitivity. High sensitivity means small movements are enough to prevent the man-down alarm from activating.
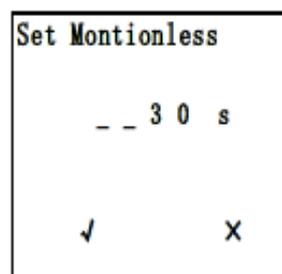
7.4 DATALOG

The instrument automatically stores the detected concentrations at a pre-set time interval. In the readout screen, the datalog icon shows that data is logged.

Data is stored in non-volatile memory for download to a PC. The data is retained, even when the instrument is turned off or the battery is removed. Data is organised in events, with a new event created each time the instrument is turned on, a configuration parameter is changed or datalogging is interrupted. Every event includes User ID, Site ID, serial number, last calibration date and the alarm limits.
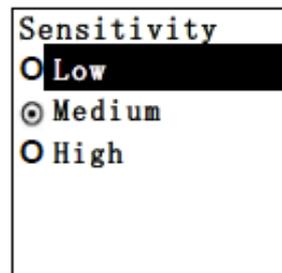
Notes
- **You cannot turn off the datalog function.**
- **By default, the instrument stores the detected concentration every 60 seconds.**

In the datalog submenu, you can adjust the interval and clear all logged data.

7.4.1 CLEAR DATALOG
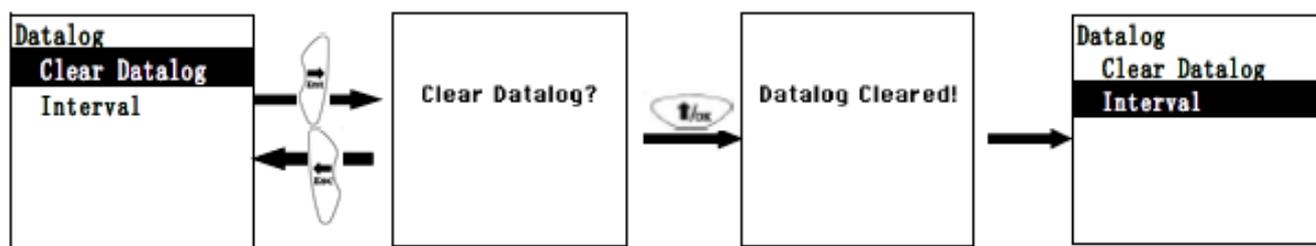
To erase all data stored in the datalog:

1.   From the Datalog submenu, press ⬆/ok or ⬇/ø to select "Clear Datalog"

2.   Press (Ent) to clear the datalog. Display shows "Clear Datalog?".

3.   Press (Esc) to cancel.
4.   Press ⬆/ok to clear the datalog.
Display shows "Datalog Cleared!" and moves to the next submenu.

7.4.2 SET DATALOG INTERVAL
Interval is shown in seconds.
The value you enter must be between 1 and 3600 seconds.
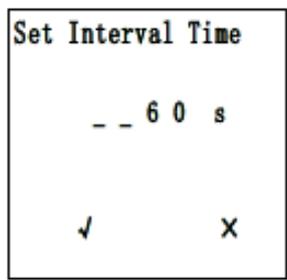
Notes
- **At a 1-second interval, the instrument can store the values for 6 days of continuous measuring.**
- **At a 60-second interval, the instrument can store the values for a year of continuous measuring.**
- **When the datalog memory is full, the instrument overwrites the oldest data in the memory.**

