PAC x000 Series
Single Gas Instruments
Operator Training

Drägersafety

Operator Training

PAC 1000, 3000, 5000 Single Gas Instruments

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Disclaimer

- This visual presentation is intended to help the user understand and correctly use the Draeger PAC x000 Instrument. It is not intended to be a substitute for the complete instruction manuals supplied with the instrument.

- IT IS THE USER'S RESPONSIBILITY TO READ AND UNDERSTAND ALL MANUALS AND INFORMATION PROVIDED WITH THE PAC x000 INSTRUMENTS!

- Pictures may not represent suitable respiratory equipment and protective clothing for every situation. Proper protection level should always be determined by the specifics of an event.

- This training program is applicable to PAC x000 Series Instruments with software version 1.0 and higher.

- Draeger is happy to assist you with any questions you have on the use of the PAC x000 Instruments.

- Draeger Safety (USA) toll free @ 1-800-922-5518

- Draeger Canada toll free @ 1-877-372-4371

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The Basics

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Description and Use

- The Draeger PAC 1000, 3000 and 5000 Monitors are Single-Gas measuring and alarm devices

- They are intended for use in detecting and warning users of hazardous levels of the following gases in ambient air:

  - oxygen (O_2)

  - carbon monoxide (CO)

  - hydrogen sulfide (H_2S)

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Instrument Layout

FRONT

Sensor Inlet

D-Ring

Visual Alarm

Audible Alarm

LCD Display

Integral Rubber Over-mold

Internal Vibrating Alarm

Control Buttons

Gas Label

Visual Alarm

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Instrument Layout

D-Ring

Integral Rubber Over-mold

Hex Screws

Serial # / Part # Label

IR Com Port

Rotatable Grip Clip

Internal Vibrating Alarm

Hex Screws

Approval Label

Li Battery

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Operating Philosophy

- **PAC x000 Monitors are operated by a 2-button key pad**
  - Left Button "**+**"
  - Right Button "OK"

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Activating the Instrument

- **Only required at first use!**
- Press and hold the "+" key for about 3 seconds
- The display will show "3", "2", "1", then the Gas Type – "CO", "H2S" or "O2" – followed by a number alternating with a "d" (days) to indicate remaining operating life of the sensor
- Release the "+" button
- The unit is now active and can be turned on.

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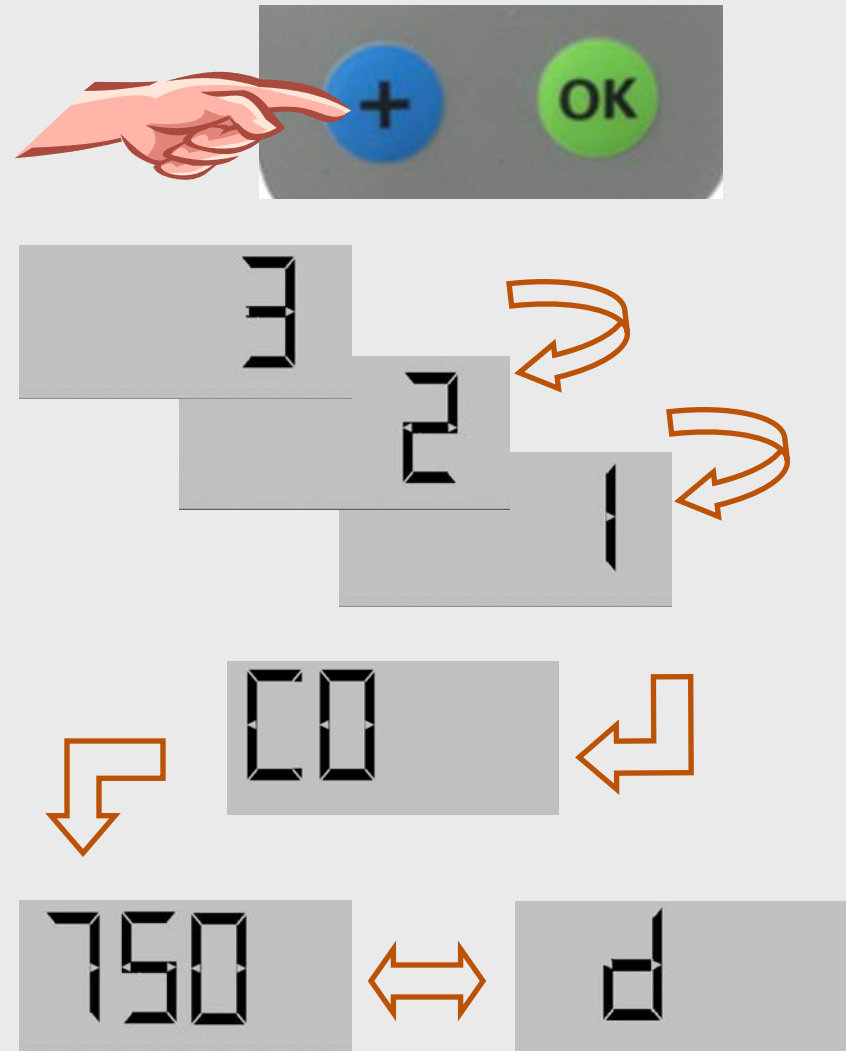
Turning the PAC x000 "ON"

- Make sure you are in a fresh air environment

- Push and Hold the "OK" button to turn the unit "ON"

- The display will count down "3", "2", "1" and the button can be released

- The instrument begins its start-up sequence

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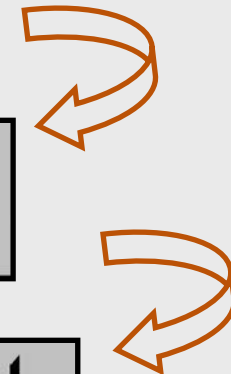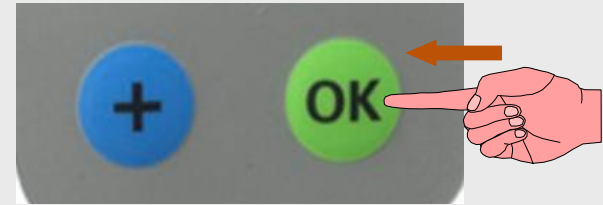
Start-Up Sequence

