Operating Instructions

MAVO**SPEC** **BASE**

Spectrometer

GOSSEN
GMC-INSTRUMENTS GROUP

15579

1.4/06.24

Thank you for selecting a GOSSEN product.
You'll enjoy easy operation, top quality and precise measurement, as well as an extensive range of applications. Please check to makes sure that all of the parts listed below have been included in the scope of delivery. If anything is missing, please contact your dealer.

- **MAVOSPEC BASE**
- **Cover cap, micro SDHC memory card (installed in the battery compartment)**
- **V070A rechargeable battery, power pack and USB interface cable, Aluminum case, sheath, carrying strap**
- **Calibration report, printed instructions German / English**
- **Operating instructions German, English, French, Italian, Spanish and EXCEL files with several protocol templates and datalogger on memory card**

Outstanding MAVOSPEC BASE Measuring Functions and Features

- **Spectral power distribution** within a range of 380 to 780 nm (VIS)
- **Chromaticity, color coordinates** per CIE 1931 [x,y], CIE 1960 [u,v], CIE 1976 [u',v'], display of the CIE standard color table with zoom
- **Correlated color temperatur CCT** and **color temperature difference relative to the Planckian locus Duv**
- **Color rendering indices Ra, Re,** R1 through R15 and **Gamut Area Index GAI**
- **Color rendering indices Rf, Rg** according **IES TM-30-20** and related graphics
- **Television Consistency Lighting Index TLCI**
- **Purity, peak wavelength, dominant wavelength**
- **Flicker value** as **index**, **percentage** [%], **frequency** [Hz] and **curve, Lightscope, IEEE 1789 rating**
- **Illuminance** with cosine-corrected measuring probe in accordance with **class B per DIN 5032-7**
- **Irradiance Ee** in the range of 380 nm to 780 nm (VIS) and **Luminous Efficacy of Radiation LER**
- **Photosynthetic photon flux density PPFD, PPFD_UV, PPFD_Blue, PPFD_Green, PPFD_Red, PPFD_FR**
- **Large dynamic range** from 10 to 100,000 lx, highest resolution: 0.01 lx
- **Measurement can be started delayed** with a 10 s timer
- **Automatic or manual measured value storage** to an interchangeable micro SDHC memory card **Quick Load Funktion**
- **Reference mode** for comparing two light sources
- **Easy data transfer** thanks to CSV format
- **Documentation of measured values** via included Excel templates for evaluation
- **Data logging function** via included Excel template for data logging, **adjustable interval**
- **Universal USB port** for convenient data exchange, device control, firmware updates and battery charging
- **Individualized system integration** via open USB interface protocol
- **Sustainable device concept** thanks to update option via USB port
- **Ecological power supply** with rechargeable Li-ion battery, recharging via USB port and display of charging status and charge level
- **Long rechargeable battery operating time** of roughly 8 hours continuous operation, expandable by adjustable display and device shutdown
- **Outstanding measured value stability** thanks to automatic temperature compensation and zero-point correction
- **Individualized calibration** (photometric and radiometric), **calibration report included in scope of delivery**

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Safety Precautions

Please read these safety precautions carefully before using your meter. This will help you to avoid damaging the product and prevent personal injury.

This symbol identifies important warnings which should be read in any case before initial startup of your GOSSEN product.

Warnings

In the event of malfunctioning, switch the meter off immediately.
If the event that smoke develops or unusual odors become apparent, which are caused by either the meter or the power pack, disconnect from mains power immediately and remove the rechargeable battery from the device in order to prevent possible fire. Continuing to operate the meter or the power pack after such malfunctions have occurred may result in severe injury.
Please contact your local dealer or GOSSEN Service in order to eliminate malfunctioning. If you bring or send the meter in for repairs, make sure that the rechargeable battery has first been removed.

Do not use the meter in proximity to flammable gases.
Electronic devices should never be used in proximity to flammable gases. Danger of explosion and fire is otherwise immanent.

Never hang the device from children with the carrying strap.
Danger of strangulation exists if the carrying strap is hung around the neck of a child.

Store the meter at a location which cannot be accessed by children.
The meter and its accessories include parts which can be swallowed. Make sure that these parts (e.g. housing covers, rechargeable batteries etc.) do not fall into the hands of children who might swallow them. Otherwise, danger of suffocation prevails.

Use suitable cables only.
Use included, original GOSSEN cables only for connection to external devices. GOSSEN assumes no liability if other cables are used.

