# LaMotte®

# DC1500 MOLYBDENUM

063 Molybdenum HR
**1.3 ppm**
Scan Blank
Scan Sample
07:47:50    010/500

## DC1500 MOLYBDENUM

**Molybdenum Colorimeter Kit**
Code 3246

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## DC1500 MOLYBDENUM KIT

■ Kit Contents

| QUANTITY | CONTENTS | CODE |
|---|---|---|
| 60 mL | *Mo Buffer | *3997-H |
| 2 x 30 mL | *Molybdenum Oxidizing Reagent | *6485-G |
| 2.5 | *Molybdenum Indicator Powder | *6486-S |
| 1 | Spoon 0.05 , plastic | 0696 |
| 2 | Pipets, 1.0 mL, plastic, w/cap | 0354 |
| 1 | Colorimeter Tubes, w/caps, set of 6 | 0290-6 |
| 1 | Water Sample Collecting Bottle | 0688 |
| 1 | 1500 Colorimeter for Molybdenum | 27926-MB |
| 1 | USB Wall Adapter | 1721 |
| 1 | USB Cable | 1720-01 |
| 1 | DC1500-MB Molybdenum Colorimeter, Manual | 3246-MN |
| 1 | DC1500-MB Molybdenum Colorimeter, Quick Start Guide | 3246-QG |

*WARNING: Reagents marked with an * are considered to be potential health hazards. To view or print a Safety Data Sheet (SDS) for these reagents go to www.lamotte.com. Search the four digit reagent code number listed on the reagent label, in the contents list or in the test procedures. Omit any letter that follows or precedes the four digit code number. For example if code is 4450WT-H, search 4450. To obtain a printed copy, contact LaMotte by e-mail, phone or fax.

Emergency information for all LaMotte reagents is available from Chem-Tel (US, 1-800-255-3924) (International, call collect, 813-248-0585).

To order individual reagents or test kit components, use the specified code number.

NOTE: After use, return *Mo Buffer (3997) to zipper top storage bag to reduce exposure to corrosive reagent.

■ Accessories

| DESCRIPTION | CODE |
|---|---|
| Test Tubes, with Caps | 0290-6 |
| Replacement Chamber | 3-0038 |
| USB Cable | 1720-01 |
| USB Wall Adapter | 1721 |
| Car Charger | 5-0132 |

## TEST METHODS SPECIFICATIONS

### ■ INTRODUCTION

Molybdenum occurs naturally in the earth's crust as molybdenite and wolfenite, and is an important element in many biochemical reactions, including nitrogen fixation. In industrial processes, such as the operation of boilers and cooling towers, molybdenum, in the form of sodium molybdate, is used as an environmentally safe corrosion inhibitor.

### ■ APPLICATION

Boiler and cooling water

### ■ RANGE

0.0 to 50.0 ppm Molybdenum

### ■ METHOD

Calcium thioglycolate reacts with molybdenum to give a yellow color with an intensity proportional to the amount of molybdenum present.

### ■ HANDLING & PRESERVATION

Molybdenum samples may be stored in either plastic or glass containers.

### ■ INTERFERENCES

Nickel levels less than 50 ppm do not interfere; aluminum levels less than 10 ppm do not interfere; chromate, at higher concentrations, interferes due to the intense yellow color. Ferrous iron levels below 50 ppm do not interfere, but low levels of ferric iron will cause a large blank. Highly buffered samples may exceed the capacity of the system possibly producing inaccurate results. Add an extra 1.0 mL of *Mo Buffer (3997) to adjust the pH of the sample to approximately 4.5. Multiply the result in ppm by 1.08.

# ANALYSIS

## PROCEDURE

| | |
|---|---|
| 1. Fill the Water Sample Collecting Bottle (0688) with sample water. |  |

| | |
|---|---|
| 2. Press and hold ⏻ until colorimeter turns on. | **Main Menu**<br>Testing Menu<br>Editing Menu<br><br>12:00:00    001/500 |

| | |
|---|---|
| 3. Press **ENTER** to select **Testing Menu**. | **All Tests**<br>063 Molybdenum HR<br><br>12:00:00    001/500 |

| | |
|---|---|
| 4. Scroll to and select **063 Molybdenum HR** from menu. | **063 Molybdenum HR**<br><br>Scan Blank<br>Scan Sample<br>12:00:00    001/500 |

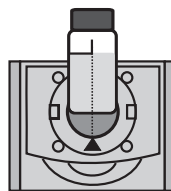| | |
|---|---|
| 5. Rinse a clean tube (0290) with sample water. Fill to the 10 mL line with sample. |  |