- The display will light up and the start-up screen will appear

- The display will then light all characters for a segment check
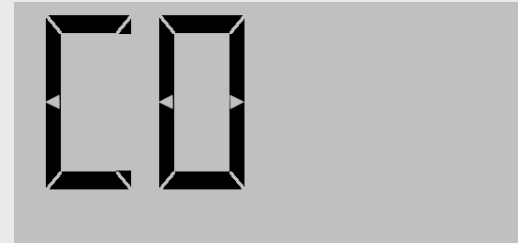
- The software version will be shown next

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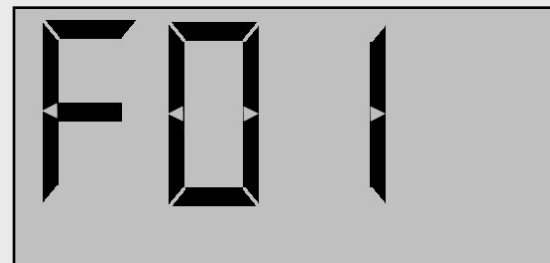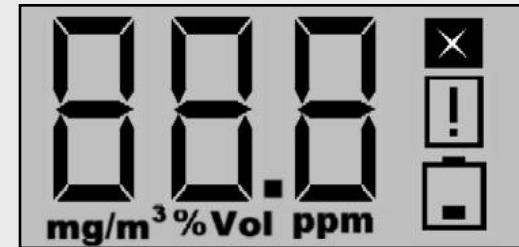
Start-up Alarm Check

● The warning lights will flash,
the audible alarm will sound
and the vibrating alarm will
activate

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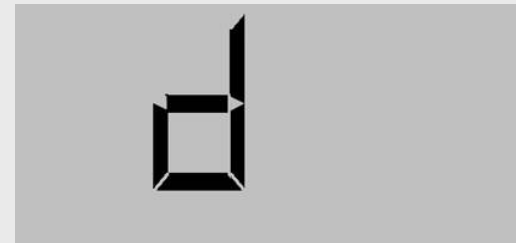
Start-Up Sequence

- The gas type will appear on the display

- A "d" and then a number, e.g. "750" will appear to indicate the number of days of operating time the sensor still has available

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Start-Up Sequence

- The instrument will then show the alarm set points
- The 1st alarm point will show as "A1", then the set point value, e.g. "35 ppm"

- The instrument will start displaying the current gas concentration

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Start-Up Sequence

- The 2nd alarm point will show as "A2", then the set point value, e.g. "50 ppm"

- The instrument will start displaying the current gas concentration.

- The display will flash until the unit is fully warmed-up

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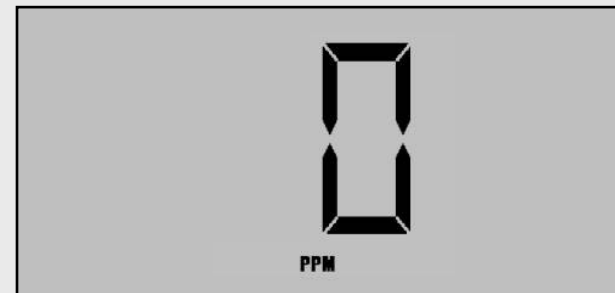
Turning the PAC x000 "OFF"

- To turn the PAC x000 "OFF", push both buttons at the same time and hold for 3 seconds

- The display will count down "3", "2", "1" and the button can be released

- The instrument beeps and flashes the alarm LED's before shutting down

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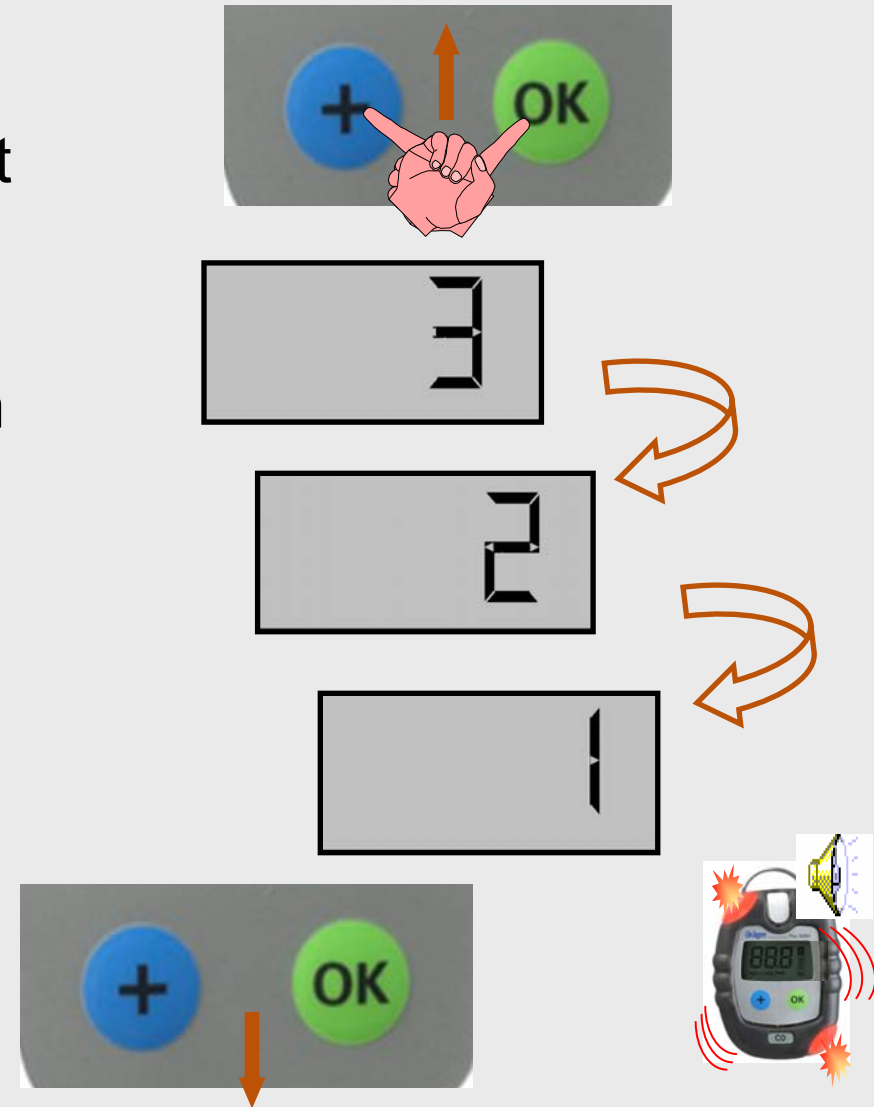
Alarms