Do not dismantle the meter.
Never touch any parts inside the housing. Injury may result. Do not repair the meter yourself. Repairs may only be conducted by appropriately trained personnel. If the meter's housing is damaged due to dropping or other external influences, remove the rechargeable battery or power pack and contact your local dealer or GOSSEN Service for repair.

Avoid any and all contact with the liquid crystals.
If the display is damaged (e.g. broken), danger of injury due to contact with glass shards or discharge of liquid crystals exists. Make sure that skin, eyes and mouth do not come into contact with the liquid crystals.

Be careful when handling rechargeable batteries.
Rechargeable batteries may leak or explode if handled incorrectly. Please adhere to the following safety precautions:

- Make sure that the meter is switched off before removing or inserting rechargeable batteries.
  If the meter is used with a power pack, supply power must first be disconnected (pull the mains plug out of the electrical outlet).
- Only use rechargeable batteries which are recommended for this meter.
- Make sure that the rechargeable battery is correctly inserted.
- Never short-circuit rechargeable batteries, and never attempt to open a rechargeable battery.
- Do not expose rechargeable batteries to excessive heat or open fire.
- Do not expose rechargeable batteries to moisture and never immerse rechargeable batteries in water.
- After removing the rechargeable battery from the meter, close the battery compartment with the lid
  (e.g. if the meter will not be used for a lengthy period of time).
- Never store rechargeable batteries together with metallic objects which might cause short-circuiting.
- Danger of leakage exists, especially in the case of empty rechargeable batteries. In order to prevent damage to the meter, rechargeable batteries should be removed when fully depleted or in the case of lengthy periods of non-use.
- When not in use, rechargeable batteries should be stored in a cool place.
- Rechargeable batteries heat up during use and may become hot. Be careful not to burn yourself when removing rechargeable batteries. Switch the meter off or wait until it has shut itself down, and then wait a bit longer until the rechargeable battery has cooled down.
- Do not use rechargeable batteries which show any signs of damage such as discoloration or deformation of the housing.

Other Notes

- Reproduction of product documentation or duplication of any excerpts therefrom necessitates the express consent of GOSSEN Foto- und Lichtmesstechnik GmbH. This applies as well to duplication in any electronic format and translation into other languages.
- GOSSEN Foto- und Lichtmesstechnik GmbH reserves the right to make changes of any type without providing advanced notice.
- GOSSEN assumes no liability for damages resulting from incorrect use of the product.
- Documentation for your GOSSEN meter was prepared with the greatest of care. If you should nevertheless discover errors, or if you would like to suggest any improvements, GOSSEN would be very pleased to hear from you.

Symbol for separate collection of recyclable materials / hazardous waste in European countries
This symbol indicates that this product must be disposed of separately. The following must be observed by users in European countries:

• This product may only be disposed of separately at a designated collection point. It may not be disposed of with household trash.
• For further information contact your local dealer or waste disposal authorities.

The following symbols are used in order to make it easier to find additional information.

!!	**Important safety precautions**: Please read these safety precautions before using the meter in order to avoid damaging your MAVOSPEC BASE.
!	**Important information** which you should also read before using your MAVOSPEC BASE
¡	**Tips**: additional, useful information regarding use of your MAVOSPEC BASE
➲	**Reference** to other information included in these operating instructions
M	**Individual functions** which can be configured in the menu

1 Initial Startup

The MAVOSPEC BASE works with an interchangeable micro SD card for measured value storage and a device-specific, rechargeable lithium-ion battery.
Use only the original V070A GOSSEN rechargeable battery included with the meter, or available as an optional accessory, and the USB charger.

- Wait until your MAVOSPEC BASE has been shut down.
- Unlock the lid at the back of the meter with a Phillips head screwdriver, remove it and pull it down and away.

Unlock.

Remove the lid.

1.1 Inserting the Memory Card

- Remove the rechargeable battery from the battery compartment.
- Insert the micro SDHC memory card into your MAVOSPEC BASE in the recess provided for this purpose in the battery compartment.
- Push the card into the slot in the meter in the indicated direction.

!	The MAVOSPEC BASE can also be operated without a memory card – all measuring and display functions are still available and only measured value storage at the meter is excluded.

Insert micro SDHC card und push into the slot.

1.2 Inserting the Rechargeable Battery

- Insert the battery into the compartment as shown in the figure. Make sure that the + and – poles are correctly connected!
- Close the battery compartment lid and secure it with the screw.

