Version

2.42

LDARtools

phx42 User Manual

Rev. Date: October 1, 2026

To confirm this manual is current, please see the phx42 Manual Documentation article in our Knowledge Base.

This page is intentionally left blank.

Table of Contents

Welcome to the LDARtools Family 1

LDARtools Technical Support 2

- LDARtools Customer Portal 3
- User Login Information 4
- Add to Firewall Whitelist 5

The Big Picture 6

Start-up Guide 7

- Intended Use 7
- Storage 7
- External Parts 8
- Connecting the Probe 9
- Preparing for Extension Probe Use 9
- Probe Care and Routing 10
- Disconnecting the Probe 10
- Power Button 11
- Power Button Indicators 12
- Filling the phx42 with H_2 13
- Charging the phx42 16
- Battery 16
- Replacing the Probe Tip Filter 17
- FAQs while Monitoring 17
- Continuous Monitoring 18

phxApp 19

- Starting the phxApp 19
- What's in the phxApp 20
- Menu Options on phxApp 20
- Firmware Updates 21
- Prepare to Ship 21
- Setting a PPM Alarm 22
- Igniting the phx42 22
- A Word About the Self-check 23

Self-check Process 24
Probe Integrity Testing 25
Manual Calibration 25
Creating Daily Calibration Reports 27
Filter Detection 27
Application Error Codes 28
Negative PPM Value Errors 29
Avoiding Contamination 29
Level 1 Repair Procedures 30
Before You Begin 30
Requirements of Level 1 Certification 30
phx42 Level 1 Repair Tech Pledge 31
How to Take the Level 1 Certification Test 32
Required Spare Parts 33
Tool Kit Inventory 33
Identify Internal phx42 Parts 34
Level 1 Repair Procedures 35
Technical Specifications 36
phx42 Operating Parameters 37
Certifications and Markings 38
General Specifications 39
Electrical Parameters 39
Battery and Charging 39
Design Characteristics 39
Electrostatic Requirements 40
Special Conditions of Use 41
Applicable Standards and Directives 42
Environmental Conditions Affecting Use 44
Chemical Exposure 44
Comprehensive List of phx42 Skills 45
Index 46

Welcome to the LDARtools Family

We are excited you have chosen the **phx42** as your VOC analyzer. The **phx42** is designed to work for you.

If you are not getting the results you want, we WANT TO HEAR ABOUT IT—immediately.

LDARtools Technical Support

At LDARtools, we want to ensure you get the maximum performance from all of the software and equipment we offer. We have made every effort to provide a comprehensive manual to assist you with using our products. If you experience issues with any of our products, please contact us for assistance right away.

For general questions, you can consult a member of the LDARtools Technical Support team by emailing support@ldartools.com.

For equipment issues, and before beginning any repair, contact the LDARtools Technical Support team by following these directions:

1. Do either:

    a. Self-check and submit an issue using the phxApp.

    b. Report an issue at LDARtools.com. Click **Support**, **Customer Portal**, log in, and then click **New Issue** to submit a new hardware issue.
    Note: *Only* use this method if the self-check option is not possible and will likely result in an immediate RMA with no possible on-site troubleshooting.

2. If a confirmation email is not received within 30 minutes, please email support (support@ldartools.com).

3. Stand by for instructions from the LDARtools Technical Support team.

REMINDER: Equipment being shipped to LDARtools for repair must have a Return Merchandise Authorization (RMA) label printed and in the box. Failure to do so will result in extra processing and diagnostic expense and time. The only exception would be written instructions from the LDARtools Technical Support team.

LDARtools Customer Portal

The Customer Portal allows you to:

- Create Support tickets
- List/Export assets purchased from LDARtools
- Track assets
- Check activated warranties
- Check outstanding orders requiring action
- See what Cores are due
- View hardware RMA status
    - Log in and click the **Hardware Issues** tab.
    - Locate issue by unit serial number in the **RMA Number** column.
    - See RMA status under the **Status of Hardware Issue** column.
- Track **phx42** repairs
- Edit user information

Customer Portal Registration

Follow the steps below to generate your personal Customer Portal login.

1. Go to LDARtools.com.
2. Click **Support** and then **Customer Portal**.
3. Click **General Questions – Request Portal Access**.
4. Fill in the required fields.
5. Click **Submit Ticket** *OR* use the site login provided with your **phx42**.

User Login Information

Use the following fields to document your personal user login information. Your customer portal credentials will permit you access to the Store and Online Training as well.

LDARtools Customer Portal

LDARtools.com → Support → Customer Portal

Username/Company-Provided Email*	
Password	

LDARtools Store

Use your Customer Portal credentials to track order history and expedite the checkout process.

LDARtools.com → Shop → Sign In

Online Training

Online training and certifications.

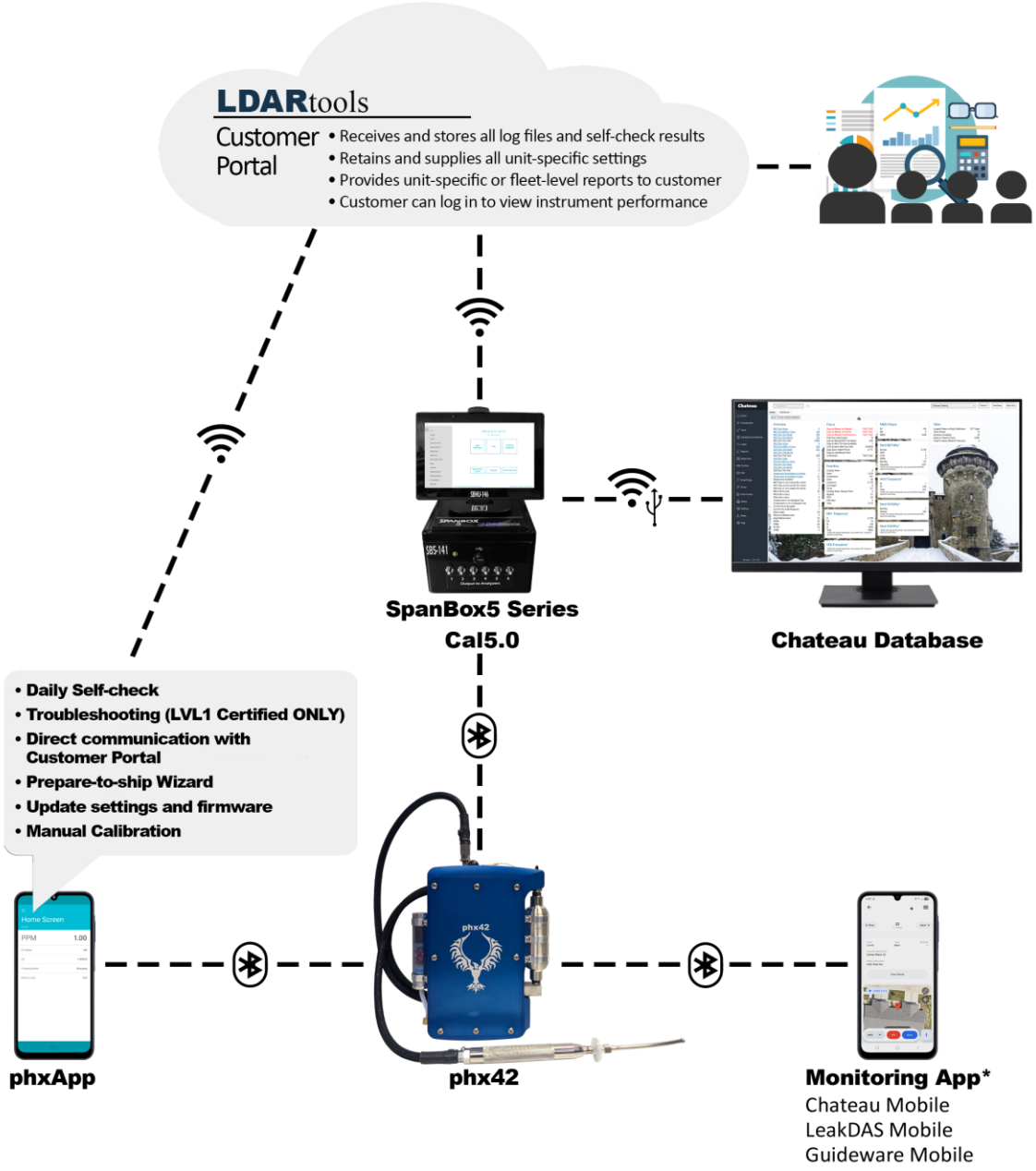
LDARtools.com → Support → Customer Portal → Courses

Add to Firewall Whitelist

The following sites must be whitelisted by your site IT Department for effective on-site troubleshooting and support.

- ldartools.com
- portal.ldartools.com
- unit-settings.ldartools.com
- ldartools.app.box.com
- time.windows.com
- time.nist.gov
- ldartoolsissuereport@gmail.com
- splashtop.com
- inteset.com
- 216.239.35.4
- app.tango.us

The Big Picture



phxApp and SpanBox5 can communicate with the Customer Portal via Wi-Fi or Cellular. Optional Wasp is available, if needed.

*Software selection will dictate compatible handheld options.

Section 1

Start-up Guide

Intended Use

The **phx42 analyzer** can be used to safely collect data in Class 1, Division 1 hazardous locations.