Alarm Level Indication

- To check the alarm level set points, turn "ON" the unit

- The display will show "A1" followed by the preset alarm value then "A2" followed by its set alarm value

- These are the concentration values preset for Alarm Level 1 and Alarm Level 2

- These values can only be changed using a PC-based program with the PAC x000

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PAC x000 Alarm System

The PAC x000 has *4* alarm Indicators

1) **Two visual alarm light sin opposite corners**

2) **Alarm characters flash in the display with the value**

3) **An audible alarm**
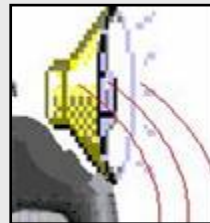
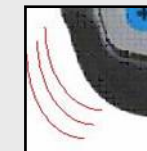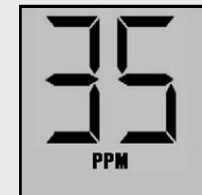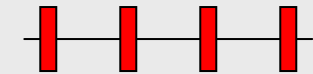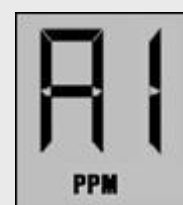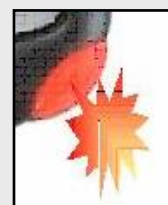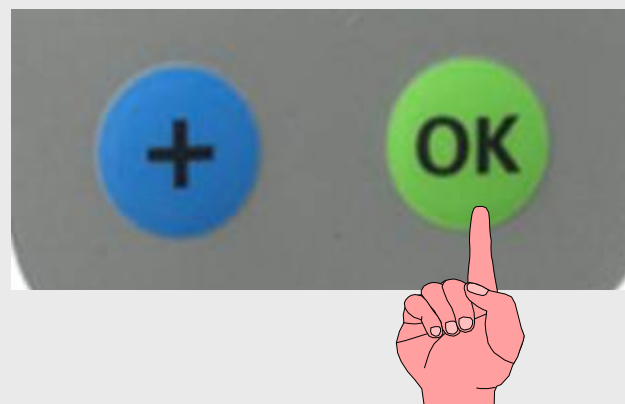4) **A vibrating alarm**

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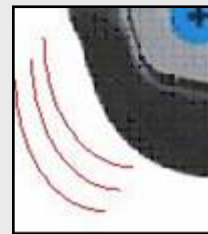
A1 Alarms

- When the A1 alarm concentration is exceeded:

  – The audible alarm sounds a single-repeating pattern

  – The visual alarms will flash a single-repeating pattern

  – The symbol "A1" will alternate with the gas concentration in the display

  – The vibrating alarm will activate

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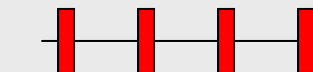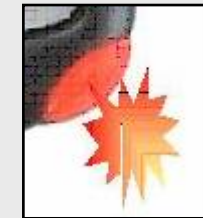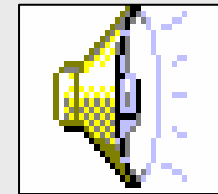
A1 Alarms

- The user should follow prescribed safety procedures

- The audible and vibrating alarms can be silenced (acknowledged) by pressing the "OK" Button

- The visual alarm and alternating symbol "A1" and gas concentration will continue to flash

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A2 Alarms

- When the A2 alarm concentration is exceeded:

  – The audible alarm sounds a double-repeating pattern

  – The visual alarms will flash a double-repeating pattern

  – The symbol "A2" will alternate with the gas concentration in the display

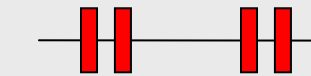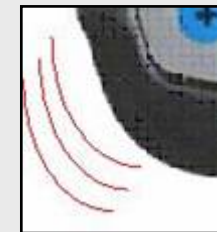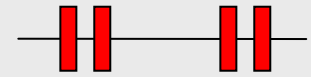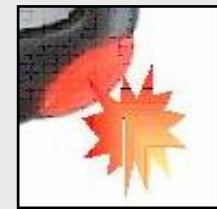 – The vibrating alarm will activate.

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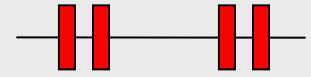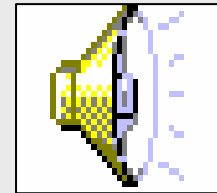
A2 Alarm

- Follow prescribed safety procedures

- The alarms can NOT be silenced (acknowledged) in any "A2" or in an "A1" O2 alarm condition

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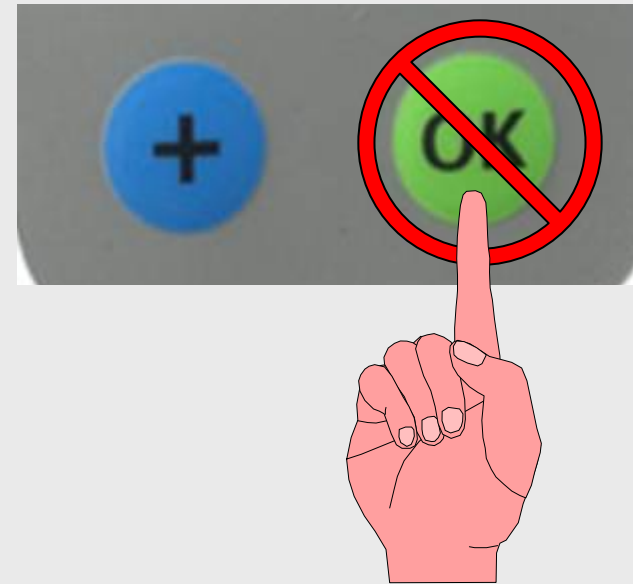
Battery Pre/Main Alarms