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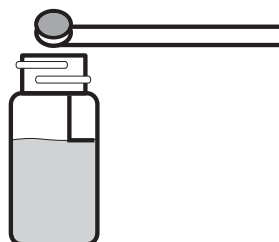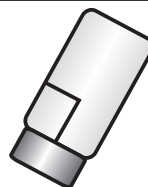| | |
|---|---|
| 6. Use the 1.0 mL pipet (0372) to add 1 mL of *Mo Buffer (3997). Cap tube and mix. | |
| 7. Use the 1.0 mL pipet (0354) to add 1 mL of *Molybdenum Oxidizing Reagent (6485). Cap and mix. Wipe tube dry. | |
| 8. Insert tube into chamber, close lid and select **Scan Blank**. | |
| 9. Remove tube from colorimeter. Use the 0.05 g spoon (0696) to add 0.05 g of *Molybdenum Indicator Powder (6486). | |
| 10. Cap and invert to mix until the powder dissolves. Solution will turn yellow if molybdenum is present. | |

| | |
|---|---|
| 11. Insert tube into chamber. Close lid. Select **Scan Sample**. Record result as Molybdenum. | Calibration<br><br>063 Molybdenum HR<br><br>**9.9** ppm<br><br>Scan BLank<br><br>Scan Sample<br><br>12:00:00     001/500 |

NOTE: The meter will remember the last scanned blank reading. It is not necessary to scan a blank each time the test is performed. To use the previous blank reading, instead of scanning a new one, scroll to Scan Sample and proceed. For the most accurate results, the meter should be blanked before each test and the same tube should be used for the blank and the reacted sample.

NOTE: For the best possible results, carry a reagent blank through the procedure. After scanning the blank, perform the test procedure on clear, colorless, distilled or deioized water. Subtract results of regent blank from all subsequent test results.
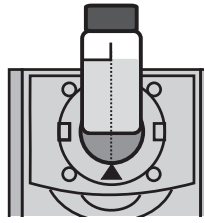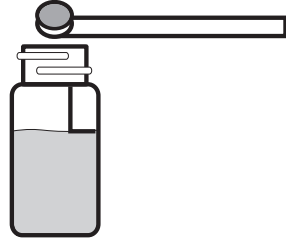
## CALIBRATION

### ■ STANDARDS

The meter should be calibrated with molybdenum standards. The calibration should be done with a distilled or deionized water blank and one molybdenum standard of known concentration. The concentration of the calibration standard should be similar to the expected concentration of the sample that will be tested.
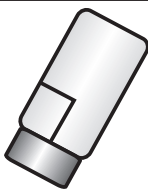
### CALIBRATION PROCEDURE

| | |
|---|---|
| 1. Press and briefly hold ⏻ to turn the meter on. The LaMotte logo screen will appear for about 3 seconds and the **Main Menu** will appear. | Main Menu<br><br>Testing Menu<br><br>Editing Menu<br><br><br><br>12:00:00     001/500 |

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| | |
|---|---|
| 2. Press **ENTER** to select **Testing Menu**. | **All Tests**<br><br>063 Molybdenum HR<br><br><br><br>12:00:00    001/500 |
| 3. Scroll to and select **063 Molybdenum HR** from menu. | **063 Molybdenum HR**<br><br><br>Scan Blank<br>Scan Sample<br>12:00:00    001/500 |
| 4. Rinse a clean tube [0290] three times with the Molubdenum standard. Fill to the 10 mL line wth the Molybdenum standard. | |
| 5. Use the 1.0 mL pipet [0372] to add 1 mL of *Mo Buffer [3997]. Cap tube and mix. | |
| 6. Use the 1.0 mL pipet [0354] to add 1 mL of *Molybdenum Oxidizing Reagent [6485]. Cap and mix. Wipe tube dry. | |

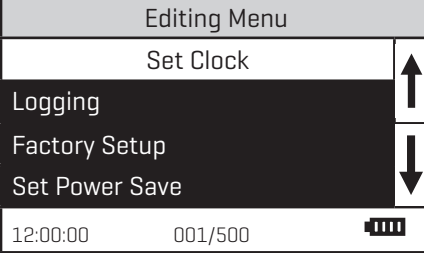| 7. | Insert tube into chamber, close lid and select **Scan Blank**. |  |
|---|---|---|
| 8. | Remove tube from colorimeter. Use the 0.05 g spoon (0696) to add 0.05 g of *Molybdenum Indicator Powder (6486). |  |
| 9. | Cap and invert to mix until the powder dissolves. Solution will turn yellow if molybdenum is present. |  |
| 10. | Insert tube into chamber. Close lid. Select **Scan Sample**. | 063 Molybdenum HR<br><br>**9.9** ppm<br><br>Scan BLank<br>Scan Sample<br><br>12:00:00　　001/500 |
| 11. | Press ⌄ to scroll to **Calibrate**. | 063 Molybdenum HR<br><br>**9.9** ppm<br><br>%T/Abs<br>Calibrate<br><br>12:00:00　　001/500 |