Insert battery.

Lock.

1.3 Charging the Battery

Connect the included USB cable first of all to the USB port on the meter and then to the USB socket on the power pack, and then connect the power pack to a mains outlet.

The LED in the housing top indicates the charging status of the rechargeable battery. It lights up red as long as the battery is charging, and changes to green when the battery has been fully charged. If the meter is switched on, a symbol appears at the battery display indicating that the device is being externally supplied with electrical power. Charging time for a fully depleted battery is about 1½ hours.

!	When connected to a PC, the device is switched to continuous operation and is supplied with electrical power from the PC's USB port.
	The meter can be operated with or without an inserted battery when connected to a PC or to the power pack.
	An additional or replacement battery (3.7 V / 1100 mAh) can be purchased from GOSSEN under order number V070A.

1.4 Default Settings

The MAVOSPEC BASE is shipped with default settings which, based on our own experience, fulfill the basic requirements of most users. A complete summary of the default settings and instructions on how to adapt them to your individual requirements are included in section 4 of these operating instructions. Entered settings are retained until they have been changed again, or until the meter is reset to its default settings as described in section 4.4.

2 The Meter and its Controls

2.1 Device Overview

2.2 Controls

DATA Key
DATA
Press key briefly: Storage of the last measurement, inactive in case of automatic storage
Press and hold: Retrieve stored measured values

MENU Key
MENU
Open menu, exit menu

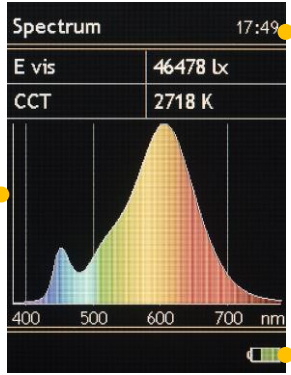
DATA + MENU Key
DATA MENU
Pressing and holding both of these keys simultaneously switches the device off.

Measurement Key
M
Measurement: Briefly press the measurement key. Long press with 10 s timer.
Settings: Acknowledge selection.
Device in sleep mode: Switch device on.

> **!** *After switching the device on, the settings used for the last work cycle are displayed.*

Ring Controller		
M	**Up/down**	**Measured value view:** Scroll through the secondary measured value windows
		Menu view: Scroll through the parameters list
M	**Left/right**	**Measured value view:** Scroll through the measured value windows
		Menu view: Menu item selection, parameter display, exit parameter display

2.3 Display



Measured Value Window

Shows the active measured value window or the measured value memory's directories and files

Status Bar

Shows the name of the active measured value window or the measured value memory's directory, and time of day

Information Bar

Shows currently running actions such as measurement, storage, loading, the file name and the battery's charging status

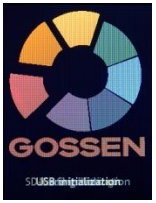
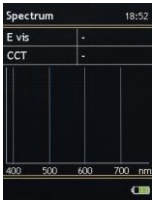
The battery icon in the information bar shows the charging status of the battery, or indicates operation with mains power or power from the PC. Even when the device is switched off, the charging status LED indicates whether the battery is being charged or has already been fully charged.

Icons in the Information Bar and the Charging Status LED			
	Battery full		Operation with mains power or at PC
	Battery partially charged		LED blinks red – battery is being charged
	Battery nearly depleted – charge now		LED lights up green – battery is fully charged

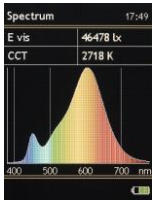
LCD brightness can be adjusted to meet your individual needs within a range of 50% to 100% in 10% steps. In order to further extend rechargeable battery operating time, display shutdown time can be adjusted after which LCD brightness is automatically reduced to 50% of the selected value. Unless the device has been fully shut down, LCD brightness is returned to its originally selected value each time a key is pressed. A complete summary of the default settings and instructions on how to adapt them to your individual requirements are included in section 4 of these operating instructions.

3 Functions

3.1 Switching the Meter On

Use the measurement key to switch the meter on.		The meter is initialized ...		… and the initial screen appears with an empty display field.	

3.2 Measuring

Press the measurement key to start. Possible from any measured value window.		A measurement is triggered and the measured values appear in the display field.	