This includes:

- Refineries and chemical plants
- Gas or oil pipelines
- Compressor and pump stations
- Oil field production facilities
- Anywhere VOCs are present
- Indoor and outdoor environments

The **phx42** must be installed in a backpack while in hazardous locations.

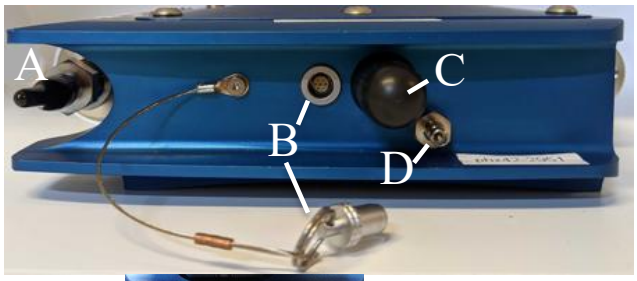
- Use a **Backpack Plate (LDAR#4207)** to protect the connection to the **phx42**.
- The **phx42** should be upright in the backpack with the north end (with **probe port**) facing up so the probe hose can run straight from the analyzer through the Velcro slot at the top, and over the tech's shoulder to avoid crimps and/or tears. Also ensure the supplied D-rings are used to keep the hose in place.
- The **phx42** must not share a pocket with any other items or tools.
- The backpack should fit snugly so the **phx42** does not tilt away from the tech or tip over. This can cause probe kinks.
- To prevent the backpack from opening and the **phx42** falling out during use, it is recommended to position the two zipper pulls to the side of the backpack, rather than joining them at the top. As an additional precaution, you can also clip the zipper pulls together.

Storage

- Overnight equipment storage and calibration should be done indoors at or near room ambient conditions (15-25 °C or 59-77 °F) with a maximum humidity of 85%.
- Ensure the H_2 is kept above 400 psi. Every unit will leak down at its own rate. Experience with your machines will dictate how often they will need recharging.

- When the **phx42** is not in use for an extended amount of time the battery must be charged routinely to maintain optimum battery performance. We recommended charge for 12 hours every 90 days.

External Parts



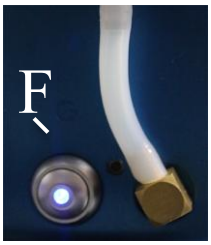
- The connection end (north end) contains the following:

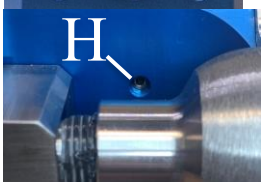
    A. H_2 fill port / H_2 Quick Fill

    B. Charging port / Charging Port Cover, tether

    C. Bluetooth® antenna

    D. Probe port





- Side panels contain the following:

    E. Scrubber (west end)

    F. Power button (west end)

    G. The **FID exhaust** (east end)

    H. Vent (east end)
    (Flame Arrestor Cap assembly is located on the side of the enclosure)

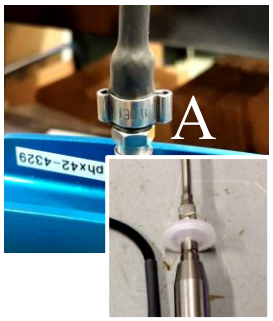
    - **Reminder**: **Never** remove the Flame Arrestor Cap unless instructed to by LDARtools Technical Support within the context of a support case. Damage to the Glow Disk is likely, if not certain.

- The **phx42** enclosure

    - The enclosure is a two-part (cover and base) aluminum housing with a serial number on top. It also has important manufacturer information and certification labeling at the bottom.

TECH TIP: The **H_2 Quick Fill Cover** and the **Charging Port Cover** must always be in place when working in a hazardous location.

Connecting the Probe



1. Snap the **quick disconnect** (A) into the **probe port**.

REMINDER: The **probe** and a **probe tip filter** must be connected to the **phx42** before igniting the device.

Never operate the **phx42 pumps** without a **filter** in place. Do not remove the **filter** on a running **phx42** (unless performing filter detection calibration).

FAQ	**Can I use an extension / other probe on the phx42?** Any device certified for use in hazardous environments using modern standards is done so with accessories defined or attached. The **phx42** was certified with the basic probe. You should consult your safety department for a hazard assessment before using a different probe. Any extension should not exceed 20ft of tubing with minimum ID of 1/8”. The tubing in the standard probe is 1/16” and cannot be used as a base for an extension probe. The extension probe should utilize the same filters as the standard probe. See Probe Integrity Inspection, Manual Calibration, Cal5.0 Manual for further instructions.
	Why is the probe handle so heavy? The **probe handle** was made from stainless steel to comply with the applicable safety standards.

Preparing for Extension Probe Use

Whenever preparing for using an extension **probe** with your phx42:

1. Log in to the Customer Portal and click **Unit Settings**.
2. Locate the phx42 on the list and click the **Edit** icon.
3. Open the **Multi Products** tab and select **Extension Probe.**
4. Using the dropdown, change to **Extension** and enter the **Probe** length of extension from the tip of the **Probe Filter** to the unit.
5. Click **Save**.
6. Next, use your Android tablet with the phxApp installed.
    - **Note:** The tablet must have a network connection *and* be connected to the network.
7. Start the phxApp and connect to your **phx42**.

Probe Care and Routing

When using the **probe**, a few basic points should be kept in mind:

- As previously stated in the **Intended Use** section on pg. 7, ensure the **phx42** is oriented in the backpack so the hose can run straight out of the analyzer, through the Velcro slot at the top, and over your shoulder to avoid crimps and/or tears. Use the supplied D-rings to keep the hose in place.

- When moving from place to place, the probe handle should be attached to the backpack to avoid drops.

- Avoid snagging or pulling on the probe hose.

- Dropping the probe onto the filter could break the filter or cause leaks at the filter interface. Use a **Backpack Plate (LDAR#4207)** to protect the connection to the **phx42**.

TECH TIP: In the event your probe assembly never becomes damaged or develops a leak, it is best practice to rebuild your probe assembly every 6 months, as older hoses can lead to future contamination.

Disconnecting the Probe

1. Pull the collar on the **quick disconnect** to release **probe.**

2. Pull the **probe** off gently.

Power Button

Unit is	And You	Then
OFF	Press and Hold for 2 seconds	Unit will turn ON.
ON	Triple Tap	Unit will ignite.
ON	Quadruple Tap (4x)	**SLEEP MODE*** Unit shuts off solenoid, stopping flow of H_2. Flame will go out. **Pump** will run for an additional 30 seconds (to evacuate moist air from the FID). **Bluetooth** will stay active. THIS is the typical end-of-day process if you are going to be charging overnight. Allow unit to recover to ambient ppm readings before entering Sleep Mode. If the unit does not recover to ambient readings, run a self-check and leave the unit running until Support responds with instructions.
ON	Press and Hold for 5-8 seconds	**POWER DOWN** **Note: If the machine is lit, use the Quad Tap to exhaust the moisture from the FID before you power down.** Unit will power down. This is a *hard power-off*. This process should be avoided unless in these situations: • **If working more than 10 hours, power off when not in use.** • **When putting aside to store (not plugged in to a charger) or for shipping.** • **When you are having connection issues.**

Power Button Indicators

The light pattern on the **power button** provides an indication of the machine's state so that you can give commands using the **power button**.

Light Pattern	**Ignited**	**Bluetooth Status**	**Charging**
OFF/2 Pulses/OFF/2 Pulses	Yes	Discoverable	No
OFF/ON/OFF/ON*	No	Discoverable	No
Steady On (Solid)	Yes	Connected	No
ON/2 Pulses/ON/2 Pulses (Solid/then flickering)	No	Connected	No
Breathing*	No	Either	Yes
No Light	Unit is Off.		
Rapid Fast blink then OFF	Unit has detected a very low **battery** and automatically powered down. In order to restart, you will have to attach the charger for at least 90 minutes before powering back on.		

*Once the **battery** is fully charged but connected to a charger then it will cycle between OFF/ON/OFF/ON and Breathing. This is because once the battery is fully charged it stops charging (even though it is still plugged in) and the light goes OFF/ON/OFF/ON until the **battery** is depleted a minimal amount and charging resumes, the light will then return to breathing.

Filling the phx42 with H_2

Gases are typically stored under pressure in metal cylinders. Cylinders are designed to withstand high pressures. Improper handling and use of compressed gases can result in devastating consequences. Be sure to follow all safety guidelines outlined by your facility.

TECH TIP: Be sure to use only **ULTRA HIGH PURE (99.999%) H_2** with a CGA-350 fitting when filling the **phx42**.

Initial Setup of Newly shipped phx42

The battery and the H_2 cylinder are drained for shipping. Special charging and fill procedures are required.

Charge the battery:

1. PULL the **Charging Port Cover (LDAR# 42013)** to access the **Charging Port**. Twisting/turning the **cover** to remove will damage the **tether**. It does "click" into the **Charging Port**, so some effort will be required to remove the **Charging Port Cover**.
2. Align the red lines on the **phx42 Charger** and the **Charging Port**. Push gently and you will feel a click.
3. Wait 90 mins.
4. Turn on the machine.

Filling Empty Cylinder with H_2

The **motor needle valve** for the **H_2 cylinder** will need time to adjust from an empty to a full cylinder.

Follow the standard "Filling the **phx42** with H_2" procedure, with the following exceptions:

- Fill as described in the normal fill procedure described below, but when the needle on the gauge stops moving, wait **3** minutes with the valve open.

