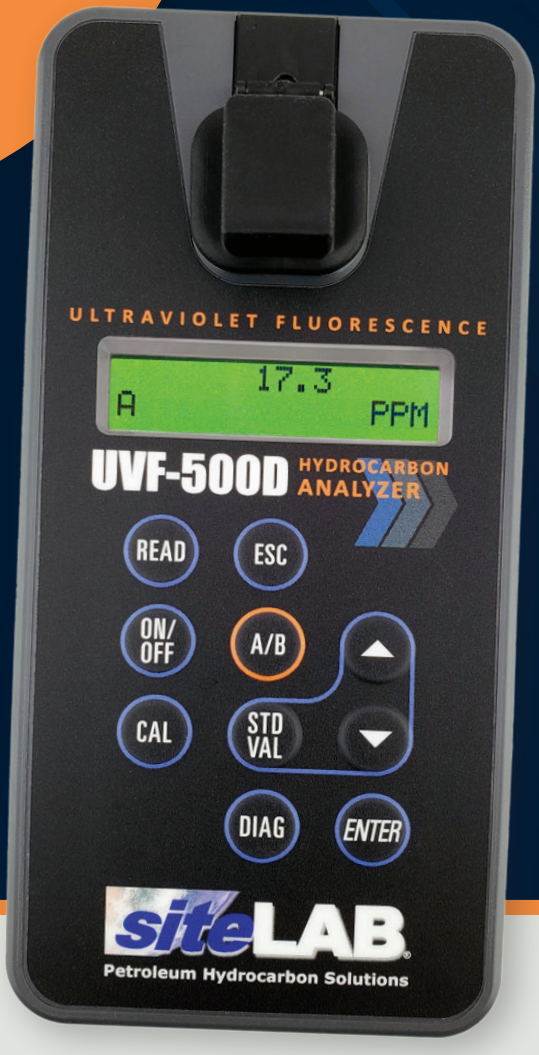
UVF-500D
HYDROCARBON ANALYZER



Version 2.0, Part No. 50200

OPERATING MANUAL

Manufactured for
Sitelab Corporation
by Turner Designs, Inc.
San Jose, California

Fluorescence-based, water quality
instruments for over 45 years

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CONTENT

1.0 INTRODUCTION

1.1 DESCRIPTION

The UVF-500D is a light weight, battery operated, handheld ultraviolet fluorescence spectrophotometer – or fluorometer – used to detect oil, fuel and other petroleum contaminants using solvent extraction.

It's small size and durability makes it the perfect tool for quick measurements in the field. The UVF-500D's dual channel capability allows users to measure hydrocarbons at two different wavelengths.

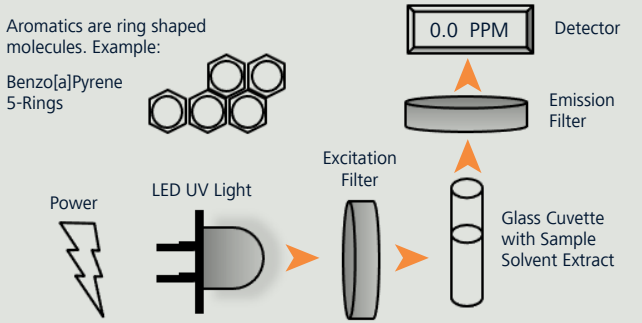
The UVF-500D uses UV LED lights and optical filters to detect polyaromatic hydrocarbons (PAHs) in the C15 to C50 carbon range. These compounds are abundant in crude oils, heavy fuel oils and other oils found in produced water, bilge water, discharge water and many other oil in water monitoring applications. Soil, sediment and oil on metal can also be tested.

The UVF-500D is not sensitive to hydrocarbons in the C6 to C15 carbon range. This includes monoaromatic hydrocarbons like benzene, toluene and other BTEX compounds (VOCs) and smaller PAH compounds, like Naphthalene. As such, gasoline, jet fuel, kerosene, diesel and other light-refined petroleum products can not be detected. The UVF-500D is not suitable for these types of contaminants.

The instrument is calibrated by measuring the fluorescence response or voltage that is generated by a known concentration of hydrocarbon. Once calibrated, the instrument converts fluorescence from an unknown sample into concentration units in parts per million. PPM is the same as mg/L (water) or mg/Kg (soil).

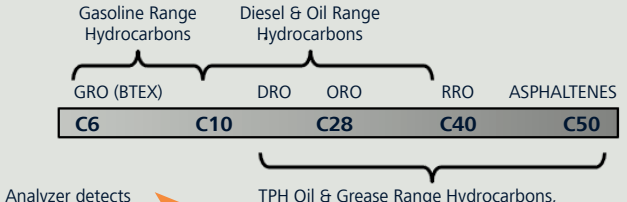
Every hydrocarbon will have a detection limit and a linear limit. The detection limit is the lowest concentration that can be accurately detected. The linear limit varies with each type of hydrocarbon. The linear range is defined by the concentration span from the detection limit to the linearity limit. As the concentration increases beyond the linear range, the slope of the line begins to reduce. At very high concentrations, the slope may become negative. This is called fluorescence 'Quenching'.

THE PRINCIPLES OF FLUORESCENCE



Aromatic compounds excite and emit energy at specific wavelengths (nanometers), which fluoresce and are detected using ultraviolet lights and optics sensitive to the hydrocarbons of interest. Voltage - or fluorescence response - is converted to concentration using a photodiode sensor.

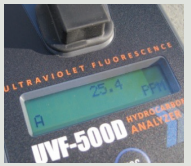
TYPES OF HYDROCARBONS DETECTED



Analyzer detects hydrocarbons in the C15 to C50 carbon range

TPH Oil & Grease Range Hydrocarbons, abundant with Heavy PAH compounds

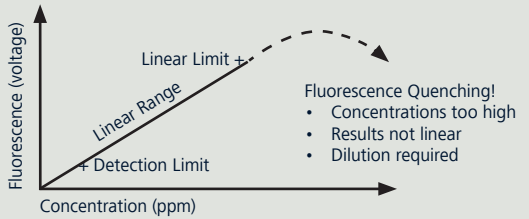
PAHs are Polyaromatic Hydrocarbons
Example: Benzo[a]Pyrene, C20



C15 APPLICATIONS C50

- Light, Medium and Heavy Crude Oils
- Heavy Fuel Oils, Bunker Oils, No. 6 Fuel
- Waste Oils, Lubricating Oils
- Marine Diesel, Weathered Fuel Oils
- Coal Tars, Bitumen, Asphalt

FLUORESCENCE INTENSITY VS. CONCENTRATION



1.2 INSPECTION AND SETUP

Upon receiving your instrument, inspect everything carefully and make sure all accessories are present.

UVF-500D, Part No. 50200 includes:

- UVF-500D Analyzer
- 4 x AAA Batteries
- TPH 100 ppm Solid Standard
- 8 mm Cuvette Adapter
- Operating Manual

UVF-500D Starter Kit, Part No. 90300 includes:

- Pipette
- 20 x Pipette Tips
- 20 x 8 mm Cuvettes
- Tool Case. Use to store equipment and UVF-500D.
- Solvent Dispenser Bottle
- Box of Tissue Wipes
- Foam Sample Rack

UVF-500D ANALYZER & STARTER KIT (Recommended)

Part No. 50200 and Part No. 90300

1.3 GENERAL INFORMATION AND PRECAUTIONS

See keypad image for buttons and functions. Press the ON/OFF button to turn the analyzer on. After a 5 second warm up, the UVF-500D will display the home screen showing it's READY for use. Pressing the ON/OFF button again will turn the unit off. If left idle for 3 minutes, the unit will turn itself off to save battery power.

The contrast of the LCD display can change with temperature and may be lighter when cold. Adjust the contrast using the arrow keys to darken or lighten LCD.

The UVF-500D has two Channels, A and B. Channel A is most often used. Always make sure to analyze the samples on the correct channel only. Using a different channel for sample analysis will give incorrect readings.