7.5 MNT (MONITOR) SETUP
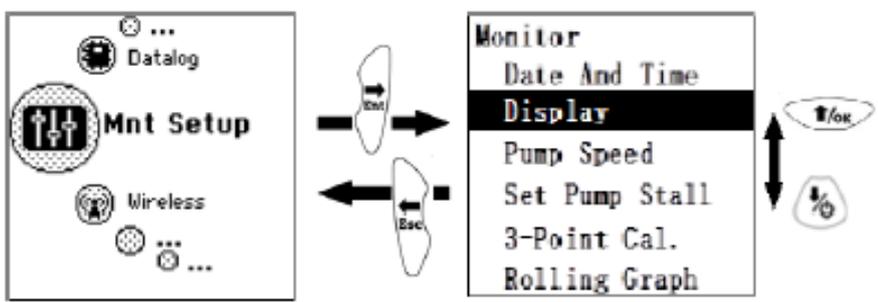
In the Monitor Setup menu, you can check and modify several other settings, including date and time, pump parameters, display parameters.
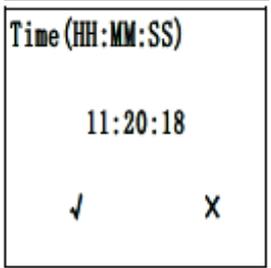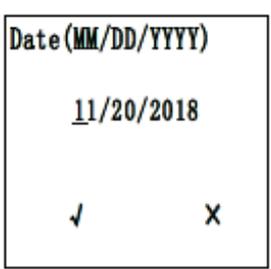
7.5.1 DATE AND TIME
Date is expressed as Month/Day/Year.
Time is expressed as Hours/Minutes/Seconds in a 24-hour clock format.

7.5.2 DISPLAY
You can change the display's contrast and backlight settings.
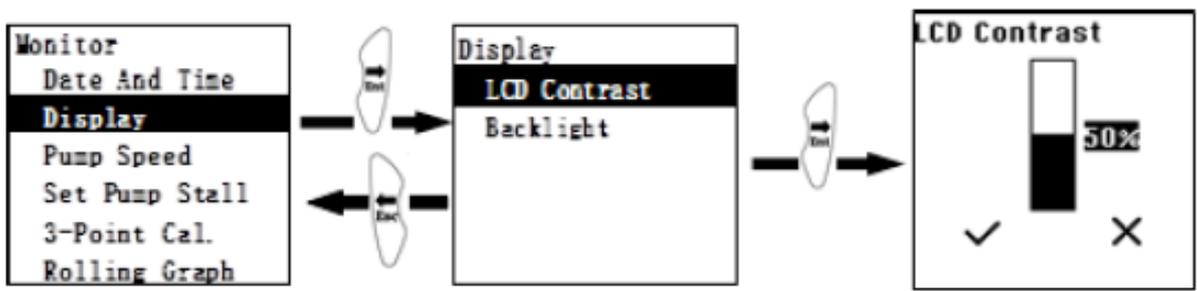
Default display contrast is about 50%. You can change the contrast level with 🔘/OK or 🔘/⏻ .
For the display backlight options, choose from:
•   Automatic.
•   Manual.
•   Off.
In Automatic, the backlight comes on and stays on in low light conditions. In Manual Mode, you can turn

the backlight on for a minute by pressing [Esc] or [Ent] from the readout screen.
1.   Press 🔘/OK or 🔘/⏻ to select the desired option.

2.   Press [Ent] to continue.

Press [Esc] to save and return to the alarm settings sub-menu.

7.5.3 PUMP SPEED
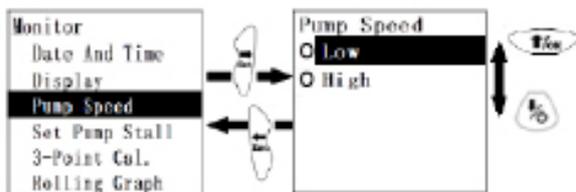
The pump can operate at three speeds, low and high, ranging from about 250 to
350cc/min with a standard 0.45 μm filter in place.

Notes
•   **Low pump speed conserves a small amount of power.**
•   **There is almost no difference in sampling accuracy.**
•   **High pump speed offers faster instrument response, especially with long sampling hoses or when detecting heavy compounds or compounds that get adsorped on inlet surfaces.**

To change pump speed:
1.   Press 🔘/OK or 🔘/⏻ to select the desired option.

