

# Multiwarn II

March 2010

NOTE: Guides are to be used by trained personnel only and DO NOT replace the manufacturer's operations or technical manuals. These guides were developed by field personnel for utilization by EPA and their contractors and are helpful in quick start-up and operations. Various limitations have been identified through the experience of the development group. Different makes, models, and updates to this equipment may change the limitations. It is recommended that calibration, maintenance, and use be recorded in a log book. If you have any changes or revisions please email one of the following: [stevenson.peter@epa.gov](mailto:stevenson.peter@epa.gov), [boykin.michael@epa.gov](mailto:boykin.michael@epa.gov), [chong.margaret@epa.gov](mailto:chong.margaret@epa.gov), [kroone.janice@epa.gov](mailto:kroone.janice@epa.gov), [zintak.leonard@epa.gov](mailto:zintak.leonard@epa.gov).



## Uses:

The Multiwarn II is a multi-gas instrument that offers IR sensing technology. The instrument can be used to continuously monitor concentrations of several gases in the ambient air and conditions in confined spaces. The Multiwarn II may be used in the following applications:

- Functions as a multi-gas IR sensor.
- Sensor Technology: Combustible Gases, and Carbon Dioxide.
- IR sensors unaffected by gases that contain sulfur, halogens, silicones, and heavy metals.
- Hydrocarbons can be measured without the presence of oxygen with the IR-Ex sensor.
- Methane, propane fuels, solvents and many petro-chemical intermediates can be measured in the parts per million (ppm) range.
- IR-EX sensor excellent for measuring combustible levels of fuels and solvents.
- IR-CO<sub>2</sub> sensor can accurately measure carbon dioxide in the ppm range.
- Capable of remote monitoring.
- 28 different sensors available.
- Data logger capabilities.
- Continuously monitor the concentration of several gases at the same time.

## Limitations:

- The Multiwarn II is designed for continuous operation between -5 to 120 °F (-20 to 40 °C) (Use outside of these parameters is possible, consult Multiwarn II and Sensor specifications for details).
- Rapid or drastic changes in temperature, humidity, or pressure may cause slight fluctuations on the sensors.
- At temperatures below 32 °F (0 °C), the humidity or pressure sensors may be slower to respond and battery life will be reduced.
- The Multiwarn II is designed for continuous operation between 5 to 95% RH (Use outside of these parameters is possible, consult Multiwarn II and Sensor specifications for details).

- Once readings have stabilized, use the Fresh Air Cal to adjust to the new ambient background.
- Condensing water collecting on the sensor or filter may inhibit gas from entering the sensors.
- The Multiwarn II is designed for continuous operation between 20.7 to 38.4 in. H<sub>2</sub>O (700 to 1300 mbar).
- If dust or mist (including splashing water) is allowed to accumulate on the sensors, it can prevent gas from entering the sensors.
- Some sensors are cross sensitive to many chemicals - see part number or manufacturers data.
- You must be in a clean environment to clean the sensor if you don't have the optional integrated pump.

### Quick Start-up and Operation:

- Make a visual inspection of the Multiwarn II monitor and accessories. If the unit is contaminated with dust or liquids, clean and dry the instrument, replace the filters.
- Watch the warm-up sequence to ensure the proper sensors and alarm values are chosen.
- Perform a bump test and calibration.
- If in fresh air, perform a fresh air calibration.
- To turn the Multiwarn II "ON," push the big button "↵" (enter).
  - The warning light will flash and the audible alarm "beeps."
  - The instrument begins the start-up sequence.
- Use "▲" for scrolling the menu.
- To turn the Multiwarn II "OFF," push the two small buttons "▼" and "▲" at the same time and hold for 3 seconds. Use ↑↓ for scrolling through menu.
  - The visual alarm will flash and the audible alarm will "beep" indicating the shut-down sequence.



### Measurements with Hose Probe

- Plug in the adapter for pump operation and fasten with the screw. The instrument will automatically switch over to pump operation. The display will show the special symbol for pump operation.
- To separate dust and dampness, install the water and dust filter between the connector and probe.
- Connect a probe to the connector.

- To terminate pump operation, unscrew and remove the pump operation adapter. The unit will switch over automatically to diffusion operation and the pump symbol goes out.

### Attaching the Pump Adapter

- The pump is activated by the magnetic switch contained in the pump adapter.
- Prior to attaching the adapter, ensure that the sensor grille and threaded fastener are free of dirt or other contamination.
- Check that the rubber nipple is not crimped.
- Insert the lip of the pump adapter into the hole on red grille. Tighten the thumb screw.