Configurable **Individual Functions** in the **MENU**			
M		Units of measure	lx / °C - fc / °F
		Decimal separator	Comma - point
		Auto int. time	on - off
		Int. time	10 to 3000 ms in 10 ms steps
		Notification	graphic - sound
		Reference mode	on - off
		Auto saving	on - off
		Spectrum	off - 5 nm - native
		Filename	time - number
		Flicker Trend	off - on
		Spectrum	off - colored - simple
		Report	display presetting
		CRI	off - all - bars - table - web
		TM30-20	on - off
		Flicker	on - off
		Data	off - 5 nm - native
		CIE	off - 1931 - 1976
		TLCI	off - on
		PPFD	off - on

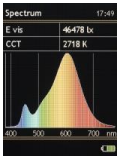
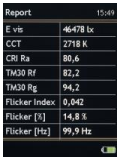
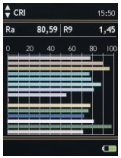
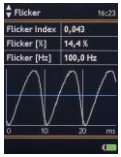
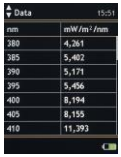
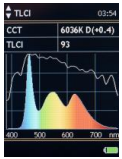
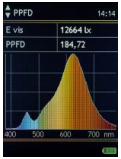
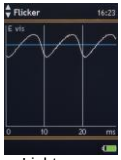
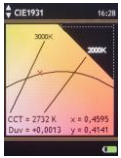
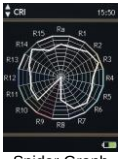
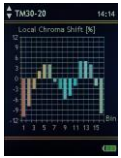
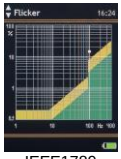
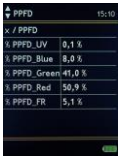
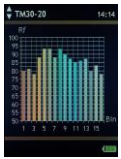
3.2.1 Measured Value Windows

After the measurement has been performed, results are displayed in the selected measured value window.

The ring controller is used to switch amongst the individual measured value windows.

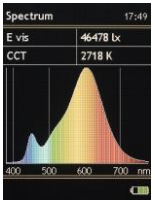
The availability of the individual measured value windows und the parameters they contain can be adapted in a customer-specific fashion in the presentation menu (see section 4). Individual measured value windows or measured values which are not displayed can be activated there.

A new measurement can be triggered in each measured value window.

Spectrum	Report	CRI	TM30-20	Flicker	Data	CIE1931	TLCI	PPFD
 CCT, E vis	 E vis, Ee, LER CCT, Duv CIE 1931 x CIE 1931 y CIE 1960 u CIE 1960 v CIE 1976 u‘ CIE 1976 v‘ CRI Ra, CRI Re CRI GAI TM30-20 Rf TM30-20 Rg λpeak λdominant Purity Flicker Index Flicker [%] Flicker [Hz] PPFD PPFD_UV PPFD_Blue PPFD_Green PPFD_Red PPFD_FR TLCI	 Ra, R9, Bar Graph	Color Vector	 Index, %, Hz, Curve	 380 … 780nm	CCT, Duv, x, y	 CCT, TLCI	 PPFD, E vis, µmol / m²s
		Ra, R1 - R15	Local Hue Shift	 Lightscope		 Zoom	Colorist Advice Table	PPFD_x
		 Spider Graph	 Local Chroma Shift	 IEEE1789 Rating			Colorist Advice Table	 PPFD_x in % of PPFD
			 Fidelity Index				Spider Graph	

3.2.2 Spectrum

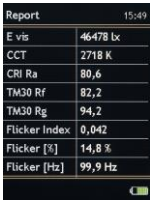
This measured value window displays the spectral power distribution of a light source and also provides information concerning color temperature and illuminance. The window as well as the colored background for the spectral power distribution can be shown or hidden with the help of the corresponding function in the presentation menu (see section 4).



E vis	Illuminance (lx/fc)
CCT	Correlated color temperature in Kelvin (K)
Graphic	Standardized spectral power distribution (mW/m²/nm) over the entire measured waveband

3.2.3 Report

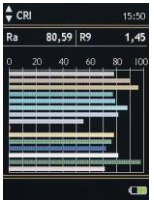
This measured value window lists all measured values calculated by the device from the measured spectral power distribution. The window as well as the individual values can be shown or hidden with the help of the corresponding function in the presentation menu (see section 4).



