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MudChecker

#365-21-ES - MudChecker v1.5 ES

Instruction Manual

Updated 2/5/2024

Ver. 2

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Introduction

The MudChecker is a portable, battery-powered device encased in a robust IP 64 enclosure that measures the composition of drilling fluids. It uses radio frequency sensor technology to detect and track the oil, water, solids, and salinity content of drilling fluids. The MudChecker is a handheld probe intended to be dipped into undiluted and diluted mud samples contained in a suitable non-metallic container.

The **MudChecker ES** is designed to measure the percentage Oil/Water/Solid content and can also detect the salinity of drilling fluids during a second measurement step. The **MudChecker KS** requires the user to manually input the salinity value, before measuring the oil, water, and solids content. The KS mode can also be selected on the ES models to expedite the measurement process if the salinity of the sample is known.

Computer software is provided with all MudChecker models. The software interfaces with the device via a USB cable and is required for the processing of measurements for the 1.0 models of the device. The 1.5 version can recall measurement results on the device or via the accompanying software. The software also allows customers to setup the unit, choose the mode of operation (KS or ES), enter parameters used in the calculation (such as mud density, oil density), log results, view results and download previous records. Records may be exported as spreadsheets.

Battery

The MudChecker is not fully charged when shipped for safety reasons. It is recommended that the unit is charged for at least two hours before initial use.

Charge the unit using the USB cable provided. If the unit is being charged from a computer, the USB cable must be attached directly to the computer, NOT via a USB hub. In general, the USB interface does not work via a USB hub. Note that USB sockets in the body of monitors are generally part of a hub.

Checking the Battery

The battery status is shown briefly when the device is powered on. You can see the battery status at any time by powering the device off and then on.



Recharging the Battery

The battery will charge automatically if plugged into a PC via the USB cable. Ensure the probe is turned off after charging from the PC by turning it on and off again.

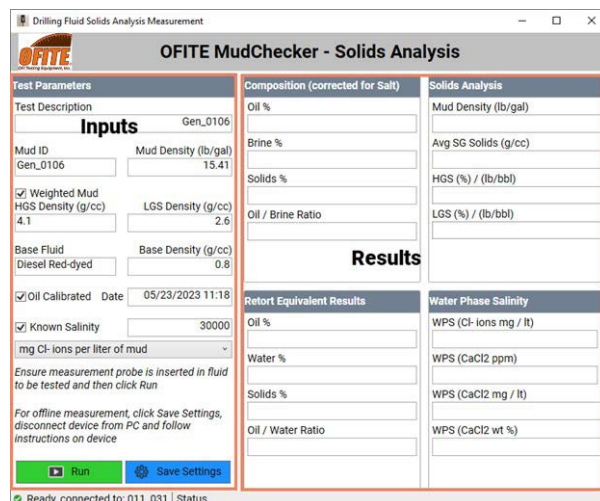
Powering On/Off

To turn the device on, hold and release the power button. It is recommended that the unit should be fully charged before use. To turn off the device press and hold the power button for 3 seconds until the Power Off message appears then release. Please ensure the unit is turned off after use to ensure the battery is not drained during storage.

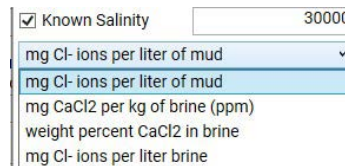
Test Setup

Before taking a measurement, you must connect the MudChecker to the host PC and enter the required inputs into the software. The software will then save those settings to the MudChecker device.

1. Connect the MudChecker to the host PC and start the software.
2. Click the “New Measurement” button to start a new test.
3. Enter the required inputs:
 - **Test Description:** comments regarding the test or any other relevant information
 - **Mud ID:** short description of the mud (maximum of 17 characters)
 - **Mud Density:** density of the whole drilling fluid in lb/gal
 - **Weighted Mud:** specifies whether the mud contains barite. If unweighted mud is being tested with no barite, uncheck this selection
 - **HGS Density:** the specific gravity of HGS or barite (if used) in SG or gm/cc
 - **LGS Density:** the specific gravity of low-gravity or drill solids in fluid in SG or gm/cc
 - **Base Fluid:** the type of base fluid in the drilling fluid. Select the type from the drop-down selection. Base fluids can be added to this list via the “Base Fluid Calibration” screen. See page 6 for details.
 - **Base Density:** specific gravity of the base fluid
 - **Oil Calibrated:** for informational purposes only since all devices are always calibrated with diesel by default or user-selected base fluids



- **Oil Calibration Date:** shows the date the base fluid was calibrated
- **Known Salinity:** this check-box is used to determine if the test is going to be run in “Known Salinity” or “Estimated Salinity” mode.
 - *Known Salinity Mode:* In this mode, basic information about the salinity of the brine phase in the drilling fluid is used to estimate the oil, water, and solids fraction in the fluid. Currently it is assumed that the brine is only comprised of calcium chloride. The user inputs the brine salinity based on their Silver Nitrate titration. There are 4 choices for the salinity input:



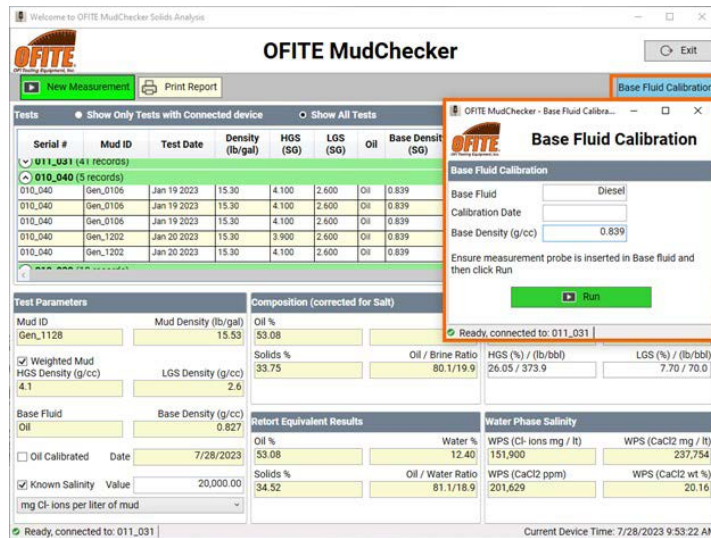
- mg Cl⁻ ions per liter of mud (comes directly from the volume of Silver Nitrate used for titration)
- mg CaCl₂ per kg of brine (or part per million)
- weight percent CaCl₂ in brine
- mg Cl⁻ ions per liter of brine

In “Known Salinity” mode, only one stage of measurement on the whole drilling fluid is required. It is not required to perform the second stage of measurement on the diluted mud sample.

- *Estimated Salinity Mode:* In this mode, the salinity data for the brine is estimated using the data and no information on the brine is required. In this mode, 2 stages of measurement are required:
 - In the first stage, measurement is performed on the whole drilling fluid sample
 - In the second stage, the software will prompt to run this stage using the diluted mud sample. This requires mixing 20 mL of whole drilling fluid with 205 mL of the DSX7 surfactant solution (#365-20-4).