TECH TIP: After you have filled the unit with H_2, it may take several attempts to ignite. This is because the H_2 pressure must stabilize. The best approach is to wait 2 minutes between each ignition attempt. If **Ignition Failure** continues after 3 tries, perform a self-check, and submit a failure with comments to the LDARtools Support team.

Fill Adapter maintenance is critical for successful operation of your **phx42**. See the **H_2 Fill Adapter (LDAR#1260) Maintenance and Installation guide** via the LDARtools Knowledge Base (help.ldartools.com → phx42 → H_2 Fill Adapter).

1. Remove the **H_2 quick-fill cover (LDAR#42908)**.

2. Ensure the following:

   (a) Verify no dust or debris is in the **H_2 Fill Port**.

   (b) Verify no dust or debris is in the **H_2 Fill Adapter**.

   (c) Verify the arrow on the red handle is pointing to the breather side of the fill valve (see photo).

   (d) Verify the gauge nearest the cylinder reads ≤ 1800 psi. If not, adjust the regulator.

   - **Note:** Do **NOT** exceed 1800 psi or the pressure relief valve will vent.

   (e) If pressure has bled off the **H_2 Fill Adapter**, turn the red handle 180° for 2 seconds to bleed any air from the system before connecting to the **phx42**.

3. Power on the **phx42**.

4. Connect the **H_2 Fill Adapter** to the **H_2 fill port**, then verify the connection by slightly pulling on the 3-way valve and spinning the collar.

5. Turn the red handle 180° to open valve. The arrow should point toward the fill hose.

6. Wait until the needle on the gauge stops moving.

7. Turn the handle back 180° to close the valve. There will be a slight hiss from the release of pressure.

8. Pull on the collar of the **H_2 Fill Adapter** to release it.

9. Twist the **H_2 quick fill cover** onto the **H_2 fill port**.

10. Close the bottle. There is no need to bleed pressure off the **H_2 fill Adapter**.

REMINDER: The **phx42** *MUST* have the **H_2 quick-fill cover** in place at all times unless filling.

A very small amount (as little as possible) of O-ring grease should be applied to the phx42 side of the quick connect once a month.

Your **phx42** is now filled with H_2, and while it has been designed to minimize possible leaks, you should handle and store it with caution.

Note: The pressure sensor on the **phx42** will max out at about 1200 psi. The unit can actually hold up to 1800 psi. Use the regulator on your fill adapter to confirm you have filled to 1800 psi.

TECH TIPS:

- Fill your cylinder at end-of-day to accomplish the following:
  - The analyzer will have enough H_2 for end-of-day drift.
  - Being full overnight allows the calibrating tech to see if the pressure is stable or dropping (leak test).
- Many successful users have adopted a 2-fill practice: Mid-day and End-of-day.
- If the **H_2 Quick Fill Cover** pops off, it's likely there's a H_2 leak. Report an issue to LDARtools Technical Support and send the log files.
- For best results, AVOID operating the **phx42** with an H_2 supply of less than 400 psi. That much pressure is required to optimize the **phx42's** ability to stabilize its lower H_2 pressure. The phx42 WILL NOT operate with an H_2 supply of less than 300 psi.
- If the **H_2 Quick Fill Cover** is missing, replace it.
- If using the **v2 H_2 Fill Port** and the filter is missing (figure c below), report an issue immediately.

a

v1 H_2 Fill Port

b

v2 H_2 Fill Port with the filter in place

c

v2 H_2 Fill Port *missing the filter*

Charging the phx42

1. Grasp the tether between the **Charging Port Cover (LDAR# 42013)** and the crimp.
2. Pull the **Charging Port Cover** straight out.

   TECH TIP: It is important to grasp the ring between the cover and the crimp when removing the **Charging Port Cover**. This accomplishes two things:

   - It protects the cable crimp.
   - Ensures you are pulling the **Charging Port Cover** out straight instead of at an angle.
3. Align the red lines on the **phx42 charger port** and the **charger.** Push gently and you will feel a click.
4. Hold down the power button for 2 seconds to power on the **phx42**—the light on the **power button** will breathe/pulse.

TECH TIP: 1) It is best to leave the charger connected during calibrations (daily, PreCal, or drift) for best battery performance. 2) Best practice is to have the chargers labeled to match a specific **phx42**. This allows you to quickly identify charger failures.

REMINDERS:

- The **Charging Port Cover** *MUST* be in place while using the **phx42** in a hazardous area.
- If charging a **phx42** with a fully depleted **battery**, the **power button** may blink rapidly or not respond at all. Leave the **phx42** powered off for a minimum of 90 minutes while connected to charger.
- If the **Charging Port Cover** is missing, replace it.
- When disconnecting the charger from the **charger port**, pull by the **charger connector** only. *DO NOT* pull on the power cord as this will result in severing the cord from the **charger connector**.

  Due to the location of the **charger port**, the **Bluetooth® antenna** may interfere with disconnecting the charger when using your right hand. If you find this to be an issue, you can either use your left hand to remove the charger, or rotate the phx42 180° to allow for easier access.

Battery

As previously stated in the **Storage** section on pg. 7, when the phx42 is not in use for an extended amount of time the battery must be charged routinely to maintain optimum battery performance. We recommended charge for 12 hours every 90 days.

Replacing the Probe Tip Filter

REMINDERS:

1. A **probe tip filter** should **ALWAYS** be in place while the **phx42 pump(s)** are running.

When prompted to change the **filter** by the handheld or before unit start up:

1. Remove the dirty **filter**, and then attach the **probe tip** to a clean **filter**. **Probe Filter-Double Thread (LDAR# 4236)**.

2. Re-ignite.

FAQs while Monitoring

FAQ	**How long should it take to recover from a high PPM to background?** It is impossible to give a specific answer without knowing what type of chemical and for what length of time the **phx42** was exposed. If you are concerned about the recovery time, replace your probe tip filter. If this doesn't resolve the issue, complete a self-check using the phxApp and submit an issue. Comment: "Slow Recovery Time."
	How can I Ignite the phx42 without removing it from my backpack? If unable to "ignite" the **phx42** from your monitoring software, you can use the "triple tap" method without removing the unit from your backpack. You will know the unit is ignited when you see a PPM reading on the monitoring screen.
	What should I do with my phx42 when I come in for lunch? 1. Fill H_2. 2. Leave running. 3. Plug it in.

Continuous Monitoring

The **phx42** can be used to *detect* low concentrations of VOC continuously. This should *not* be used for continuous monitoring of known to be present VOCs, but for normally clean air that could contain VOC. Sustained High levels of VOC and harsh chemicals can cause contamination and or damage to the **phx42** as it is designed as a detection tool, not a process monitoring analyzer.

The **phx42** and its charger *MUST* be outside of a hazardous area.

Before use, check for H_2 leaks with the following procedure:

1. Install a new H_2 fill adapter **O-ring**.
    - **Note:** If using the **phx42** constantly, no replacement frequency is necessary for the **O-ring**. Otherwise, replace the **O-ring** annually or every 500 fills (whichever comes first), or if a leak is detected.
2. Turn off the **phx42**.
3. Bleed air from the fill adapter.
4. Adjust the regulator to 1000 psi.
5. Connect the fill adapter to the **phx42**.
6. Open the fill valve.
7. Turn off the H_2 supply bottle.
8. Note the pressure on the fill adapter gauges.
9. Let it sit for 1 hour.
10. *IF* there is no drop in pressure on the gauges, turn the bottle back on, and then turn on the **phx42**.
11. Plug in the charger and ignite.

Section 2

phxApp

1. The phxApp can be downloaded from Google Play or obtained from your site's IT department.

Starting the phxApp

1. Install the **phxApp** on an Android device with internet access.
2. Open the **phxApp** on your device.
3. Tap the **phx42** device you want to connect to, then tap **Connect to phx**.

   Note: You will need an internet connection the first time you connect to each **phx42**. Any values specific to the unit are only updated during the "initialization" when the unit first connects to the phxApp. If your goal is to update settings, you only need to "initialize." If you are already connected to the phxApp, and you need to update settings, you should disconnect, and reconnect.

   You will be directed to the **phx42** screen once connection is complete.

An internet connection is required with the **phx42** in the following scenarios:

1. When pairing with a new handheld device.
2. To update the unit settings (this should be requested by LDARtools support).
3. To perform a self-check and/or report an issue.

Scan or click the QR code for a video demonstration of connecting to and igniting your phx42 with the phxApp.

What's in the phxApp

The home screen provides:

- The PPM reading (negative number means the unit is not ignited)
- The LPH_2 (Low Pressure H_2) Status
- H_2 (H_2 Tank Pressure)
- The battery status
- The battery charge percentage
- The **Ignite** button

Menu Options on phxApp

1. Tap **Menu.**
2. Tap any of the following:
   - **Calibrate:** Calibrate manually.
   - **Self-check:** Do a self-check on your **phx42**.
     (You must have a Customer Portal login to submit an issue)
   - **Device Details:** Provides more details about your device. Code of the day or login required. Support will provide code of the day as needed.
   - **Update Firmware:** Update the **phx42**'s firmware.
   - **Prepare to Ship:** Drains battery and H_2 supply.
   - **Survey Components**: Inspect components using a CSV file. Contact LTI Support for more info.
   - **Settings**: Set PPM Alarm and Response Factor.
   - **Report App Issue**: Report an App Error or Bug. Use self-check to report an issue with the **phx42**.
   - **Disconnect:** Disconnect from the **phx42**.
   - **About:** See versions of software, settings, and Firmware

Firmware Updates

1. From the menu, tap **Update Firmware**.
2. Select the version of the update.
3. Tap **Update**. Once complete, the phxApp will automatically disconnect from **phx42**.
4. Refresh the Bluetooth list if needed.
5. Select the **phx42** from the list
6. Tap **Connect**.
7. From the menu, tap **About**.
8. Confirm the firmware version is correct.
9. Tap **Done**.