| | |
|---|---|
| 12. Press **ENTER** to select **Calibrate**. A reverse font (light background with dark characters) will appear to indicate that the reading can be adjusted. | **063 Molybdenum HR**<br><br>**9.9** ppm<br><br>∧, ∨=Edit, ENTER=Save<br>∧ +ENTER=Default<br><br>12:00:00      001/500 |
| 13. Press **∧** or **∨** to adjust the value shown to the concentration of the prepared standard, 10.00 in this example. NOTE: A maximum adjustment of 25% is possible. | **063 Molybdenum HR**<br><br>**10.0** ppm<br><br>∧, ∨=Edit, ENTER=Save<br>∧ +ENTER=Default<br><br>12:00:00      001/500 |
| 14. Press **ENTER** to save the value.<br><br>To leave the Calibration procedure without saving the adjustment, press **EXIT**.<br><br>Press **∧** and **ENTER** at any time to return to the default value.<br><br>The calibration has now been standardized and can be used for testing. Scroll to **Scan Blank** and begin testing. | **063 Molybdenum HR**<br><br>**10.0** ppm       ↑<br>%T/Abs<br>Calibrate<br>12:00:00      001/500 |
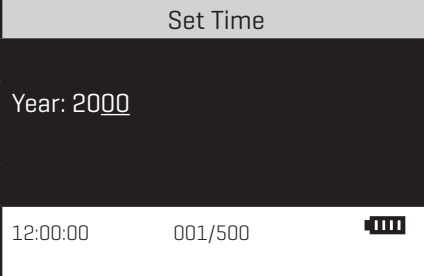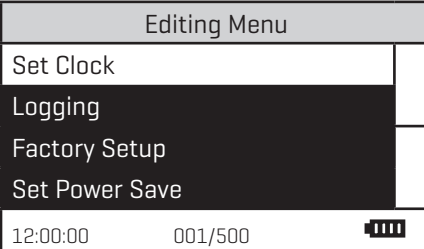
## SET UP

### ■ SETTING THE CLOCK

Setting the clock allows the correct time and date stamp to be stored with each reading in the data logger.

| 1. From the **Editing Menu**, press ⋀ or ⋁ to scroll to **Set Clock**. | Editing Menu |
|---|---|
| | Set Clock |
| | Logging |
| | Factory Setup |
| | Set Power Save |
| | 12:00:00          001/500 |

| 2. Press **ENTER** to select **Set Clock**. The year is displayed. Press ⋀ or ⋁ to scroll to the appropriate character. Press **ENTER** to select the character. The month, day, hour, format hour, minute, second, AM/PM will be dislpayed. Repeat for each. | Set Time |
|---|---|
| | Year: 20<u>00</u> |
| | 12:00:00          001/500 |

| 3. Press **ENTER** to select the final character. The time and date will be saved and the meter will return to the **Editing Menu**. | Editing Menu |
|---|---|
| | Set Clock |
| | Logging |
| | Factory Setup |
| | Set Power Save |
| | 12:00:00          001/500 |

## ■ LOGGING DATA

The default setting for the data logger is enabled. The meter will log the last 500 data points. The counter in the center bottom of the display will show how many data points have been logged. The display will show 500+ when the data logger has exceeded 500 points and the data points are being overwritten.

| | |
|---|---|
| 1. From the **Editing Menu**, press ⏶ or ⏷ to scroll to **Logging**. | **Editing Menu**<br>Set Clock<br>Logging<br>Factory Setup<br>Set Power Save<br>12:00:00　　001/500 |
| 2. Press **ENTER** to select **Logging**. | **Logging**<br>Display Test Log<br>Logging Enabled<br>Logging Disabled<br>Erase Log<br>12:00:00　　001/500 |
| 3. Press ⏶ or ⏷ to scroll to desired function. | **Logging**<br>Display Test Log<br>Logging Enabled<br>Logging Disabled<br>Erase Log<br>12:00:00　　001/500 |
| 4. Press **ENTER**. The screen will display **Storing...** for about 1 second and return to the **Editing Menu**. | **Editing Menu**<br>Set Clock<br>Logging<br>Factory Setup<br>Set Power Save<br>12:00:00　　001/500 |

## ■ FACTORY SETUP

The Factory Setup menu is used in manufacturing of the colorimeter. This menu is not for use by the operator in the field.

## ■ SETTING POWER SAVE

The power saving Auto Shutoff feature will turn the meter off when a button has not been pushed for a set amount of time. The default setting is disabled. To change the setting:

| | |
|---|---|
| 1. From the **Editing Menu**, press ⌃ or ⌄ to scroll to **Set Power Save**. | **Editing Menu**<br>Set Clock<br>Logging<br>Factory Setup<br>Set Power Save<br>12:00:00   001/500 |

| | |
|---|---|
| 2. Press **ENTER** to select **Set Power Save**. | **Set Power Save**<br>Disable<br>5 Minutes<br>15 Minutes<br>30 Minutes<br>12:00:00   001/500 |

| | |
|---|---|
| 3. Press ⌃ or ⌄ to scroll to desired function. | **Set Power Save**<br>Disable<br>5 Minutes<br>15 Minutes<br>30 Minutes<br>12:00:00   001/500 |

| | |
|---|---|
| 4. Press **ENTER**. The screen will display **Storing....** for about 1 second and the meter will retun to the **Editing Menu**. | **Editing Menu**<br>Set Clock<br>Logging<br>Factory Setup<br>Set Power Save<br>12:00:00   001/500 |

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## ■ SETTING THE BACKLIGHT TIME

The backlight illuminates the display for enhanced viewing. The default setting is 10 seconds. If Button Control is chosen the backlight button on the key pad will act as an on/off switch and the backlight will remain on or off when the meter is being used. When one of the other settings – 10, 20 or 30 seconds – is chosen, the display will be illuminated for the specified amount of time after any button is pressed.

