LOCTITE®
EQUIPMENT

OPERATION MANUAL

ZETA®
Meter 7010

ZETA®
Meter 7020

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Introduction to the ZETA® Meter 7010

The Zeta® Meter 7010 is a self-contained, electro-optic radiometer that measures and displays total UV energy and UV irradiance. It is designed to withstand the extremes of UV and high temperatures that are part of the UV curing environments.

The carefully designed optical sensing system measures only certain wavelengths while rejecting others that are not relevant to the process. The output of the sensing system is converted to digital form and displayed in a liquid crystal readout.

The Zeta® Meter 7010 measures across the ultraviolet spectrum from 320 to 390 nanometers, (UVA region). The spectral response curve is shown in Figure 8 in the Appendix.

The Process Values

The two process values read by the The Zeta® Meter 7010 are peak irradiance, (power density), and dosage, (total energy). Peak irradiance, an instantaneous value, is the highest point of UV power per unit area that the unit sees during the exposure period. The instrument displays irradiance in watts per square centimeter.

Dosage or total energy per unit area, (the terms are interchangeable), equals the average irradiance times the exposure time. Dosage is measured in Joules per square centimeter.

The UV radiant power and dosage that are specified for a given process must be monitored and maintained in order for Loctite® UV/VIS light curing products to cure fully and attain their full range of properties.

Figure 1
Zeta® Meter 7010

Temperature Value

The Zeta® Meter 7010 also provides an internal temperature sensor that senses and displays the internal temperature of the device. This reading is provided so you can keep the unit within safe operating parameters. It is not an indication of the temperature of the curing system. The temperature reading is displayed in degrees centigrade for 3/4 second when the instrument enters the RUN mode.

Overview of Data Acquired by Zeta® Meter 7010

During each exposure run, the Zeta® Meter 7010 collects the data shown in the matrix in Figure 2. The matrix shows the data in a format similar to the format in which the data is stored in the memory of the instrument.

Value	UVICURE Plus Wavelength
Dosage	UV J/cm^2
Intensity	UV W/cm^2

Figure 2 - Matrix showing data collected by Zeta® Meter 7010

Components Shipped

Each instrument is shipped along with this user's manual and calibration certificate in a protective foam-lined carrying case.

Manual

This manual contains all the information you need to use and maintain the Zeta® Meter 7010. There is an introduction to the instrument and the process values measured, a description of the hardware, specifications, and instructions for using the instrument in your application. Any maintenance problems that are not covered in this manual should be addressed to Loctite Technical Service.

Hardware

Specifications*

Display:
4-digit LCD.

Range:
UVA- 5mW/cm^2 to 5W/cm^2

Accuracy:
+/- 5% typical; +/- 10% guaranteed.

Spectral Response:
One channel continuously monitored during operation.

UVA 320-390nm

Spatial Response:
Approximately cosine.

Operating Temperature Range:
0-75˚C internal temperature; tolerates much higher external temperatures for short periods; audible alarm indicates when internal temperature is too high. **CAUTION:** The maximum internal temperature is 80˚C. If internal temperature exceeds this, the warranty is voided.

Time-Out Period:
4 minutes RUN mode (no energy observed); 2 minutes DISPLAY mode (no key activity).

Batteries:
Two user-replaceable lithium cells, Duracell® DL2450, Sanyo® CR2450 or equivalent.

Battery Life:
1500 readings with typical use.

Dimensions:
4.60 (Dia) x .50 (H) inches; 117 x 12.7 millimeters

Weight:
11.75 ounces (333.1 grams).

Package Material:
Aluminum, stainless steel.

Carrying Case Material:
Cut polyurethane interior to accommodate radiometer. Scuff-resistant nylon exterior cover.

Carrying Case Weight:
1 pound (453.6 grams)

Carrying Case Dimensions:
12 x 4.7 x 8.25 inches; 304.8 x 119.4 x 209.6 mm (WxHxD)

*Specifications subject to change without notice

Physical Features

The main physical features of the Loctite® Zeta® Meter 7010 are shown in Figure 3.