2.   Press [Ent] to continue.
3.   Press [Esc] to save and exit

Note
Each pump speed has its own Pump Stall threshold.

7.5.4 SET PUMP STALL
The pump shuts down when drawing a sample asks too much current, indicating
a blockage. Shutting down the pump saves pump life, the accompanying alarm
alerts the user that the sampling path is blocked.

The pump stall threshold is expressed in a current draw number. The number in
the top right corner of the screen is the present current draw.
To correctly set the pump stall threshold:
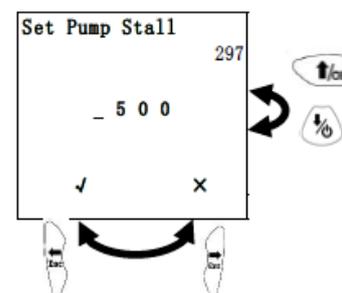
1. Briefly block the inlet probe with your finger.
2. Observe the rise in pump current value.
3. Set the stall threshold about 50-100 units above the unblocked pump reading, but lower than the blocked pump reading.

7.5.5 ROLLING GRAPH

If the Rolling Graph function is enabled, the display in basic User Mode shows the instantaneous
reading together with a real-time plot of readings in the last 2 minutes.

To set Rolling Graph:

1. Press $\boxed{\textsf{I/OK}}$ or $\boxed{\textsf{↓/⏻}}$ to select the desired option.

2. Press $\boxed{\textsf{Ent}}$ to continue.

3. Press $\boxed{\textsf{Esc}}$ to save and exit
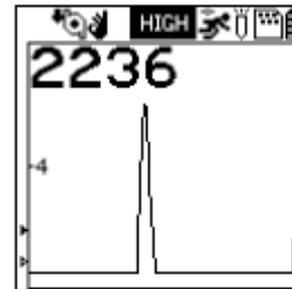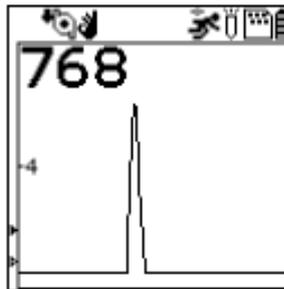
7.5.7 REAL TIME DATA

Real time data output is available on some NEO models via a USB cable and/or wirelessly via Bluetooth Low Energy using an Android App. Please contact WatchGas for more information.

7.5.8 LANGUAGE
The display language can be set to English or Chinese.
To set display language:
1. Press ⬆/OK or ⬇/⏻ to select the desired option.
2. Press Ent to continue.
3. Press Esc to save and exit

```
Language
◉ English
O Chinese
```
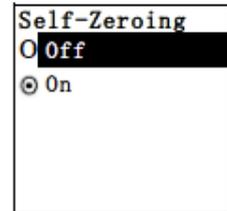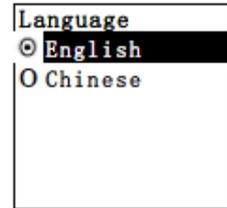
7.5.9 SELF-ZEROING
With Self-Zeroing enabled, the instrument re-zeroes automatically if the signal drifts below the last Zero Calibration for some time.

Notes
Such drift can occur:
- **Slowly as the lamp ages**
- **As dust or oil film accumulates on the lamp window**
- **As environmental conditions change, such as background matrix gas, humidity or temperature.**
- **The default setting of self-zeroing is off.**

At the time of enabling self-zeroing, make sure the instrument is running in a clear environment for several minutes to ensure that the baseline zero signal is well established.

```
Self-Zeroing
O Off
◉ On
```

To set Self-Zeroing:
1. Press ⬆/OK or ⬇/⏻ to select the desired option.
2. Press Ent to continue.
3. Press Esc to save and exit

