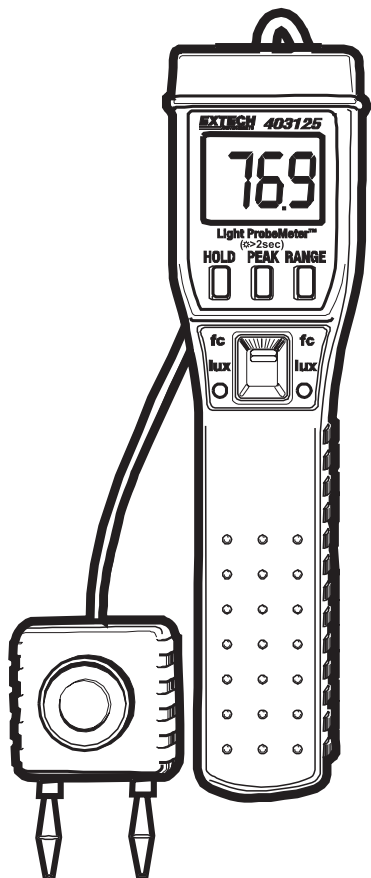**User's Guide**

EXTECH
INSTRUMENTS

Digital Light Meter

Model 403125

Warranty

EXTECH INSTRUMENTS CORPORATION warrants this instrument to be free of defects in parts and workmanship for one year from date of shipment (a six month limited warranty applies to sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization or visit our website www.extech.com for contact information. A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

Introduction

Congratulations on your purchase of the Extech 403125 Digital Light Meter. This portable, compact light meter provides lux and fc measurements. This meter includes a backlit LCD display and offers PEAK HOLD and DATA HOLD functionality. This meter is shipped fully tested and calibrated and, with proper use, will provide years of reliable service.

Safety Instructions

It is recommended that the user read and understand the safety and operational instructions before using the light meter. Please read the following WARNINGS:

- To avoid electrical shock do not operate this meter in wet or damp conditions.
- Do not immerse the meter in liquid. For cleaning instructions, refer to the maintenance section of this manual.
- To avoid injury and fire hazard, do not use this meter in potentially explosive environments.
- To avoid eye injury, wear eye protection if there is the possibility of exposure to high intensity light rays.
- Cover the sensor head when not in use. This will extend the life of the photo-diode employed in the sensor head.

Specifications

General Specifications

Display	3 ½ digit backlit LCD display (reads 0 to 1999)
Over range indication	OL (over load) is displayed
Measurement rate	2.5 readings per second (nominal)
Battery power	Four (4) 1.5V 'AAA' batteries
Battery life	200 hours typical
Low battery indication	Battery symbol is displayed when the battery power drops below the operating voltage
Operating conditions	32 to 122°F (0 to 50°C) < 70% Relative Humidity
Storage conditions	-4 to 140°F (-20 to 60°C) < 80% Relative Humidity (with batteries removed)
Analog output	0.1mVDC per display digit
Dimensions	6.7 x 1.7 x 1.6" (170 x 44 x 40mm)
Weight	Approx. 7.76 oz. (220g) with batteries

Electrical Specifications

Ranges	20, 200, 2000, 20,000 fc and lux (note that the 20,000 range is displayed in the x10 mode, meaning that the display must be multiplied by 10).
Resolution	0.01 lux/fc maximum
Accuracy	20, 200 ranges: ± (5% of reading + 10 digits)
	2000, 20,000 ranges: ± (3% of reading + 10 digits)
	Accuracy note: Stated accuracy for ± 9°F at 73°F (±5°C at 23°C) < 70% Relative Humidity
Spectral response	CIE photopic
	Note: The CIE photopic curve is an international standard for the color response of the average human eye. The CIE standard illuminant 'A' is defined as a gas-filled Tungsten-filament lamp operating at a correlated color temperature of 2856K.
Peak Hold response	50ms minimum response time for the measurement of a light pulse
Acceptance angle	f'_2 < 2% cosine corrected (150°)
Units conversion	10.764 fc = 1 lux (lumens/meter^2)
	0.0929 lux = 1 fc (lumens/foot^2)
Temperature Coefficient	0.056 times the specified accuracy per ^{o}F (< 64.4^{o}F or > 82.4^{o}F)
	0.1 times the specified accuracy per ^{o}C (< 18°C or > 28°C)

Meter Description

1. LCD display

2. Pushbuttons:

   - Backlight ☼ and PEAK button – Momentarily press this button to activate/deactivate the Peak Hold function. The **PMAX** display icon will appear. In the Peak Hold mode of operation, only the highest reading will be displayed. Press and hold this button for 2 seconds to switch on the backlight. Press and hold this button again for 2 seconds to turn the backlight off.

   - RANGE button – Press to select the desired lux or fc range. Each press of the RANGE button selects a new range. The available ranges are 20, 200, 2000, and 20,000 lux or foot candles. Displays in the 20,000 range must be multiplied by 10.

   - HOLD button – Press to freeze the displayed value (the **H** icon will switch on). Press again to exit the Data Hold mode.

