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INSTRUCTIONS



LM90/92 LIGHTMETERS

MARTINDALE
● ● ● **ELECTRIC**

Trusted by professionals



INTRODUCTION

This instrument is a portable easy to use 3½ digit, compact digital lightmeter designed for simple one hand operation. It provides measurements in lux and fc units. The meter has a backlit LCD display, PEAK-HOLD (50m pulse light) and DATA-HOLD features.

THIS MANUAL COVERS MODELS LM90 & LM92

SAFETY INFORMATION

Read the safety and operation instructions before using the lightmeter.

WARNING

- To avoid electric shock, do not operate this product in wet or damp conditions.
- To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.
- To avoid eye injury, wear eye protection if there is a possibility of exposure to high-intensity rays.
- Do not immerse in liquids, clean the sensor head using only a damp cloth.
- Cover sensor head when not in use to extend silicon photodiode sensor life.

SPECIFICATIONS

GENERAL

Display: 3½ digit liquid crystal display (LCD) with maximum reading of 1999

Over range: (OL) is displayed

Low battery indication: the "  " is displayed when the battery voltage drops below the operating level

Martindale Electric will carry out routine calibration (on a chargeable basis) if the instrument is returned, carriage paid, to the address on the final page of this document. Alternatively, a chargeable collection and return service is available.

Repair & Service

There are no user serviceable parts in this unit. Return to Martindale Electric Company Ltd if faulty. Our service department will promptly quote to repair any faults that occur outside the warranty period.

Storage Conditions

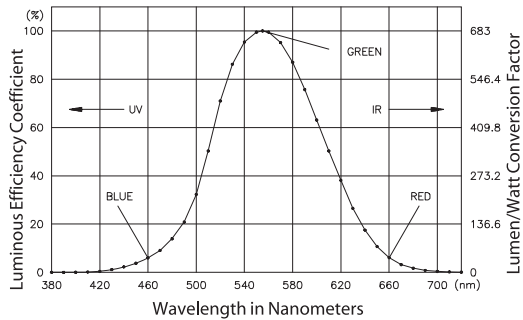
The unit should be kept in warm, dry conditions away from direct sources of heat or sunlight, with the battery removed and in such a manner as to preserve the working life of the unit. It is strongly advised that the unit is not kept in a tool box where other tools may damage it.

Warranty

Faults in manufacture and materials are fully guaranteed for 2 years from date of invoice and will be rectified by us free of charge, provided the unit has not been tampered with and is returned to us with its housing unopened. Damage due to dropping, abuse or misuse is not covered by the guarantee. Nothing in these instructions reduces your statutory rights.

Wavelength (nm)	Vλ CIE Photopic Luminous Efficiency Coefficient	Photopic Lumen/Watt Conversion Factor
380	0.0000	0.05
390	0.0001	0.13
400	0.0004	0.27
410	0.0012	0.82
420	0.0040	2.73
430	0.0116	7.91
440	0.0230	15.7
450	0.0380	25.9
460	0.0600	40.9
470	0.0910	62.1
480	0.1390	94.8
490	0.2080	142.0
500	0.3230	220.0
510	0.5030	343.0
520	0.7100	484.0
530	0.8620	588.0
540	0.9540	650.0
550	0.9950	679.0
555	1.0000	683.0
560	0.9950	679.0
570	0.9520	649.0
580	0.8700	593.0
590	0.7570	516.0
600	0.6310	430.0
610	0.5030	343.0
620	0.3810	260.0
630	0.2650	181.0
640	0.1750	119.0
650	0.1070	73.0
660	0.0610	41.4
670	0.0320	21.8
680	0.0170	11.6
690	0.0082	5.59
700	0.0041	2.78
710	0.0021	1.43
720	0.0010	0.716
730	0.0005	0.355
740	0.0003	0.170
750	0.0001	0.820
760	0.0001	0.041

CIE Photopic Curve



The CIE photopic curve is an international standard for the colour response of the average human eye

SEE TABLE ON NEXT PAGE

OPERATOR MAINTENANCE

Battery Replacement

Power is supplied by a 9 volt "transistor" battery. (NEDA1604, IEC 6F22). The "  " appears on the LCD display when replacement is needed. To replace the battery, remove the two screws from the back of the meter and lift off the battery cover. Remove the battery from the battery contacts.