The UVF-500D's clear plastic sample well is fragile and is not water proof. Avoid spilling samples into the well. Never pour or squirt solvent, water or cleaning agents into the well or damage to the plastic interior will occur.

Use a dry cotton swap to clean out the well or lightly soak the swab with alcohol or warm water to clean the sample well if necessary. Keep the lid down to protect the sample well from dust when not in use.

The UVF-500D uses 8 mm round glass cuvettes for most applications. Smaller mini-cell cuvettes are also available. Both size cuvettes use special cuvette adapters which slide in and out of the sample well. The cuvette adapters should be clean and free of dust or dirt which may scratch the inner walls of the sample well. Take care not to spill samples into the adapter. Use a tissue wipe to dry and clean adapter prior to use.

The glass cuvettes must be clean and dry on the outside when used for analysis. Use a tissue wipe to remove any liquids or fingerprints before placing the cuvette into the cuvette adapter. The cuvettes need to be filled at least half way full, enough liquid to fill and clear the 4 cutout holes in the adapters. Avoid air bubbles in the cuvettes, which can occur when using the smaller mini cell cuvettes. Avoid transferring emulsions to the cuvette since bubbles of water in the extract will cause incorrect measurements.

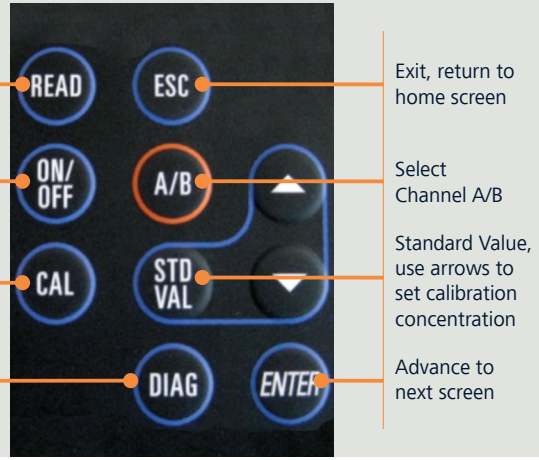
Operate the UVF-500D at room temperature or within these limits: 40° to 105°F (4° to 40°C) for best performance. The UVF-500D is not explosion proof or intrinsically safe. It is not designed in any way to be used in an explosion proof designated area.

The adjustable pipette, included in the Starter Kit, Part No. 90300, is a high quality, high precision positive displacement pipette with a volume range of 50 uL to 250 uL using the pipette tips provided. Avoid air bubbles in pipette tip when diluting samples or making calibration standards.

The UVF-500D is compatible with hexane, methanol and most other popular solvents. The same solvent should be used for sample analysis, testing blanks and making calibration solutions. Purchase solvents in glass bottles only and not in plastic bottles, which can cause interference with readings caused by phthalates.

Use Sitelab's plastic solvent dispenser bottle included in the Starter Kit, Part No. 90300, when testing samples and pour back into solvent bottle when not in use. This squirt bottle is coated with a solvent resistant material. Avoid using cheaper plastic squirt bottles or phthalates will contaminate the solvent and cause poor results. Solvents are highly flammable and should be handled carefully. Use a cup or jar to collect solvent waste generated from testing samples.

UVF-500D KEYPAD



CAUTION! SAMPLE WELL IS FRAGILE!

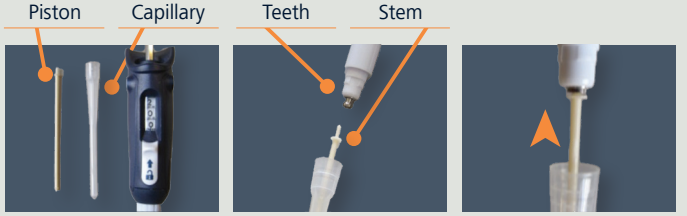
- Avoid spilling samples, water or solvents into the sample well.
- Only put the cuvette adapter into the well, not the glass cuvette or any other object.
- If the sample well or cuvette adapter is dirty, use a cotton swab damp with alcohol to gently clean.

The sample well is made of a special UV plastic that can damage easily. Keep the lid down when not in use.

ANALYZE SAMPLES WITH LID UP OR DOWN

Samples can be analyzed with the rubber lid up or down. Position the cuvette adapter and TPH Solid Standard into the sample well with the handle in the back.Glass cuvettes with plug caps will stick up slightly but this has no effect on measurement.Keep the lid down when not in use to protect sample well from dust or spills.

PIPETTE TIP INSTALLATION



Pipette uses capillary/ piston pipette tips. Adjust setting to volume desired (uL, micro liters).

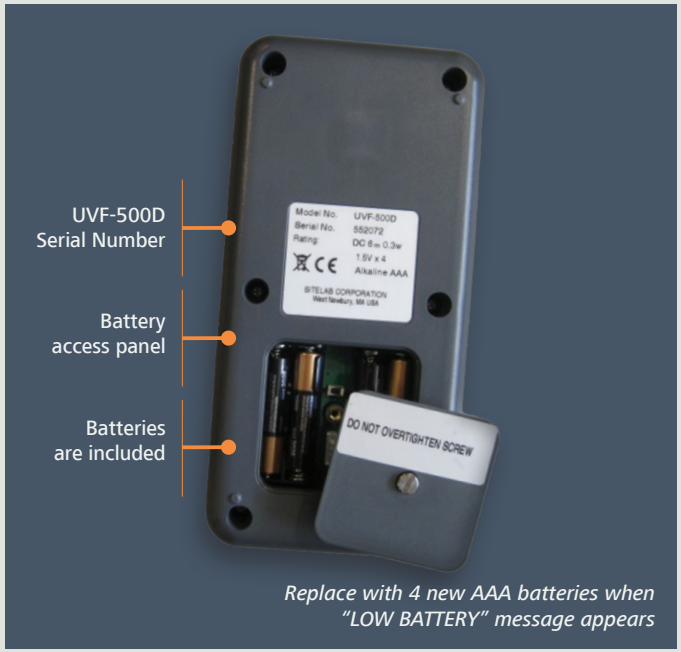
Press the push button down to extend the teeth. Push all the way down to eject the pipette tip.

Connect piston stem to teeth until it is firmly seated and snap capillary onto pipette.

1.4 BATTERY INSTALLATION AND REPLACEMENT

Install or replacement of batteries when low battery message is displayed. A set of new batteries will last for over 1,000 sample readings. Replacing the batteries will not delete or erase the calibration stored on the analyzer. Remove the battery panel on the back of the instrument by loosening the center screw and then gently pulling on the screw. There is some resistance due to the o-ring which is used for watertight sealing. When finished, hold the battery panel down in place and tighten screw until it is snug. Do not over tighten the screw. Use silicon based grease to lubricate o-ring if needed.

UVF-500D BACK SIDE



Replace with 4 new AAA batteries when "LOW BATTERY" message appears

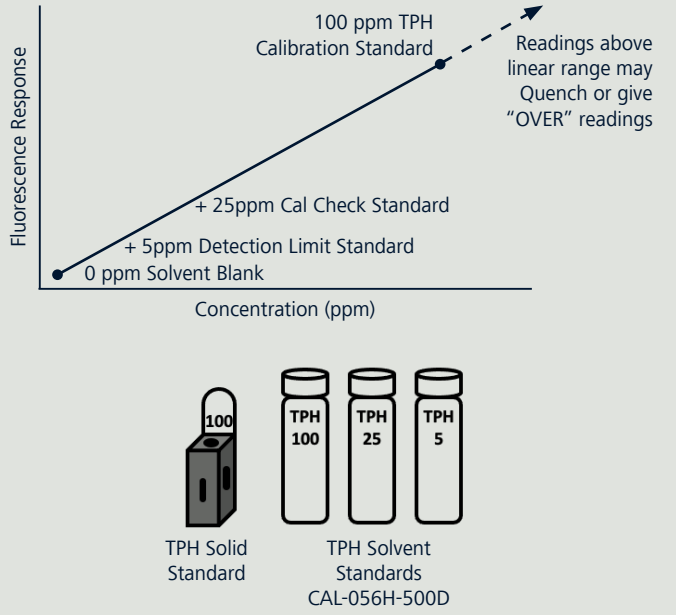
2.0 OPERATION AND FEATURES

2.1 LINEAR RANGE AND SENSITIVITY

The linear range is the concentration range within which the readout of the UVF-500D is directly proportional to the concentration of the hydrocarbon. You must make sure the instrument is calibrated in the linear range, which can vary depending on the aromatic content in your oil and the concentration of the calibration standard you are using. The UVF-500D uses a 1-point calibration.