Calibration

All MudChecker units already include calibration data for Diesel as base fluid. If other base fluids are used in your drilling fluids, the device must be calibrated using the base fluid. The Base Fluid Calibration utility can be accessed from the main program screen using the button on the top right-hand corner.



1. Make sure the device probe and probe cover (shield) are clean. If necessary clean with Iso-Propyl Alcohol.
2. Connect the MudChecker device to the host computer.
3. Start the MudChecker software. Then click the “Base Fluid Calibration” button to display the Base Fluid Calibration screen
4. Insert the MudChecker probe into the base fluid. Make sure the probe is properly inserted into the fluid such that the 4 horizontal slots in the probe shield are fully submerged
5. Input the name of the Base Fluid and the density (g/cc or SG).
6. Click the Run button and wait for the measurement to be completed
7. Acknowledge the confirmation dialog box. Once acknowledged, the base fluid calibration data is saved to the local database on the host PC and is now available for selection in the “New Measurement” window. The window will automatically close once “OK” is clicked.



Device Navigation

The MudCecker device has four navigation buttons:



Power / Scroll / Hold to Cancel or Power Off



Navigate Down One Level in Menu / Enter

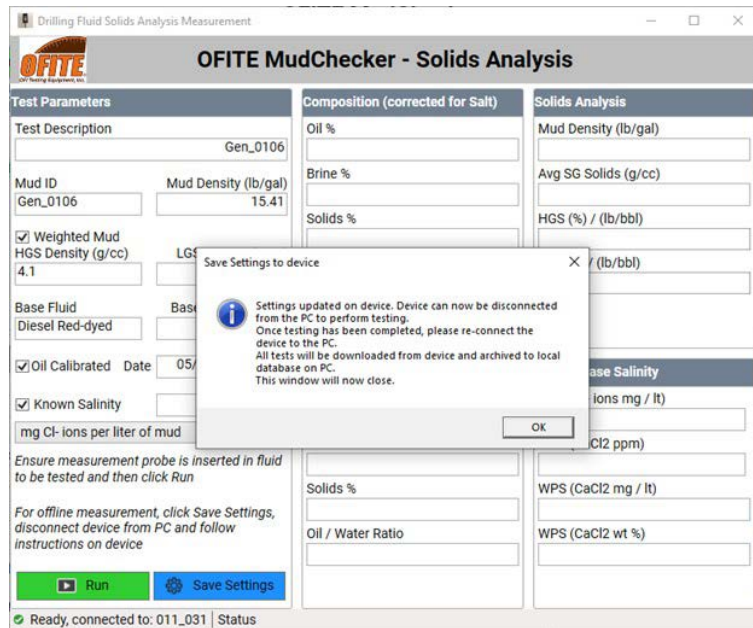


Increase or Decrease Parameter Value / Hold Both to
Go Back One Level

Testing

Standalone

In standalone mode, the test input data can be downloaded to the device to perform off-line testing. After the input data is downloaded to the device, it can be disconnected from the host PC and measurements can be performed off-line. Once the measurement is completed, the device can be plugged back into the PC and all test data will be downloaded from the device into the PC and results analyzed automatically. The image below shows the confirmation dialog for settings updated on the device and also instructions on next steps. Once the OK button is clicked, the software returns to the main screen.



Note



Note

In standalone mode, no analysis is performed on the device. All analyses are performed on the PC. Multiple tests (100 max) can be performed in this mode before results are downloaded to the host PC.

If multiple tests are performed, the same set of input data will be used for all tests. If different input data are required for each test, the device must be connected to the PC to update input data before each test.

1. Ensure the mud sample is homogenous. Mix the sample thoroughly using a blender if necessary. Ensure there are no air bubbles in the sample before inserting the probe. Immerse the probe so that the slots in the probe shield are submerged.
2. Power on the device using the power button.
3. Navigate to the “Measure” menu option using the navigation keys and use the Enter key to select it.
4. The device will present the input parameters selected during set up. Ensure these are correct and use the enter key to continue. Mud Density can be adjusted on the device using the navigation and +/- keys.

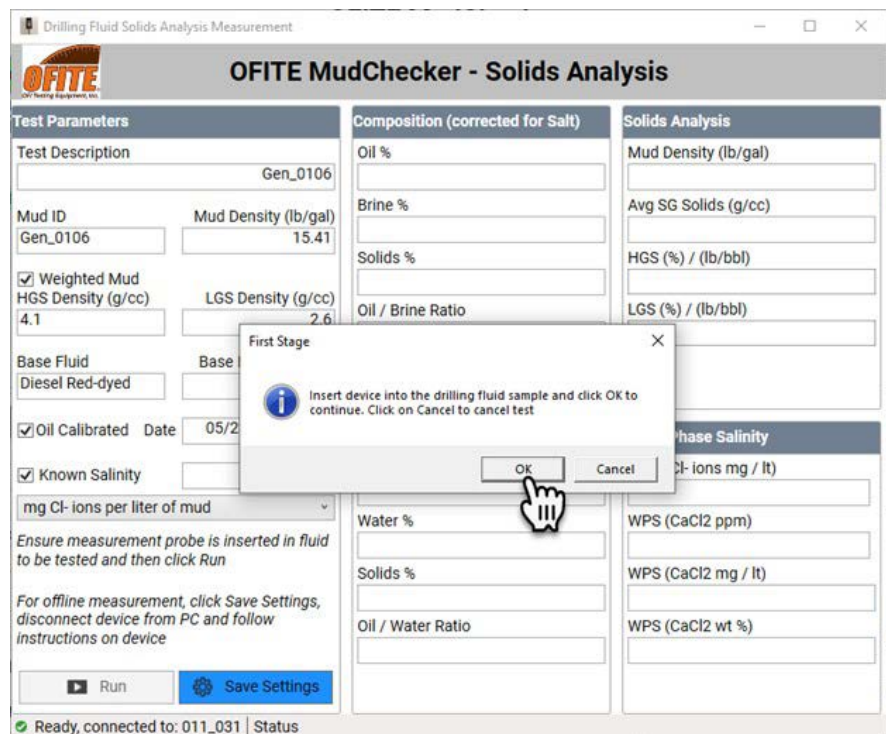
5. Attach the probe to the MudChecker device. Then press the enter key and insert the probe into your drilling fluid sample.
6. Once the probe is fully submerged in your drilling fluid sample, press the enter key to initiate the measurement process. The device will make an audible tone once measuring is complete.
7. If you are testing in Known Salinity mode, your test is complete. If you are testing in Estimated Salinity mode, continue with the next steps.
8. Open a packaged container of DSX7 (#365-20-4) dilution solution. Pour the contents of the DSX7 container into a blending cup. Using a syringe, measure out 20 mL of undiluted drilling mud and inject the mud into the DSX7 solution. Blend the contents. It is recommended:
 - Use a quality blender.
 - To avoid splashing, blend at the slowest speed and gradually increase to the highest speed.
 - Ensure the vortex is half the height of the fluid level in the cup while blending.
 - Blend for two minutes to ensure the emulsion has been thoroughly broken.
9. Attach the probe to the MudChecker device. Then press the enter key and insert the probe into the diluted drilling fluid sample.
10. The device will make an audible tone once the measurement process is complete.
11. If operating the MudChecker v1.5, press the enter key to calculate and recall your measurement results. MudChecker v1.0 models require the device to be connected to the software to recall results.