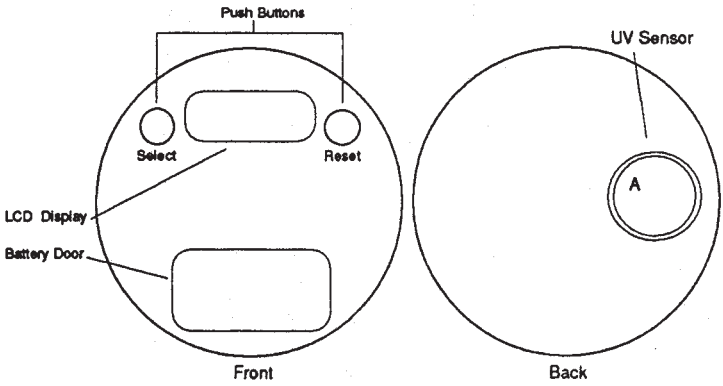

Figure 3 - Zeta® Meter 7010 Physical Features

Operation

Doing An Exposure Run

1. Turn the unit on by pressing either the Select or the Reset button. The unit flashes the software version, PX.XX, for one-half second.
2. Do a short press of the Reset button to clear memory and put the unit in the RUN mode. The display flashes “run” after momentarily displaying the internal temperature of the unit. Confirm that the unit flashes “run” before initiating a reading. A long press of the Reset button will turn the unit off.
3. Put the device on the belt under the UV source with the LCD display down, directed away from the light source. Pass it through the system. When it comes out, the display will still be flashing “run.” CAUTION: Exposing the LCD display to high intensity UV radiation will damage the LCD.
4. Press Select to exit RUN mode and display the reading. It will be in the same display mode that it was in before the exposure run, but will display the new value.

Understanding How Readings Are Stored and Displayed

The Zeta® Meter 7010 writes the data it senses into a section of non-destructible memory each time you do an exposure run. The internal temperature reading is the internal temperature of the unit when placed in the RUN mode. The intensity and dosage readings are based on what the unit senses optically during the exposure run. The data readings are displayed in the LCD display. The wavelength of the displayed reading is shown at the top of the display and the units of the value of the reading are listed at the right of the display. See Figure 4.

If the peak intensity exceeds threshold, the displayed value of irradiance or energy will flash, indicating that the results cannot be considered valid.

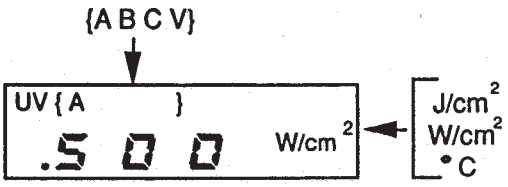

Figure 4 - LCD Display Showing Wavelength and Value Units

Displaying Readings on the Zeta® Meter 7010

The matrix in Figure 2 (page 4) shows all data readings taken and stored during an exposure run. Each short press of the Select button changes the display from peak irradiance to total energy and back. Short presses are identified by a short chirp after the press. A long press of the Reset button will turn the unit off. The unit displays “Off” momentarily and then turns off.

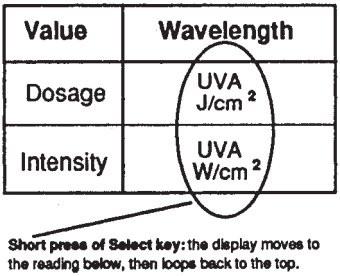

Figure 5 - Order in which values are displayed

Converting Data Readings

If your specifications are in milliwatts or millijoules, you will need to convert your instrument readings from watts and joules to milliwatts and millijoules. Do this by moving the decimal point three places to the right of the display. See Figure 6.

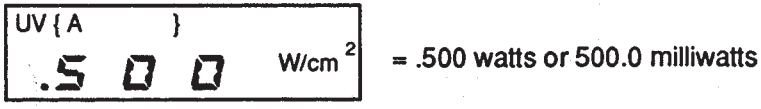

Figure 6 - Converting Data Readings

Low Battery Indicator

When the batteries need to be changed, “LO BATT” is displayed in the upper right corner of the LCD display as shown in Figure 7. If this happens during an exposure run, the reading is still valid. The low battery indicator is designed to illuminate early enough so that your data remains valid. If battery capacity drops to the point where data integrity is affected, the unit automatically writes zero to all locations. Under severe low battery conditions, the unit does not enter RUN mode. Therefore, confirm that the unit flashes “run” before initiating a reading.