NOTE: The backlight feature uses a significant amount of power. The longer the backlight is on, the more frequently the battery will have to be charged if the USB/Wall Adapter is not being used.

| 1. From the **Editing Menu**, press ⬆ or ⬇ to scroll to **Backlight Time**. | Editing Menu |
| --- | --- |
| | Logging |
| | Factory Setup |
| | Set Power Save |
| | Set Backlight Time |
| | 12:00:00    001/500 |

| 2. Press ENTER to select **Set Backlight Time**. | Set Backlight Time |
| --- | --- |
| | Button Control |
| | 10 seconds |
| | 20 seconds |
| | 30 seconds |
| | 12:00:00    001/500 |

| 3. Press ⬆ or ⬇ to scroll to desired option. | Set Backlight Time |
| --- | --- |
| | Button Control |
| | 10 seconds |
| | 20 seconds |
| | 30 seconds |
| | 12:00:00    001/500 |

| 4. Press ENTER. The screen will display **Storing...** for about 1 second and the meter will return to the **Editing Menu**. | Editing Menu |
| --- | --- |
| | Logging |
| | Factory Setup |
| | Set Power Save |
| | Set Backlight Time |
| | 12:00:00    001/500 |

## ■ SELECTING A LANGUAGE

There are seven languages available: English, Spanish, French, Portuguese, Italian, Chinese, and Japanese.

| | |
|---|---|
| 1. From the **Editing Menu**, press ⊙ or ⊙ to scroll to **Select Language**. | **Editing Menu**<br>Factory Setup ↑<br>Set Power Save<br>Set Backlight Time<br>Select Language<br>12:00:00   001/500 🔋 |

| | |
|---|---|
| 2. Press ⒺⓃⓉⒺⓇ to select **Select Language**. | **Select Language**<br>English<br>Spanish<br>French<br>Portugese ⬇<br>12:00:00   001/500 🔋 |

| | |
|---|---|
| 3. Press ⊙ or ⊙ to scroll to desired language. | **Select Language**<br>English<br>Spanish<br>French<br>Portugese ⬇<br>12:00:00   001/500 🔋 |

| | |
|---|---|
| 4. Press ⒺⓃⓉⒺⓇ. The screen will display **Storing...** for about 1 second and the meter will return to the **Editing Menu**. | **Editing Menu**<br>Set Power Save ↑<br>Set Backlight Time<br>Bluetooth Menu<br>Select Language<br>12:00:00   001/500 🔋 |

NOTE: If meter unintentionally switches to another language, use the procedure above to reset the meter to the desired language. For example, to reset the meter to English:

1. Turn meter on.
2. Press ⊙ one time. Press ⒺⓃⓉⒺⓇ.
3. Press ⊙ five times. Press ⒺⓃⓉⒺⓇ.
4. Press ⒺⓃⓉⒺⓇ.

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## ■ LOOPING MENUS

Long menus, such as the Tsting Menu, incorporate a looping feature which allows the user to quickly reach the last choice in the menu from the first choice. In a looping menu the last choices in the menu are above the first choice and scrolling upward moves through the menu in reverse order. Scrolling downward moves through the menu from first choice to last but the menu starts over following the last choice. So all menu choices can be reached by scrolling in either direction. The diagrams below demonstrate a looping menu.

| | | |
|---|---|---|
| AND SO ON | AND SO ON | AND SO ON |
| :   :   : | :   :   : | :   :   : |
| :   :   : | :   :   : | :   :   : |
| THIRD TO LAST | LAST CHOICE | LAST CHOICE |
| SECOND TO LAST | AND SO ON | AND SO ON |
| LAST CHOICE | :   :   : | :   :   : |

| TESTING MENU | | | TESTING MENU | | | TESTING MENU | | |
|---|---|---|---|---|---|---|---|---|
| FIRST CHOICE | ↑ | | :   :   : | ↑ | | :   :   : | ↑ | |
| SECOND CHOICE | | | THIRD TO LAST | | | THIRD TO LAST | | |
| THIRD CHOICE | ↓ | | SECOND TO LAST | ↓ | | SECOND TO LAST | ↓ | |
| ANOTHER | | | LAST CHOICE | | | LAST CHOICE | | |
| 12:00:00   001/500 | 🔋 | | 12:00:00   001/500 | 🔋 | | 12:00:00   001/500 | 🔋 | |

| | | |
|---|---|---|
| AND ANOTHER | FIRST CHOICE | FIRST CHOICE |
| AND SO ON | SECOND CHOICE | SECOND CHOICE |
| :   :   : | THIRD CHOICE | THIRD CHOICE |
| :   :   : | ANOTHER | ANOTHER |
| LAST CHOICE | AND ANOTHER | AND ANOTHER |

The feature called **Looping Menu** can be turned on and off in the **Editing Menu**. The default setting is ON.