Testing

With Software

In software mode, the test is run with the device connected to the PC.

1. Ensure the mud sample is homogenous. Mix the sample thoroughly using a blender if necessary. Ensure there are no air bubbles in the sample before inserting the probe. Immerse the probe so that the slots in the probe shield are submerged.
2. Power on the device using the power button.
3. Attach the probe to the MudChecker device. Then insert the probe into your drilling fluid sample.
4. Click the “Run” button to initiate testing.
5. The software will prompt you to insert the device probe into the drilling fluid and then click “OK” to start the test. Click “Cancel” to start over.
6. Once testing is completed, the software displays a confirmation message. The user then has the option to discard the test results or save the test results into the Test Archive.



Cleaning the Probe

For best results, clean the probe thoroughly between tests.

1. Remove the probe shield.
2. Wipe the outside of the probe shaft with a soft cotton cloth or paper towel.
3. Use the cloth to wipe the exposed inner and outer probe shield surfaces.
4. Always fit a probe shield to the unit after cleaning to prevent accidental damage to the inner probe.

Do not use cloths made from artificial fibers such as nylon as this increases the risk of electrostatic discharge to the unit.

When cleaning the inner part of the probe, hold the unit using the stainless-steel collar at the top of the probe to reduce the chance of any electrostatic discharge damage to your MudChecker.

Care should be taken when screwing or unscrewing the outer probe shield of the probe to prevent cross threading. If the shield does become cross threaded, please contact OFITE for service.

If the shield is difficult to remove from the probe extra torque can be obtained by putting an Allen key through the two holes at the bottom end of the shield and applying force gently.

Do not over tighten the probe shield.

Software

Introduction

The MudCheckerApp software is designed to communicate with and control the hand-held MudChecker drilling fluid analyzer unit.

Main Functions of the Software

- Communicate with the MudChecker to control the device and access data and measurements from the device
- Display test data and analysis and data interpretation
- Report test results and basic drilling fluid properties
- Archive test data for further analysis
- Store device calibration data

The screenshot displays the OFITE MudChecker software interface. At the top, it says "Welcome to OFITE MudChecker Solids Analysis" and "OFITE MudChecker". Below this are buttons for "New Measurement" and "Print Report". The main area shows a table of tests with columns for Serial #, Mud ID, Test Date, Density (lb/gal), HGS (SG), LGS (SG), Oil, Base Density (SG), Oil Cal?, KS?, Salinity, and Unit. A dropdown menu is open for "011_031 (41 records)".

Below the table, there are several panels for detailed data:

- Test Parameters:** Mud ID: Gen_1128, Mud Density (lb/gal): 15.53, HGS Density (g/cc): 4.1, LGS Density (g/cc): 2.6, Base Fluid: Oil, Base Density (g/cc): 0.827, Oil Calibrated: , Date: 7/19/2023, Known Salinity: , Value: 20,000.00, mg Cl- ions per liter of mud.
- Composition (corrected for Salt):** Oil %: 53.08, Brine %: 13.17, Solids %: 33.75, Oil / Brine Ratio: 80.1/19.9.
- Solids Analysis:** Mud Density (lb/gal): 15.530, Avg SG Solids (g/cc): 3.7579, HGS (%) / (lb/bbl): 26.05 / 373.9, LGS (%) / (lb/bbl): 7.70 / 70.0.
- Retort Equivalent Results:** Oil %: 53.08, Water %: 12.40, Solids %: 34.52, Oil / Water Ratio: 81.1/18.9.
- Water Phase Salinity:** WPS (Cl- ions mg / lt): 151,900, WPS (CaCl2 mg / lt): 237,754, WPS (CaCl2 ppm): 201,629, WPS (CaCl2 wt %): 20.16.

At the bottom, it shows "Ready, connected to: 011_031" and "Current Device Time: 7/19/2023 2:13:30 PM".

Software

Architecture

The MudCheckerApp is a conventional Windows®-based software application based on the Microsoft .NET Core framework. The minimum hardware and software requirements are:

- Minimum 1 GHz processor
- Minimum 8GB RAM
- Minimum Windows 7 (x64) Operating System
- Microsoft Office (minimum version 2020)
- 1 USB port – minimum USB 2.0
- Microsoft .NET Desktop Runtime (x64 Architecture, Version 6.0.16)

The software is installed on the host PC using software installation files provided with the device. At least one USB port (minimum USB 2.0) is required on the host PC to install the software as well as communicating with the device. While the software can run on Windows 7, it is recommended to run on Windows 10 or higher.

The software requires Microsoft Office (Office 365 or earlier) installed on the host PC for reporting capabilities.

The software is comprised of several modules that automatically interact with each other to share data; communicate with the hand-held device (via USB port); analyze experimental data to calculate oil, water (and brine), and solids fractions in Non-Aqueous Fluids (NAF); and for reporting and data analysis purposes.

The device can be operated while connected to the software or in stand-alone mode. In connected mode, the software allows the user to input key information on the drilling fluid (inputs) and perform the measurement on the fluid. Once testing is complete, the software automatically collects measured data from the device, processes the data using sophisticated engineering analyses, displays results, generates Microsoft Excel-based reports, and archives test data and results for further analyses.

In stand-alone mode, the software communicates with the device to transmit drilling fluid input data. Once the device is updated, it can be disconnected from the host PC and perform measurements on the drilling fluid. Once testing is completed and the device is plugged back into the host PC, test data is automatically downloaded from the device and analyzed in the software. Analysis results and Excel-based reports can then be generated from the software.

The MudChecker communicates with the software via USB communication. USB 2.0 (or higher) must be available on the host PC as well as one open USB slot.

Notes

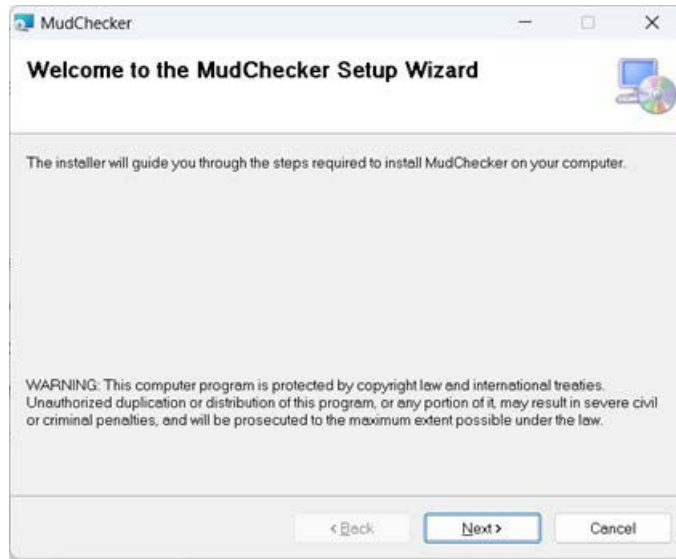
- It is important to note that only one device can be connected to the software at a time.
- Multiple devices can be used with the software. However, only one device can be connected at a time
- Avoid plugging in or unplugging any other USB device (such as thumb drives) while the test or the software is running. This is particularly important while the test is running (Mode 1 connected to the software) as Windows normal feature of automatic USB detection will interfere with the communication between the software and the device, which may cause the test to be prematurely terminated.
- MudChecker devices can be switched in the PC while the software is running. Do not switch devices or unplug a device while the test is running (In Mode 1 with the software) as this may interfere with the normal operation of the device.
- The micro USB cable supplied with the device should be used to connect the device to the PC. Other cables may be used but not recommended.
- The drivers for the device USB should automatically be installed the first time it is connected to the host PC. In case the device communication is not working properly, it may be necessary to go to the manufacturer website (for example FTDI) to download the required USB drivers for the PC.

