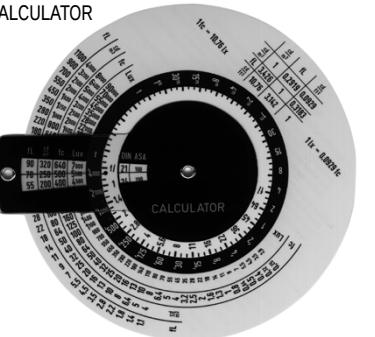
GOSSEN

MAVOLUX 5032C/B

Digital Luxmeter

3-349-042-15
2/7.99

CALCULATOR



Sensor

Display

Light Detector

Keypad

MAVOLUX 5032C/B

Luminance Attachment

Table of Contents Page

1 Applications

The MAVOLUX 5032C or B luxmeter and Footcandle meter is a handy, easy to use and highly accurate measuring instrument. It allows for the measurement of illumination in either lux or footcandles as well as luminance in cd per square meter or footlamberts with optional luminance attachments which can be screwed onto the sensor, and are available as accessories.

The instrument is equipped with color correction, i.e. its spectral response has been matched to that of the human eye, V(λ), in accordance with DIN 5032, part 7, class C for MAVOLUX 5032C or class B for MAVOLUX 5032B.

The correction filter is integrated into the sensor. All important light characteristics can thus be accurately measured without taking correction factors into consideration.

Integrated cosine correction is included as well in order to assure that oblique, incident light is also evaluated correctly.

MAVOLUX 5032C:
Even very intense light (e.g. daylight or headlights) can be measured without additional accessories.
MAVOLUX 5032B:
Even minimal amounts of light can be measured, e.g. emergency lighting.

2 Operation

First install the included battery (one 1.5 V mignon, alkaline-manganese cell per IEC LR6) into the battery holder. Open the snap-fastener at the battery compartment at the back panel of the measuring instrument. Be certain that the battery is correctly poled when inserted according to the poling indication in the battery compartment.

2.1 Battery Test

Battery testing is performed automatically. If the "⊣⊢" symbol appears at the display, the battery must be replaced.

2.2 Taking Measurements

Switch the measuring instrument on by pressing the "on/off" key.

After the instrument has been switched on, automatic measuring range selection is always active. The currently selected measuring range can be locked by briefly pressing the „Auto ↕ " or the „Range" key (range hold). Browsing up or down through additional measuring ranges is accomplished by briefly pressing the scroll keys in a repeated fashion. If both the „Auto ↕ " and the „Range" keys are pressed and held simultaneously, the instrument is returned from manual to automatic measuring range selection.

2.3 Special Functions

After the MAVOLUX 5032C/B has been switched on, the "auto-mode" is always active, i.e. the measuring range with the best resolution is selected automatically, and the display is refreshed at a frequency which is equal to the measuring rate of the A-D converter (approx. 2.5 measurements per second).

Hold Key

When the hold key is activated, the current measurement value is frozen at the display.
The hold function is cancelled if the key is activated a second time.

MAX Key

Maximum illumination or luminance can be determined by activating the MAX function, after which the highest detected value is stored to memory.
The MAX function is cancelled if the key is activated a second time.

lx/fc Key

The "lx/fc" is used to select the desired unit of measure, either lux or footcandles. When one of the luminance attachments is screwed to the sensor (see chapter 3, page 6), the instrument will automatically switch over to reading the corresponding units of cd/m^2 or fL.

Combining Special Functions

The hold and MAX functions are mutually incompatible. If one is selected, the other is automatically disabled. If a measurement value has been obtained with the hold or the MAX function, it cannot be converted into the other unit of measure by activating the “lx/fc” key. The hold or MAX function is exited in such cases.

2.4 Overload Display

If a measuring range is exceeded, “OL.” (overload) appears at the display.

2.5 Switching the Measuring Instrument Off

Switch the measuring instrument off by pressing the “on/off” key. The instrument is switched off automatically if none of its keys are activated for a period of approximately 2 minutes.

2.6 Measuring Luminance (accessory required)

Illumination defines the amount of light which strikes a surface, and luminance is a measure of the amount of light reflected from a surface.

When the luminance attachment has been screwed onto the sensor, the measuring instrument is automatically switched to the luminance mode and indicates the measurement value with the correct numeric value at the display (you do not have to convert the value as is the case with older measuring instruments!).

2.7 Tips for Taking Correct Measurements

Make sure that the illuminated surface is lit up in a complete and uniform fashion (e.g. no shadows cast by hand or body). Hold the sensor parallel to the surface to be evaluated, if illumination of the surface is to be measured (e.g. workstation lighting).