If using the TPH Solid Standard delivered with the UVF-500D or TPH Calibration Kit Part No. CAL-056H-500D or CAL-056M-500D, the analyzer's linear range goes from zero ppm to 100 ppm. The linear limit in most UVF-500Ds is about 200 ppm. Samples may read "OVER" or quench if above this limit.

THE PRINCIPLES OF FLUORESCENCE



2.2 CHANNEL SELECTION

The UVF-500D is a fixed, multi-wavelength fluorometer. The A/B button allows the user to toggle between two different Channels. The display will show the A or B label in the lower left corner on the home screen to identify which channel is activated. Channel A is most commonly used. It has better sensitivity to hydrocarbons compared to Channel B.

A/B CHANNEL BUTTON

The A/B button switches Channels. Each Channel uses a different LED and set of optical filters for measurement. For most applications, always use Channel A. Hydrocarbons will fluoresce stronger at this wavelength.

2.3 DIAGNOSTIC INFORMATION

Press the DIAG button to access the diagnostic screens for both Channels. Record the %FS-BLK and %FS-STD values shown on the screen for future reference. %FS is Percent Fluorescence Scale and is based on the fluorescence response (or voltage) detected by the analyzer when it was calibrated. These values are replaced with new %FS values each time a new calibration is performed.

%FS-BLK is for the blank and should have a value close to zero or less than 1 when using clean extraction solvent. %FS-STD is for the calibration standard. For best performance, the %FS-STD value should be greater than 2. The maximum value is 100 %FS. When using the 100 ppm TPH solid standard to recalibrate the analyzer, the diagnostic values should be close (within 10%, no greater than 20%) to the factory calibration values and each time it's used thereafter.

When calibrated using different types of oils, the diagnostic values will vary depending on the concentration and aromatic content of the oil standard. If the same oil is always used to prepare calibration standards to test samples, the diagnostic values should be close (within 10%, no greater than 20%) each time it's calibrated. If not, then recalibrating the analyzer should be performed.

A/B CHANNEL BUTTON

The Diagnostic button displays important sensitivity values for the blank and calibration standard stored in memory. The analyzer's response – or voltage – is shown as percent fluorescence scale (%FS).

2.4 STANDARD VALUE BUTTON

The STD VAL button sets the calibration concentration. The factory calibration's standard values for both Channel A and B are set to 100 ppm. To change the concentration, use the arrow keys to increase or decrease the value. Each time you press the arrow key, the value moves by 0.1 increments. Hold down on the arrow key to change concentrations more quickly. The lowest value is 1. The highest value is 9999.

A/B CHANNEL BUTTON

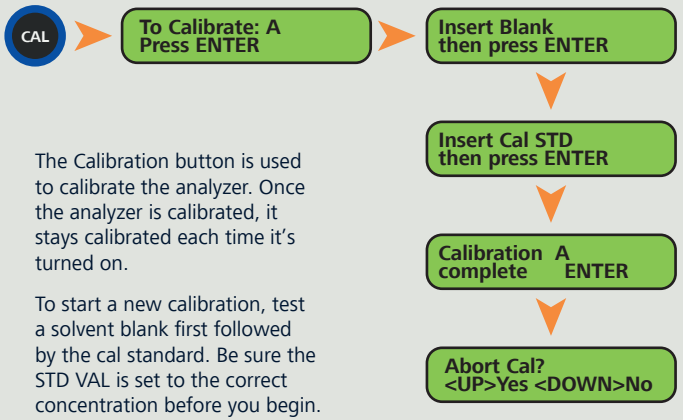
The Standard Value button sets the calibration concentration using the arrow keys. This value should be set to 100 when using the TPH solid standard. The Channel used is also displayed.

2.5 CALIBRATION BUTTON

The CAL button is used to calibrate the analyzer. Once calibrated, the analyzer stays calibrated each time you turn it on. It doesn't need to be recalibrated. If batteries require replacement, the calibration stored in memory will not be lost for either Channel.

Each UVF-500D arrives factory calibrated to Sitelab TPH. Refer to Section 3.0 Calibration Procedures in this manual for detailed instructions.

CALIBRATION SCREENS



The Calibration button is used to calibrate the analyzer. Once the analyzer is calibrated, it stays calibrated each time it's turned on.

To start a new calibration, test a solvent blank first followed by the cal standard. Be sure the STD VAL is set to the correct concentration before you begin. If recalibrating the analyzer using the TPH solid standard, the STD VAL should be set to 100.

This message appears after a few seconds if you do not press ENTER when calibration is complete. Use arrow keys to continue.

2.6 CUVETTE SELECTION

The cuvette adapter included with the UVF-500D uses 8 mm round glass cuvettes. This cuvette size should be used for all applications. Smaller mini-cell size cuvettes and mini-cell cuvette adapters are also available. See more on UVF-500D.COM or contact Sitelab Corporation for details.

2.7 SOLVENT SELECTION

Use hexane solvent for oil in water applications. Hexane CAS# is 110-54-3. Hexane may also be called n-hexane or normal hexane.

Use methanol solvent for oil in soil applications. Methanol CAS# is 67-56-1.

Try and use "HPLC" grade or other high laboratory grade solvents. Solvent is not included with sample test kits.

Water sample with hexane solvent added for extraction. This oily water shows hydrocarbons dissolve into the solvent. Hexane is a non-polar solvent; it separates and floats on top of water.

Test without solvent? Really clean water may contain hydrocarbons soluble enough in water without the need for solvent. Simply fill the cuvette with water and analyze. Results should be close to sample readings using solvent extraction.

Solvents are flammable liquids! Handle with care, wear gloves and use in a well ventilated area. Dispose solvent waste properly following local, state, federal or international requirements. See material safety data sheet (MSDS) for details.

3.0 CALIBRATION PROCEDURES

3.1 CALIBRATION OVERVIEW

The UVF-500D uses a 1-point calibration plus a blank. Each channel will store a separate calibration. The analyzer arrives factory calibrated on Channel A using hexane for the blank and Sitelab's TPH calibration standard. The TPH Solid Standard included with the analyzer has been adjusted to produce the same response. The analyzer is calibrated on Channel B at 100 ppm using a highly aromatic hydrocarbon. The TPH Solid Standard will not read as 100 ppm when analyzed on Channel B if the analyzer is calibrated with it on Channel A.

If the source oil is available, it can be used to calibrate. The source oil may fluoresce stronger or weaker compared to the TPH factory calibration and may produce more accurate readings compared to the laboratory methods.

HOW TO CALIBRATE THE UVF-500D

- Before you calibrate, select which Channel to use and confirm STD VAL is set to the standard's concentration.
- Press the CAL button and ENTER to begin the calibration process. If you make a mistake, press the ESC button at at any time to abort and return to the home screen.
- Fill the cuvette half full with clean solvent and use for the blank. Insert the cuvette into the adapter, close the lid and press ENTER when ready. The "READING Blank" message appears for a few seconds.
- Empty cuvette with blank and fill with the calibration standard, place into the adapter, close the lid and press ENTER when ready. T he "READING Cal STD" message appears.
- Press ENTER when prompted when calibration is complete. The home screen appears and the analyzer is ready for analysis.