Pre alarm

- Activates audible, visual and vibrating alarm
- The "Low Bat" icon will flash in the lower right hand corner of the display
- Alarms can be silenced (acknowledged) by pressing the "OK" key for one second
- Unit will operate for about one more week

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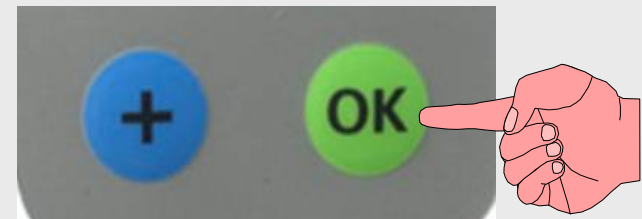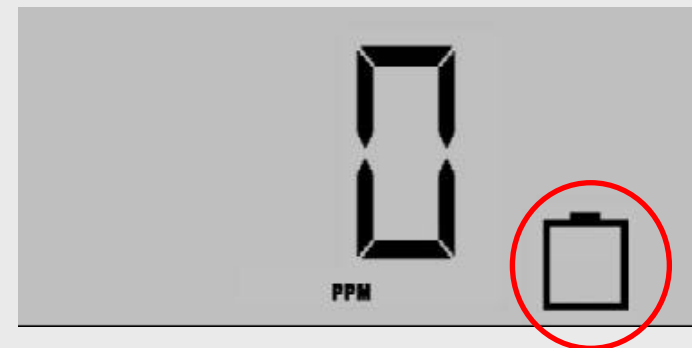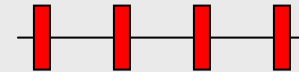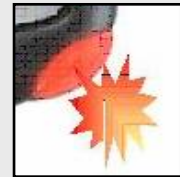
Battery Pre/Main Alarms

Main Alarm

- Audible and visual alarms activate in double repeating pattern

- The "Low Bat" icon blinks in the same pattern

- The alarm can not be silenced (acknowledged)

- The unit will automatically turn off after 1 minute

- Change battery (see Battery section or Manual)

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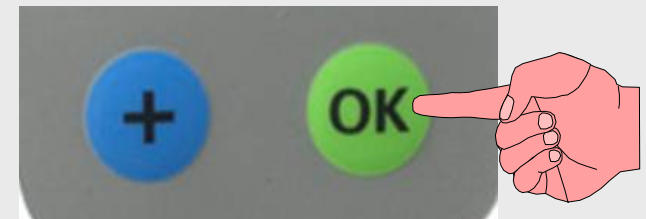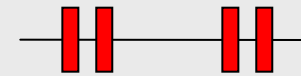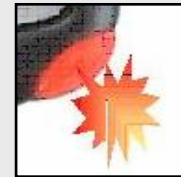
Fault Alarm

- When a fault has occurred in the unit:

  - The audible and visual alarms activate in a triple-repeating pattern

  - A 3-digit code will appear in the display with an error icon "X". Refer to Trouble Shooting Codes in Manual for more information.

  - Correct problem if possible or Contact Draeger Service for help.

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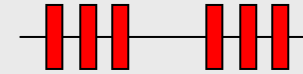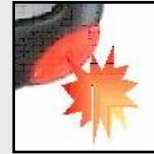
Fault Alarms

- ## Trouble Shooting Codes

Trouble shooting error codes

Code	Cause	Remedies
100	Flash / EEprom write fail	Contact DrägerService
102	AD system defect	Contact DrägerService
104	Flash check sum wrong	Contact DrägerService
107	Self test failed	Contact DrägerService
109	Configuration incomplete	Configure again
210	Fresh air calibration failed	Repeat operation
220	Span calibration failed	Repeat operation
240	Bump test failed	Repeat bump test or calibrate instrument

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Using the Grip Clip

- The PAC x000 can be used with or without the Grip Clip

- To use the Clip, pull up on the metal tab to open the jaws

- Place jaws on either side of the item to be gripped – belt, waistband, pocket, etc.

- Push down on metal tab to close the jaws and grip the item

Grip Clip

Metal Tab

Jaws

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Using the Grip Clip

- The Clip orientation can be changed on the back of the unit by opening the clip and partially removing the Phillips screw.

- The clip will rotate between the bosses on the rear of the unit.

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Preparing for Use

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Prior to Each Use

- Make a visual inspection of the Monitor.

- Watch the warm-up sequence to ensure that the proper sensor and alarm values are displayed

- Follow the proper bump test and calibration procedures as outlined by your workplace

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Operating Life Remaining

- With the unit turned "OFF", press and hold the "+" button for 3 second countdown

- The display will show Gas Type – "CO", "H2S" or "O2"

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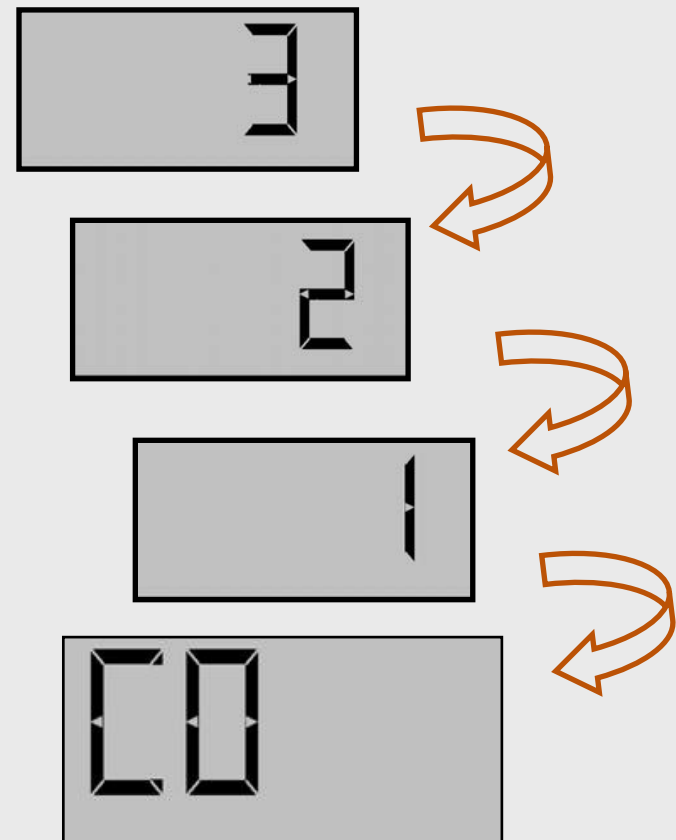
Start-Up Sequence