Software

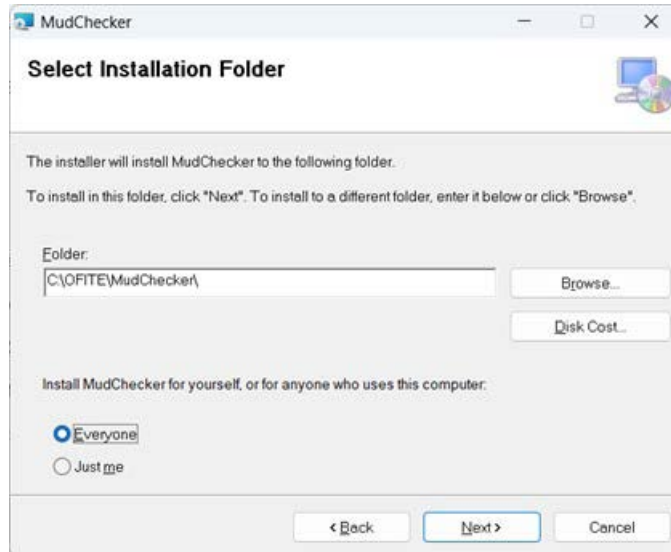
Installation

Installation files are provided on a USB thumb drive with the device. To install the software:

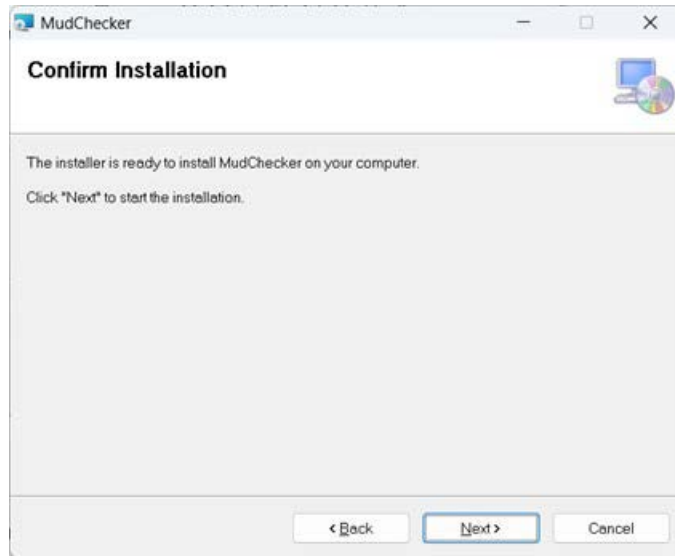
1. Insert the thumb drive into a USB port.
2. Double-click “setup.exe” to start the installation.



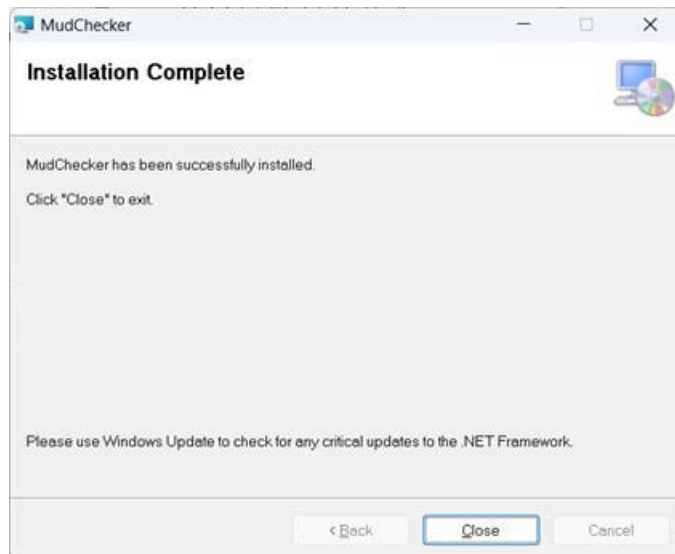
3. Click Next to select the installation location. Make sure the “Everyone” checkbox is checked. This ensures any users of the host PC will be able to access the software.



4. Click Next to start copying files to the host PC.



5. Click Next to complete the installation.



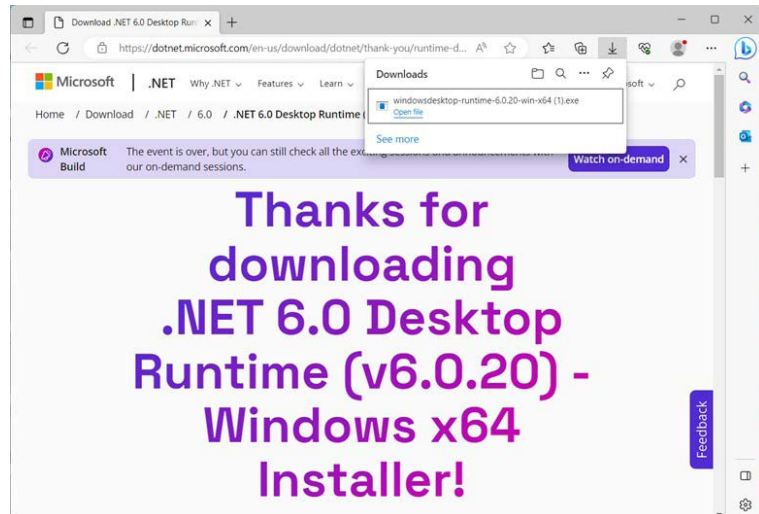
6. Click Close to dismiss the installation window.
7. If the .NET Desktop Runtime (version 6.0.16 or higher) is not available on the host PC, then the software will automatically prompt the user to install it. Please note that an Internet connection is required to download the required installation files automatically from Microsoft. Click Yes to continue the installation process.