FAQ	**How will I know when a new version of Firmware is available?** It is not necessary to update your firmware unless instructed to do so by LDARtools support. New versions of the firmware will be available on the "Firmware" tab of the phxApp. **Updating firmware will clear calibration records for that day.**
	Do I need to calibrate my phx42 after I update the firmware? Yes. Loading new firmware will clear your calibration records. Avoid updating the firmware unless you have already pulled your monitoring data and performed drifts for the day.

Prepare to Ship

1. From the menu, tap **Prepare to Ship**.
2. Select Domestic or International.
3. Tap **Start**.

TECH TIP: Most units will take from 30 minutes to 2 hours. Some units could take up to 5 hours. Be sure to leave the **phx42** plugged in until all the H_2 has drained. Monitor the status bars to confirm status. Report any problems by running a self-check.

Setting a PPM Alarm

1. Tap the **Menu** in the top-left corner of the screen.
2. Tap **Settings**.
3. Tap the **PPM Alarm** field.
4. Enter the PPM Alarm value you want to set.
5. Tap **Save**.

Igniting the phx42

1. Tap **Ignite**.

****ATTENTION****	The **phx42** must be ignited for at least 15 minutes prior to calibration, drift, as well as any monitoring that is going to be performed. **If the analyzer is used before it is warm, you may receive readings outside of the factory-specified accuracy ranges.**

*During ignition attempts, filter detection is bypassed while the pumps come up to pressure. **Failure to ignite after three consecutive attempts should be reported to LDARtools.** Continued attempts to ignite the unit can result in contamination being pulled into the system.

A Word About the Self-check

- The self-check in the phxApp is used to diagnose, anticipate, and correct any problems that may occur with the phx42. This process allows you to verify the health of the unit, transfer logs (limit length), calibrate your filter detection, and report an issue if any operating parameter is out of range.
- If using a SpanBox5 with Cal5.0, we recommend performing a self-check monthly. If not, a self-check should be performed daily with the phxApp *before* calibration.
- We are displaying PASSED / FAILED / COMPLETE, but we are storing the actual values for troubleshooting purposes.
- All of the following parameters (and more) are evaluated during self-check:
    - Glow Disk
    - Solenoid
    - HPH_2
    - Temperatures
    - LPH_2 Stabilization
    - Sample pressure
    - Sample PPL
    - Probe check
    - Combustion PPL
    - Combustion pressure
    - Pico Amps
    - Other failed parameters may show on-screen as “phx42 error”
- Once you have performed a self-check in the phxApp, any non-acceptable results for any analyzer are flagged and you are given an opportunity to comment and submit to the LDARtools Customer Portal.
- If your phx42 requires an RMA, the diagnosis provided by the self-check will help us return your phx42 as soon as possible.

Self-check Process

1. Tap **Menu**.
2. Tap **Self-check**
3. Follow on-screen prompts.
4. After completion:
    a. In the event of a routine self-check to reset filter calibration, or update settings, and everything passes with no support required, leave the comment field blank, click OK,

    and logs will still be transferred.

    b. If everything passes, but you know there is still an issue to report, slide the

    Submit as Issue toggle to report an issue and enter comments.

    TECH TIP: Report an issue if any operating parameter is out of the published range.

    c. If the unit fails a step, the phxApp will automatically create a Support Issue. To ensure a response from LDARtools support you MUST PROVIDE DETAILS IN THE COMMENT FIELD. Support will analyze the logs, your comments, and then respond.

TECH TIP: Comments should include the time the issue occurred and the process that was being done when the issue occurred. Sample:

- 5:45 AM attempting to calibrate using SB5-998, unit failed calibration on 500 gas.
- 12:30 PM Tech reported a “filter blocked” error with a new filter.
- 4:15 PM Unit failed drift on SB5-999, passed Probe Integrity Inspection.

Scan or click the QR code for a video demonstration of the self-check process.

Probe Integrity Testing

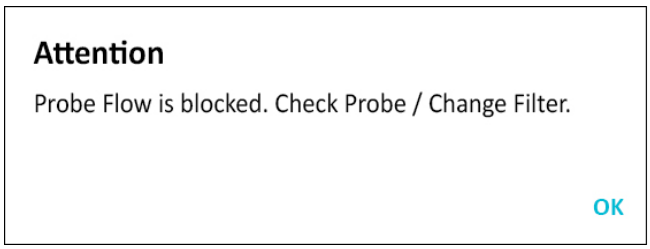
A **probe integrity inspection** is used to identify leaks too small to be detected during the **probe** block step of the self-check. It involves connecting an ignited **phx42** to a supply of zero air and running an alcohol-based wipe along the whole length of the **probe**, while watching the handheld for deflection.

The best practice is to conduct a **probe integrity inspection** every week and/or anytime you have a drift or calibration failure, or suspect a **probe** problem. See the linked **Level 1 Probe Integrity Inspection** procedure on pg. 35 for more information on the inspection process.

Note: A probe integrity inspection is *NOT*…

- A visual inspection
- Blocking the probe tip
- Swapping a suspected leaking probe with a "known" good probe

In the event a filter error is not resolved when following the on-screen prompts during a self-check, a **probe testing adapter (LDAR#4300)** should be used. The probe testing adapter is designed to help identify the root cause of filter-related errors (see error samples below).



To use the **probe testing adapter**:

1. Remove the **probe**, attach the **probe testing adapter** with a clean **probe tip filter** directly to the **phx42**, and run a self-check.
2. If there are no errors, then the **probe** was the cause of the issue. Report the **probe** issue to Support.
3. If there *are* errors, submit the issue to Support and comment: "Self-check completed with **probe testing adapter**."

Manual Calibration

The **phx42** must be ignited for at least 15 minutes prior to calibration, drift, as well as any monitoring that is going to be performed. The **phx42** should not be calibrated with On-Demand regulators as they do not consistently simulate the monitoring process. The vacuum required to open and hold open the valve can and does affect calibration accuracy.

Before you begin manually calibrating with gas bags, please take note of these precautions to ensure the most accurate calibration possible:

- LDARtools recommends using a SpanBox.
- When filling bags, do not fill them completely. Doing so is not only bad for the bag, but it can also cause calibration issues.
- Make sure the bag is not pinched or pressed during calibration.
- Make sure the bag valve is fully open to ensure proper flow.
- Always start with the lower concentration and work your way up to the highest concentration when calibrating, confirming, or drifting.
- Always calibrate a 0 PPM (Zero Air) and a concentration above 2 PPM Methane in AIR.
- Calibration overwrites all prior calibrations. Back-to-back calibrations with different probes do nothing but overwrite the previous calibration.

1. Confirm/Install a clean **Probe Tip filter**.
2. Run the self-check on the phxApp before starting calibrations.
3. Check Probe flow using **Flow Meter Assembly (phx42)** - LDAR# 4024 (0.2-0.3 L/min).
4. Allow for a 15-minute warm-up period.
5. Tap **Menu**.
6. Tap **Calibrate**.
7. Tap **Calibrate All**
8. Type the actual PPM for the cylinder onto the PPM field.
9. Apply gas (begin with 0 PPM) and then tap **Generate**.
10. Let the calibration run.

    The **phx42** will sample the gas, then display the "Calibration Complete" message.

11. Repeat Steps 7-9 until all the Calibration Spans have been added, then tap **Done.**

Note: To calibrate using **Extension Probes** without changing the unit settings, apply gas, wait 18 seconds, and then tap **Calibration**.

TECH TIP: If you experience long Response Times, do a self-check and report the issue in the comments.

TECH TIP: In the event of a drift failure, report an issue after completing a probe integrity check.

FAQ	**What do I do about slow recovery during Daily Calibration?** If, during the confirmation phase after Daily Calibration, it takes more than 2 minutes to recover to the 2 PPM level, you can recalibrate to Zero by clicking the **Cal Zero** button in the phxApp.
	I must use On-Demand Regulators, is there anything I can do? If you must use On-Demands, apply the gas 20 seconds before starting the calibration. Even if you can calibrate, you will experience drift issues.
	Are there any special considerations when calibrating an extension probe? The standard response time is 1 second per foot. When calibrating an extension probe adjust the response time according to probe length (max of 20 ft).

Creating Daily Calibration Reports

The **phx42** does not automatically create daily calibration reports when the device is manually calibrated. A **SpanBox5** with **Cal5.0** is required for digital calibration records to be created for reporting purposes.

For assistance upgrading to a **SpanBox5** for the **phx42** contact sales@ldartools.com.

Filter Detection

phx42 is designed to inform you if you are attempting to operate without a filter. The **phx42** is set to detect a certain vacuum and will not operate if this specific pressure is not met.

To calibrate your filter detection value

Run a self-check through the phxApp and follow the prompts using a .22-micron filter (LDAR#4236).

- **Note on Filters**
    - Our .22-micron filter is recommended over the original 1-micron filter (LDAR#25) as it provides additional filtration to increase the reliability of our software's removal detection feature. The .22-micron filter also distributes accumulated debris more effectively around the filter surface, whereas the original filter allowed contaminants to pile up on the filter in a way which would block the sample flow quicker.