### Activating the Pump

- If a proper connection is made, and the hose and filter are not blocked, the pump symbol [Ø] will appear on the display and the pump will run.
- A blocked sample line will cause a fault alarm.
- Check the hose and filter for blockages.
- If the problem persists, take the unit out of service immediately.

### Principles of Operation:

Multiwarn II combines electrochemical, catalytic oxidation and infrared (IR) sensing technology for a total of up to 5 sensors. There are over 25 different sensors for toxic gases, 2 different catalytic sensors for combustible gases or carbon dioxide. Instrument utilizes a high-performance membrane pump with a flow of 0.6 Liters/Minute. The internal pump can draw ambient gases from distances greater than 100 feet.

### Additional Operation Information:

- Sensor position does not affect the ability to detect gas or influence sensor specifications. In “dirty” or “sloppy” conditions, it is best to wear the unit upside-down.
- Sensors can be changed quickly in the field with no need to re-calibrate the instrument.
- The infrared and catalytic combustible gas channels can be adjusted to measure multiple gases and ranges. Designed so the user can switch between gases and ranges.
- The information “I” symbol indicates there is something that the user should be aware of. The instrument is **still** usable!

A warning (Information)	i
A fault	⚡
Battery pre-alarm	🔋
Battery main alarm	🔋
Instrument switched on during charging	🔌
Pump attached and running	⊖
Flow alarm during pump operation	⊗

### Replacing Sensors:

- Turn the instrument off.
- Unscrew the instrument cover (two screws). Requires 1/16" Hex Head wrench.
- Unscrew the plate and filter disc (two screws) and remove carefully. Take care not to damage the filter disc.
- A max of 3 EC (electrochemical) sensors can be installed. They can be fitted in any position and are interchangeable.
- Remove the sensors to be replaced and insert the new sensors. Make sure to observe the coding on the sensor plug.
- Screw the plate and filter disc and ensure that the seal sits correctly.
- Screw on the cover. Check for the correct size of the sealing to suction opening.
- Switch on the instrument to load sensor data. The sensor warming up period only begins after the sensor data has been loaded.

**Note: IR sensor, solid installed, may only be changed by Dräger Service.**

### Replacing the Filter Disc:

- Turn the instrument off.
- Remove the two screws from the instrument cover.
- Unscrew the plate with the filter disc, and remove carefully.
- Take out the filter disc and fit in a new one.
- Screw on the plate and filter disc, checking that the seal fits perfectly.
- Screw on the cover.

### Calibration:

A calibration is not possible if the date and time are not set.

Warning: Prior to calibration, the particular sensor must be warmed up!

**The sequence of operations must be respected!** First check the zero value, in the event of any correction, immediately check the sensitivity and adjust if necessary.

**For EC and IR sensors:** Adjust zero point and sensitivity.

**For CAT Ex sensor:** Adjust heat-of-reaction zero point, thermal-conduction zero point and heat-of reaction sensitivity.



### Fresh Air Calibration

In the "Maintenance" menu: (Press ← Hold)

- Position the selection cursor on "Fresh air calibr" using the up and down arrow keys.
- Press the "←" button. The function is called up.
  - The sensitivity if the EC O<sub>2</sub> sensor is set to 20.9% by volume, the zero point of the IR CO<sub>2</sub> sensor is set to 0.03% by volume, and the zero point of all other sensors is set to 0.
- When the fresh air calibration is completed, set the cursor point to 'forward' on the display screen.
- Press the "←" key. The Maintenance menu is displayed.

## Zero Calibrate

Under the Maintenance menu:

- Scroll the selection cursor on “zero calibrate” using the up and down arrows. Default (0001) requires password.
- Press the “←” key, the zero calibration submenu will be displayed for the installed sensors. The first group of two letters identifies the type of sensor, i.e., IR = Infrared Sensor. The second group of letters identifies the gas to be measured.
- Using the arrow keys, place the cursor on the sensor to calibrate.
- Press the “←” button, the function will be called up. The cursor will point to “back.” The Cat Ex sensor also features “zero point WT” and “zero point ML” functions. (WT = heat-of-reaction and WL = thermal conduction)
- Positions the section cursor on “forward.”
- Press the “←” key.
- Hold the calibration in front of red intake for zero calibration. Calibration gas will depend on sensor being calibrated. (See manual for specifics).
- Press the “←” key.
- Wait for the measured value to stabilize.
- Press “←” twice.
- Switch off the test gas supply.
- To return to the ‘zero calibrate’ menu, press “←” again, and calibrate the remaining sensors the same way.