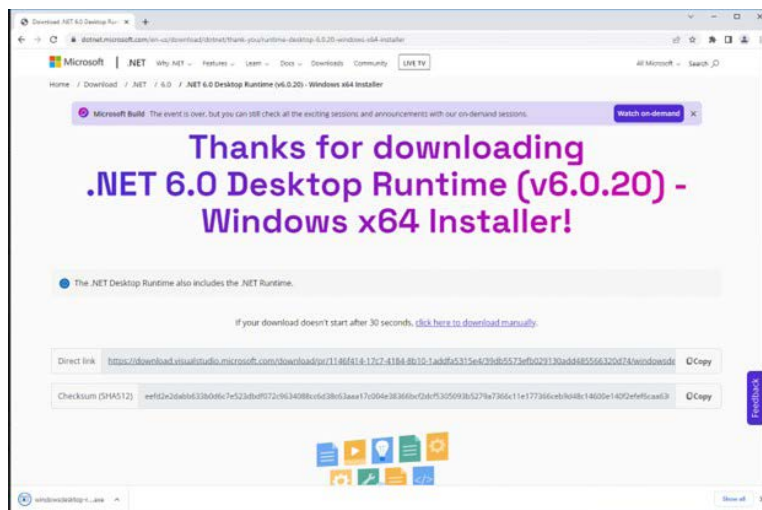
Note

The .NET Desktop Runtime software installation file is included on the thumb drive that is shipped with the MudChecker. If you prefer to use that file, skip to step 11.

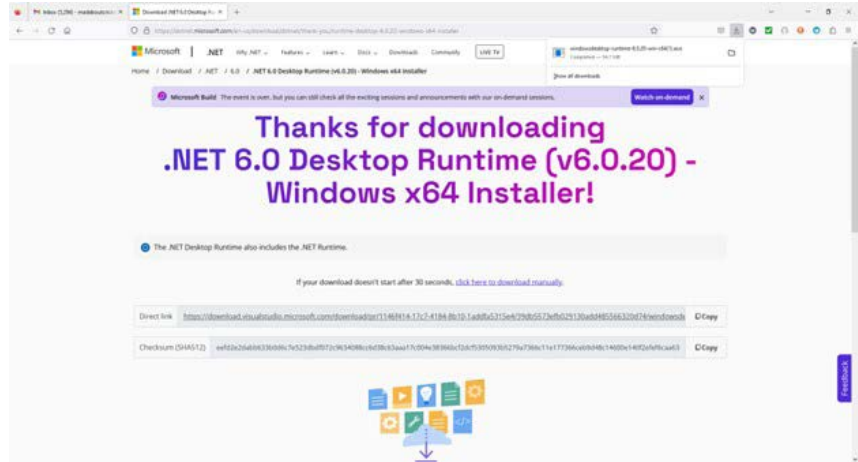
8. Confirm that the download process was able to download the installation file from Microsoft. The installation file is called “windowsdesktop-runtime-6.0.20-win-x64.exe”. Please note that while the installation file from Microsoft may change based on the minimum requirement from Microsoft, the system will automatically detect and install the minimum required framework version.



9. The location of the installation file depends on the web browser on the host PC. The image above shows how the file appears in Microsoft Edge. In Google Chrome, the downloaded files are usually shown on the lower left-hand corner of screen as shown below.



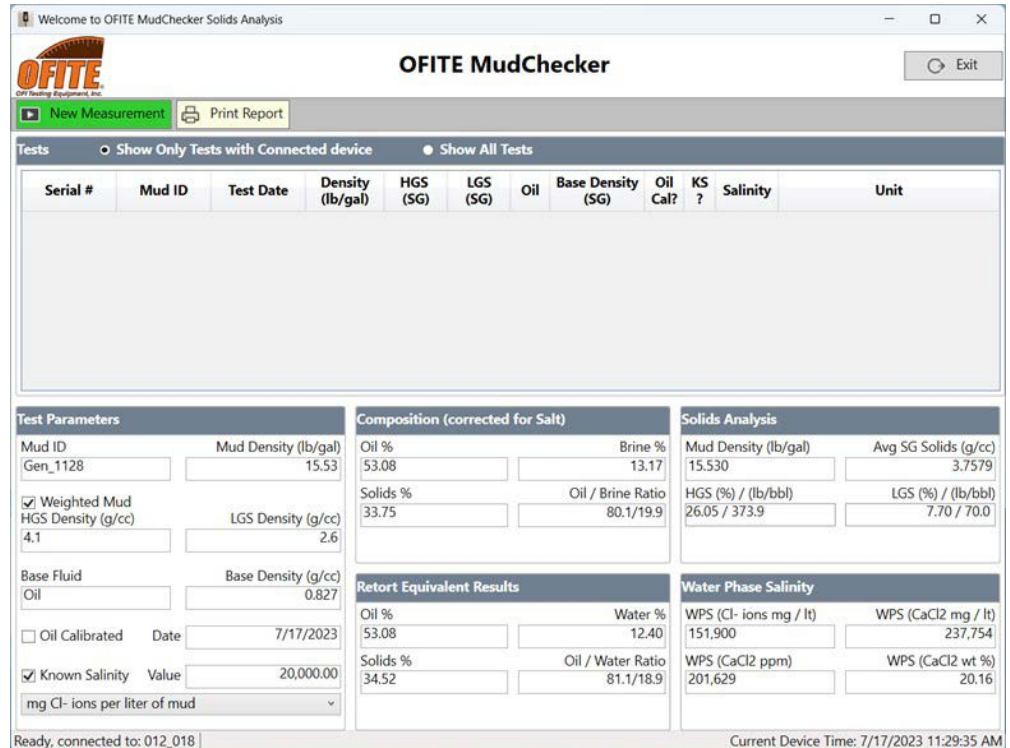
10. In Mozilla Firefox, the download files can be located in the top toolbar as shown below.



11. Run the “windowsdesktop-runtime-6.0.20-win-x64.exe” installation file to install the .NET Framework. Ensure that the software was installed correctly.

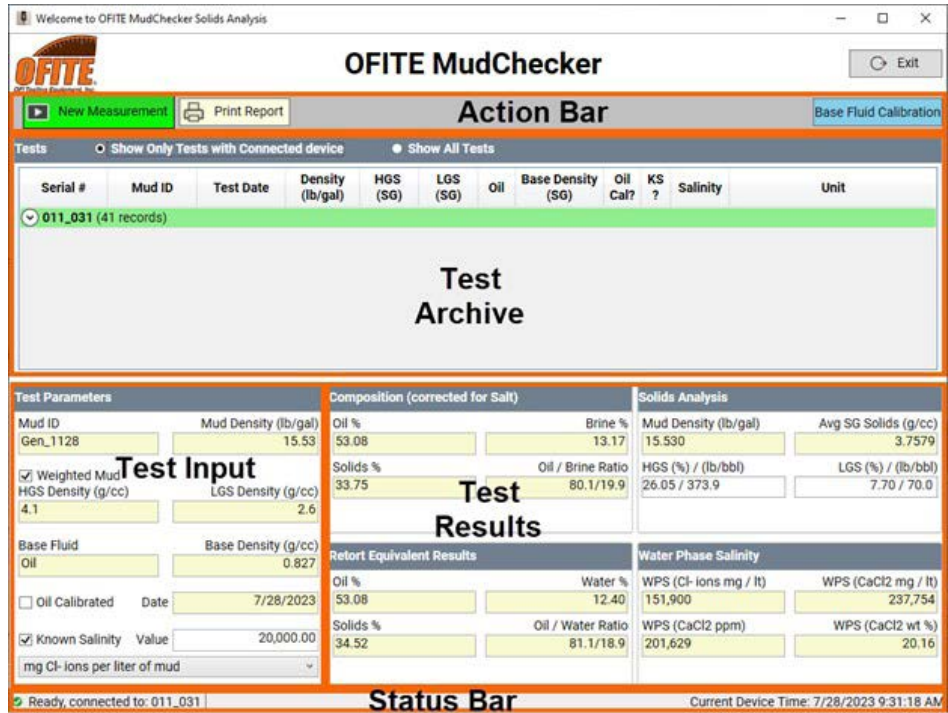
12. Run the MudCheckerApp to verify that all necessary components are installed correctly. Double-click the MudCheckerApp icon on the desktop to run the software.