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# COMPUTER CONNECTION

### ■ OUTPUT

USB

### ■ COMPUTER CONNECTION

USB Type A, USB mini B, Order Cable Code 1720.

### ■ WATERLINK CONNECT

The meter may be interfaced with any Windows-based 64 bit computer by using the LaMotte WaterLink Connect program and a USB cable. The program will store test information and results in a local database, and allow for exporting this data to a comma separated value (CSV) file. The meter will send the following data: time/date stamp, name of test, sample value, sample units, meter name, and location. To download WaterLink go to http://softwarecenter.lamotte.com/.  Select "WaterLink Connect Software for Windows FREE Download".

# BATTERY

### ■ BATTERY/AC OPERATION

The colorimeter may be operated on battery power using a USB wall adapter or USB computer connection. If using the meter as a bench top unit, use the wall adapter if possible to extend the battery life. The meter will remain on when the USB adapter is used.

To charge the battery with the wall adapter, plug the smaller end of the USB cable (USB mini B connector) into the meter and the larger end of the USB cable (USB type A connector) into the wall adapter. Plug the wall adapter into an AC outlet. Reinsert the rubber USB port plug after charging. To charge the battery from a computer, plug the smaller end of the USB cable (USB mini B connector) into the meter and the larger end of the USB cable (USB Type A connector) into a USB port on a computer. The battery icon will show no bars and flash when the unit first turns on. Then the indicator will indicate the battery status by showing 0, 1, 2, 3, or 4 bars.

It will take 6 hours to fully charge a low battery. The battery icon will flash when the battery is charging. The battery icon will show four bars and stop flashing when it is fully charged. The charging circuit will automatically switch to a float charge when the battery is fully charged. The charger may remain connected. Some computers will NOT supply power to their USB ports during standby operation. The wall adapter will charge the unit continuously.

Storing the meter above ambient room temperature will decrease the battery charge more quickly than storage at room temperature. If the meter does not turn on, it means that the battery is at a very low charge. Charging the battery with the wall adapter in this state may take up to 10 hours. At low temperatures, approaching 0 °C, the battery will charge more slowly. It will not charge at all below 0 °C. The battery icon will show no bars and continuously flash if the battery is getting low but the unit will still operate normally. A "Low Battery" message on the status bar of the display will replace the time

when the battery voltage is too low for proper operation and accuracy may be degraded. A "Shutdown Low Batt" message on the display will appear for a few seconds before the power is switched off when the battery is too low to operate the unit. When the battery icon simultaneously flashes bars 1 and 2 followed by bars 3 and 4, it is an indication that the battery is damaged and technical support should be contacted.

To extend the battery life:

- Shut down the unit with the power switch when not taking measurements or use the power save option to have the unit automatically turn off after 5 minutes.
- Store the unit at a moderate temperature.
- Fully charge the battery before storing the unit for extended periods of time.
- Fully charge the battery at least once per year. Failure to do so may result in a permanently drained battery.
- Limit backlight use. The unit consumes 3X normal power with the backlight on. Set the backlight time option to 10 seconds, or select "Button Control" and keep the backlight off.

### BATTERY REPLACEMENT

The lithium ion battery used in this unit should last for many years with normal use. When it no longer powers the unit long enough to meet testing requirements it will need to be replaced. Lithium ion batteries that are properly charged and stored do not usually lose all capacity; they just have less capacity after hundreds of charge cycles. This unit uses a custom battery assembly that is only available from LaMotte Company. Battery replacement must be performed at a LaMotte authorized repair facility. The water resistant housing of this meter should not be opened by the user

## MAINTENANCE

### ■ CLEANING

Clean the exterior housing with a damp, lint-free cloth. Do not allow water to enter the light chamber or any other parts of the meter. To clean the light chamber and optics area, point a can of compressed air into the light chamber and blow the pressurized air into the light chamber. Use a cotton swab dampened with Windex® window cleaner to gently swab the interior of the chamber. Do not use alcohol; it will leave a thin residue over the optics when dry.

### ■ REPAIRS

Should it be necessary to return the meter for repair or servicing, pack the meter carefully in a suitable container with adequate packing material. A return authorization number must be obtained from LaMotte Company by calling 800-344-3100 (US only) or 410-778-3100, faxing 410-778-6394,

## ■ METER DISPOSAL

Waste Electrical and Electronic Equipment (WEEE)

Natural resources were used in the production of this equipment. This equipment may contain materials that are hazardous to health and the environment. To avoid harm to the environment and natural resources, the use of appropriate take-back systems is recommended. The crossed out wheeled bin symbol on the meter encourages the use of these systems when disposing of this equipment.