## Span Calibrate

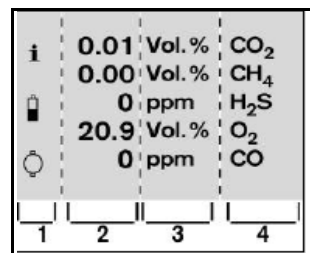
Under the Maintenance Menu:

- Using the arrow keys, place the cursor on “span calibrate.”
- Press the “←” key. The span calibrate submenu will be displayed.
- With the arrow keys, move the cursor to the sensor to be calibrated.
- Press “←.”
- Position the cursor on “Span Calibrate.”
- Press the “←” key.
- If the concentration of the span gas does not match, change the concentration on screen with the arrow keys.
- Place the cursor on ‘forward’ and press “←.”
- Supply the gas in order to adjust the sensor sensitivity.
- Press the “←” button.
- Wait for the value to stabilize.
- Press the “←”key.
- Turn off the gas supply.
- Push the “←” key.
- Calibrate the other sensors in the same manner.

## Multiwarn II Display

The display is split into four sections:

- 1) Special Symbols
- 2) Gas Values
- 3) Concentration units
- 4) Gas Type



i	0.01	Vol. %	CO <sub>2</sub>
⬆	0.00	Vol. %	CH <sub>4</sub>
⬇	0	ppm	H <sub>2</sub> S
⬆	20.9	Vol. %	O <sub>2</sub>
⬇	0	ppm	CO
1	2	3	4

### Alarm Triggers

- The relevant gas level exceeds, or in the case of oxygen, falls below the concentration of the alarm setting.
- The relevant values exceeds the set alarm thresholds for the exposure alarm setting.
- The battery is no longer sufficiently charged to run the instrument.
- There is insufficient flow in pump operation.
- Instrument and sensor faults.



### Fault Alarm

- Consists of a continuous audible alarm.
- The visual alarm will light continuously.
- The fault symbol will remain in the display until the problem is corrected.
- The alarm indicates that the instrument is not operating properly and requires immediate service or corrective action.

### A1 Alarms

- Pre-alarm for Ex and TOX and for oxygen deficiency.
- The audible alarm sounds a single-repeating pattern.
- The visual alarms will flash a single-repeating pattern.
- The display character “A1” will be activated in the display.
- The audible alarm can be acknowledged.

### A2 Alarms

- Main alarm for TOX or Ex or main alarm for oxygen excess.
- The audible alarm sounds a double-repeating pattern.
- The visual alarms will flash a double-repeating pattern.
- The display character “A2” will be activated in the display.
- The audible and visual alarm can NOT be acknowledged (silenced) in “A2” or in O2 “A1” alarm.

**Note: The pre-alarms can be acknowledged. The main alarms are latching and remain active until the conditions are safe again.**

### Multiwarn II Warming Station:

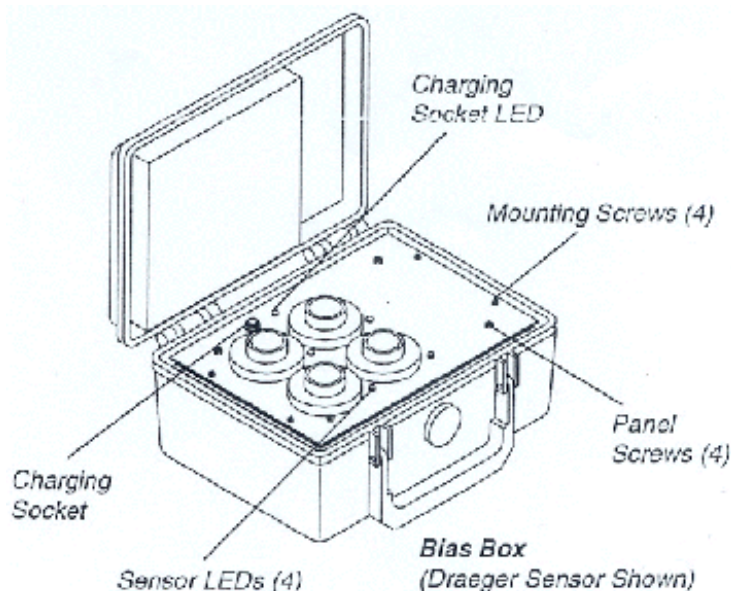
The Dräger Bias Box (warming station) is designed to shorten the warm-up time for Dräger printed circuit board assembly (PAC) sensors. When the Bias Box is not available, warm-up time for sensors could be as long as 24 hours. Warming time for sensors vary greatly. Even