Please observe the following:

– Artificial sources of light do not reach full power until after they have been on for a lengthy period of time, and should therefore be switched on 15 minutes before measurements are taken.
– Mains voltage influences the intensity of light generated by artificial light sources.
  Check the mains voltage with a voltmeter. We recommend the handy METRAVOLT® 10D from GOSSEN-METRAWATT GMBH.

2.8 Ever-Ready Case

A leather ever-ready case for the luxmeter and a leather quill for the sensor are included as standard equipment. A clip is provided at the rear for attaching the instrument to a belt.

A window in the ever-ready case, as well as an opening for the sensor in the quill, allow for outdoor use even under inclement weather conditions.

The leather quills for the sensor and the luminance attachment (accessory) can be fastened to the ever-ready case with Velcro strips at the right and left.

When storing the equipment, please place the sensor in the quill with the measuring aperture turned away from the opening. So the light sensitive surface will be protected.

3 Accessories

Separately available accessories expand the applications range of the instrument.

Calculator for the camera man and the professional photographer

The measuring results from any luxmeter can be selected at this exposure calculating disc with a diameter of approximately 110 mm, and the corresponding exposure time / aperture combinations can be viewed. Values can be read from the calculating disc in the following units of measure: lux (lx) and footcandles (fc), or candela per square meter (cd/m^2) and footlamberts (fL).

Luminance Attachment

The luminance attachment measures reflected light, i.e. the luminance of a surface, with a measuring angle of $\varepsilon^1/_{10} = 20°$.

The measuring instrument is informed by a touch-sensitive switch as to whether or not the luminance attachment has been attached and which one.

The luminance measurement value is indicated at the display with the correct numeric value and unit of measure (see also chapter 2.6, page 5).

A different measuring attachment is required for measurements of the luminance either in cd per square meter or in in footlamberts (fL).

4 Technical Data

Characteristics MAVOLUX 5032C

Meas. Quantity		Measuring Range		Resolution in lx	Resolution in fc
		in Lux (lx)	in footcandles (fc)		
Illumination	I	0.1 … 199,9	0.01 … 19.99	0.1	0.01
	II	1 … 1 999	0,1 … 199.9	1	0.1
	III	10 … 19 990	1 … 1 999	10	1
	IV	100 … 199 900	10 … 19 990	100	10
		in Candela/m² (cd/m²)	in footlambert (fL)	in cd/m²	in fL
Luminance (with luminance attachment for cd/m² or fL)	I	1 … 1 999	0.1 … 199.9	1	0.1
	II	10 … 19 990	1 … 1 999	10	1
	III	100 … 199 900	10 … 19 990	100	10
	IV	1 000 … 1 999 000	100 … 199 900	1000	100

Most Important Error Limits MAVOLUX 5032C

Characteristics	Allowable Error Limits per DIN 5032 Class C	Actual Error MAVOLUX 5032C
V(λ) Matching	9%	7.5%
True Cosine Evaluation	6%	2%
Linearity	5%	1.5%
Adjustment Error	2%	1%
Total Error	20%	15%

Light Detector	silicon photodiode with V(λ) filter per DIN 5032 part 7, class C
Error Limits	per DIN 5032, part 7, class C

Characteristics MAVOLUX 5032B

Meas. Quantity	Measuring Range			Resolution in lx	Resolution in fc
		in Lux (lx)	in footcandles (fc)		
Illumination	I	0.01 … 19,99	0.001 … 1.999	0.01	0.001
	II	0.1 … 1 99,9	0.01 … 19.99	0.1	0.01
	III	1 … 19 99	0,1 … 1 99.9	1	0.1
	IV	10 … 19 990	1 … 19 99	10	1
		in Candela/m² (cd/m²)	in footlambert (fL)	in cd/m²	in fL
Luminance (with luminance attachment for cd/m² or fL)	I	0.1 … 199.9	0.01 … 19.99	0.1	0.01
	II	1 … 1 999	0.1 … 199.9	1	0.1
	III	10 … 19 990	1 … 1 999	10	1
	IV	100 … 199 900	10 … 19 990	100	10

Most Important Error Limits MAVOLUX 5032B

Characteristics	Allowable Error Limits per DIN 5032 Class B	Actual Error MAVOLUX 5032B
V(λ) Matching	6%	3%
True Cosine Evaluation	3%	2%
Linearity	2%	1%
Adjustment Error	1%	0,8%
Total Error	10%	8%

Light Detector	silicon photodiode with V(λ) filter per DIN 5032 part 7, class B
Error Limits	per DIN 5032, part 7, class B