E vis	Illuminance (lx/fc)
Ee	Irradiance (W/m²)
LER	Luminance Efficacy Ratio (lm/W)
CCT	Correlated color temperature in Kelvin (K)
Duv	Delta uv – color temperature difference relative to the Planckian locus
CIE 1931 x	Color system standard CIE 1931, color coordinate x
CIE 1931 y	Color system standard CIE 1931, color coordinate y
CIE 1960 u	Color system standard CIE 1960, color coordinate u
CIE 1960 v	Color system standard CIE 1960 color coordinate v
CIE 1976 u‘	Color system standard CIE 1976, color coordinate u‘
CIE 1976 v‘	Color system standard CIE 1976, color coordinate v‘
CRI Ra	Color rendering index Ra - color rendering index
CRI Re	Color rendering index Re - color rendering index
CRI GAI	Gamut area index - color rendering index
TM30-20 Rf	Fidelity index
TM30-20 Rg	Gamut index
ʎ peak	Wavelength (nm) of the maximum spectral radiant intensity (ʎp) – peak intensity
ʎ dominant	Dominant wavelength
Purity	Color purity

Flicker index	Flicker index		
Flicker [%]	Flicker as a percentage		
Flicker [Hz]	Flicker frequency		
PPFD	Photosynthetic photon flux density PPFD	PAR range	400 - 700 nm
PPFD_UV	Photosynthetic photon flux density PPFD	UV range	380 – 400 nm
PPFD_Blue	Photosynthetic photon flux density PPFD	Blue range	400 – 500 nm
PPFD_Green	Photosynthetic photon flux density PPFD	Green range	500 – 600 nm
PPFD_Red	Photosynthetic photon flux density PPFD	Red range	600 – 700 nm
PPFD_FR	Photosynthetic photon flux density PPFD	Far Red range	700 – 780 nm
TLCI	Television Lighting Consistency Index		

3.2.4 CRI



These measured value windows display color rendering index Ra and individual indices R1 through R15 in various formats. The window as well as all or one preferred display format can be shown or hidden with the help of the corresponding function in the presentation menu (see section 4).

Bars	Color rendering indices R1 through R15 as a bar graph as well as Ra and R9 as numeric values
Table	Color rendering index Ra and color rendering indices R1 through R15 as numeric values
Web	Color rendering index Ra and color rendering indices R1 through R15 as a spider graph

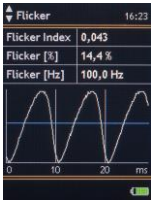
3.2.5 TM30-20

These measured value windows displays the evaluation of the color rendering according the new IES standard TM-30-20. It shows information about the fidelity index Rf, the gamut index Rg and further information in the related graphics. The window can be shown or hidden with the help of the corresponding function in the presentation menu (see section 4).

Color Vector Graphic
Local Hue Shift Graphic
Local Chrome Shift Graphic
Fidelity Index Graphic

3.2.6 Flicker

These measurement windows represent the measured flicker values as well as the curve of the illuminance and make an evaluation according to IEEE1789. The window can be shown or hidden under MENU - Display (see section 4).



Flicker	Index, percent [%], frequency [Hz] and zoomed curve
Lightscope	Absolute curve of illuminance
IEEE 1789	Evaluation graph according IEEE 1789

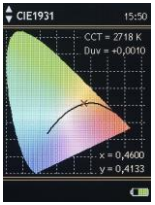
3.2.7 Data

This measured value window displays irradiance either as original data from the sensor or as data interpolated to even 5 nm steps. The window as well as the preferred display format can be shown or hidden with the help of the corresponding function in the presentation menu (see section 4).

Wavelength (nm), associated irradiance (mW/m²/nm)

3.2.8 CIE

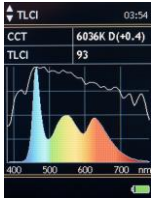
These measured value windows display the color coordinates in the respective CIE standard color system and depict chromaticity graphically in the associated standard color diagram. In addition the correlated color temperature CCT, the distance to the Planckian curve and the color coordinates are displayed. Furthermore, there is a zoom function on the Planckian curve. The window as well as one preferred standard color system can be shown or hidden with the help of the corresponding function in the presentation menu (see section 4).



CIE 1931	Standard color system, graphic – chromaticity in the standard color diagram, color coordinates x, y
CIE 1976	Standard color system, graphic – chromaticity in the standard color diagram, color coordinates u', v'

3.2.9 TLCI

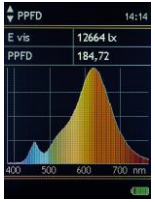
This measured value window displays the spectrum of the light source as well as the assigned reference spectrum. It shows additional information about color temperature, radiator type, standardized distance to the standardized color temperature and the Television Lighting Consistency Index. The window can be shown or hidden with the help of the corresponding function in the presentation menu (see section 4).