3.2 CALIBRATE USING TPH SOLID STANDARD

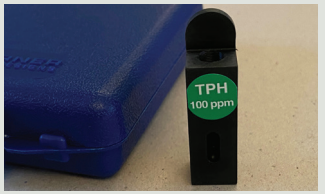
Turn analyzer on, select Channel A and set STD VAL to 100. From the home screen, press CAL and start by testing a solvent blank. Fill a glass cuvette ½ full with clean solvent and press ENTER when prompted. Remove the blank, insert the TPH Solid Standard and press ENTER when prompted. Press ENTER again to accept the calibration. Press ESC to abort at any time.

WARNING!
Products contain solvent, flammable liquids!

Part No. CAL-056H-500D: In hexane solvent, use for oil in water measurement
Part No. CAL-056M-500D: In methanol solvent, use for oil in soil measurement

100 PPM TPH SOLID STANDARD

- Included with analyzer, use on Channel A only
- Case includes factory calibration %FS data
- Tuned to fluoresce same as Sitelab TPH Calibration Kit, P/N CAL-056H-500D
- Use to recalibrate or to check calibration curve



Do not adjust the TPH Standard!
Wrench not included

3.3 CALIBRATE USING TPH CALIBRATION KIT

Turn analyzer on, select Channel A and set STD VAL to 100. From the home screen, press CAL and start by testing a solvent blank. Fill a glass cuvette ½ full with clean solvent and press ENTER when prompted. Remove the blank. Use the same cuvette or use a new cuvette and fill with the 100 ppm TPH calibration standard. Carefully pour the standard into the cuvette or use the pipette to transfer standard into the cuvette. Use a tissue wipe to clean the cuvette before inserting it into the cuvette adapter. Press ENTER when ready and press ENTER again to accept the calibration. Press ESC to abort at any time.

More detailed instructions are provided with each calibration kit. The hydrocarbons in this product are specially formulated to match well to EPA 1664, 9071B and other oil and grease gravimetric methods. Hexane and methanol standards fluoresce similar to each other and exhibit similar DIAG values within 20% (or 80 to 120 ppm). Find the calibration kits on UVF-500D.COM

SITELAB TPH-OIL CALIBRATION KIT"

- Ready to use standards at 100 ppm, 25 ppm and 5 ppm concentrations
- Includes two 500 ppm reference standards used to make new calibrators
- Standards are reusable, 6-month expiration date
- Includes Certificate of Analysis, instructions, MSDS and 20 cuvettes

4.0 SAMPLE TEST PROCEDURES

4.1 LABORATORY SUPPLIES USED FOR ANALYSIS

Solvent extraction methods require the use of various laboratory supplies. For best performance, use the test kits available from Sitelab to analyze your water or soil samples. These kits are easy to use and allow for fast, accurate measurement. Refer to the "Quick Reference Guide" provided with each kit for additional test instructions.

Set up the analyzer and equipment on a table with plenty of work space. If working indoors, use in a well ventilated room. Results must be recorded manually, the UVF-500D does not have a computer connection. The UVF-500D also does not have a data logger. Pressing the READ button each time produces a new reading, erasing the previous one. However, analyzing a sample multiple times can and should be performed to check repeatability. Record your results in a log book or use the forms included in Sitelab's test kits.

If you need to purchase glass cuvettes or other items separately, see section 8.0 Products and Accessories Available.

Note: Solvent is not included with any sample test kits.

SOIL EXTRACTION KIT

Part No. EXTR010-20

- Use for soil and sediment applications.
- Box contains supplies for 20 samples. Use with methanol.

WATER TEST KIT

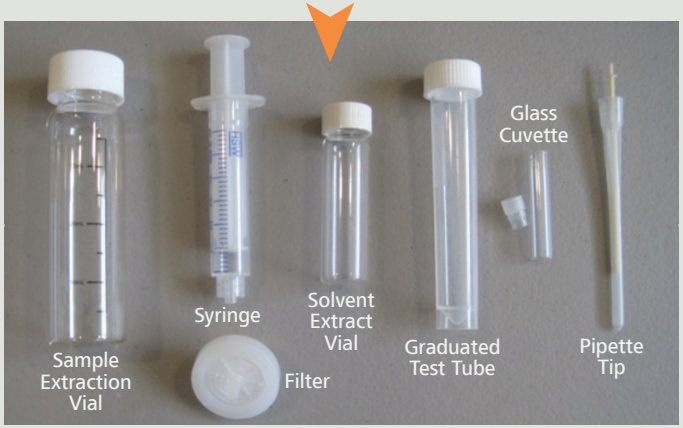
Part No. EXTR60-500D

- Use for most oil in water applications. Ideal for clean, less oily water.
- Box contains supplies for 60 samples. Use with hexane.

WATER EXTRACTION KIT

Part No. EXTR010-20-HEX

- Use to test dirty, oily or highly contaminated water.
- Or use to prepare your own oil calibration standards.
- Box contains supplies for 20 samples. Use with hexane.

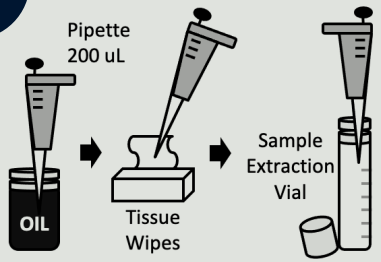


4.2 PREPARE AND USE YOUR OWN OIL FOR CALIBRATION

Oil is diluted in solvent from 1 million ppm down to low, detectable concentrations used to calibrate the analyzer and measure samples.

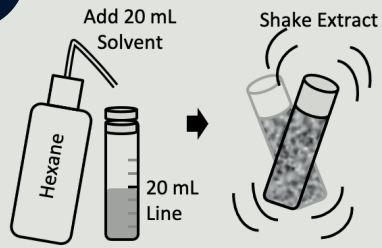
Procedures shown here use the materials included in Sitelab's Extraction Kit, Part No. EXTR010-20-HEX. Alternatively, use your own bottles, volumetric flasks and other glassware to prepare your standards.

1



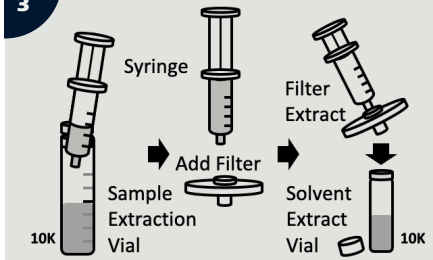
Prepare a 10,000 ppm Oil Extract:
Start by using the pipette to suck up 200 uL (micro liters) of oil from your oil sample. Use a tissue to wipe off any oil stuck t the outside of the tip. Dispense contents into glass sample extraction vial.

2



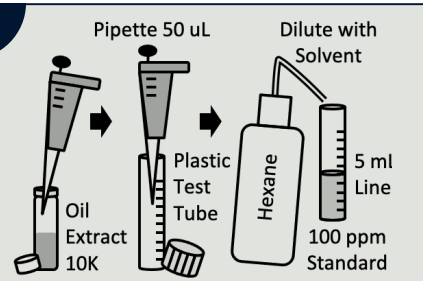
Add Hexane to the solvent dispenser bottle. Squirt hexane into the vial up to the 20 mL line. Be precise! Screw on the cap and shake Extract for several minutes. If the Extract is light in color and not dark, silty or dirty, filtering is not required, go to Step 4.

3



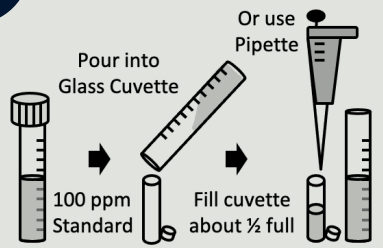
Dip a syringe into the extraction vial and suck up 3-5 mL of Extract into the syringe. Remove from vial and screw on a filter. Push down on the plunger and filter the Extract into a solvent extract vial. Label Extract vials with concentration (10K or 10,000 ppm).