Measuring Rate	approx. 2.5 measurements per second

Digital Display

LCD Field	50 mm x 25 mm
Display	7 segment
Char. Height	13 mm
Digits	3½ places
Overload Display	“OL.” is displayed

Power Supply

Battery	1.5 V mignon alkaline-manganese cell per IEC LR 6
Service Life	approx. 75 hours continuous operation, equivalent to approx. 2500 measurements
Battery Test	Automatic display of “ ⊣⊢ ” symbol when battery voltage drops to below approx. 1.0 V

Electromagnetic Compatibility (EMC)

Interf. Emission	EN 50081-1: 1992
Interf. Immunity	EN 50082-1: 1992

Mechanical Design

Housing	Plastic
Dimensions	Meter: 65 x 120 x 19 mm (without ever-ready case) Sensor: 31 x 105 x 30 mm
Weight	Meter and sensor: approx. 200 gr. w/o battery
Light Detector	Light collector surface at diffuser: approx. 20 mm dia.
Cable from Meter to Sensor	MAVOLUX 5032C: cable coil, available with extension MAVOLUX 5032B: cable coil, permanently attached
Cable Length	approx. 1.5 m

Technical Data, Accessories

Luminance Attachment (meas. angle $\varepsilon^{1}/_{10} = 20°$)

5 Maintenance and Calibration

No special maintenance is required if the instrument is handled correctly. Keep outside surfaces clean. Use a slightly dampened cloth for cleaning. Avoid the use of cleansers, abrasives or solvents.

Should the instrument nevertheless not work to your complete satisfaction, please send it to our Service Division who will speedily carry thorough the necessary repairs. The equipment will be calibrated while using a standard light source of 2856 K corresponding to the PTB Standard Specifications.

Recalibration Schedule

We recommend re-calibration every 1 to 3 years depending upon how the instrument is used. Please contact our calibration service, whose address is included on page 15.

6 Illumination Regulations

The following definitions are included in part 1 of the DIN 5035 standard under the heading “Terms and General Requirements”:

Nominal Illumination

Nominal illumination values for indoor areas include 20/50/100/200/300/500/750/1000/1500 and 2000 lx.

The nominal illumination value is related to the mean aging factor of the lighting system in question.

The nominal illumination value which is assigned to a specific type of room or activity is related to the difficulty of the respective visual task. The assumption is made that the nominal illumination value and its influence on ones ability to see are not impaired by interference effects such as direct glare, reflected glare and loss of contrast, as well as unsuitable color and color rendition.

The assignment of a specific nominal illumination value to a visual task is based upon persons with average sight. A sight defect which has not been fully corrected with glasses etc., can be partially or fully compensated for by increasing illumination.

Illumination at the Workplace

Nominal illumination of at least 200 lx is required for continuously occupied indoor workstations, unless another value is required due to operational or optical, physiological reasons.

In rooms or indoor areas which are continuously occupied by personnel, nominal illumination of at least 100 lx is required.

Planning Values and Minimum Values

The nominal illumination value should be multiplied by a factor of 1.25 for planning purposes.

The mean, arithmetic illumination value at the workplace may not have a value of 0.8 times less than the nominal illumination value, independent of the aging factor of the lighting system. However, illumination at any given workstation may never have a value of less than 0.6 times the nominal illumination value.

DIN 5035 Part 2, Illumination with Artificial Light

Under the heading “Recommended Values for Indoor and Outdoor Work Areas”

This standard includes an extensive table which classifies types of work areas and activities, illumination values, the color of the light, characteristic color rendition levels and classifications for the limitation of direct glare. Important notes concerning special requirements for lighting systems are included in an additional column, for example, under which circumstances additional illumination at any single workstation would be recommended, or even required.

A table with recommended values for outdoor work areas has also been added since the version issued in October, 1979. In addition, characteristic color rendition levels have been updated to correspond to the classifications set forth in DIN 5035 part 1.

7 For Lighting and Illumination Technicians

The measurement of illumination is required for the planning, and during the installation of lighting systems for which testing and monitoring is required by law, as well as for the definition of illumination values for hygienic, physiological, psychological or safety reasons.

Scope of applicability, terminology, responsibility, requirements and practical guidelines have been set forth to a great extent in various DIN standards.

Definitions:

General Lighting

Uniform lighting within a room which provides for roughly equal seeing conditions at all points within the room.

Workplace Oriented General Lighting

General lighting with specified relationships between lamps and specific workstations (see DIN V ENV 26385 for definition of workplace).

Individual Workstation Illumination

Illumination for a single workstation in addition to general lighting.