- If using the 1-micron filter, please follow the procedure below:

Step 1	Confirm with Support your phx42 units have been properly set for two-filter operation.
Step 2	Run a self-check through the phxApp and follow the on-screen prompts for the filter settings *using two filters*.
Daily Routine	Run self-check with two probe filters. There is no need to reset the filters again until you have a troubleshooting issue.
Troubleshooting	1. If you receive the "Feels like you removed my filter" message, perform a probe integrity inspection and… 2. Run a self-check through the phxApp and follow the on-screen prompts for filter setting. When prompted, remove BOTH filters at the same time.

When to calibrate your filter detection value

There are three times you should recalibrate your filter detection value:

1. If you see the error: "Feels like you just removed my filter. Please give me a fresh filter so we can get back to work."

2. If you notice the pump DOES NOT turn off when replacing the filter throughout the day.

3. At a minimum, once per month if you routinely use Cal5.0 for daily calibrations.

Responding to a failed filter calibration

If you are unable to calibrate your filter, do a probe integrity inspection (see procedure). Report an issue, including the results of the probe integrity inspection in the comments section.

Application Error Codes

If the application you are using with the **phx42** gives an error code, this is what your machine is trying to say:

Code	Description
5	Too many calibration points.
16	My flame is out.
18	This application failed to set the date and time. I really like to know at least WHEN I am!
19	This calibration cannot be deleted. Contact LDARtools Technical Support.

20	This calibration cannot be possible. I'm reading this signal lower than the last gas you applied.
21	It has been less than x seconds since the last ignition. Cannot calibrate. Please wait.
22	I can't run on H_2 this low!

Negative PPM Value Errors

If a negative PPM value is displayed, it means one of the following:

Code	Description
-40	"Pump at max power for too long, report the issue."
-41	"Probe Flow is blocked. Check Probe/ Change Filter."
-42	"Feels like you just removed my filter. Please give me a fresh filter so we can get back to work."
-43	"Feels like you just removed my filter. Please give me a fresh filter so we can get back to work. (Filter Calibrated)"
-45	"Looks like we just found a high PPM leak. Wait 30 seconds and reignite me. (Chamber overtemp)"
-46	"Trying to ignite! If 3rd attempt fails, report the issue."

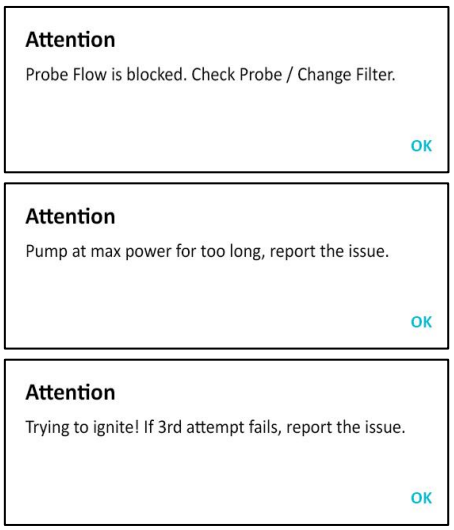
Avoiding Contamination

Contamination is a costly phx42 repair. To avoid contamination, you can follow these best practice steps:

1) Weekly probe integrity inspection
2) Daily self-check if not running Cal5.0
3) *Always* have a filter installed during ignition

Then, PAY ATTENTION TO THE PROMPTS!

After attempting to ignite 3 times, run a self-check. Disregarding prompts may damage the phx42.



Section

3

Level 1 Repair Procedures

Before You Begin

Before any troubleshooting *or* repairs are performed on-site, you must report an issue using the **New Issue** form on the LDARtools Customer Portal, or report the issue through the phxApp (preferred). You will then receive instructions and procedures from the LDARtools Support team.

Remember, to protect the intrinsic safety and reliability of the **phx42 analyzer**, ONLY certified personnel may perform the repairs. Any repairs that cannot be performed based on the procedures provided by LDARtools must be authorized in writing by LDARtools management.

Make sure to complete any required hazard analysis as appropriate or required by your facility.

REMINDER: On-site Level 1 repairs are not required. It is a privilege enjoyed by some LDARtools customers where circumstances allow. If unable to meet the requirements below, Level 1 Support will not be provided.

Requirements of Level 1 Certification

- Internet access (see firewall whitelist on pg. 5)
- Company email access
- Phone Access
- Review the **phx42** Level 1 pledge.
- Passed the **phx42** Level 1 Certification Exam or Refresher in the last 90 days.
- **phx42** Tool Kit LDAR#4203
- Spare Parts inventory (listed below)
- Android device with internet access.

phx42 Level 1 Repair Tech Pledge

- I will **report an issue** before doing any repair or replacement inside a **phx42** case.
- I will **report issues using the phxApp on an internet connection.**
- I understand a log file is being recorded as soon as a **phx42** is powered on. The machine does not need to do anything other than power on.
- I will never turn on or run a **phx42** pump without a probe filter in place.
- I will not use any part in or on a **phx42** that was not provided by LDARtools.
- I will never use electrical tape, duct tape, soldering irons, wire crimps, or anything else not provided by LDARtools to do a repair.
- I will not perform repairs that are not authorized by LDARtools.
- I understand that I am working on equipment that is full of H_2 and strapped to a person's back.
- I will maintain an inventory of at least:
    - 1 QTY – **Sample Pump**
    - 1 QTY – **Combustion Pump**
    - 2 QTY – **Glow Disk Assembly**
    - 1 QTY – **Scrubber Media Kit**
    - 1 QTY – **v2 Probe Repair Kit**
- I will perform weekly probe integrity inspections per the procedure in the **phx42** user manual.
- I will perform the **phx42** self-check at a minimum of once per month with the phxApp.
- I understand that failure to perform the self-check will greatly increase in field equipment failures.
- I will immediately discard/recycle or return to LDARtools replaced parts.
- I will report my own issues, check my email for updates, and respond to the support case.

How to Take the Level 1 Certification Test

In order to complete on-site troubleshooting and repairs we require the Technician to become Level 1 Certified.

Level 1 Certification is valid for 90 days. If your certification has lapsed, please log in and retake the test to ensure your certification is current.

To access online training and complete the **phx42** Level 1 Certification course:

1. Sign in to your Customer Portal account at: LDARtools.com → Support → Customer Portal
2. Click **Courses** at the top.
3. Select the **phx42** Level 1 Certification course and proceed.

If you have any questions, email support@ldartools.com.

REMINDER: We recommend completing the test on your computer. Smartphones (especially older ones) may experience long load times without a strong and stable internet connection.

Required Spare Parts

phx42 Spare Parts Kit LDAR#4230 – 1QTY

1. **Sample Pump** LDAR# 42490 – 1 QTY
2. **Comb. Pump** LDAR# 42491 – 1 QTY
3. **Glow Disk Assembly** - 2 QTY
4. **Scrubber Media Kit** LDAR#4222 – 1 QTY
5. **v2 Probe Repair Kit** LDAR#4315 – 1 QTY

No. of **phx42** on site	No. of recommended spare parts kits
1-5	1 kit
10+	2 kits

Tool Kit Inventory

phx42 Tool Kit LDAR#4203 – 1QTY

a. **5/32 Allen Insert Tool**
LDAR#4226- 1QTY

b. **T25 Security Torque Bit**
LDAR#964 – 1QTY

c. **Philips Screwdriver Bit**
LDAR#4218 – 1QTY

d. **1/16 Allen Insert Tool**
LDAR#4225 – 1QTY

e. **0.7 mm Hex Driver**
LDAR#4216 – 1QTY

f. **Glow Disk Tool**
- Case included (not pictured)