- After the gas type appears on the display, press the "+" button to go to to the next screen

- A "d" for 'days' will show. Press "+" again and then a number, e.g. "750" will appear

- The number represents the amount of operational days remaining on the unit

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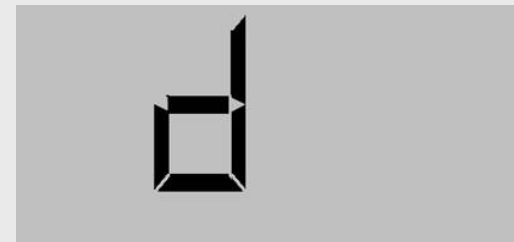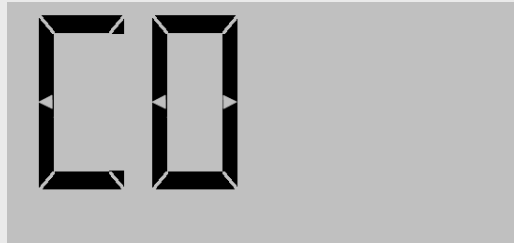
Monitor End of Life

- When the PAC x000 is nearing the end of its operational life, starting at 30 days remaining, it will warn the user of the remaining operating life when it is turned "ON".

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Sensor End of Life

- After pressing the "OK" button, before the normal start-up screens, the display will alternately flash a number and then a "d" for days remaining

- The "OK" button must be pressed for 1 second to acknowledge this message

- Contact Draeger for Replacement at the earliest convenient time

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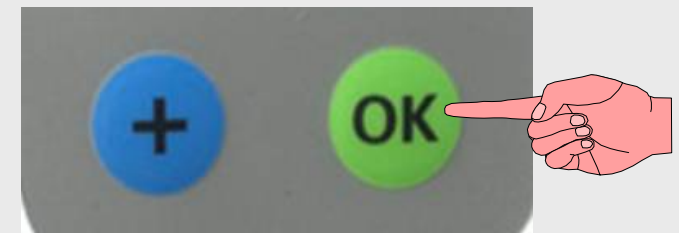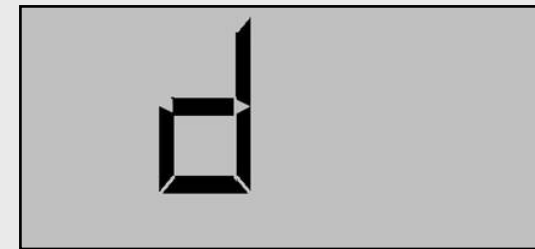
Sensor End of Life

- When the display indicates a "0" and a "d" the unit's operating life is over and the flashing display will no longer be acknowledgeable.

- The unit needs to be taken out of service immediately!

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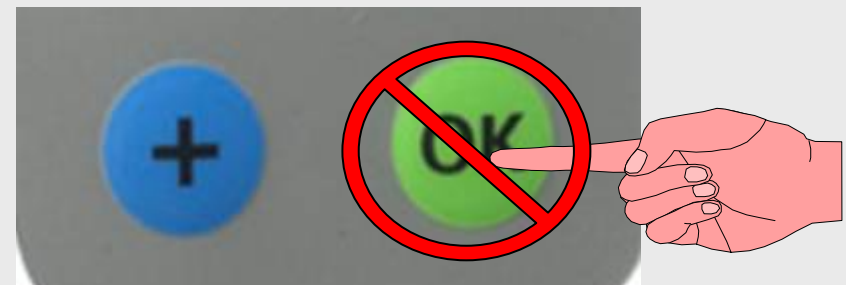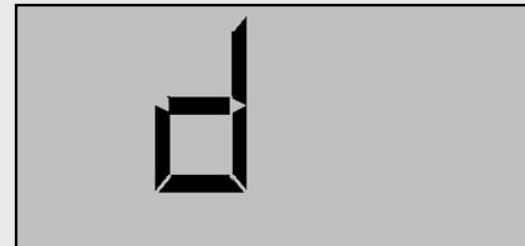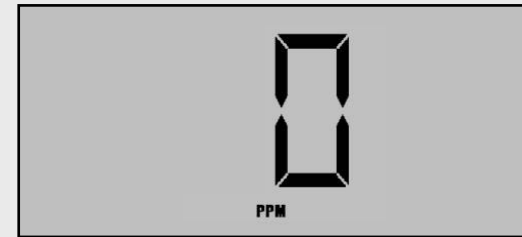
Dust & Water Filter

Sensor Filter

- It is recommended for most applications that a dust and water filter be placed over the Sensor opening to protect the sensor

- Not doing so could allow dust and water penetration, causing sensor or instrument damage

- These filters require periodic replacement

- Please see manuals or sensor data sheets for restrictions on the use of these filters

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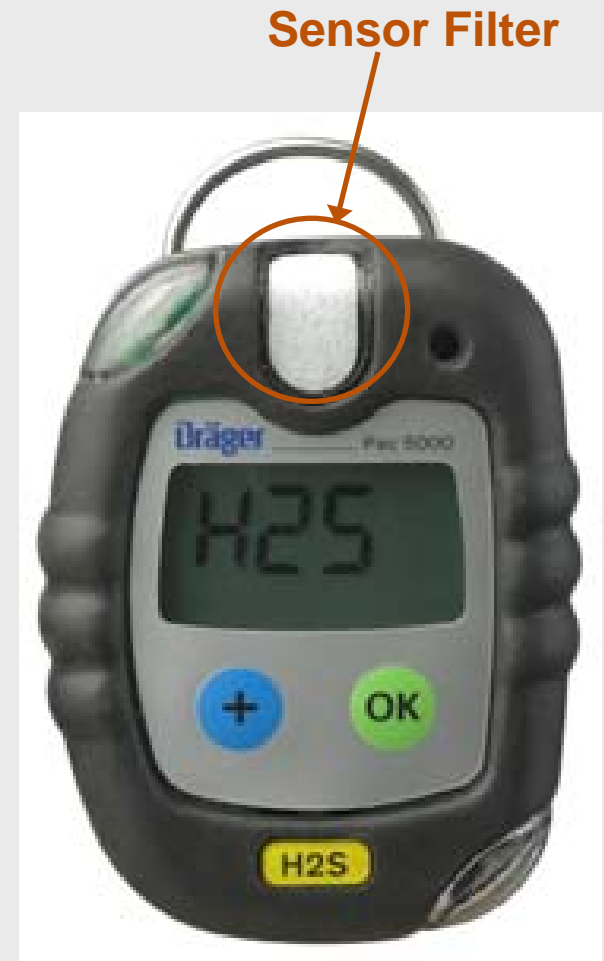
The PAC x000 Battery