13. If the software is installed correctly, the main screen should display.



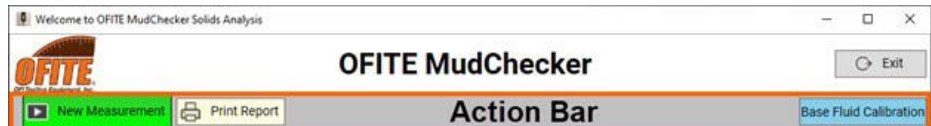
Software Layout

The main screen of the software is shown below. Various areas of the main screen are grouped according to their functionality and are highlighted and described in the section below.



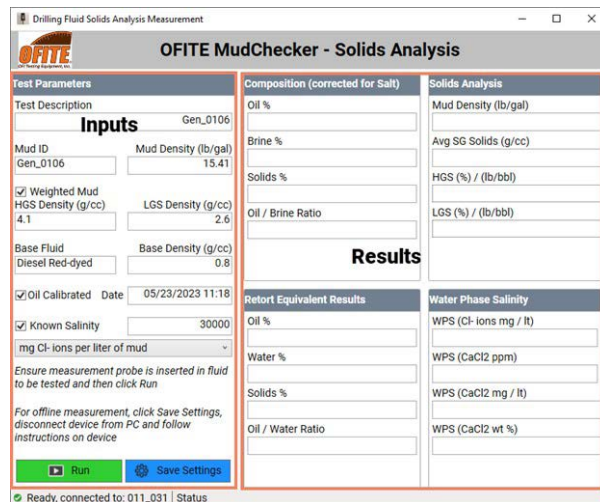
Action Bar

The Action Bar allows the user to Run a New Measurement (Test), or to print an Excel-based report for any archived test.



New Measurement

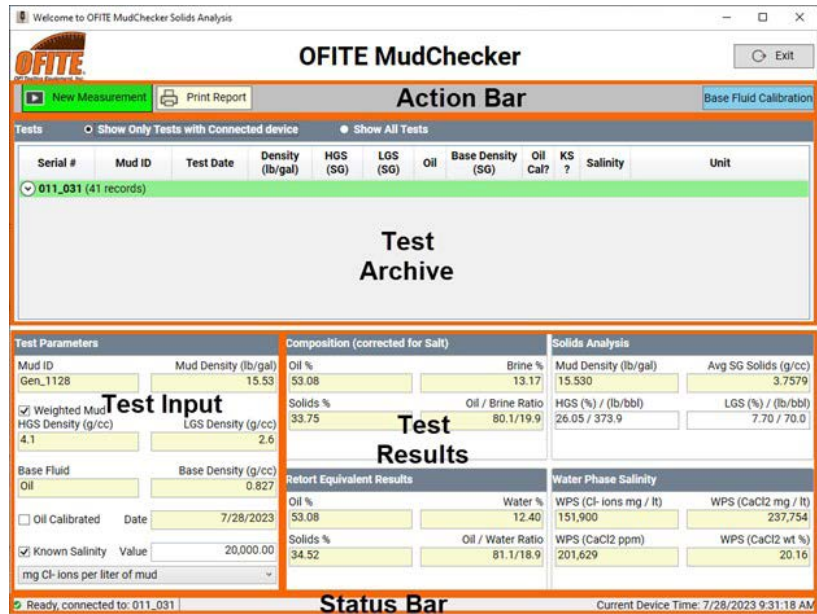
Click the “New Measurement” button to initiate a new measurement (or test).



Software

Results / Analysis

Once a test is completed, any analysis, browsing, or printing functions are accessed from the software main screen.



Availability of Results

When running test in Mode 1 through the software, once the confirmation message is accepted and results are saved, the new test is automatically added to the end of the list shown in the "Test Archive" group in the grid. Results are sorted by Test Data and grouped by Device Serial Number.

When running in Mode 2 in stand-alone mode, results are automatically downloaded from the device and archived in the grid in the "Test Archive" group. To download new tests, simply connect the device to the host PC and then launch the software. Since the device has an auto-sleep feature if left untouched for some time, it is best to first connect the device to the host PC and wait about 15 seconds for the device to completely turn on. It is not required to turn the device on before connecting to the PC; it automatically turns on when connected. After about 15 seconds, launch the software from the icon in the desktop. The software automatically detects and downloads new tests on the device. Note that tests once downloaded from the device are removed from the device memory and archived in the host PC database.

Browsing Existing Tests

The grid shown in the “Test Archive” group can be used to browse all archived tests in the host PC database. Results can be viewed only for the device currently connected to the host PC, or can be viewed for all archived tests. This can be performed by making the appropriate choice in the “Tests” header in the grid.

The screenshot shows the OFITE MudChecker software interface. At the top, it says "Welcome to OFITE MudChecker Solids Analysis". Below that is the "OFITE MudChecker" title bar and a navigation menu with "New Measurement" and "Print Report" buttons. The main area is divided into two sections: "Tests" and "Test Parameters".

The "Tests" section has a dropdown menu set to "Show Only Tests with Connected device". Below this is a table of test records for device 011_031:

Serial #	Mud ID	Test Date	Density (lb/gal)	HGS (SG)	LGS (SG)	Oil	Base Density (SG)	Oil Cal?	KS ?	Salinity	Unit
011_031	(41 records)										
010_040	(5 records)										
010_039	(18 records)										
009_029	(22 records)										
010_029	(1 record)										
010_041	(1 record)										
(17 records)											
011_031	(1 record)										

The "Test Parameters" section shows various input fields and calculated values:

- Mud ID: Gen_1128, Mud Density (lb/gal): 15.53
- Weighted Mud: HGS Density (g/cc): 4.1, LGS Density (g/cc): 2.6
- Base Fluid: Oil, Base Density (g/cc): 0.827
- Oil Calibrated: Date: 7/28/2023
- Known Salinity: Value: 20,000.00 mg Cl- ions per liter of mud

The "Composition (corrected for Salt)" section shows:

- Oil %: 53.08, Brine %: 13.17
- Solids %: 33.75, Oil / Brine Ratio: 80.1/19.9

The "Solids Analysis" section shows:

- Mud Density (lb/gal): 15.530, Avg SG Solids (g/cc): 3.7579
- HGS (%) / (lb/bbl): 26.05 / 373.9, LGS (%) / (lb/bbl): 7.70 / 70.0

The "Retort Equivalent Results" section shows:

- Oil %: 53.08, Water %: 12.40
- Solids %: 34.52, Oil / Water Ratio: 81.1/18.9

The "Water Phase Salinity" section shows:

- WPS (Cl- ions mg / lt): 151,900, WPS (CaCl2 mg / lt): 237,754
- WPS (CaCl2 ppm): 201,629, WPS (CaCl2 wt %): 20.16

At the bottom, it says "Ready, connected to: 011_031" and "Current Device Time: 7/28/2023 9:49:41 AM".