Figure 7 - Low Battery Display

Replacing the Batteries

Follow these procedures to replace the batteries.

1. Loosen the screw on the battery door and remove the door.
2. Remove the old batteries.
3. Install two new lithium cells (Duracell® DL2450 or Sanyo® CR2450), observing polarity. The unit is designed so it will not operate with reversed cells.
4. Replace the door and the screw.

Over-Temperature State

If the internal temperature of the Zeta® Meter 7010 exceeds 65º C during an exposure run, the unit will emit a steady beeping tone after the run. However, the data it has collected is accurate and can be read by pressing the Select key. When you do this, the beeping tone stops, and you can step through the data readings.

In addition, if the internal temperature of the unit exceeds 75º C the unit beeps once, then displays the internal temperature continuously. It will not operate until the internal temperature drops below 75º C. You should confirm that the unit flashes "run" before initiating a reading. **CAUTION:** If you press Reset to initiate the RUN mode, before the unit cools to 75ºC, all data from the previous exposure run is cleared from memory. The unit beeps and again continuously displays the temperature.

Diagnostics

The Zeta® Meter 7010 continuously performs internal self-tests. If the unit detects an internal problem, it will display one of the following error codes on the LCD display. *Both error codes indicate unresolvable problems that require returning the unit to Loctite for repair. Contact Customer Service prior to returning the unit at 800-243-4874.*

EI = E^2PROM WRITE ERROR

E2 = E^2PROM READ ERROR

Calibration

The Zeta® Meter 7010 has been calibrated prior to shipment. A certificate of Calibration is provided with the unit. The recommended calibration frequency is every 6 months. To arrange for re-calibration of the unit, call Loctite at 1-800-LOCTITE (562-8483).

Warranty

Loctite expressly warrants that all products referred to in this Instruction Manual for the Zeta® Meter 7010 (hereafter called "Products") shall be free from defects in materials and workmanship. Liability shall be limited, as its option, to replacing those Products which are shown to be defective in either materials or workmanship or to credit the purchaser the amount of the purchase price thereof (plus freight and insurance charges paid thereof by the user). The purchaser's sole and exclusive remedy for breach of warranty shall be such replacement or credit.

A claim of defect in materials or workmanship in any Products shall be allowed only when it is submitted in writing within one month after discovery of the defect or after the time the defect should reasonably have been discovered and in any event, within 6 months after the delivery of the Products to the purchaser. No such claim shall be allowed in respect of products which have been neglected or improperly stored, transported, handled, installed, connected, operated, used or maintained or in the event of unauthorized modification of the Products including, where products, parts, or attachments for use in connection with the Products are available from Loctite, the use of products, parts or attachments which are not manufactured by Loctite.

No Products shall be returned to Loctite for any reason without prior written approval. Products shall be returned freight prepaid, in accordance with instructions from Loctite.

NO WARRANTY IS EXTENDED TO ANY EQUIPMENT WHICH HAS BEEN ALTERED, MISUSED, NEGLECTED, OR DAMAGED BY ACCIDENT, OR IF THE SYSTEM USED TO DISPENSE ANY LIQUID MATERIAL OTHER THAN LOCTITE CORPORATION PRODUCTS.

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Appendix

Spectral Response Curve

Figure 8 shows the spectral response curve for the UVA transmission band.

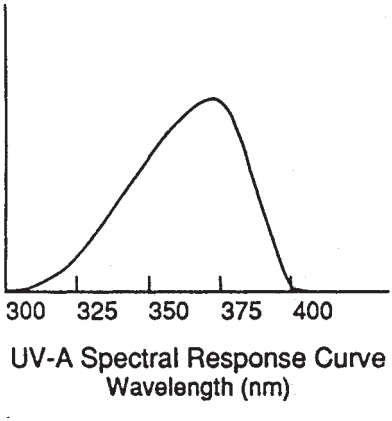

Figure 8 - Spectral Response Curve

Introduction to the ZETA® Meter 7020

The Zeta® Meter 7020 is a self-contained, electro-optic instrument designed to measure and display the UV power density (irradiance) emitted by a UV spot curing system. The units displayed are watts per square centimeter. Decreased radiant power related to the degradation of UV lamps, light guides, and reflectors can result in declines in process efficiency or incomplete curing of Loctite® UV/VIS light products. The Zeta® Meter 7020 UV Power Meter is designed to provide the operator with instant feedback as to the performance of the spot curing system based upon changes in the radiant power. NOTE: New lamps may exhibit an initial decline in UV power over the first several hours of use. However, after that period the output should stabilize.