4



Prepare a 100 ppm Oil Standard:
Attach a new tip to the pipette and transfer 50 uL of the Extract into a graduated plastic test tube. Squirt hexane into the tube up to the 5 mL line, screw on cap and briefly shake to mix. This creates a 100 ppm standard.

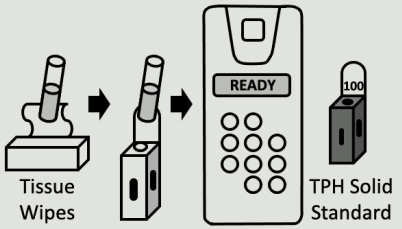
5



Use the 100 ppm standard to calibrate the analyzer. This is recommended as a starting point, since you won't know how fluorescent the oil is. Pour the 100 ppm standard into a glass cuvette or use the pipette to transfer the standard to cuvette (less messy).

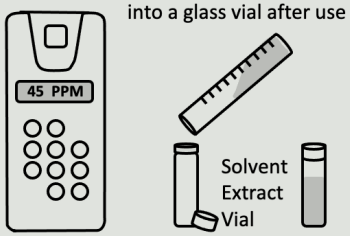
6

Check Oil's TPH Response



Test the 100 ppm standard first on the analyzer calibrated to the TPH Solid Standard set on Channel A. Wipe the cuvette clean with a tissue wipe, insert into the cuvette adapter and place into the analyzer. Press the READ button and record the value.

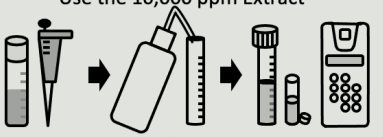
7



If TPH reading is higher than 5 ppm and lower than 200 ppm, the 100 ppm oil standard is suitable to calibrate for measurement, proceed to Step 10. If not, then prepare and use higher or lower concentrations. Store the standard in a glass vial for future use.

8

Use the 10,000 ppm Extract

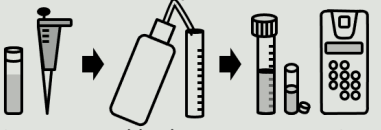


Pipette	Add Solvent	Concentration
250 uL x2	to 5 mL line	= 1,000 ppm
250 uL	to 5 mL line	= 500 ppm
100 uL	to 5 mL line	= 200 ppm

Prepare Higher Oil Concentration:
If the 100 ppm oil standard fluoresces too weak, use the 10,000 ppm Extract to make and use higher oil standards. Use the pipette to transfer Extract into a plastic test tube and dilute with solvent using examples shown above.

9

Use the 100 ppm Standard

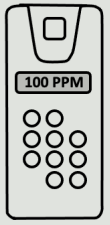


Pipette	Add Solvent	Concentration
250 uL x4	to 5 mL line	= 20 ppm
250 uL x2	to 5 mL line	= 10 ppm
50 uL	to 5 mL line	= 1 ppm

Prepare Lower Oil Concentrations:
If the 100 ppm oil standard fluoresces too strong, use the 100 ppm standard to make and use lower oil standards. Use the pipette to transfer standard into a plastic test tube and dilute with solvent using examples shown above.

10

Calibrate UVF-500D



Select Channel A or B

Set the STD VAL to the oil standard's concentration

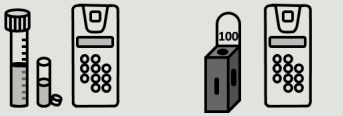
Check DIAG values after calibration is finished

Calibrate the analyzer using the oil standard. Use hexane for the blank. At a minimum, the %FS-BLK value should be less than 1 and the %FS-STD value greater than 2. If the %FS-STD value is below 2, then recalibrate using a higher oil standard in Step 8.

continue on next page

QC

Quality Control Tests



Confirm your Calibration is Linear

Test Response of TPH Solid Standard

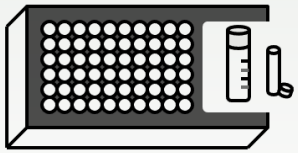
If you test lower concentrated oil standards, results should be linear, ideally within +/- 10%, no greater than 20% off. Test the TPH Solid Standard and record it's fluorescence response. It will not read as 100 ppm (it may read "OVER"), but it's response will be unique and specific to your oil.

4.3 PROCEDURE FOR OIL IN WATER ANALYSIS

Water samples are extracted in solvent which dissolves the hydrocarbons into solution for analysis. Use this method to test any type of water; seawater, brackish water, produced water, groundwater, etc.

Procedures shown here use the materials included in Sitelab's Water Test Kit, Part No. EXTR60-500D plus the UVF-500D, part No. 50200 and the materials in the UVF-500D Starter Kit, Part No. 90300.

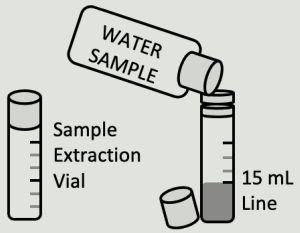
Use the Water Test Kit for most oil in water applications, including clean, less oily water that does not require filtration or dilution. Alternatively, use your own bottles, flasks and other glass wear to extract and analyze your samples.



UVF-500D
Water Test Kit
Part No. EXTR60-500D

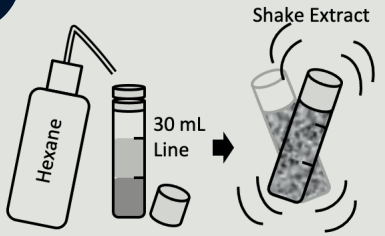
continue on next page

1



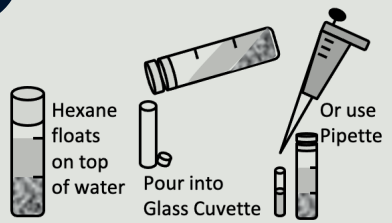
Shake water sample prior to use to mix contents thoroughly. Quickly pour 15 mL of water into a glass sample extraction vial. The vials have 5 mL graduations, be precise. If you do not have a container or bottle to collect your water sample, use an extraction vial to collect sample.

2



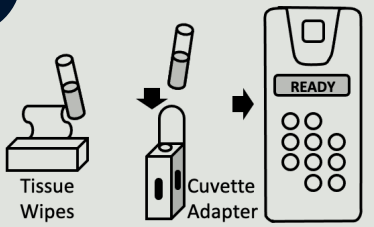
Add Hexane to the solvent dispenser bottle. Add 15 mL of hexane into the vial. Hexane will float on top of the water, so squirt up to the 30 mL line. Be precise. This creates a 1:1 or "1X" Extract. Screw and tighten the cap. Shake Extract for two minutes. The oil will dissolve into the solvent.

3



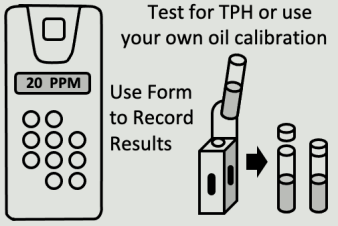
After shaking, allow time to settle so the solvent and water separate. Remove cap and pour top solvent layer into a glass cuvette about ½ full. Avoid water from bottom of vial! Alternatively, use a pipette to transfer the Extract to cuvette (less messy).

4



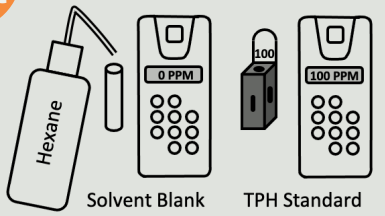
Clean cuvette with sample Extract using a tissue to remove any liquids or fingerprints and place into the cuvette adapter. Turn analyzer on, open the lid, slide adapter into the testing well and press the READ button. The lid does not need to be closed. Use Channel A only for TPH.

5



Record the concentration. Press READ again to check repeatability. If the analyzer is calibrated using the TPH solid standard, samples with readings below 5 ppm report as "Non Detect." Add plug cap to cuvette to avoid spills or to analyze later. Save the Extract, use it to make dilutions if necessary.