- The PAC units run on a replaceable Lithium battery

- Running for 24 hours/day, 7 days/week with 2 minutes of alarm/day, expect:

  – CO and H2S units will operate about 12 to 14 months

  – O2 units will operate about 4 - 6 months

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Replacement Batteries

- Batteries are part of the intrinsic safety approvals of any instrument, including the PAC x000 Series. Use only replacement batteries listed in the Manual:

    - Duracell 123 Photo, Lithium, 3 V
    - Duracell 123 Ultras, Lithium, 3 V
    - Panasonic CR 123A, Lithium, 3 V
    - Energizer EL 123A, Lithium, 3 V
    - Powerone CR 123A, Lithium, 3 V

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Changing the Battery

- To change the PAC x000 battery, remove the four hex screws around the back of the instrument case.

Hex Screws

Hex Screws

- Pull the front and back case halves apart to expose the battery

Front   **Back**

Battery

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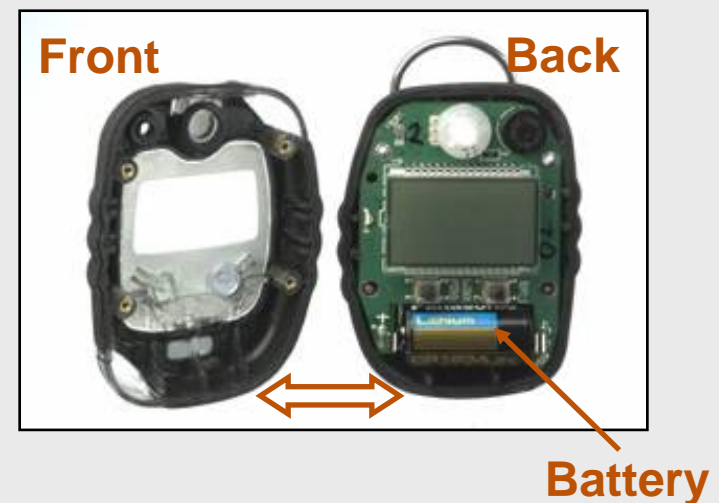
Changing the Battery

- **Carefully remove the old battery**

- **Replace with an approved Lithium Battery, observing the '+/-' polarity**

- **Close unit and replace four hex screws**

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Bump Testing the PAC Instruments

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Bump Testing

- A Bump Test is a functional test of an instrument to ensure it is operating properly:

  - the sensor responds and indicates changing gas concentration properly

  - the alarms work and are set correctly

- The PAC Instruments can be set to remind the user to perform regular bump tests.

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Bump Test Notification

- The PAC Instruments may set up to remind the user to perform regular bump tests at user selectable frequency.

- If this function is active, the "!" icon will appear in the display next to the reading, indicating a bump test is required.

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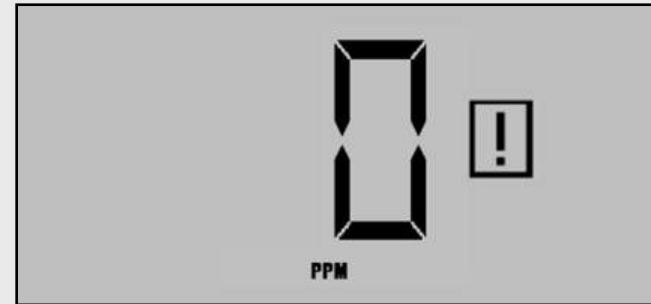
Bump Test mode

- The unit will remain functional, but the icon will not clear until a successful bump test is performed on the unit.

- To Bump test, a known gas must be applied to the unit with a higher concentration than the A2 set point.
  - CO typical 50 ppm
  - H2S typical 25 ppm
  - O2 typical 17% Vol.

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Manual Bump Test

- Place the calibration adapter over the sensor port on the unit.

- Press the "+" key three times in succession to enter the bump test mode

- The unit will double beep and the display will flash

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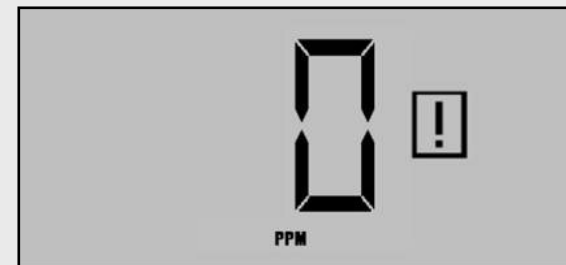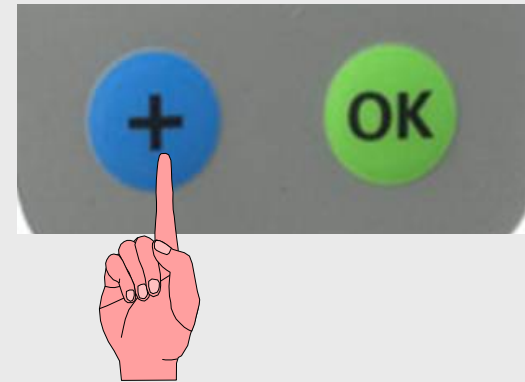
Manual Bump Test

- Apply gas to the unit and observe the reaction

- Watch the sensor response on the display and note the alarm functions –audible, visual & tactile - at the A1 and A2 alarm points

- The display will continue flashing. Wait for the reading to stabilize.