Components Shipped

Each instrument is shipped along with this user's manual and calibration certificate in a protective foam-lined case. Included in each case are three adapters to accommodate different size light guides. The adapters are 5mm, 7mm and 10mm.

Manual

This manual contains all the information you need to use and maintain the Zeta® Meter 7020.

Figure 9 - ZETA® Meter 7020

Hardware

Specifications*

Radiant Power Range:
0-19.999W/cm^2

Resolution:
10mW/cm^2

Accuracy:
+/- 5% typical; +/- 10% maximum.

Display:
3-1/2 digit LCD

Power Source:
Lithium Battery Stick

Battery Life:
12,500 hours continuous operation (over 100,000 readings)

Overall Dimensions:
6.40" L x 1.74" Diameter (16.26cm x 4.42cm)
Measurement head - 2.13" Diameter (5.41cm)
Weight: 12.8 oz (358 grams)

Operating Temperature Range:
0-70ºC

Display Time:
2.5 to 5 minutes

Spectral Range:
UVA 320-390nm

Case Materials:
Aluminum, polyester, quartz

*Specifications subject to change without notice

Operation

Taking a Reading with the ZETA® Meter 7020

Be careful not to shine UV light into eyes. It is recommended that you wear protective safety glasses when using the Zeta® Meter 7020.

1. Select and install the proper adapter for the light guide to be inserted.
2. Grip the Zeta® Meter 7020 in the left hand.
3. Place thumb on “START” button.
4. Insert light guide into light guide opening on measurement head of the Zeta® Meter 7020 UV intensity meter.
5. Press and hold the “START” button.
6. Open the shutter on the UV light source.
7. Release “START” button. After “START” button is released, the displayed UV intensity reading will be held for approximately 3 minutes until the “START” button is pressed again.
8. Close the shutter on the UV light source.
9. Remove the light guide from the measurement head on the Zeta® Meter 7020.

Note: The light guide end must be inserted into the adapter completely each time a test is performed so that the offset distance is constant.

Maintenance

Normally no maintenance is required. However, the light guide opening window can be cleaned, if required, by using a cotton swab moistened with isopropyl alcohol. Dry the window with a dry cotton swab.

If the unit fails to operate as described here, contact Loctite Customer Service at 800-243-4874.

Calibration

The Zeta® Meter 7020 has been calibrated prior to shipment. A certificate of Calibration is provided with the unit. The recommended calibration frequency is every 6 months. To arrange for re-calibration of the unit, call Loctite at 1-800-LOCTITE (562-8483).

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A claim of defect in materials or workmanship in any Products shall be allowed only when it is submitted in writing within one month after discovery of the defect or after the time the defect should reasonably have been discovered and in any event, within 6 months after the delivery of the Products to the purchaser. No such claim shall be allowed in respect of products which have been neglected or improperly stored, transported, handled, installed, connected, operated, used or maintained or in the event of unauthorized modification of the Products including, where products, parts, or attachments for use in connection with the Products are available from Loctite, the use of products, parts or attachments which are not manufactured by Loctite.

No Products shall be returned to Loctite for any reason without prior written approval from Loctite. Products shall be returned freight prepaid, in accordance with instructions from Loctite.

NO WARRANTY IS EXTENDED TO ANY EQUIPMENT WHICH HAS BEEN ALTERED, MISUSED, NEGLECTED, OR DAMAGED BY ACCIDENT, OR IF THE SYSTEM USED TO DISPENSE ANY LIQUID MATERIAL OTHER THAN LOCTITE CORPORATION PRODUCTS.

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