QC

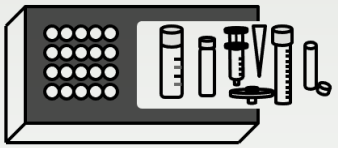


Quality Control Tests:
Fill a cuvette with hexane and test a blank to make sure the solvent is clean. Readings should be close to zero ppm. Test the TPH calibration standard to check for drift. Readings should be close to 100 ppm (+/- 10%). Use Channel A only for TPH in water.

4.4 PROCEDURE FOR DIRTY OR HIGHLY CONTAMINATED WATER

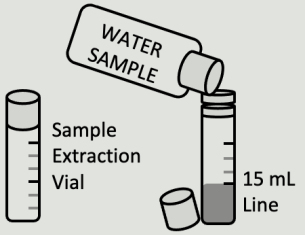
Use for dirty, oily or highly contaminated oil in water applications which require filtration and/or dilution for analysis.

Procedures shown here use the materials included in Sitelab's Water Extraction Kit, Part No. EXTR010-20-HEX 500D plus the UVF-500D, part No. 50200 and the materials in the UVF-500D Starter Kit, Part No. 90300.



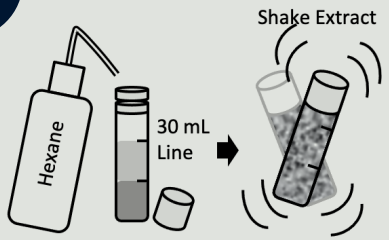
UVF-500D
Water Extraction Kit
Part No. EXTR010-20-HEX

1



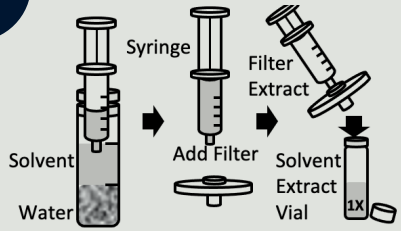
Shake water sample prior to use to mix contents thoroughly. Quickly pour 15 mL of water into a glass sample extraction vial. The vials have 5 mL graduations, be precise. If you do not have a container or bottle to collect your water sample, use an extraction vial to collect sample.

2



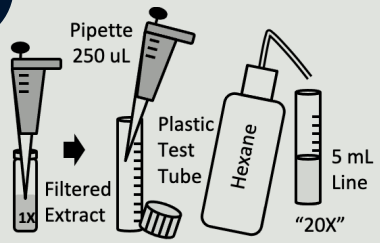
Add Hexane to the solvent dispenser bottle. Add 15 mL of hexane into the vial. Hexane will float on top of the water, so squirt up to the 30 mL line. Be precise. This creates a 1:1 or "1X" Extract. Screw and tighten the cap. Shake Extract for two minutes. Allow time to settle when finished.

3



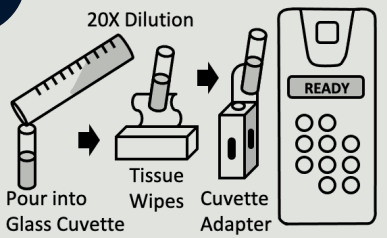
Dip a syringe into the top solvent layer from vial and suck up 3 to 5 mL of Extract into syringe. Avoid water from bottom of vial! Remove from vial and screw on a filter. Push down on the plunger and filter the Extract into a glass solvent extract vial. Add cap and label vial with ID and "1X."

4



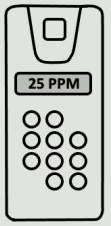
Use the filtered Extract to make dilutions for analysis. Add a tip to the pipette, adjust setting to 250 uL and transfer Extract into a graduated test tube. Fill test tube up to 5 mL line with hexane, add cap and shake. This example creates a 20X dilution. Save Extract for additional dilutions.

5



Fill a glass cuvette about ½ full with dilu tion. Clean cuvette with a tissue to remove any liquids or fingerprints and place into the cuvette adapter. Turn analyzer on. If testing for TPH, use Channel A only. Open the lid and slide adapter into the testing well. Press the READ button.

6



Test for TPH or use your own oil calibration

Multiply Reading by 20 for "20X" dilution

Report Result as 500 ppm (mg/L).

Record the concentration. Press READ again to check repeatability. Multiply the reading by the dilution to report final concentration. If the analyzer is calibrated to TPH, samples with readings below 5 ppm are too low and "OVER" readings are too high. Test lower or higher dilutions as needed.

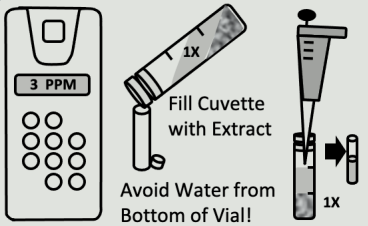
7

Sample Dilution Examples

Pipette	Add Solvent	Dilution
50 uL	to 5 mL line	= 100X
100 uL	to 5 mL line	= 50X
250 uL	to 5 mL line	= 20X
250 uL x2	to 5 mL line	= 10X

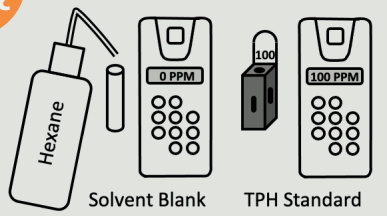
Use the filtered Extract to prepare and test other dilutions as needed. We recommend starting with a 20X Dilution first to use for analysis. Rinse and clean the test tube, cuvette and pipette tip with solvent to reuse.

8



Extracts clear in color – either filtered or unfiltered – which exhibit low readings when testing dilutions can be used for analysis. Pour the Extract into the cuvette or use the pipette to transfer contents (less messy). Place into analyzer, press READ and report concentration. No multiplier is used.

QC

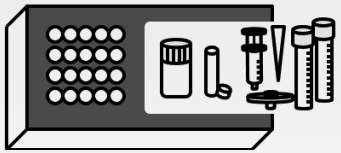


Quality Control Tests:
Fill a cuvette with hexane and test a blank to make sure the solvent is clean. Readings should be close to zero ppm. Test the TPH calibration standard to check for drift. Readings should be close to 100 ppm (+/- 10%). Use Channel A only for TPH in water.

4.5 PROCEDURE FOR OIL IN SOIL ANALYSIS

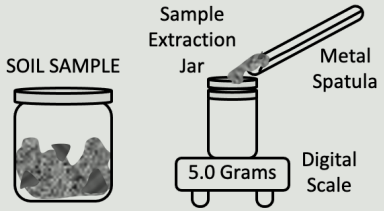
Soils, clays and sediments are extracted in methanol, filtered and diluted for analysis.

Procedures shown here use the materials included in Sitelab's Soil Extraction Kit, Part No. EXTR010-20 plus the UVF-500D, part No. 50200 and the materials in the UVF-500D Starter Kit, Part No. 90300 and the Soil Accessory Kit, Part No. 90300-SAK.



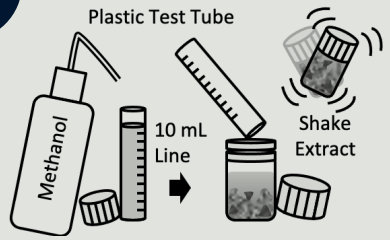
UVF-500D
Soil Extraction Kit
Part No. EXTR010-20

1



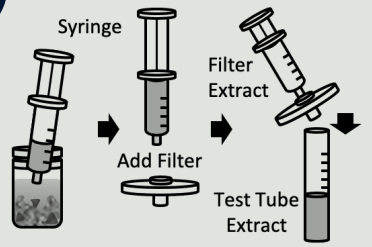
Mix your soil sample prior to use to homogenize contents. Using a plastic sample extraction jar, remove the lid and place the jar onto the digital scale and tare the weight to zero. Scoop out and weigh 5.0 grams of soil into the jar using the spatula. Be precise (within +/- 0.1 g).