7.5.10 WIRELESS
Wireless radio communication can be enabled if the instrument has a wireless module installed.

To set Wireless:
1. Press ⬆/OK or ⬇/⏻ to select the desired option.
2. Press Ent to continue.
3. Press Esc to save and exit
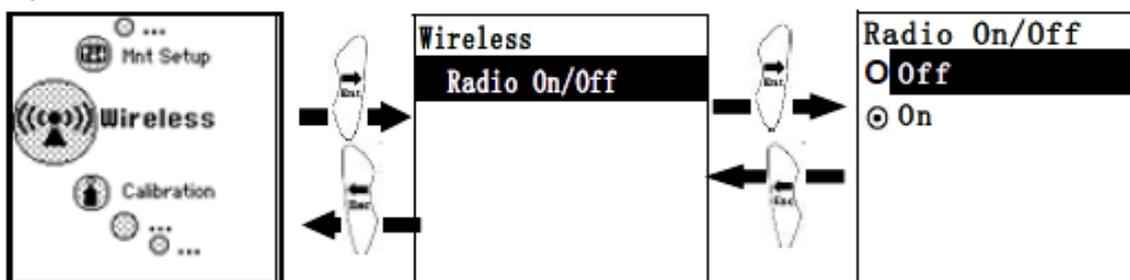
8. Computer interface met WatchGas Suite

The WatchGas Suite software can be used to:

* Log real-time data.
* Download logged data.
* Upload configuration parameters to the instrument
* Upgrade the instrument firmware.

The WatchGas Suite can be downloaded from https://www.watchgas.eu/downloads.html .

8.1 CONNECTING AND CONFIGURING

1. Turn on the instrument and press Up from basic User Mode to go into PC comm.
2. Connect the WatchGas M-011-3003-000 USB cable to the PC and with the Micro-USB end to the instrument.
3. Start WatchGas Suite on your PC and click the "Search" button to find the instrument.
4. Find the instrument in the left bar Device Connected list. Click on the S/N to get the configuration file from the instrument.
5. Edit the configuration parameters as desired and click "Write" to upload the configuration to the instrument.
6. "Read" allows downloading the current configuration file from the instrument.
7. "Save" allows storing the current configuration file to the PC.
8. "Load" allows calling up a stored configuration file from the PC to WatchGas Suite.
9. To update the instrument firmware, select "Firmware Upgrade". The firmware must first be downloaded to the PC from the WatchGas website www.WatchGas.eu.