though the sensor has been warmed up in the Bias Box, it may take several minutes for the sensor to warm when it is placed into the Multiwarn. The purpose of the warming station is to dramatically reduce the warming time. Example: Warming time of  $\text{Cl}_2$  sensor is 1.5 hours to 2.0 hours when put into Multiwarn for the first time, it still required 15-20 minutes warm up. The Bias Box can also store sensors that are not currently in use.

### Quick Start:

- Insert sensor. A correctly aligned sensor will generate a long flash once every second.
- During warm-up, LED will illuminate two short flashes every three seconds.
- Sensor is ready once the LED emits one short flash every three seconds.



### Set-Up:

- Charge batteries at least 48 hours prior to use. (Batteries are rechargeable)
- Box will operate for about 300 hours per charge.
- Charger can be attached continuously. Charge socket will be lit signifying battery is charging.
- Bias Box will shut off if batteries are too low to provide reliable operation. LEDs will not be lit.

### Routine Maintenance:

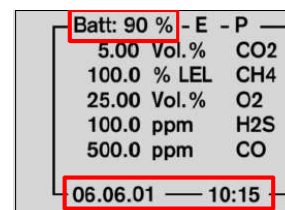
- Instrument should be inspected and serviced every six months by trained professionals.
- Replace the sensors as necessary, or when they can no longer be calibrated.
- Change the filter disc in front of the filters as needed. If the measurement value setting time is too long, it is time to change the filter disc.
- Some sensors are cross sensitive to many chemicals, see part numbers or manufacturer's date.
- If you don't have the optional integrated pump, you must go to a clean area to clean the sensor.

### Battery Information:

Utilizes a rechargeable NiCad battery capable of 10 hours of continuous operation. The battery should be recharged after each use, and after the latest alarm has been triggered or after 3 weeks.

## Checking the Battery Level

- Press and hold the Up Arrow “▲” button
- This activates the information screen whether the instrument is on or off
- The remaining battery level is shown at the top of the screen
- The installed sensors which have been activated and their ranges are shown in the middle of the screen
- Time and date are shown on the bottom of the screen

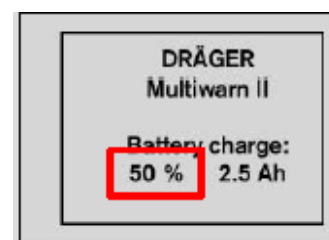


## Low Battery A1 and A2 Alarms

- Low Battery A1 is activated when battery has less than 30 minutes of operation remaining.
  - ▶ The horn will beep and the visual alarm will flash in this situation
  - ▶ This alarm can be silenced by pressing the Enter Button “↵”
- Low Battery A2 is activated when the battery is nearly dead
  - ▶ The instrument will automatically shut-down in about 2 minutes to prevent damage to the battery

## Battery Charging

- Charging typically requires about 8 hours
- When charging, the alarm light will flash
- The amount of battery operation time remaining will be indicated in %
- When fully charged, the light will stop flashing
- Leaving the unit on charge will not damage the battery



**NOTE:** It is recommended that due to the many types of rechargeable battery configurations, the Equipment Managers verify proper battery charging and operation through monthly equipment operation until battery is discharged prior to charging.

## Changing Battery Packs

- Turn the instrument off
- The battery is released by pushing out the battery-release tabs and pulling the battery pack away from the measurement unit

## Replacement of Auxiliary Equipment/Supplies

### Equipment Options

- An integrated pump, optional but recommended.
- 50-hour data logger and versatile operating software (optional)
- Personal and area monitoring of the ambient air to detect toxic and explosive gases as well as excess or insufficient oxygen.