2



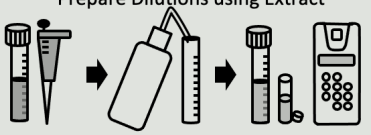
Add Methanol to solvent dispenser bottle. Squirt 10 mL of methanol into a graduated plastic test tube. Pour contents into the extraction jar. This creates a 2:1 or 2X Extract. Tighten cap and shake for 2 minutes. Use 20 mL methanol for clay or highly contaminated samples for 4X Extract.

3



Let the extraction jar settle for several minutes after shaking. Gently remove the lid, dip a syringe into the top surface layer and suck up 3-5 mL of Extract into the syringe. Screw on a filter, push down on the plunger and filter the Extract into a test tube. Label test tube with "2X" or "4X."

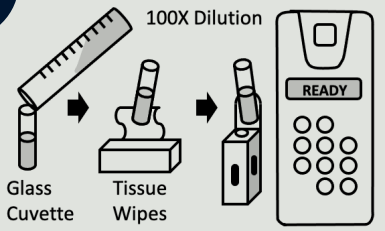
4



Pipette Extract	Add Solvent To	2X Extract Dilution	4X Extract Dilution
250 uL x2	5 mL line	= 20X	= 40X
200 uL	5 mL line	= 50X	**= 100X**
100 uL	5 mL line	**= 100X**	= 200X
50 uL	5 mL line	= 200X	= 400X

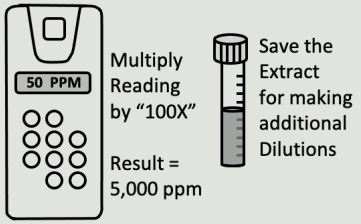
Use the pipette to transfer Extract into a second test tube and dilute with methanol using examples shown above. We recommend starting with a 100X Dilution first to use for analysis.

5



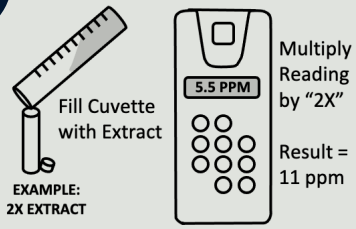
Fill glass cuvette about ½ full with the Dilution made in Step 4. Clean cuvette using a tissue to remove any liquids or fingerprints and place into the cuvette adapter. Turn analyzer on, select Channel A and slide adapter into the testing well. Close the lid and press the READ button.

6



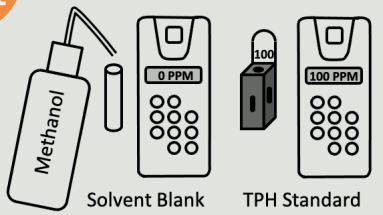
The concentration is be displayed after a few seconds. Press READ again to check repeatability. Multiply reading by dilution made to report final concentration. Rinse and clean glass cuvette, test tube and pipette tip with solvent to prepare and test higher or lower dilutions, if needed.

7



Extracts clear in color and exhibit low readings when testing dilutions can be used for analysis. Pour the Extract into the cuvette or use the pipette to transfer contents (less messy). Place into analyzer, press READ and report concentration by multiplying the reading by either 2X or 4X dilution.

QC



Quality Control Tests:
Fill a cuvette with methanol and test a blank to make sure the solvent is clean. Readings should be close to zero ppm. Test the TPH calibration standard to check for drift. Readings should be close to 100 ppm (+/- 10%). Use Channel A only for TPH in soils.

5.0 DATA QUALITY

5.1 CALCULATING AND REPORTING RESULTS

Accuracy and validity of your test results is dependent on a number of factors. It is very important to follow the procedures. When testing dilutions, make sure you use the correct multiplier to report the final concentration. As such, save and store your extracts if retesting is necessary. Remember too that calibration is key; if the UVF-500D is not calibrated correctly, it will not perform properly and will produce poor results.

Samples with readings between zero and the minimum detection limit are too low and should be reported as ND or "Non Detect". When doing so, make sure to account for any dilution performed. For example, if testing with Sitelab TPH standards, the minimum detection limit is 5 ppm. If a 1X water extract reads below 5 ppm, report the result as "ND <5 ppm." If a 20X water dilution reads below 5 ppm, report the result as "ND <100 ppm," calculated by multiplying 5 by 20X.

5.2 QUALITY CONTROL TESTS

Use this check list before using the UVF-500D to confirm the analyzer is properly calibrated and setup for the analysis you want.

If you retest your calibration standard, readings should be within 10% to the calibrator's concentration for best performance. If the reading is higher or lower by more than 20%, then recalibrating the analyzer should be performed.

QUALITY CONTROL CHECKLIST

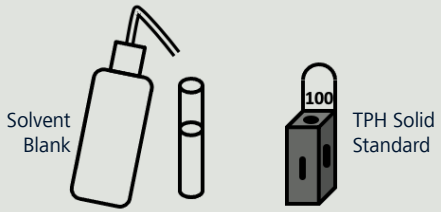
READ: Test a solvent blank, readings should be close to zero ppm. Test the standard, readings should be close to the calibrator's concentration. For TPH, readings should be close to 100 ppm (+/- 10% no more than 20%).

Channel A/B: For TPH and almost all other applications, use Channel A

STD VAL: This value should be set to the concentration of the calibration standard. For TPH, the standard value should be 100 ppm.

DIAG: Displays sensitivity values of the blank and calibration standard

- %FS-BLK should be less than 1
- %FS-STD should be greater than 2
- If calibrated to TPH, %FS-STD value should be close to the factory calibration, typically between 30-70.



5.3 CORRELATION TO LABORATORY METHODS

This fluorescence method should correlate to most other laboratory test methods. This includes US EPA gravimetric Methods 1664, 9071B and various gas chromatography (GC) methods used in the environmental and oil and gas industries.

If testing split samples sent to a certified laboratory do not directly correlate (1 to 1), the results should trend and be proportionate to the laboratory results. If this is the case, use a response factor to adjust your test results so the results correlate more directly. If testing water with Sitelab's TPH calibration and results do not match well, use the target oil from you site, if available, to calibrate and test your samples. An Adjustable Solid Standard, Part No. 50950 is available and can assist with your analysis.

If results do not improve, poor correlation may be due to the method used for comparison or the laboratory made an error. Testing split samples with multiple labs should be considered.

ADJUSTABLE SOLID STANDARD

Part No. 50950

- Works on Channel A or B
- Includes case with two hex wrenches to adjust and fine tune readings to match your standard or sample's response.
- Functions similar to Sitelab's TPH Solid Standard.

6.0 TROUBLESHOOTING

The UVF-500D displays different error screens informing you of a problem. Follow the instructions shown here to correct the problem. Please contact Sitelab Corporation if you need assistance, have questions or require training.

If you are using your own oil standards and need help deciding which concentration to use, test the standards first using Sitelab's TPH calibration to see how fluorescent it is before using it to calibrate. Refer to Steps 6 and 7 in Section 4.2 of this manual for details. See examples below.

EXAMPLE 1: LOW FLUORESCENT OIL – MARINE DIESEL

At 100 ppm, oil's TPH response was 3.3 ppm or 30 times lower.

UVF-500D Calibrated with 100 ppm Oil Standard

Channel A DIAG Values:		Channel B DIAG Values:
%FS-BLK = 0.2	Good	Does not calibrate
%FS-STD = 1.3	Low	"Standard<Blank"

UVF-500D Calibrated with 200 ppm Oil Standard

Channel A DIAG Values:		Channel B DIAG Values:	
%FS-BLK = 0.2	Good	%FS-BLK = 0.4	Good
%FS-STD = 2.6	Good	%FS-STD = 0.0	Too Low

This oil is not detectable on Channel B, it's too weak at these concentrations. It responds best on Channel A at 200 ppm. The %FS-STD value is greater than 2 compared to the %FS-STD value calibrated at 100 ppm. The 200 ppm calibration will be more linear.