Applications Examples for the Measurement of Illumination

- Planning and installation of lighting systems and monitoring of same for aging, contamination and efficiency
- Daylight in indoor rooms (DIN 5034)
- Inspection of safety lighting (minimum illumination is equal to 1 lx in accordance with German workplace regulations)
- Traffic illumination with street lights for transportation vehicles and systems (DIN 5044)
- Technical evaluation of automotive headlights (DIN 5037)
- Gymnastics and sports (DIN 18032 part 1)
- Lighting for sports facilities (DIN 67526-1)
- Illumination of construction sites, railway yards, airport aprons and other outdoor areas
- Illumination of buildings, towers and smokestacks
- Illumination of greenhouses and plants

Illumination with Artificial Light (DIN 5035)

This standard applies to the artificial illumination of indoor rooms, and is generally applicable to the artificial illumination of outdoor areas which are used for the same purposes as the corresponding indoor rooms. In cooperation with all interested parties, the standards committee has made an effort to establish minimum illumination requirements which are, on the one hand, technically feasible, and which, on the other hand, do not represent any unreasonable requirements for the user. In combination with ASR 7/3, the standard represents an accepted and binding technical specification, by means of whose application the requirements set forth in ArbStättVO, paragraph 7, section 3 dated March 1975, are fulfilled.

8 Fundamental Light Theory

The illumination value indicates how intensely a surface is illuminated. The unit of measure used for illumination is lux (abbreviated lx). The lux is defined as follows: a light source with a luminous intensity of 1 candela (abbreviated cd) generates an illumination value of 1 lux from a distance of 1 meter. Candela is equal to the light intensity which is radiated in a certain direction by a source, emitting a monochromatic radiation at a frequency of 540×10^{12} cps and whose radiation power in that direction is 1/683 Watt by sterodiant.

Another illumination unit of measure which is most commonly used in England and the USA is the footcandle. One footcandle is equal to the illumination of a light source with a luminous intensity of 1 candela at a distance of 1 foot.

Footcandles and lux can be converted as follows:

1 footcandle = 10.76 lux

1 lux = 0.0929 footcandles

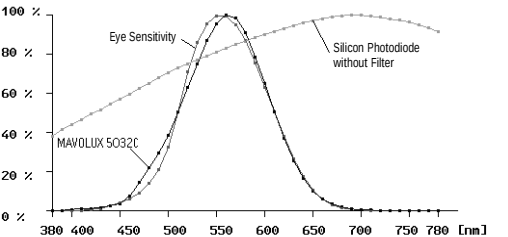
Light must be evaluated based upon the sensitivity of the human eye in accordance with the internationally accepted definition for the spectral response, V(λ), of the human eye which is adjusted to bright light. This response curve represents the mean value which was determined based upon tests conducted with a large number of persons.

The integrated silicon photodiode has been so well matched to the spectral response of the human eye through the use of filters, that it has achieved a rating of accuracy class C for MAVOLUX 5032C and class B for MAVOLUX 5032B in accordance with DIN 5032, part 7.

Additional details can be found in the DIN 5032 standard.

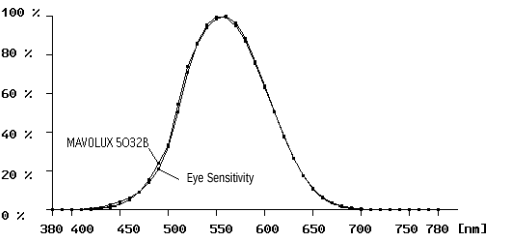
9 V(λ) Matching

MAVOLUX 5032C:



Matching Error of the MAVOLUX 5032C approx. 7.5%

MAVOLUX 5032B:



Matching Error of the MAVOLUX 5032B approx. 3%

10 Product Support

If required please contact:

GOSSEN Foto- und Lichtmeßtechnik GmbH
Hotline Produktsupport
Phone +49 911 86 02 - 181
Fax +49 911 86 02 - 142

11 Repair, Replacement Parts and Calibration Service

If required please contact:

GOSSEN Foto- und Lichtmeßtechnik GmbH
Lina-Ammon-Strasse 22
90471 Nuremberg, Germany
Phone +49 911 86 02 - 172
Fax +49 911 86 02 - 142
e-mail info@gossen-photo.de

Printed in Germany • Subject to change without notice

GOSSEN Foto- und Lichtmeßtechnik GmbH
Lina-Ammon-Str. 22
D-90471 Nürnberg, Germany
Phone +49 911 86 02 - 180
Fax +49 911 86 02 - 142
http://www.gossen-photo.de

GOSSEN