Take-back systems will allow the materials to be reused or recycled in a way that will not harm the environment. For more information on approved collection, reuse, and recycling systems contact local or regional waste administration or recycling services.

## GENERAL OPERATING INFORMATION

### ■ OVERVIEW

The meter is a portable, microprocessor controlled, direct reading colorimeter. It has a graphical liquid crystal display and 6 button keypad. These allow the user to select options from the menu driven software, to directly read test results or to review stored results of previous tests in the data logger. The menus can be displayed in seven different languages.

The LaMotte tests are precalibrated for LaMotte reagent systems. The colorimeter displays the result of these tests directly in units of concentration.

The optics feature a colored LED. The LED has a corresponding silicon photoiode with an integrated interference filter. The interference filter selects a narrow band of light from the corresponding LED for the colorimetric measurements.

A USB wall adapter, USB computer connection or lithium battery powers the colorimeter.

### ■ GENERAL OPERATING INFORMATION

The operation of the colorimeter is controlled by the menu driven software and user interface. A menu is a list of choices. This allows a selection of various tasks for the colorieter to perform, such as scan blank and scan sample. The keypad is used to make menu selections that are viewed on the display.

## ■ THE KEYPAD

The keypad has 6 buttons which are used to perform specific tasks.

| | |
|---|---|
| ⋀ | This button will scroll up through a list of menu selections. |
| ENTER | The button is used to select choices in a menu viewed on the display. |
| ☀ | This button controls the backlight on the display. |
| ⋁ | This button will scroll down through a list of menu selections. |
| EXIT | This button exits to the previous menu. |
| ⏻ | This button turns the meter on or off. |

## ■ THE DISPLAY AND MENUS

The display allows menu selections to be viewed and selected. These selections instruct the colorimeter to perform specific tasks. The menus are viewed in the display using two general formats that are followed from one menu to the next. Each menu is a list of choices or selections.

The display has a header line at the top and a footer line at the bottom. The header displays the title of the current menu. The footer line displays the time and the date, the data logger status and the battery status. The menu selection window is in the middle of the display between the header and the footer.

The menu selection window displays information in two general formats. In the first format only menu selections are displayed. Up to 4 lines of menu selections may be displayed. If more selections are available they can be viewed by pressing the arrow buttons ⋀ ⋁ to scroll the other menu selections into the menu selection window. Think of the menu selections as a vertical list in the display that moves up or down each time an arrow button ⋀ ⋁ is pressed. Some menus in the colorimeter are looping menus. The top and bottom menu choices are connected in a loop. Scrolling down past the bottom of the menu will lead to the top of the menu. Scrolling up past the top of the menu will lead to the bottom of the menu.

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| Header | Menu Title |
|---|---|
| Main Window Selection | First Choice |
| | **Second Choice** |
| | **Third Choice** |
| | **Another** |
| Footer | 12:00:00    001/500    ☀P ▮▮▮▮ |

And Another

And So On
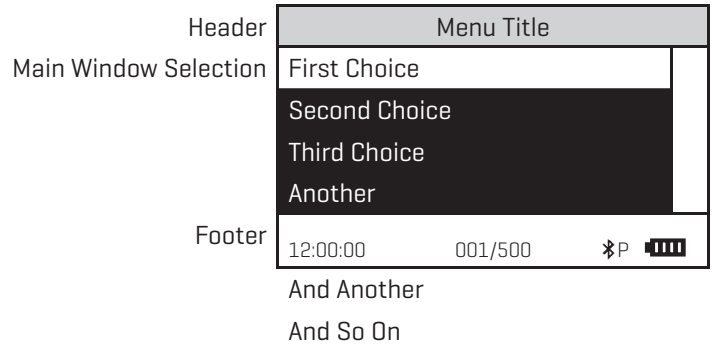
A light bar will indicate the menu choice. As the menu is scrolled through, the light bar will highlight different menu choices. Pressing the **ENTER** button will select the menu choice that is indicated by the light bar.

In the second format the menu choice window takes advantage of the graphical capabilities of the display. Large format graphic information, such as test results or error messages or the LaMotte logo is displayed. The top two lines of the display are used to display information in a large, easy to read format. The menus work in the same way as previously described but two lines of the menu are visible at the bottom of the display.

| Header | Menu Title |
|---|---|
| Message or Result Window | **Result or Message** |
| | Another |
| Main Window Selection | **And Another** |
| Footer | 12:00:00    001/500    ▮▮▮▮ |