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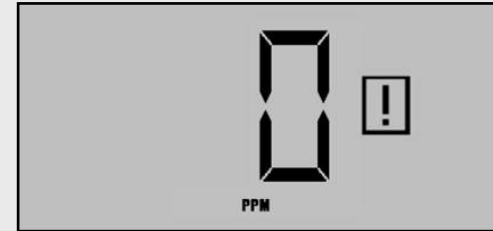
Successful Manual Bump Test

- When the reading is stable, press the "OK" button for 1 second, then remove the gas.

- The reading should drop and the unit will go into Measurement Mode.

- If the Bump Test was successful, the "!" icon will disappear and the unit will read fresh air.

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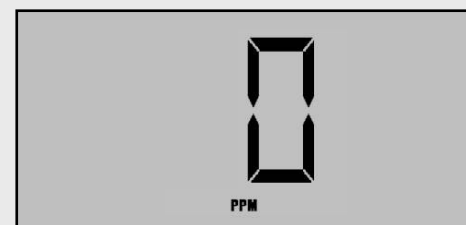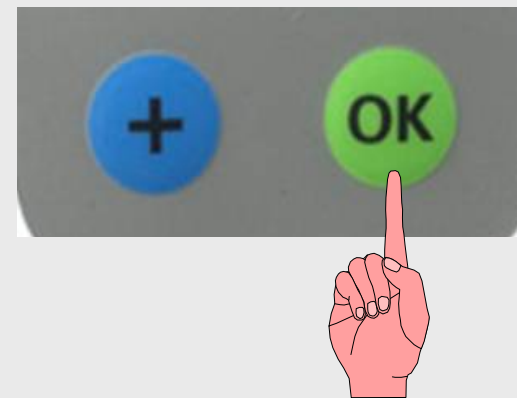
Failed Manual Bump Test

- If the Bump test is NOT successful, the display will flash between "- - - " and "240" with both an "!" and an "X" icon.

- The unit is not usable!

- Repeat the bump test, and if the unit fails, perform a calibration or contact Draeger for help.

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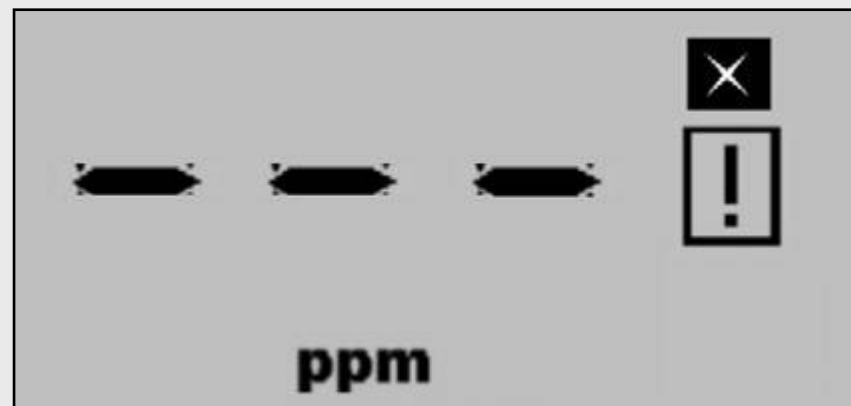
Automated Bump Test Station

- Draeger also offers a drop-in bump test station to automate the bump test procedure and record the test results.

- Contact Draeger for more information.

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Environmental Conditions

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Environmental Conditions

Temperature

- PAC Instruments are designed for continuous operation between -20 to 120°F (-30 to 50°C)

- Use outside of this range may be possible for short periods; please contact Draeger for details

- Rapid or drastic changes in temperature may cause temporary fluctuations of the reading or fault alarms to activate

- At temperatures below 32°F (0°C), the sensors may be slower to respond and battery life will be reduced

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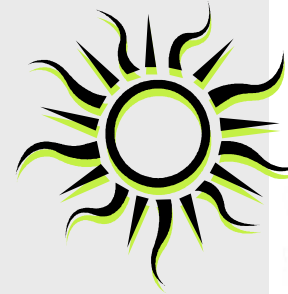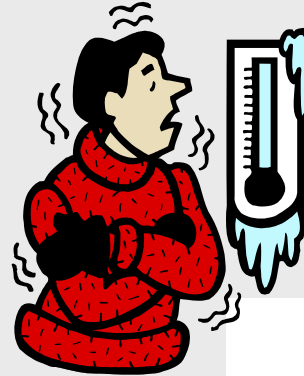
Environmental Conditions

Humidity

- The PAC Instruments are designed for continuous operation between 5 to 95 %RH

- Use outside of these parameters is possible for Short periods; please contact Draeger for details

- Rapid or drastic changes in humidity may cause temporary fluctuations of the sensors

- Condensing water collecting on the sensor or filter may inhibit gas from entering the sensors

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Environmental Conditions

Pressure

- The PAC x000 is designed for continuous operation between 20.7 to 38.4 in. Hg (700 to 1300 mbar)

- Rapid or drastic changes in pressure (entering pressurized vessels or large changes in elevation) may cause slight fluctuations on the sensors