Notes
* **Any USB A to Micro B USB cable will work for charging.**
* **For PC communication with WatchGas Suite, WatchGas USB cable P/N M-011-3003-W00 is required.**
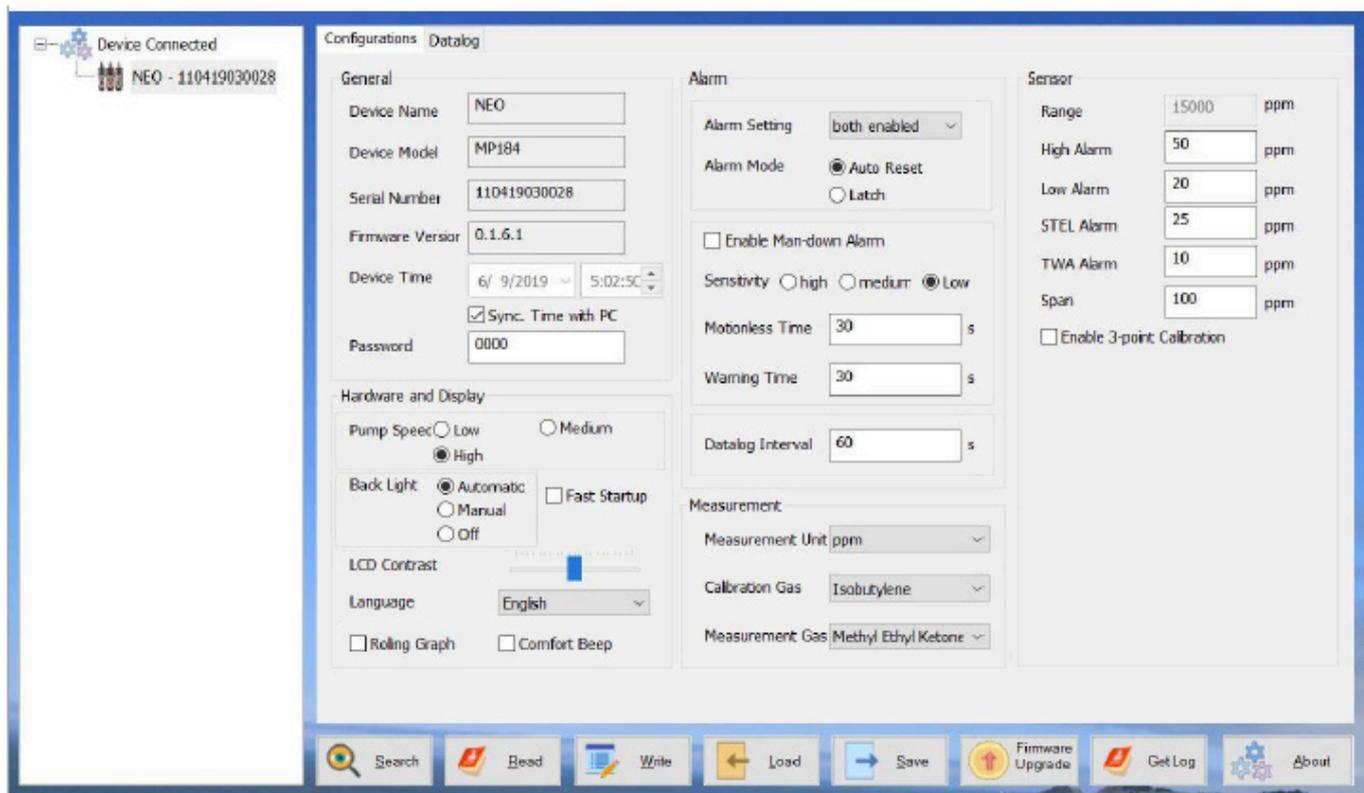
WATCHGAS SUITE CONFIGURATION SCREEN

8.2 RETRIEVE DATALOG

1. Select "Get Log" to download the datalog from the instrument to the PC.

Note
- **This process can take several minutes because datalogging is always on and large files are created when the instrument is used for prolonged periods.**
- **A new Single Datalog file is created each time the instrument is turned on or the configuration is changed.**

The datalog files appear under the "Datalog" tab on the top of the screen. Below is sample screen of datalog information listing sample point time and instantaneous reading.

To export a single event:
2. Select the event you want to download from the middle pane.
3. Right-click the right pane.
4. Click "Export Single Datalog" and follow the screen instructions.