And So On

Last Choice
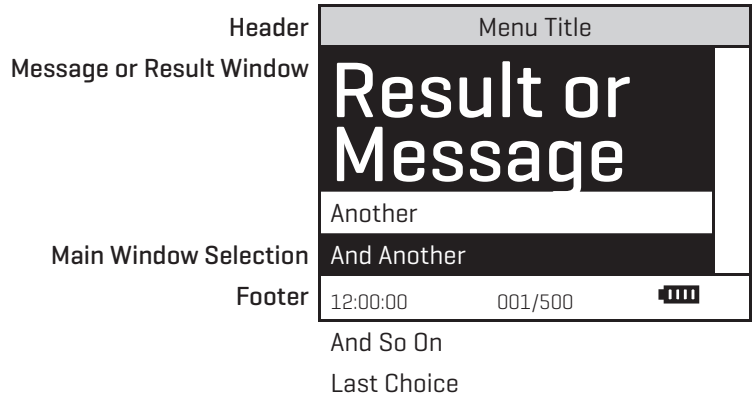
As described previously, the **EXIT** button allows an exit or escape from the current menu and a return to the previous menu. This allows a rapid exit from an inner menu to the main menu by repeatedly pushing the **EXIT** button. Pushing ⏻ at any time will turn the colorimeter off.

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The display may show the following messages:

| ▮▮▮▮ | Battery Status |
|---|---|
| ↑ ↓ | More choices are available and can be viewed by scrolling up and/or down through the display. |
| Header | Identifies the current menu and information on units and reagent systems if applicable. |
| Footer | In the data logging mode the number of the data point is displayed and the total number of data points in the memory will be shown. The footer also shows current time and battery status |

## ■ TUBES AND CHAMBERS

The colorimeter uses one type of tube (Code 0290) for all test factors.

The handling of the tubes is of utmost importance. Tubes must be clean and free from lint, fingerprints, dried spills and significant scratches, especially the central zone between the bottom and the sample line.

Scratches, fingerprints and water droplets on the tube can cause stray light interference leading to inaccurate results. Tubes that have been scratched in the light zone through excessive use should be discarded and replaced with new ones.

Tubes should always be washed on the inside and outside with mild detergent prior to use to remove dirt or fingerprints. The tubes should be allowed to air-dry in an inverted position to prevent dust from entering the tubes. Dry tubes should be stored with the caps on to prevent contamination.

After a tube has been filled and capped, it should be held by the cap and the outside surface should be wiped with a clean, lint-free absorbent cloth until it is dry and smudge-free. Handling the tube only by the cap will avoid problems from fingerprints. Always set the clean tube aside on a clean surface that will not contaminate the tube. It is imperative that the tubes and light chamber be clean and dry. The outside of the tubes should be dried with a clean, lint-free cloth or disposable wipe before they are placed in the meter chamber.

Tubes should be emptied and cleaned as soon as possible after reading a sample to prevent deposition of particulates on the inside of the tubes.

Variability in the geometry of the glassware and technique is the predominate cause of variability in results. Slight variations in wall thickness and the diameter of the tubes may lead to slight variations in the test results. To eliminate this error the tubes should be placed in the chamber with the same orientation each time.

Chambers which have been scratched through excessive use should be discarded and replaced with a new one.

### ■ SAMPLE DILUTION TECHNIQUES

If a test result is out of the range of the meter, it must be diluted. The test should then be repeated on the diluted sample. The following table gives quick reference guidelines for dilutions of various proportions.

| Amount of Sample | Deionized Water to Bring Final Volume to 10 mL | Multiplication Factor |
|---|---|---|
| 10 mL | 0 mL | 1 |
| 5 mL | 5 mL | 2 |
| 2.5 mL | 7.5 mL | 4 |
| 1 mL | 9 mL | 10 |
| 0.5 mL | 9.5 mL | 20 |

All dilutions are based on a final volume of 10 mL, so several dilutions will require small volumes of the water sample. Graduated pipets should be used for all dilutions. If volumetric glassware is not available, dilutions can be made with the colorimeter tube. Fill the tube to the 10 mL line with the sample and then transfer it to another container. Add 10 mL volumes of deionized water to the container and mix. Transfer 10 mL of the diluted sample to the colorimeter tube and follow the test procedure. Repeat the dilution and testing procedures until the result falls within the range of the calibration. Multiply the test result by the dilution factor. For example, if 10 mL of the sample water is diluted with three 10 mL volumes of deionized water, the dilution factor is four. The test result of the diluted sample should be multiplied by four.

## GENERAL INFORMATION

### ■ PACKAGING AND DELIVERY

Experienced packaging personnel at LaMotte Company assure adequate protection against normal hazards encountered in transportation of shipments.

After the product leaves LaMotte Company, all responsibility for safe delivery is assured by the transportation company. Damage claims must be filed immediately with the transportation company to receive compensation for damaged goods.

### ■ GENERAL PRECAUTIONS

**READ THE INSTRUCTION MANUAL BEFORE ATTEMPTING TO SET UP OR OPERATE THE METER.** Failure to do so could result in personal injury or damage to the meter. The meter should not be used or stored in a wet or corrosive environment. Care should be taken to prevent water from wet tubes from entering the meter chamber.