3. Sensor cable – Connects sensor to meter

4. Sensor (sensor cover not shown)

5. Sensor mounting plugs - Fits into docking jacks at top of meter

6. Docking jacks – Sensor can be attached here for storage or while measuring.

7. Function switch – Three positions OFF, LUX, and FC

8. Handle and battery compartment (rear)

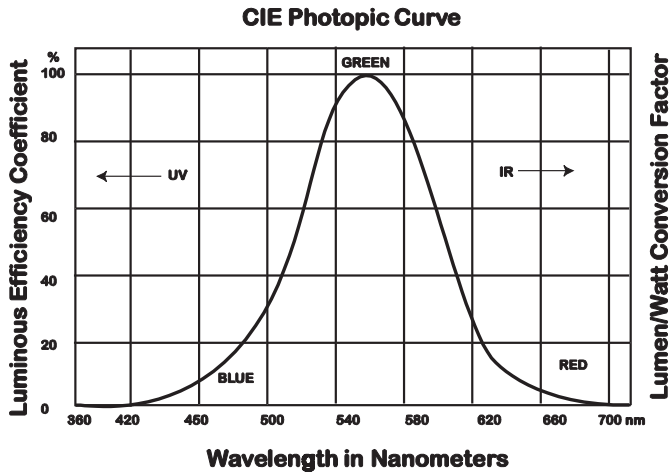9. Analog output jack

Operation
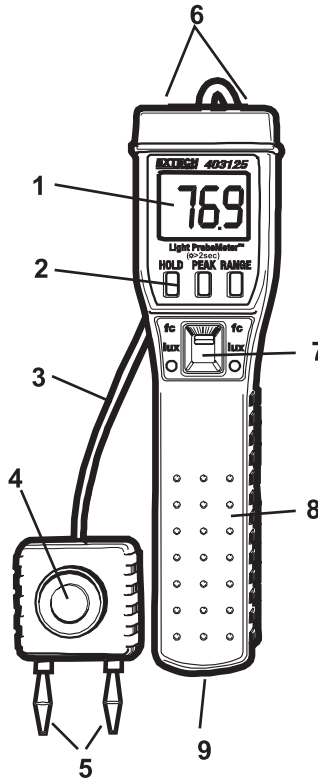
1. Set the function switch to the desired unit of measure; lux or fc.

2. Remove the light sensor cover.

3. Hold the sensor head steady or place it in a secure area and allow the sensor to collect light. The light must encompass the entire sensor dome. Ensure that the user does not cast a shadow on the sensor dome. The sensor is connected to the meter by a 4' (1.5m) cable. While measuring, the sensor can be kept docked on the meter (as it is shipped) or it may be disconnected and used remotely.

4. Read the illuminance value on the display. If the approximate magnitude of the light is not known, step through the ranges using the RANGE button until a measurement is displayed. If **x10** appears on the LCD, the meter is in the 20,000 range and the reading must be multiplied by 10. The **OL** (overload) icon appears if readings are out of range.

5. While taking a measurement, press the HOLD button to freeze a displayed reading. Press HOLD again to release the displayed reading. The **H** icon will appear on the display when the meter is in the HOLD mode.

6. If it is desired to know only the highest reading of a given measurement period, press the PEAK button at the start of a measurement period. The **PMAX** display icon will switch on in the PEAK mode and the display will only show the highest reading. Momentarily press the PEAK button again to exit the PEAK mode.

7. Press and hold the PEAK button for seconds to activate the display backlight. Press and hold the PEAK hold button again for 2 seconds to switch the backlighting off.

8. Cover the sensor when not in use.

Measurement Considerations

1. For best results, repeat measurements several times to ensure that the light source has remained stable.

2. Avoid flexing the cable excessively at either end.

3. **The Inverse Square Law**: The law states that the illuminance **E** at a point on a surface varies directly with the intensity **I** of a point source, and inversely for the square of the distance **d** between the source and the point. If the surface at the point is perpendicular to the direction of the incident light, the law is expressed as $E = I / d^2$.

4. **Cosine Law:** The law states that the illuminance on any surface varies with the cosine of the angle of incidence. The angle of incidence θ is the angle of the surface plane and the direction of the incident light. The inverse-square law and the cosine law can be combined as follows: $E = (I \cos \theta) / d^2$.

CIE Photopic Curve

CIE Photopic Curve

Luminous Efficiency Coefficient / **Lumen/Watt Conversion Factor** vs **Wavelength in Nanometers**

Analog Output

The meter can be connected to a chart recorder or other analog recording device via the output jack at the bottom of the meter. A mono (two wire) 2.5mm plug and cable (not supplied) are required. The analog output is 0.1mVDC per display digit.

Maintenance

Battery Replacement

When the battery power falls below the operating voltage, the battery symbol appears on the display. If the battery symbol appears on the LCD or if the LCD does not switch on when the meter is turned on, replace the batteries as follows:

1. Remove the Phillips screw on the back of the meter.
2. Open the battery compartment.
3. Replace the four (4) 'AAA' 1.5V batteries observing polarity.
4. Replace the battery compartment cover and secure the compartment screw.

Cleaning

Use only a lightly damp cloth to clean the meter. Do not use abrasives, solvents, or harsh detergents. Keep the plastic sensor dome clean and free from scratches; it may be cleaned with a soft cloth and isopropyl alcohol.

Typical Light Levels (for general reference only)

Foot candles	Lux	Typical Light Levels
> 10000	> 107600	Sunlight
1000 to 10000	10760 to 107600	Operating Room
100 to 1000	1076 to 10760	Assembly (fine) Football stadium Emergency room Drafting table
10 to 100	107 to 1076	Overcast day Assembly (general) Classroom Casual reading Shipping area Stairwell Auditorium
1 to 10	10.7 to 107	ATM machine Storage room Building entrance Parking lot
0 to 1	0 to 10.7	Highway Full moon

Calibration and Repair Services

Extech offers repair and calibration services for the products we sell. Extech also provides NIST certification for most products. Call the Customer Service Department for information on calibration services available for this product. Extech recommends that annual calibrations be performed to verify meter performance and accuracy.