LDAR#4220 – 1QTY

g. **Probe Testing Adapter**
LDAR#4300 – 1QTY

h. **Flame Arrestor Wrench**
LDAR#42191 – 1QTY

i. **Wiha Driver**
LDAR#965 – 1QTY

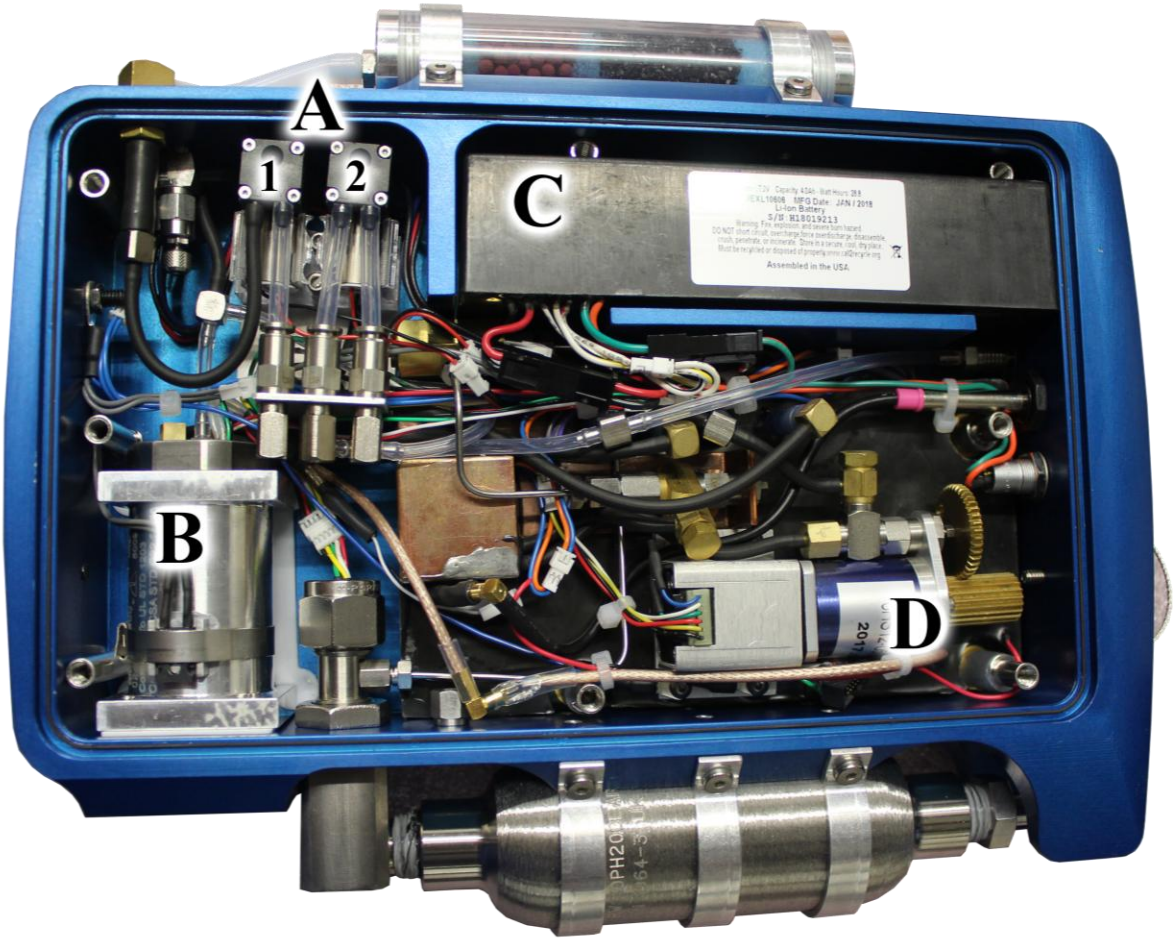
j. **Angled Wire Cutters**
LDAR#1741 – 1QTY

k. **Scrubber Spanner Wrench**
LDAR#4219 – 1QTY

l. **Fixed-Tip Retaining-Ring Pliers**
LDAR#4217 – 1QTY

Additional tools:
Flow Meter Assembly (phx42) - LDAR# 4024

Identify Internal phx42 Parts



A. Pumps

   1) Combustion

   2) Sample

B. FID Housing

C. Battery

D. Motorized Needle Valve

Level 1 Repair Procedures

Please refer to the following procedures for all Level 1 repair procedures.

- Antenna Upgrade
- Battery Replacement
- Bluetooth Signal Strength Check
- Broken Probe Tip Filter Removal
- Charging Port Cap Installation
- Glow Disk Replacement
- phx42 v1 Probe Assembly
- phx42 v1 Probe Disassembly
- phx42 v2 Probe Assembly
- phx42 v3 Probe Repair
- Probe Integrity Test
- Probe Testing Adapter Procedure
- Pump Replacement (Combustion)
- Pump Replacement (Sample)
- Removing/Installing Enclosure Lid
- Scrubber Media Replacement

Hard copy users:
Scan QR code to access work instruction procedures.

Section 4

Technical Specifications

What You Get:

- **phx42**
- Standard Probe
- Shipping Pelican Case

What You Need:

- H_2 Fill Adapter
- External Handheld
- Backpack (**Note**: While the selection of the backpack is up to the end user, the **phx42** must not share a pocket with any other items or tools.)
- Training and Installation – We require all new customers purchase training/install. The **phx42** has the best technology and we want to make sure you know how to make it work for you.
- 12V (Max) 1A nominal Class II Power Supply with applicable connector fitting.

What You Might Want:

- Software
- Spare Parts Kit – The kit includes all parts you might need for minor on-site repairs.
- Extended Warranty

Warranty and Replacement Parts:

- Repairs are only to be made by LDARtools Certified Personnel. Repair by noncertified personnel will invalidate the warranty and require factory recertification.
- All replacement parts must be obtained from LDARtools. Use of parts from unauthorized vendors will invalidate the product warranty and may impair the intrinsic safety of the device.

Cleaning and Equipment Maintenance:

- The **phx42** may be cleaned using a damp rag in a non-hazardous location.
- If the **phx42** experiences a defect or malfunction resulting from misuse, or accident including internal contamination it must be returned to LDARtools for factory recertification.

phx42 Operating Parameters

Warm-up Time (M21/LDAR mode)	15 Minutes
Probe Flow Rate	0.2 to 0.35 Liters/minute
Accuracy / Range	The greater of 10% or +/- 1.0 PPM at calibration points 0 to 100,000 PPM (methane)*. *Factory Calibration is available for spans higher than commercially available.
Linear Range	0-10,000 PPM with Zero Air and a single span point between 100-500 PPM. Linear Accuracy greater of 10% or +/- 1.0 PPM. The linear range can be increased to 50,000 PPM if calibration points of 10,000 PPM and 25,000 PPM are added.
High Elevation	Contact Technical Support if attempting to operate your **phx42** at elevations at 5000 ft or above. We can update settings to enable high altitude operations.

Certifications and Markings

Method21 Compliant Analyzer

The following is marked directly on the product:

LDARtools, Inc.
1102 Dickinson Ave. Dickinson, TX 77539 USA
Model # 4200
Serial # phx42-xxxx
MM/YYYY
Control Drawing Reference number: D-phx42-DSD
Use only IS Battery Pack: LDAR#42200
Class I, Division 1, Groups A, B, C, D, T3 (Per UL and CSA deviations)
Class I, Zone 1 AEx db ia IIC T3 Gb
CE 0359 Ex II 2G
Ex db ib IIC T3 Gb
AEx db ib IIC T3 Gb
-20°C ≤ Tamb ≤+40°C

The following additional ratings and warnings exist:

- WARNING: To prevent ignition of a hazardous atmosphere, batteries must only be charged in an area known to be nonhazardous.
- AVERTISSEMENT: Pour empêcher l'allumage d'une atmosphêre dangereuse, des batteries dovient seulement être chargêes dans un secteur connu pour être nonhazardous.
- WARNING: Do not open enclosure in hazardous locations.
- AVERTISSEMENT: n'ouvrez pas l'enceinte dans des endroits dangereux.

Certificates:

ITS17ATEX202629X
IECEx ETL 17.0055X

General Specifications

- Weight: 8 lbs. [3.6 kg]
- Size: 10” x 2.16” x 7.5” = 162 $inch^3$ [411.48 cm^3]
- Battery life: 10+ hours
- H_2 life: 10+ hours

Electrical Parameters

- See D-phx42-DSD for equipment electrical parameters.

Battery and Charging

- Use only IS Battery Pack: LDAR#42200
- See Battery Spec Sheet for pack details.
- Charge with 12V (Max.) 1A nominal Class II Power Supply with applicable connector fitting.
- Allow 10 hours or overnight to fully charge.
- Charge for 12 hours every 90 days.

Design Characteristics

- External PDA Control
- Integrated Bluetooth
- FID Only
- Durable Flame Arrestor Housing
- Replaceable Battery
- Connection points all on one side

Electrostatic Requirements

The phx42 analyzer must be carried within a backpack in normal use. It shall be ensured that this backpack complies with the electrostatic requirements of IEC 60079-0 to prevent electrostatic charging of the equipment contained.

Static electricity occurs commonly in industry and daily life. Many of the effects are harmless and either pass completely unnoticed or are simply a nuisance, but static electricity can also give rise to a hazardous situation. In such situations, the hazard can generally be reduced by charge relaxation. Hazards caused by electrostatic charge include ignition and / or explosion of flammable atmospheres, see IEC 60079-0 and EN 13463-1.

In addition, static electricity can introduce operational problems during manufacturing and handling processes, e.g. by causing articles to adhere to each other, or by attracting dust. Static electricity is generated by:

a) the contact and separation of solids e.g. the movement of conveyor belts, plastics film, etc. over rollers, the movement of a person;
b) the flow of liquids or powders, and the production of sprays;
c) induction phenomena, i.e. objects reach high potential or become charged due
d) to being in an electric field.

The accumulation of electrostatic charge can give rise to hazards and problems in a wide range of industries and working environments, and to ignition and explosion hazards particularly in chemicals, pharmaceuticals, petroleum and food processing industries. Because of the large number of industrial processes that could be involved it is not possible to give detailed information relevant to all of them. Instead, please refer to IEC/TS 60079-32-1-2013 document which describes the problems associated with each process and provides guidance on how to avoid them. This information should enable the plant operator to take whatever precautions could be necessary to avoid ignitions of potentially flammable atmospheres and electrostatic shocks (i.e. conductive floors, dissipative footwear, protective clothing and gloves).”

Special Conditions of Use

- Equipment has the facilities to connect a charger in the non-hazardous area which has been assessed for a maximum Um of 12V. This Um voltage is required to be maintained in accordance with Clause 16.2 of IEC 60079-14.

- Equipment is intended to be carried within a backpack in normal use. It shall be ensured that this backpack complies with the electrostatic requirements of IEC 60079-0 to prevent electrostatic charging of the equipment contained.

- The following metal parts have been considered isolated metal parts and have the potential to hold charge.

Main Enclosure:	1.78nF
Probe head:	18.54pF

  Refer to the "Electrostatic Requirements" section of the instruction manual for details on the mitigation of electrical discharge.