Measurement rate: 2.5 times per second, nominal.

Operating Environment: 0°C to 50°C (32°F to 122°F) at< 70% relative humidity

Storage Temperature: -20°C to 60°C (-4°F to 140°F), 0 to 80% R.H. with battery removed from meter

Accuracy: Stated accuracy at 23°C ± 5°C (73°F ± 9°F), <70% relative humidity

Battery: Standard 9V battery (NEDA 1604, IEC 6F22 006P)

Battery Life: 200 hours typical with carbon zinc battery

Dimensions (HxWxD): 190mm(H) x 65.5mm(W) x 35mm(D)

Weight: 210g including battery

ELECTRICAL

Photometric Formulas:

$10.764 \cdot \text{footcandles} = \text{lux} (\text{lumens}/\text{meter}^2)$

$0.0929 \cdot \text{lux} = \text{footcandles} (\text{lumens}/\text{foot}^2)$

Range LM90: 20lux, 200lux, 2000lux, 20klux

20fc, 200fc, 2000fc, 20kfc

Range LM92: 200lux, 2000lux, 20klux, 200klux

200fc, 2000fc, 20kfc, 200kfc

Resolution: 0.1lux, 0.1fc

Spectral response: CIE photopic

Acceptance angle: $f'2<3\%$ cosine corrected (150°)

Total accuracy for CIE standard illuminant A (2856K): $\pm(3\% \text{rdg} + 10 \text{dgts})$

CIE standard illuminant A can be realised by means of CIE standard source A, which is defined as: A gas-filled tungsten-filament lamp operating at a correlated colour temperature of 2856K

Temperature Coefficient: $0.1x (\text{specified accuracy})/^{\circ}\text{C}$ (<18°C or >28°C),

$0.056x(\text{specified accuracy})/^{\circ}\text{F}$ (<64.4°F or >82.4°F)

Peak Hold response time: >50mS pulse light.

OPERATING INSTRUCTIONS

Push buttons

Peak-Hold Switch:

Press "PEAK" button to toggle in and out of the PEAK-HOLD mode. The "  " indicator is displayed. (Response Time: >50mS)

Display Back-Light Button

Pressing "  " button to turn on the Back-Light.

Pressing "  " button to turn off the Back-Light.

HOLD (DATA-HOLD) Button

Press "HOLD" button to toggle in and out of the DATA-HOLD mode. In the DATA-HOLD mode, the "  " indicator is displayed and the last reading is held on the display.

OPERATION

1. Set the function switch to the desired lux or fc units.
2. Remove the sensor head cover.
3. Hold the sensor head steady and make certain that the light source completely fills the cosine correction dome.
4. Move away from the sensor head to avoid shadowing it. The sensor head has a 1.5 meter cable to allow separation between the observer and the measurement location.
5. Read the illuminance value from the display. If magnitude of lux (or fc) is not known, set RANGE switch to the highest range and reduce until a satisfactory reading is obtained.
6. Cover sensor head to extend sensor life.

SPECIAL CONSIDERATIONS

- Keep the plastic domed cosine corrector clean and free of scratches. It may be cleaned with a soft cloth and isopropyl alcohol.
- When light is received from many directions simultaneously, take special care to avoid reflections or shadowing the sensor with your body.
- For best accuracy, repeat the measurement several times to ensure that the light source has remained stable.
- Avoid flexing the cable excessively at either end of the cable.
- 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 as the square of the distance d between the source and the point. If the surface at the point is normal to the direction of the incident light, the law is expressed by $E=I/d^2$.

- Cosine Law

The law that the illuminance on any surface varies as the cosine of the angle of incidence. The angle of incidence θ is the angle between the normal to the surface and the direction of the incident light. The inverse-square law and the cosine law can be combined as $E=(I \cos \theta)/d^2$.

Cleaning

Periodically wipe the case with a damp cloth, do not use abrasives or solvents.