### Detection Limits and Sensor Part Numbers:

Part Description	Part No.
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Multiwarn II BP LEL, Oxygen, Carbon Monoxide, Hydrogen Sulfide XS-2 & pump	4523062
Multiwarn II BEP LEL, Oxygen, Carbon Monoxide, Hydrogen Sulfide XS-2 Sensors, Data logger & pump	4523047
Multiwarn II SP IR-Ex	4523049
Multiwarn II SEP IR-Ex	4523052
Multiwarn II SP IR-CO2	4523055
Multiwarn II SEP IR-CO2 LEL, Oxygen, Carbon Monoxide, Hydrogen Sulfide XS-2 Sensors, Infrared Sensor for Carbon Dioxide, Data logger & pump	4523057

Recommended Optional Sensors: NH<sub>3</sub>, Cl, HCN, H<sub>2</sub>S, Arsine, Phosgene.

All Multiwarn II Monitors come with an internal sampling pump, pump actuator, calibration adapter, and battery charger. 'E' versions contain the internal Data logger. 'S' versions are quipped with an infrared sensor. All other sensors are ordered separately. 'B' indicates 4-gas version and 'P' indicates internal pump.

Gas	Max. Range	Resolution	Part No.
Acetaldehyde	0-200 ppm	1 ppm	6809115
Acetylene	0-100 ppm	1 ppm	6809115
Acrylonitrile	0-100 ppm	0.1 ppm	6809522
Ammonia	0-300 ppm	1 ppm	6809145
Arsine	0-10.0 ppm	0.01 ppm	6809135
Bromine	0-20.0 ppm	0.01 ppm	6809165
Butadiene	0-100 ppm	0.1 ppm	6809115
Carbon Dioxide	0-5.00 % Vol.	0.01 % Vol.	6809175
Carbon Monoxide	0-2000 ppm	1 ppm	6809105
Carbon Monoxide	0-10,000 ppm	1 ppm	6809120
Chlorine	0-20.0 ppm	0.01 ppm	6809165
Chlorine Dioxide	0-20.0 ppm	0.01 ppm	6809165
Combustible Gases	0-100 % LEL	1 % LEL	6808280
Diborane	0-1.00 ppm	0.01 ppm	6809135
Diethylamine	0-100 ppm	1 ppm	6809545
Diethyl Ether	0-200 ppm	1 ppm	6809522
Dimethylamine	0-100 ppm	1 ppm	6809545
Dimethyl Sulfide	0-40 ppm	0.1 ppm	6809200
Ethanol	0-300 ppm	1 ppm	6809115
Ethylene	0-100 ppm	1 ppm	6809115
Ethylene Oxide	0-200 ppm	1 ppm	6809115
Formaldehyde	0-200 ppm	1 ppm	6809115
Fluorine	0-20.0 ppm	0.01 ppm	6809165
Germane	0-20.0 ppm	0.01 ppm	6809135
Hydrogen	0-2000 ppm	1 ppm	6809185
Hydrogen Cyanide	0-50.0 ppm	0.1 ppm	6809150
Hydrogen Selenide	0-1.00 ppm	0.01 ppm	6809135
Hydrogen Sulfide	0-100 ppm	1 ppm	6809110
Hydrogen Sulfide	0-1000 ppm	1 ppm	6809180
Iso-Butene	0-300 ppm	1 ppm	6809522
Iso-Propyl Alcohol	0-300 ppm	1 ppm	6809115
Methanol	0-200 ppm	1 ppm	6809115
Methyl Amine	0-100 ppm	1 ppm	6809545
Nitric Oxide	0-100 ppm	1 ppm	6809125
Nitrogen Dioxide	0-50 ppm	0.1 ppm	6809155
Oxygen	0-25.0% Vol.	0.1 % Vol.	6809130
Phosphine	0-10.0 ppm	0.01 ppm	6809135
Phosphine	0-1000 ppm	1 ppm	6809535
Propylene	0-100 ppm	1 ppm	6809115
Propylene Oxide	0-200 ppm	0.1 ppm	6809115
Silane	00-10.0 ppm	0.01 ppm	6809135
Styrene	0-100 ppm	1 ppm	6809522
Sulfur Dioxide	0-50.0 ppm	0.1 ppm	6809160
Tetrahydrothiophene	0-40 ppm	0.1 ppm	6809200
tert-Butyl Mercaptan	0-40 ppm	0.1 ppm	6809200
Triethylamine	0-100 ppm	1 ppm	6809545
Trimethylamine	0-100 ppm	1 ppm	6809545
Vinyl Acetate	0-100 ppm	1 ppm	6809115
Vinyl Chloride	0-100 ppm	1 ppm	6809115

**Contact  
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