To export all events:
2. Right-click the right pane.
3. Click "Export Whole Datalog" and follow the screen instructions.
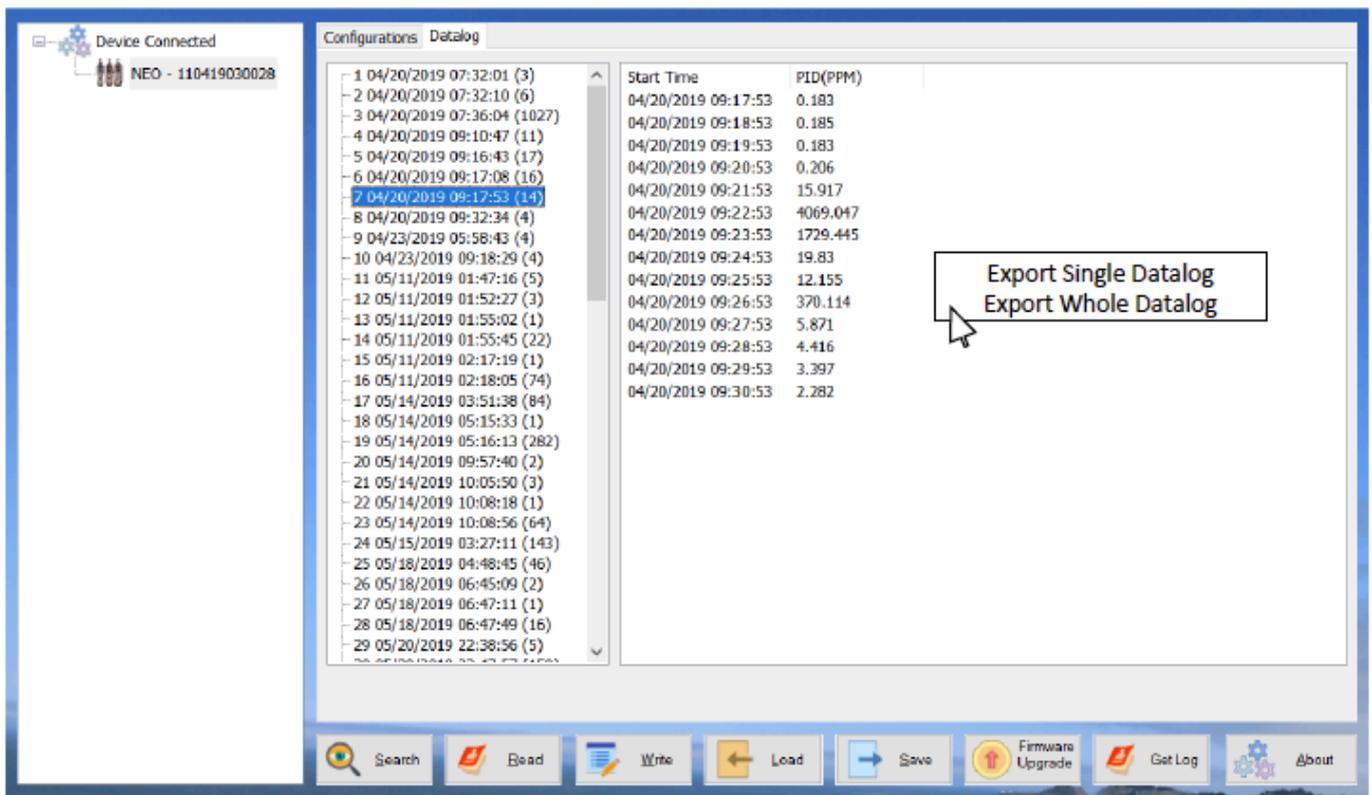
WATCHGAS SUITE DATALOG SCREEN

9. Maintenance

> ## Warning
> Service work performed by unauthorized personnel voids all warranties, especially those concerning intrinsic safety.
>
> Only preform maintanance in non-hazardous locations only.

9.1 LAMP CLEANING OR CHANGING

1. Unscrew the Sensor Cap and pull the sensor straight out, using a slight rocking motion if necessary.	
2.Put on finger gloves and pull out the lamp. Insert a new lamp, or clean the existing lamp as described below.	
3. Use a cotton swab wetted with methanol to clean the flat window surface of the lamp. If greasy dirt is hard to remove using methanol, the window can be polished using fine alumina powder polishing paste.	
4. Use a clean tissue to wipe the lamp window.	
5. Re-insert the cleaned lamp, plug in the sensor and screw on the sensor cap. 6. Re-connect the battery.	

Always re-calibrate the PID after cleaning the lamp and/or sensor.

9.2 SENSOR CLEANING

1. Disconnect the battery.

2. Unscrew the Sensor Cap and pull the sensor straight out, using a slight rocking motion if necessary.

3. Put the sensor into a beaker and cover with pure methanol or ethanol.

4. Put the beaker into an ultrasonic cleaning bath and turn on for 5 minutes. Then replace the alcohol with distilled water and turn on for 2 minutes. Lastly, take out sensor and dry it. If possible, use a gentle stream of clean air to blow the residual liquid out of the sensor.
5. Plug in the completely dried sensor and screw on the sensor cap.
6. Re-connect the battery

Always re-calibrate the PID after cleaning the sensor.