**NEVER PUT WET TUBES IN THE METER.**

## ■ SAFETY PRECAUTIONS

Read the labels on all LaMotte reagent containers prior to use. Some containers include precautionary notices and first aid information. Certain reagents are considered hazardous substances and are designated with a * in the instruction manual. Safety Data Sheets (SDS) can be found at

Keep equipment and reagent chemicals out of the reach of young children.

Ensure that the protection provided by this equipment is not impaired. Do not intall or use this equipment in a manner that is not indicated in this manual.

## ■ LIMITS OF LIABILITY

Under no circumstances shall LaMotte Company be liable for loss of life, property, profits, or other damages incurred through the use or misuse of its products.

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## ■ SPECIFICATIONS & RANGES

INSTRUMENT TYPE: Colorimeter

| | |
|---|---|
| Readout | 160 x 100 backlit LCD, 20 x 6 line graphical display |
| Wavelengths | 428 nm |
| Wavelength Accuracy | ±2% FS |
| Readable Resolution | Determined by reagent system |
| Wavelength Bandwidth | 10 nm  typical |
| Photometric Range | −2 to +2 AU |
| Photometric Precision | ± 0.001 AU at 1.0 AU |
| Photometric Accuracy | ±0.005 AU at 1.0 AU |
| Sample Chamber | Accepts 25 mm diameter flat-bottomed test tubes |
| Light Sources | 1 LEDs |
| Detectors | 1 silicon photodiode |
| Modes | Pre-programmed tests, absorbance, %T |
| Pre-Programmed Tests | YES, with automatic wavelength selection |
| Languages | English, Spanish, French, Portuguese, Italian, Chinese, Japanese |
| Temperature | Operation: 0-50 °C; Storage: -40-60 °C |
| Operation Humidity Range | 0-90 % RH, non-condensing |
| USB Port | Mini B |
| Power Requirements | USB wall adapter, USB computer connection or lithium ion rechargeable battery |
| Battery | Charge Life: Approximately 380 tests with backlight on to 1000 tests with backlight off. Battery Life: Approximately 500 charges. |
| Electrical Rating | Rated voltage (5V), Rated power of input current (1.0A) at mini-USB input port |
| Data Logger | 500 test results |
| Waterproof | IP67 with USB port plug in place |
| Dimensions (LxWxH) | 3.5 x 7.5 x 2.5 inches, 8.84 x 19.05 x 6.35 cm |
| Weight | 13 oz, 362 g (meter only) |

## ■ CE COMPLIANCE

The colorimeter has been independently tested and has earned the European CE Mark of compliance for electromagnetic compatibility and safety. To view certificates of compliance, go to

## ■ IP67 Certification

The  meets IP67 standards for protection against dust and immersion only when the USB port plug is in place. Documentation is available at www.

## TROUBLESHOOTING

### ■ ERROR MESSAGES

**Over Range**

If the message  OVERRANGE  is displayed when scanning a sample, the sample may be over range or under range. If the sample is over range the sample should be diluted and tested again (see Sample Dilution Techniques and Volumetric Measurements, page 25).

If overrange is displayed, press **ENTER** to continue testing on diluted samples.

Note: After pressing **ENTER**, the overrange cncentration will be displayed. This concentration is an **approximation only**.

| 063 Molybdenum HR |
| --- |
| Overrange |
| <Enter> continue |
| Scan Blank |
| Scan Sample |
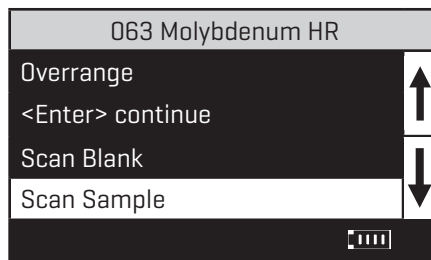
### ■ CALIBRATION

As with all pre-calibrated meters, it is highly recommended, even if not required by regulations, that the user periodically verify the performance of the meter by running standards with a predetermined concentration. Results outside of specification are an indication that the meter needs to be adjusted. This can be done following the user calibration described on page 10. If the user calibration fails to properly adjust the meter then the meter should be returned to LaMotte Company for recalibration. (See page 20).

### ■ STRAY LIGHT

The colorimeter should have no problems with stray light. Make sure that the sample compartment lid is always fully closed.

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## ◼ TROUBLESHOOTING GUIDE

| *PROBLEM* | *REASON* | *SOLUTION* |
|---|---|---|
| ▐▆▆▐ Flashing | Low battery. Readings are reliable. | Charge battery or use USB wall/computer adapter. |
| "Low Battery" | Battery voltage is very low. Readings are not reliable. | Charge battery or use USB wall/computer adapter. |
| "Shut Down Low Batt" Shut Down | Battery is too low to operate the unit. | Charge battery or use USB wall/computer adapter. |
| "Overrange" | Sample is outside of acceptable range. | Dilute sample and test again. |
| Unusually large negative or positive readings when performing calibration | Incorrect standards used to calibrate meter. | Use fresh 0.0 standard in clean tube. Reset meter to factory default settings. Recalibrate meter. |

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