- The analyzer must be carried within a backpack which suitably protects the product from unwanted metal to metal impact and thus prevents possibility for dangerous sparking in explosive atmospheres.

- Equipment contains an FID housing certified to protection concept Ex db. Per the requirements of this standard no modification or repair is permitted to be made to the equipment flamepaths.

Applicable Standards and Directives

Ordinary Locations Safety Standards	
IEC 61010-1: 2010 +C1: 2011 +C2:2013	Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements *Note: For CB Scheme
EN 61010-1: 2010	Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements *Note: For European differences of CB Scheme
UL 913: Ed 8: 2013 and	Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations
CAN/CSA-C22.2 NO. 157-92 (R2016)	Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
UL 61010-1-2012 and CSA C22.2 No. 61010-1-12	Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements *Note: For USA and Canada national differences of CB Scheme
Hazardous Locations Safety Standards	
IEC 60079-0: 2011 +C1: 2012 +C2:2013	Explosive atmospheres - Part 0: Equipment - General requirements *Note: For IECEx Certification
IEC 60079-1: 2014	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" *Note: For IECEx Certification
IEC 60079-11: 2011 +C1: 2012	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i" *Note: For IECEx Certification
EN 60079-0: 2012 / A11:2013	Explosive atmospheres - Part 0: Equipment - General requirements *Note: For ATEX Certification
EN 60079-1:2007	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" *Note: For ATEX Certification
EN 60079-11:2012	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i" *Note: For ATEX Certification
UL 1203, 5th Ed., Revised: 04/24/2015	Explosion-proof and Dust-ignition-proof Electrical Equipment for use in Hazardous (Classified) Locations *Note: For USA listing certification (Division scheme)
UL 60079-0, 6th Ed., Revised: 07/26/2013	Explosive atmospheres - Part 0: Equipment - General requirements *Note: For USA listing certification (Zone scheme)
UL 60079-1, 6th Ed., Revised: 08/09/2013	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" *Note: For USA listing certification (Zone scheme)

UL 60079-11, 6th Ed. Revised: 03/28/2014	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i" *Note: For USA listing certification (Zone scheme)
CSA C22.2 No. 30 – 1986, R2012	Explosion-proof Enclosures for use in Class I Hazardous Locations *Note: For Canada listing certification (Class I, Division 1)
CSA C22.2 No. 25 – 1966, R2014	Enclosures for Use in Class II, Groups E, F, and G Hazardous Locations *Note: For Canada listing certification (Class I, Division 1)
CSA C22.2 No. 60079-0: 2011	Explosive atmospheres - Part 0: Equipment - General requirements *Note: For Canada listing certification (Zone scheme)
CSA C22.2 No. 60079-1: 2011	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" *Note: For Canada listing certification (Zone scheme)
CSA C22.2 No. 60079-11: 2014	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i" *Note: For Canada listing certification (Zone scheme)

EU Directives	
PED 2014/68/EU	The pxh42 Gas Analyzer does not fall into a PED category but must be designed in accordance with Article 4.3, commonly referred to as Sound Engineering Practice.
EN 1127-1:2011	See Technical File Lodging.

Environmental Conditions Affecting Use

The following table describes the conditions where using the device and sample stream monitoring is recommended:

External Influence	Reference Operating Conditions	Normal Operating Conditions	Operative Limits	Transportation and Storage Limits
Ambient Temperature	23±2 °C 73±2 °F	-20 to +40 °C -4 to 104 °F	-20 and +40 °C -4 and 122 °F	-20 to +40 °C -4 and 122 °F
Ambient Pressure	860 to 1060 mbar	70 to 108 kPa		20 to 108 kPa
Relative Humidity	50%±10%	FID: 20 to 95% noncondensing	15 and 95% noncondensing	0 to 100%
Conducted Susceptibility		N/A (The phx42 is battery-operated)		
Conducted Emission		N/A (The phx42 is battery-operated)		
ESD Sensitivity			>6000 Volts	
Battery Charging Voltage	12V (Max.) DC	12V (Max.) DC		N/A
Elevation for Use	Sea Level	Max 2000M	Max 2000M	

Chemical Exposure

The **phx42** Gas Analyzer uses a flame ionization detector to analyze atmospheric samples containing hydrocarbons. Sample gas is collected and passed through a H_2 flame and ions from combustion of the sample are measured, recorded, and reported. Primary gas used for equipment calibration is Methane in Air (various concentrations).

Comprehensive List of phx42 Skills

Normal Operations

1. Clean it
2. Power it ON/OFF
3. Know the end-of-day sleep mode procedure
4. Change **Filter**
5. Ignite it
6. Connect and Disconnect to the phxApp or your Monitoring Software
7. Fill H_2
8. Confirm that the **H_2 Cap** is in place
9. Attach unit to **Charger**
10. Confirm that the **Charging Port Cover** is in place
11. Take a PPM Reading
12. Initiate a self-check using the phxApp
13. Block the **Probe tip** during the self-check process
14. Calibrate using Cal5.0 (if applicable) AND Manually Calibrate
15. Report issues to LDARtools
16. Perform the Probe Integrity Inspection (weekly)
17. Initiate the Prepare-to-Ship Wizard
18. Receive it after shipping
19. Collect Inspection records with the Basic Survey Mode (optional)
20. Verify that you have most current version of **phx42** Manual
21. Update the phxApp firmware
22. Set a PPM Alarm
23. Set a Response Factor other than 1

Level 1 Certified Operations

1. Troubleshoot issue with LDARtools Technical Support
2. Repair a **Probe**
3. Remove broken **probe tip filter**
4. Replace **Scrubber filter media***
5. Replace the **Glow Disk***
6. Replace the **Battery***
7. Replace a **Pump***

*Only *after* reporting an issue on the Customer Portal.

Index

Antenna 47
Bluetooth 8, 11, 12, 16, 21, 39
Calibrate 20, 26, 45
charger 12, 13, 16, 41
Charging port 8
Charging Port Cover 8, 13, 16, 25, 45
Combustion 23, 31, 34
Device Details 20
extension 9, 47
FAQ 9, 17, 21, 27, 47
FID exhaust 8
Firmware 20, 21
Flow Meter Assembly 26, 33
H_2 fill port 14, 15
H2 Quick Fill Cover 8, 15
Hydrogen 8, 13, 14, 20, 31, 36, 39, 45, 47
Hydrogen fill port/H2 Quick Fill 8
Ignite 17, 20, 22, 45
Ignition Failure 13
LPH2 ..... 20, 23
Menu 20, 22, 24, 26
Motorized Needle Valve 34
O-ring 15, 47
Pelican Case 36
phxApp 19, 20, 21, 23, 26, 27, 31, 45, 47
Power button 8
POWER DOWN 11
Prepare to Ship 20, 21
Probe port 8
probe tip filter 9, 17, 45
quick disconnect 9, 10, 47
Scrubber 8, 31, 33, 45, 47
Self-check 17, 20, 21, 24, 26
Settings 20, 22
SLEEP MODE 11
software 2, 17, 20
Spare Parts 30, 33, 36
TECH TIP 8, 13, 16, 21, 27
Vent 8
Warranty 36

phx42 Manual Change Log		
Rev1	3/8/2018	Added to Technical Specifications section
Rev1.2	4/9/2018	Added Uncontrolled If Printed watermark and pump repair procedures
Rev1.3	5/7/2018	Added Flame Arrestor warning
Rev1.4	5/15/2018	Added Changelog, revised power button indicator table and title page
Rev1.5	5/22/2018	Moved changelog, edited pulse pattern, added references to phx42 report feature, and other miscellaneous changes.
Rev1.6	6/19/2018	Added "the Big Picture", List of "phx42 skills", updated power button table, added "Sleep Mode" and "Power Down" Definition, added "Rapid Blink" definition to "Power Button Indicators" table, added "Tech Tip" to H_2 Fill section. Expanded the Charging procedure. Added data to 42App section.
Rev1.7	6/22/2018	Added Scrubber medium replacement procedure, added receiving from shipping procedure, removed duplicate backpack details, moved probe inspection to the beginning of the level 1 section. Added Tech Tips to the charging and pump replacement procedure.
Rev1.8	8/01/2018	Added Best Practice to H_2 fill section. Added Best Practice, Note, Important, Tech Tip icons. Revised spare parts kit to include spare part numbers per phx42, increase quantity of sample pumps to 2, and added H_2 fill cover to list. Added FAQ questions on extension probe and sample pumps. Added 42App error code table. Added Glow disk Repair Procedures. Changed "glow-disk" to "glow disk." Added tubing description to weekly probe integrity check. Added phx42 operating parameters. Grammar and punctuation changes. Added quick disconnect image. Changed column order for "Power Button" section. Added missing sections to ToC.
Rev1.9	10/01/2018	Added reference to Docs section of Support Portal. Formatting changes. Added orientation references to the external parts section. Changed Tech tip/Note/Important to Tech tip/Reminders. Added FAQs. Revised Receiving After Shipping. Added instructions on how to take Level 1 test. Revised the toolkit inventory page. Revised the weekly probe inspection section. Revised the removal and reinstallation of the enclosure lid. Revised the Scrubber media section. Added the glow disk repair section. Added the User login information section.
Rev2.0	01/10/2019	Added Antenna Procedure. Added fill adapter and O-ring maintenance note. Changed power connection to electrical connection. Added plastic filter collar procedures. Added note on differences between sample and combustion pumps. Edited calibration section to include recalibration to zero note. Added note on Support Portal and Customer login page. Added Firewall whitelist. Added Probe construction and probe repair sections.
Rev2.01	1/18/2019	Updated Filter Detection section and clarified reignition attempt criteria. Updated flow rate to .2 - .3 in Technical section. Edited Manual Calibration procedure. Added FAQ to Pump section.
Rev2.02 AND 2.03	9/19/2020	Updated Filter Detection Section, updated tool kit list, remove probe repair procedure, updated phxApp name
Rev2.04	11/18/2020	Updated link on cover page. Added pictures (set screw, vent, charging port/cover) updated pictures with clearer lettering. Added Storage instructions. Updated self-check process. Added section for filling empty/dead units. Added Appendix A. Added Index
Rev2.05	2/26/2021	Added Tech tip referring to keeping at least 400psi of H_2 in the unit. Added Tip referring to ignition attempts. Changed nominal operating temp to 104°. Added Elevation warning to parameters. Added info to the Filter Detection page. Added 15-minute warm up requirement to "Igniting phx42" section Removed "More about the phxApp" section