10. Troubleshooting

Problem	Possible reasons	Solutions
Cannot turn on power after charging the battery	Defective battery	Call WatchGas service center to replace battery
Reading abnormally High	Dirty Filter	Replace filter
	Dirty sensor module	Clean or replace sensor module
	Excessive moisture or water condensation	Blow-dry the sensor module
	Incorrect calibration	Calibrate the unit
Reading abnormally Low	Dirty Filter	Replace filter
	Dirty sensor module	Clean or replace sensor module
	Weak or dirty lamp	Clean or replace lamp
	Incorrect calibration	Calibrate the unit
Buzzer inoperative	Buzzer disabled	Check that buzzer is not turned off
	Bad buzzer	Call WatchGas service center
Inlet flow too low	Pump diaphragm damaged or has debris.	Call WatchGas service center
	Flow path leaks.	Check flow path for leaks; e.g., sensor mo-dule O-ring, tube connectors, Teflon tube compression fitting
"Lamp" alarm on during operation	Lamp drive circuit.	Turn unit off and back on
	Weak or defective PID Lamp.	Replace UV Lamp
PC does not recognize instrument	Wrong cable	Use WatchGas USB cable N / P M-011-3003-W00

11. Specifications

Size	260 x 78 x 58 mm (with boot)
Weight	708 g (24.9 oz) (with boot)
Sensor technology	Photo-ionization sensor with standard 10.6 eV lamp (9.8 eV lamp in MP186)*
Temperature	-20° to 50°C (-4° to 122°F)
Humidity	5% ~ 95% RH (Non-condensing)
Alarm type	High, Low, TWA and STEL alarms Over range alarm, battery low alarm Man-Down alarm with pre-alarm and real-time re-mote wireless notification Low Flow Alarm: Auto pump shutoff at low-flow condition
Alarm signal	Acoustic: 95 dB @ 30 cm Visual: flashing bright red LEDs, and on-screen indication of alarm conditions plus wireless remote alarm notification Vibration alarm
Display	128 x 128 graphical LCD, 45 x 44 mm, with LED backlight for enhanced display readability
Direct Readout	Real-time reading of gas concentration (ppb, ppm, mg/m^3, $\mu g/m^{3)}$, PID measurement gas and correction factor, lamp on/off, Man-Down alarm on/ off, battery status, pump status, datalogging on/off, wireless on/off, temperature and time
Calibration	Two/three-point calibration
Datalogging Capacity	Standard 12 months at one-minute intervals Storage interval adjustable from 1 to 3,600 seconds
Battery / Run time	Rechargeable Lithium-Ion battery with 24 hours typical operation
Measurement	Pumped
Housing	Durable rubber boot, color coded for different models
Sampling Pump	Built-in pump with 2 settings from 300 to 430 cc/min Sample from up to 30 m (100 ft)
Charging and communication	Charging, data download, instrument setup and firm-ware upgrades on PC or laptop via Micro USB Wireless data and alarm status transmission via built-in RF modem
Response time T_{90}	3 seconds (t_{90}) VOC Mode 45 seconden @ 20°C (68°F) Benzene Tube Mode
Accuracy	±3% (at calibration point)
Wireless range	1,000 ft (300 m) line of sight
Correction Factors	Integrated Correction Factor list of more than 200 compounds
IP-Rating	IP67, IP66 when turned on
EMI/RFI	Highly resistant to EMI/RFI Compliant with EMC Directive 2014/30/EU
Safety certifications	**UL/cUL:** Class I, Div 1, Group ABCD **IECEx:** Ex ia IIC T4 Ga **ATEX:** II 1G Ex ia IIC T4 Ga **CE:** Conformité Européenne
Warranty	2 Years including lamp and sensor (1-year for 9.8 eV lamp)

12. 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 +31 (0)85 01 87 709 for repair/return information.

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V2.0