Records for a given device can be expanded in the grid by clicking on the small downward arrow next to the device serial number.

The screenshot shows the OFITE MudChecker software interface with the "Tests" dropdown menu set to "Show All Tests". The table of test records is expanded to show individual test data for device 010_040:

Serial #	Mud ID	Test Date	Density (lb/gal)	HGS (SG)	LGS (SG)	Oil	Base Density (SG)	Oil Cal?	KS ?	Salinity	Unit
010_040	Gen_0106	Jan 19 2023	15.30	4.100	2.600	Oil	0.839	<input type="checkbox"/>	<input checked="" type="checkbox"/>	30,000	mg Cl- ions per liter of mud
010_040	Gen_0106	Jan 19 2023	15.30	4.100	2.600	Oil	0.839	<input type="checkbox"/>	<input checked="" type="checkbox"/>	30,000	mg Cl- ions per liter of mud
010_040	Gen_0106	Jan 19 2023	15.30	4.100	2.600	Oil	0.839	<input type="checkbox"/>	<input checked="" type="checkbox"/>	30,000	mg Cl- ions per liter of mud
010_040	Gen_1202	Jan 20 2023	15.30	3.900	2.600	Oil	0.839	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	25,000	mg Cl- ions per liter of mud
010_040	Gen_1202	Jan 20 2023	15.30	4.100	2.600	Oil	0.839	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	25,000	mg Cl- ions per liter of mud

The "Test Parameters" section shows:

- Mud ID: Gen_1128, Mud Density (lb/gal): 15.53
- Weighted Mud: HGS Density (g/cc): 4.1, LGS Density (g/cc): 2.6
- Base Fluid: Oil, Base Density (g/cc): 0.827
- Oil Calibrated: Date: 7/28/2023
- Known Salinity: Value: 20,000.00 mg Cl- ions per liter of mud

The "Composition (corrected for Salt)" section shows:

- Oil %: 53.08, Brine %: 13.17
- Solids %: 33.75, Oil / Brine Ratio: 80.1/19.9

The "Solids Analysis" section shows:

- Mud Density (lb/gal): 15.530, Avg SG Solids (g/cc): 3.7579
- HGS (%) / (lb/bbl): 26.05 / 373.9, LGS (%) / (lb/bbl): 7.70 / 70.0

The "Retort Equivalent Results" section shows:

- Oil %: 53.08, Water %: 12.40
- Solids %: 34.52, Oil / Water Ratio: 81.1/18.9

The "Water Phase Salinity" section shows:

- WPS (Cl- ions mg / lt): 151,900, WPS (CaCl2 mg / lt): 237,754
- WPS (CaCl2 ppm): 201,629, WPS (CaCl2 wt %): 20.16

At the bottom, it says "Ready, connected to: 011_031" and "Current Device Time: 7/28/2023 9:50:41 AM".

Click on any row in the data grid to view test inputs data and associated results of the solids analysis calculations. Input data of the drilling fluid is shown in the “Test Input” group.

Test Results

Results from a test selected in the data grid are shown in the “Test Results” group. The various results are grouped and are described below.

Group: Composition (corrected for Salt)

- Oil %: the volumetric percent (fraction) of oil in the sample
- Brine %: the volumetric percent of brine in the drilling fluid sample
- Solids %: the volumetric percent of solids in the drilling fluid sample, corrected for the presence of salt
- Oil / Brine Ratio: the ratio of oil to water volumetric fraction in the drilling fluid sample

Group : Retort Equivalent Results

- Oil %: the volumetric percent (fraction) of oil in the sample
- Water %: the volumetric fraction of water in the sample, similar to what would be measured on the retort
- Solids %: the volumetric percent of Solids in the drilling fluid sample, similar to what would be measured on the retort
- Oil / Water Ratio: the ratio of oil to water volumetric fraction in the drilling fluid sample

Group : Solids Analysis

- Mud Density (lb/gal): the calculated density of the drilling fluid based on the calculated (estimated) volumetric fraction of components and the respective density of each component. This should match or be very close to the input mud density.
- Avg SG Solids: the average (or equivalent) density of all solids in the drilling fluid sample
- HGS % / (lb/bbl): the volumetric fraction of high gravity solids (barite) in the drilling fluid sample, and the mass concentration in lb/bbl
- LGS % / (lb/bbl): the volumetric fraction of low gravity solids (drill solids) in the drilling fluid sample, and the mass concentration in lb/bbl

Group : Water Phase Salinity

- WPS (Cl^- ions mg/l): aqueous-phase chloride concentration from calcium chloride expressed in milligrams per liter
- WPS (CaCl_2 mg/l): aqueous-phase calcium chloride concentration expressed in milligrams per liter
- WPS (CaCl_2 ppm): aqueous-phase calcium chloride expressed in milligrams per liter
- WPS (CaCl_2 wt%): aqueous-phase calcium chloride expressed as weight percent

Software Reports

Any archived test available in the host PC can be exported as an Excel-based report. The various groups in the report are similar to those described for the software.

The screenshot shows an Excel spreadsheet with the following data:

MudChecker - Solids Analysis							
Device Serial Number	011_031			Test Date	Jul 10 2023		
Input Data							
Test Notes	Gen_0721						
Mud Density (lb/gal)	15.84			Mud ID	Gen_0721		
HGS Density (g/cc)	4.1			LGS Density (g/cc)	2.6		
Base Fluid	Oil			Base Density (g/cc)	0.839		
Known Salinity Value	18000 mg Cl- ions per liter of mud						
Composition (corrected for Salt)							
Oil (%)	55.8	Brine (%)	9.5	Solids (%)	34.8	Oil/Brine Ratio	85.7 / 14.3
Retort Equivalent Results (un-corrected)							
Oil (%)	55.8	Water (%)	8.7	Solids (%)	35.5	Oil/Water Ratio	86.5 / 13.5
Solids Analysis							
Mud Density (lb/gal)	15.8			Average SG Solids (g/cc)	3.797		
HGS (vol%)	27.7			HGS Mass (lb/bbl)	398.1		
LGS (vol%)	7			LGS Mass (lb/bbl)	63.9		
Water Phase Salinity							
WPS (Cl- ions mg / lt)	190,400			WPS (CaCl2 mg/lt)	298,100		
WPS (CaCl2 ppm)	243,900			WPS (CaCl2 wt%)	24		

Tips

Blender Information

We recommend you use a high-quality blender suitable for mixing drilling fluids, such as a Hamilton Beach single spindle mixer.

Blending Your Drilling Fluid Sample for Salinity Test

Oil, water, and solids can separate in a drilling fluid which has settled. For the most accurate results it is essential to ensure the drilling fluid is homogeneous.