EXAMPLE 2: HIGH FLUORESCENT OIL – NO. 6 FUEL OIL

At 100 ppm, the oil's TPH response was "OVER." At 20 ppm, the oil's TPH response was 120 ppm or 6 times higher.

UVF-500D Calibrated with 100 ppm Oil Standard

Channel A DIAG Values:	Channel B DIAG Values:	
Does not calibrate	%FS-BLK = 0.4	Good
"Cal Std too high"	%FS-STD = 3.6	Good

UVF-500D Calibrated with 20 ppm Oil Standard

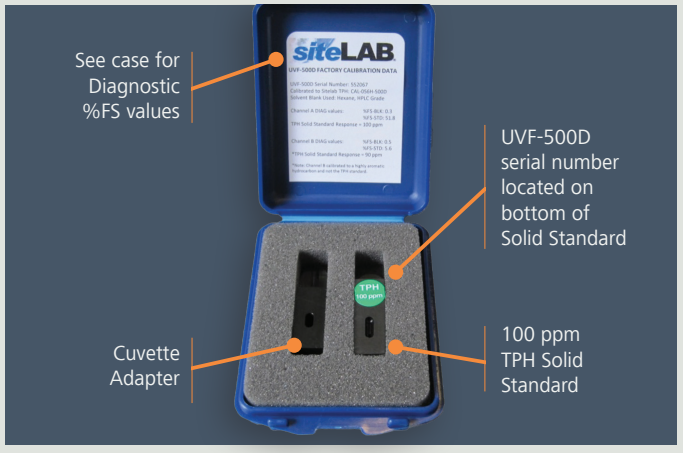
Channel A DIAG Values:		Channel B DIAG Values:	
%FS-BLK = 0.2	Good	%FS-BLK = 0.4	Good
%FS-STD = 44.1	Good	%FS-STD = 0.8	Too Low

This oil is detectable on both Channel A and B. It responds best on Channel B at 100 ppm, it has a higher %FS-STD value compared to 20 ppm. When used on Channel A, it responds well at 20 ppm. It will not calibrate at 100 ppm, it's signal is too strong. Using the 20 ppm calibration on Channel A will give you better/lower detection limits compared to using the oil calibrated on Channel B.

ERROR SCREENS

OVER A PPM	**OVER Readings:** Sample concentration is too high and above the linear range. Dilute sample and retest.
Blank too high Check Blank	**Blank too high, Check Blank:** Solvent used to calibrate has too much interference. Always calibrate using clean solvent only.
Cal Std too high Recalibrate	**Cal Std too high, Recalibrate**: Concentration of the standard is too high, it fluoresces too strong. Calibrate with a lower concentration.
Standard < Blank Recalibrate	**Standard < Blank, Recalibrate:** Concentration of the standard is too low, it fluoresces too weak, less than the solvent blank. Calibrate with a higher concentration.
Low Battery	**Low Battery:** Replace with four new AAA batteries Calibration and diagnostic data will be stored in memory, will not be lost.
Circuit Failure	**Circuit Failure:** UVF-500D requires service or repair. Contact Sitelab Corp.

UVF-500D FACTORY CALIBRATION DIAG VALUES



The TPH Solid Standard is “tuned” for each instrument. It will not respond the same using a different UVF-500D. Included with the UVF-500D, Part No. 50200.

7.0 WARRANTY

7.1 TERMS

Obstitech ApS warrants the UVF-500D handheld hydrocarbon analyzer and accessories to be free from defects in materials and workmanship under normal use and service for a period of 12 months from the date of shipment from Obstitech, with the following restrictions:

- Obstitech is not responsible for replacing parts damaged by accident or neglect. Damage from corrosion is not covered. Damage caused by customer modification of the instrument is not covered.
- This warranty covers only Obstitech products and is not extended to equipment used with our products. We are not responsible for incidental or consequential damages, except in those states or countries where this limitation is not allowed. This warranty gives you specific legal rights and you may have other rights which vary from state to state or country to country.
- Damage incurred in shipping is not covered.

7.2. WARRANTY SERVICE

To obtain service during the warranty period, the owner shall take the following steps:

1. Write, email, or call our service partner Sitelab Corporation and describe as precisely as possible the nature of the problem. Phone (USA) +1 978-363-2299. Email: support@site-lab.com
2. Carry out any adjustments or tests as suggested by Sitelab Corporation.
3. If proper performance is not obtained you will be issued a Return Authorization number (RMA). Package the unit, write the RMA number on the outside of the shipping carton, and ship the instrument, prepaid, to Sitelab Corporation. If the failure is covered under the warranty terms, the instrument will be repaired and returned free of charge, for all customers in the contiguous continental United States. For customers outside of the contiguous continental United States who purchased equipment from one of our authorized distributors, contact the distributor. If you purchased directly, contact us. We will repair the instrument at no charge. Customer pays for shipping duties and documentation to Obstitech, while Obstitech pays for return shipment. Custom duties, taxes and fees are the responsibility of the customer.

7.3. OUT-OF-WARRANTY SERVICE

Follow steps for Warranty Service as listed above. If we can assist you by phone or by email, we will be glad to, at no charge. Repair service will be billed on a fixed price basis, plus any applicable duties and/or taxes. Shipment to Obstitech ApS should be prepaid. Your bill will include return shipment freight charges. Address for shipment: Sitelab Corporation, 86 Coffin Street, West Newbury, MA 01985 USA.

For further details see: uvf-500d.com/terms-and-conditions

8.0 PRODUCTS AND ACCESSORIES AVAILABLE

A full list of products and accessories is available on the UVF-500D.COM website. Sitelab's most commonly used products with part numbers are highlighted below. These products are described in this manual.

UVF-500D Analyzer
50200

UVF-500D Starter Kit
90300

Water Test Kit
EXTR60-500D

Water Extraction Kit
EXTR010-20-HEX

Soil Extraction Kit
EXTR010-20

8 mm Glass Cuvettes
50957

Soil Accessory Kit
90300-SAK

TPH-Oil Calibration Kit
CAL-056H-500D

TPH-Oil Calibration Kit
CAL-056M-500D

Adjustable Solid Standard
50950

9.0 UVF-500D INSTRUMENT SPECIFICATIONS

Weight & Dimensions:	14 oz (0.4 Kg); 1.75" x 3.5" x 7.25" (4.5 cm x 8.9 cm x 18.4 cm).
Power Requirements:	4 x AAA batteries (included). Battery life >1000 measurements.
Operating Temperature:	40°F to 105°F; 4°C to 40°C.
Principle of Operation:	Ultraviolet Fluorescence (UVF), dual channel spectrophotometer.
Detector:	Factory-installed photodiode sensor.
Light Source:	Light Emitting Diodes (LED), Channel A and Channel B.
Optical Filters:	Two sets of factory-installed excitation and emission filters.
Compounds Detected:	Polyaromatic hydrocarbons in the C15 to C50 carbon range.
Detection Limits:	Minimum detection limits in low ppm range, 5 ppm to 0.05 ppm. No upper limit, samples above calibration are diluted for analysis.
Display:	16 x 2 character LCD (2.5" x 0.6"; 6 cm x 1.5 cm).
Readout:	Measures concentrations in PPM units (mg/L or mg/Kg).
Date Output:	Not available. Record results manually.
Diagnostics:	Displays percent fluorescence scale (%FS); important sensitivity values for calibration standard and blank.
Cuvettes:	Uses disposable glass cuvettes, adapters available for 2 sizes.
Solvents:	Compatible with hexane, methanol and all other popular solvents.
Calibration:	Single-point and blank. 100 ppm TPH solid standard included.
Blank:	Reads and subtracts solvent blank.
Response Time:	5 Seconds.
Automatic Power Down:	After 3 minutes of inactivity
Alarms:	Low battery, circuit failure, high blank, over readings.
Warranty:	One-year warranty, parts and labor.
Approvals:	CE, UL and C-UL. ISO 9001 manufacturing.

Made in USA

OBSTITECH
WATER ANALYZERS

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