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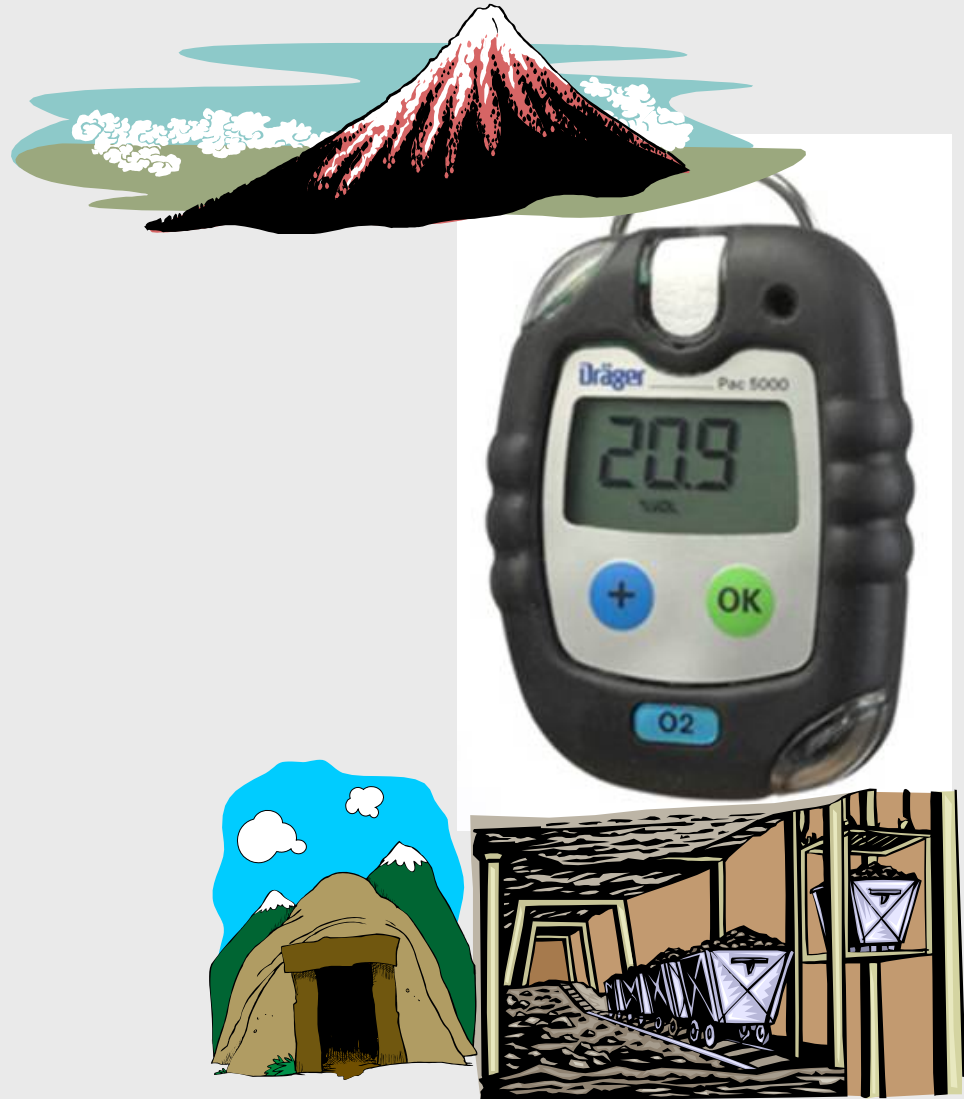
Environmental Conditions

Dust & Mist

- If dust or mist (including splashing water) is allowed to accumulate on the filter or sensor, it can prevent gas from entering the sensor

- In "dirty" or "sloppy" conditions, it is best to wear the PAC x000 upside-down to prevent the sensor from being blocked by contaminate accumulation

- Sensor position does not affect the ability to detect gas or sensor specifications

- If unit is contaminated with dust or liquids, clean and dry the instrument, replace the filters, and bump check or calibrate before returning to service

Drägersafety
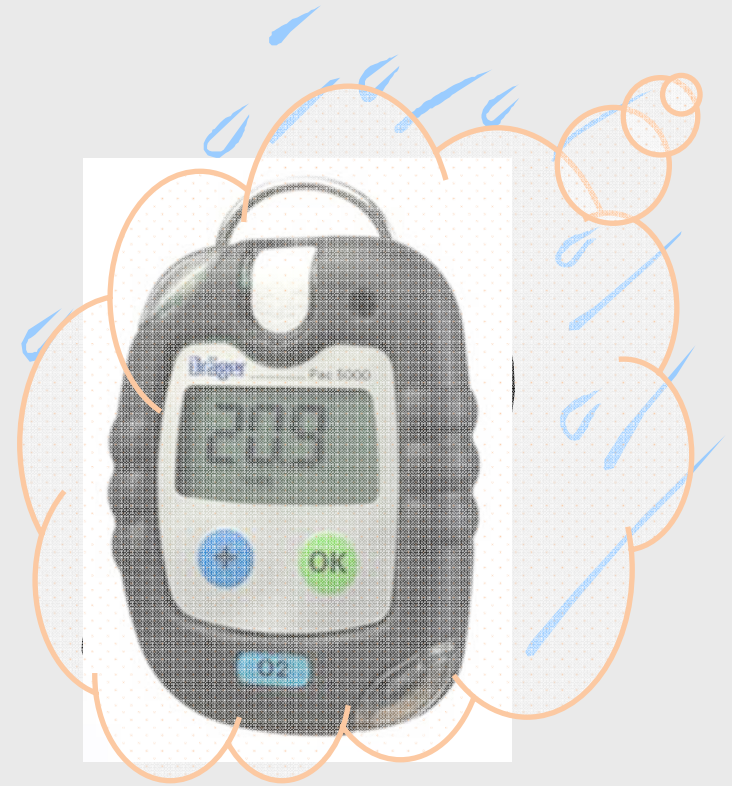
Safety Approvals

- The units meet the intrinsic safety requirements for use in hazardous areas for ATEX, UL and CSA

  - UL Class I, II Div I, Group A, B, C, D, E, F, G,
    Temp Code T4
    $-30°C ≤ Ta ≤ +55°C (-22°F ≤ Ta ≤ +131°F)$

  - cUL Class I, II Div I, Group A, B, C, D, E, F, G,
    Temp Code T4
    $-30°C ≤ Ta ≤ +55°C (-22°F ≤ Ta ≤ +131°F)$

  - CE0158 (89/336/EEC, 94/9/EC)

  - DEMKO 04 ATEX
    I/II M 1/2 G EEx ia I/IIC T4,
    $-30°C ≤ Ta ≤ +55°C (-22°F ≤ Ta ≤ +131°F)$

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Review of Basics

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Quick Review

- Push the "OK" button to turn the Instrument "ON" and Hold during countdown

- To turn the Instrument "OFF", push both buttons at the same time and hold for > 3 seconds

- If there is an alarm, read the display for information icons and gas values

- Take the appropriate safety precautions

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Accessories

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Accessories

- Bump-Test Station

- Leather Carrying Case

- Sensor Filters

- Configuration Software

- Calibration Supplies

- Service Contracts

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Optional Software Functions

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PACVision Software Functions

- Calibration

- Bump Testing and Recording

- Adjust Bump Test/Calibration Interval

- Reconfigure Alarm Levels

  - A1 & A2

- Confidence Beep

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THANK YOU FOR YOUR ATTENTION!