Rev2.06	3/30/2021	Edited Manual Calibration, new External Parts photo, H_2 Quick fill and Charging port Tech Tip, new Tool Kit photo, added tools to Tool Kit list, added Probe Test Adapter section, moved and edited Probe Care and Routing section, edited Power Button Section, Edited Charging the phx42 Section, removed all reference to "Gas Check", Edited Filter Detection Section, Application Error Codes updated. Edited Firewall Whitelist.
Rev2.07	8/5/2021	Updated Level 1 Tech Pledge, updated "Required Spare Parts" list (pg. 25) according to Pledge revisions, edited "Level One" to "Level 1" throughout document, edited "Hydrogen" to "H_2" throughout document, edited "Spanbox5" to "SpanBox5" (pg. 20), edited "glow disk" to "Glow Disk" throughout document, edited "Self-Check" to "Self-check" / "self-check" depending on use and placement throughout document
Rev2.08	9/7/2021	Removed, "Sleep mode, connected, disconnected, or ignited are all ok. In some cases, a flameout will occur. This is normal," from step 3 of the Fill Adapter Maintenance section under *Filling the phx42 with H_2* on page 9.
Rev2.09	11/11/2021	Updated any references to "42 app" to "phxApp." Added Tech Tip regarding Ultra High Pure (99.999%) H_2 to Filling procedure on pg. 9; removed individual Level 1 repair procedures from section 3, added list of Level 1 repair work instructions linked to corresponding documentation; enlarged internal components diagram in section 3 on pg. 26, added "Internal" to section header; updated contents to reflect changes; updated tool kit inventory photo, rearranged parts list accordingly; added spare parts kit part number; revised online training access instructions. Changed "Sample Flow" to "Probe Flow" on page 39. Changed recommended probe flow rate to ≥0.12 Liters/minute on page 39 with note stating to report an issue if probe flow rate drops below 0.12 Liters/minute. Removed table below "Responding to failed filter calibration section on page 20. Removed right-most column on the "Accuracy and Linear Range" row of the phx42 Operating Parameters table on page 32.
Rev2.10	12/2/2021	Added step instructing to allow for 15-minute warm-up period after step 3 to Manual Calibration section (pg. 19).
Rev2.11	12/6/2021	Added customer support registration instructions (pg. 28), revised user login information page (pg. 29) with new hyperlinks and directories and added specifics to assist with registration for first-time users. Removed specific references to Litmos.
Rev2.12	1/5/2022	Relocated Technical Support section (formerly Section 4) up to page 2—original pg. 2 Technical Support page featured same content as first page of original Section 4 Tech Support; changed all references to "Customer Support Portal" to "Customer Portal"; added text to Self-check section step 4.a (pg. 21) informing user not to type anything in the event of regular daily/weekly self-check procedures; added list of scenarios requiring internet connection (pg. 16); added list of negative PPM value errors (pg. 24).
Rev2.13	1/7/2022	Relocated (and edited) Tech Tip regarding reporting an issue in the event any operating parameter is outside of the published range on pg. 21; changed recommended probe flow rate on pg. 32 from *≥ 0.12 Liters/minute* to *0.2 to 0.35 Liters/minute*.
Rev2.14	1/19/2022	Updated Firewall Whitelist (pg. 5) as per K. Moses and K. Regan's specifications.
Rev2.15	1/26/2022	Removed cal.ldartools.com and api.splashtop.com from the Firewall Whitelist as per K. Moses' request, revised "Scrubber Medium" to "Scrubber Media" where stated.
Rev2.16	3/15/2022	Revised online training instructions for LMS change (pg. 4, 27), updated whitelist to remove Litmos domain and add the talentLMS domain (pg. 5).
Rev2.17	4/13/2022	Added text regarding to replacing probe tip filter to *FAQs while Monitoring* (pg. 15).

Rev2.18	5/19/2022	Added Flame Arrestor Cap warning back after removal of the Glow Disk replacement work instruction from the Level 1 Repair section. The warning now appears in the external parts overview (pg. 8); removed "Probe Flow is blocked. Check Probe/Change Filter" error from *When to calibrate your filter detection value* (pg. 23); added "troubleshooting" to Level 1 Repair advisory at start of section (pg. 25); revised index.
2.19	5/25/2022	Added advisory to step 2.d (pg. 13) not exceed 1800 psi when filling with H_2; removed "Recommended" from "Recommended Probe Flow Rate" (pg. 32)
2.20	6/9/2022	Revised registration instructions for Level 1 certification online training, removed "Ease of Use and Safety Features" section (pg. 34).
2.21	6/16/2022	Revised "12v" to "12V Max." for the power supply type under the "Battery and Charging" section (pg. 34, 37, 42).
2.22	7/22/2022	Added LDARtools Box web address to the Firewall Whitelist (pg. 5).
2.23	8/31/2022	Added section on continuous monitoring (pg. 16); added reminder about not disconnecting the charger by pulling on the cord, using the charger connector only (pg. 15).
2.24	11/22/2022	Added updated version of the "Big Picture" quality system image (pg. 6), added QR codes in the phxApp section for both the connecting/ignition and self-check processes (pg. 17, 23).
2.25	12/05/2022	Added line to Fill Adapter/Port tech tips regarding action to take when a filter is missing from the v2 fill port; also added photo demonstrating fill port types (pg. 14).
2.26	1/9/2023	Added section detailing instructions for Extension Probe preparation (pg. 9)
2.27	1/31/2023	Updated "Creating Daily Calibration Reports" section (pg. 26) with additional text detailing requirements for creating digital calibration records.
2.28	11/14/2023	• Pg.15: Added tech tip specifying phx42 will not operate under 300 psi • Pg.16: Revised charging tech tip to specify labeling chargers as best practice • Pg.18: Added O-ring replacement frequency details note to item 1 • Pg.25: Added tech tip concerning what to do in the event of a drift failure • Pg.33: Removed Battery Testing Procedure from Level 1 list since it was reclassified as a Level 2
2.29	11/30/2023	Added WI-phx42-116 to Level 1 Repair Procedure list (pg. 33).
2.30	2/20/2024	Replaced reference to "Resources → Documentation" with reference to Knowledge Base path for H_2 Fill Adapter Maintenance/Install guide (pg. 14), updated hardware photo on cover, updated "current version" notice on cover to reference knowledge base.
2.31	4/4/2024	Added tech tip to Probe Care section (pg. 10) instructing user to rebuild probe assemblies every 6 months as best practice; updated Level 1 Repair Procedure list to link to knowledge base articles.
2.32	8/1/2024	Added note to Manual Calibration section (pg. 25) stating process for calibrating with extension probes without having to change unit settings.
2.33	8/22/2024	Removed "Power Cycle phx42" step from Firmware Update procedure in phxApp section (pg. 21).
2.34	10/25/2024	Expanded "Word About the Self-Check" section with Tech Tip information (pg. 23); added information comparing 1-micron and .22-micron filters, and procedures for 1-micron filter use to "Filter Detection section (pg. 27-28); added "Probe Integrity Testing" section based on related Tech Tips (pg. 25); added Avoiding Contamination section based on related Tech Tips (pg. 29).
2.35	11/19/2024	Moved "Storage" section to pg. 7; added section about how proper probe hose routing to the "Intended Use" section (pg. 7); added new "Battery" section below "Charging the phx42" section (pg. 16) using information from "Storage."

2.36	4/2/2025	Split Accuracy and Linear Range section into separate rows with updated descriptions in the Operating Parameters table (pg. 37).
2.37	5/13/2025	Revised wording in Knowledge Base info box on cover, and for looking up hardware issue status in Customer Portal (pg. 3).
2.38	7/31/2025	Updated phx42 stock image to 2025 version with v3 probe where applicable; added paragraph with recommendation to prevent phx42 from falling out of backpack when in use; updated Level 1 procedure list to include new v3 Probe Repair procedure.
2.39	5/11/2026	Added Tango and Odoo addresses to whitelist (pg. 5)
2.40	5/26/2026	Updated User Login Information page for new store site information.
2.41	8/19/2026	Updated portal registration instructions for Odoo use (pg. 3); updated User Login Information for Odoo use (pg. 4); updated phx42 Level 1 test instructions for Odoo use (pg. 32).
2.42	10/1/2026	Updated networking white list to remove Agiloft and obsolete Store addresses, and add new Unit Settings address.