We recommend following the below best practise for blending your diluted drilling fluid sample:

- Use DSX7 Dilution solution bottles directly from OFITE
- Open a sealed bottle of DSX7 and pour all of the contents into a blending cup.
- Using a syringe, measure out 20 mL of undiluted drilling mud and inject the mud into the DSX7 solution (be careful not to deposit the sample on the sides or on the blade assembly above the liquid line).
- Switch on your blender. To avoid splashing, blend at the slowest speed and gradually increase to the highest speed.
- Ensure the vortex is half the height of the fluid level in the cup whilst blending.
- Blend for 2 minutes to ensure the oil emulsion is sufficiently broken.

The MudChecker requires chloride ions to be saturated in the water phase in order to measure. Similarly to traditional titration methods unsaturated chlorides will be attributed as solids.

Submerging the Probe

It is essential to ensure that the MudChecker probe is inserted into the drilling fluid sample so that the horizontal slots at the top of the probe are submerged in the sample.

Expelling Bubbles and Air Gaps

When carrying out a measurement ensure that all air bubbles are expelled. We recommend that you do this by giving the probe a gentle wiggle while submerged in the sample.

Safety

Safety Precautions

Failure to follow these precautions could cause explosions or leaks resulting in fire, injury, and damage to the surroundings. If the battery inside the unit leaks and you or your clothing comes in contact with the leaking substances, immediately flush with large amounts of water and seek medical assistance.

- Before using the MudChecker please be sure to read the safety precautions described.
- Always be sure to operate the equipment correctly.
- The safety precautions below are intended to instruct you in the safe and correct operation of the unit and its accessories to prevent injuries to yourself or other persons and damage to the equipment. 'Equipment' refers to the MudChecker unit itself, the power adapter supplied, and the USB lead also supplied.
 - Do not attempt to disassemble or alter any part of the equipment that is not expressly described in this guide. Opening the equipment or tampering with its seals will invalidate the warranty and is in breach of the terms and conditions of sale.
 - The equipment contains no user serviceable parts. Do not attempt to open or dismantle it.
 - Stop using the equipment and switch the unit off immediately if it emits smoke or fumes. Contact OFITE immediately.
 - Do not use the equipment if it has condensation on or in it, or if you have wet hands.
 - Do not allow the body of the equipment to be immersed in water or any other liquids. If it does:
 - Immediately turn the unit off and disconnect the USB lead. Continuing to use the equipment could result in fire or electrical shock.
 - Wipe all wet items dry with a soft, absorbent cloth.
 - If the unit has been immersed, please consult your OFITE directly.
 - The gaskets on the unit case should be inspected regularly for signs of swelling and wear. If this occurs, please advise your OFITE.
 - Damage to the unit enclosure or top lid may significantly degrade the IP rating of the unit. Such damage should be discussed with OFITE.

- The MudChecker contains a high capacity, rechargeable, Lithium-based battery. While the MudChecker unit is splash proof it should not be submerged in water or any other liquid as this could cause the battery to explode. Water will also cause failure of the electronics.
- The MudChecker must not be exposed to temperatures higher than 40°C (104°F) for prolonged periods as this can cause failure to operate correctly and failure of the battery, especially during charging. Charging at these temperatures is inhibited by the firmware. It is recommended that the unit should not be exposed to direct sunlight for long periods of time. If required to operate above this temperature please contact OFITE for advice.
- Do not place the unit near a heat source (e.g. engine exhaust, radiator) or expose it to direct flame or heat, or leave it in the glove box or trunk of a vehicle for prolonged periods of time.
- Do not use substances containing alcohol, Benzene, thinners or other solvents to clean the body of the equipment as this might damage the sealing and reduce the splash resistance.
- Keep the body of the unit, its probe, and the connector sockets clean and dry.
- Dropping or subjecting the unit or probe to large shock could cause damage that will prevent correct and accurate operation. If this does occur, please contact OFITE.
- At lower temperatures, the internal battery will become discharged sooner.

Warranty and Return Policy

Warranty:

OFI Testing Equipment, Inc. (OFITE) warrants that the products shall be free from liens and defects in title, and shall conform in all respects to the terms of the sales order and the specifications applicable to the products. All products shall be furnished subject to OFITE's standard manufacturing variations and practices. Unless the warranty period is otherwise extended in writing, the following warranty shall apply: if, at any time prior to twelve (12) months from the date of invoice, the products, or any part thereof, do not conform to these warranties or to the specifications applicable thereto, and OFITE is so notified in writing upon discovery, OFITE shall promptly repair or replace the defective products. Notwithstanding the foregoing, OFITE's warranty obligations shall not extend to any use by the buyer of the products in conditions more severe than OFITE's recommendations, nor to any defects which were visually observable by the buyer but which are not promptly brought to OFITE's attention.

In the event that the buyer has purchased installation and commissioning services on applicable products, the above warranty shall extend for an additional period of twelve (12) months from the date of the original warranty expiration for such products.

In the event that OFITE is requested to provide customized research and development for the buyer, OFITE shall use its best efforts but makes no guarantees to the buyer that any products will be provided.

OFITE makes no other warranties or guarantees to the buyer, either express or implied, and the warranties provided in this clause shall be exclusive of any other warranties including ANY IMPLIED OR STATUTORY WARRANTIES OF FITNESS FOR PURPOSE, MERCHANTABILITY, AND OTHER STATUTORY REMEDIES WHICH ARE WAIVED.

This limited warranty does not cover any losses or damages that occur as a result of:

- Improper installation or maintenance of the products
- Misuse
- Neglect
- Adjustment by non-authorized sources
- Improper environment
- Excessive or inadequate heating or air conditioning or electrical power failures, surges, or other irregularities
- Equipment, products, or material not manufactured by OFITE
- Firmware or hardware that have been modified or altered by a third party
- Consumable parts (bearings, accessories, etc.)

Returns and Repairs:

Items being returned must be carefully packaged to prevent damage in shipment and insured against possible damage or loss. OFITE will not be responsible for equipment damaged due to insufficient packaging.

Any non-defective items returned to OFITE within ninety (90) days of invoice are subject to a 15% restocking fee. Items returned must be received by OFITE in original condition for it to be accepted. Reagents and special order items will not be accepted for return or refund.

OFITE employs experienced personnel to service and repair equipment manufactured by us, as well as other companies. To help expedite the repair process, please include a repair form with all equipment sent to OFITE for repair. Be sure to include your name, company name, phone number, email address, detailed description of work to be done, purchase order number, and a shipping address for returning the equipment. All repairs performed as "repair as needed" are subject to the ninety (90) day limited warranty. All "Certified Repairs" are subject to the twelve (12) month limited warranty.

Returns and potential warranty repairs require a Return Material Authorization (RMA) number. An RMA form is available from your sales or service representative.

Please ship all equipment (with the RMA number for returns or warranty repairs) to the following address:

OFI Testing Equipment, Inc.
Attn: Repair Department
11302 Steeplecrest Dr.
Houston, TX 77065
USA

OFITE also offers competitive service contracts for repairing and/or maintaining your lab equipment, including equipment from other manufacturers. For more information about our technical support and repair services, please contact techservice@ofite.com.