TLCI	Spectrum, reference spectrum, color temperature, radiator type, standardized distance to the standardized color temperature, TLCI
Colorist Advice Table	Correction values for lightness, chroma, hue of each sector
Qa Spider Graph	Value Q1 to Q18 for the Color Checker Colors as spider graph

3.2.10 PPFD

This measurement value window shows the spectral power distribution of a light source in PPFD µmol/m²s for the assessment of plant lighting. It provides information about the illuminance and the total PPFD over the PAR range. In addition, individual PPFD values can be called up over various spectral ranges and can also be displayed as a percentage of the total PPFD. The window can be shown or hidden under MENU – Display, see Chapter 4.



E vis	Illuminance (lx / fc)
PPFD	Photosynthetic photon flux density PPFD - PAR range 400 - 700 nm
Graph	PPFD spectral power distribution (µmol/m²s)
PPFD Table	PPFD (400 nm–700 nm), PPFD_UV (380 – 400 nm), PPFD_Blue (400 – 500 nm), PPFD_Green (500 – 600 nm), PPFD_Red (600 – 700 nm), PPFD_FR (700-780 nm)
PPFD Table in % PPFD	Displays the individual spectral values of the PPFD table in % of PPFD

3.3 Measuring in Reference Mode - Comparison Mode

With the reference mode, the data of two light sources can be compared with each other. For this purpose, it is necessary first to measure the light source to be used as a reference and to store the measurement result in the device. Then activate the reference mode under MENU - Measurement and load the saved file as a reference. This remains even after switching off the reference mode but only until the meter is switched off. After switching it on again, the measuring device will remain in normal measuring mode until the reference is reloaded.

Pressing the measurement key triggers a new measurement and compares it to the loaded reference. As soon as the reference mode is activated and a reference is loaded, only the measured value windows Spectrum, Report and CIE are available in modified form.

In the **spectrum window**, you can now switch between three specific measured value windows with the ring controller up / down:

Spectrum Measure	Measured values, colored spectrum measurement, spectral curve reference white
Spectrum Reference	Reference values, colored spectrum reference, spectral curve measurement blue
Spectrum Delta	Delta values, spectral curves reference white and measurement blue

In the **report window**, the display changes to two-line structure with delta value, reference value and measured value for the measured variables activated in the MENU display report.

In the **CIE window** additionally the reference value is displayed as a triangle.

3.3.1 Measured Value Windows in Reference Mode

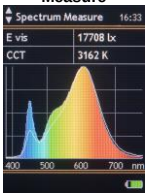
After measurement, the result is displayed in the selected measured value window.

Between individual measured value windows is changed with ring controller.

The availability of individual measured value windows and the parameters contained therein can be adapted under MENU - Display customer specific, see chapter 4. If individual measured value windows or measured values are not displayed, they can be activated there.

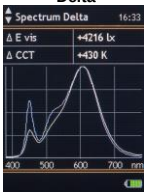
A new measurement can be triggered in each measurement window.

Spectrum Measure

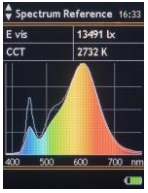


CCT, E vis

Spectrum Delta



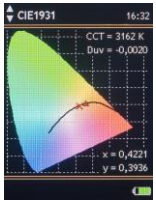
Spectrum Reference



Report

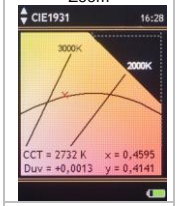
E vis, Ee, LER,
CCT, Duv
CIE 1931 x
CIE 1931 y
CIE 1960 u
CIE 1960 v
CIE 1976 u‘
CIE 1976 v‘
CRI Ra, CRI Re
CRI GAI
TM30-20 Rf
TM30-20 Rg
λpeak
λdominant
Purity
Flicker Index
Flicker [%]
Flicker [Hz]
PPFD
PPFD_UV
PPFD_Blue
PPFD_Green
PPFD_Red
PPFD_FR
TLCI

CIE1931



CCT, Duv, x, y

CIE1931
Zoom



3.4 Measured Value Memory

The MAVOSPEC BASE has an interchangeable micro SDHC memory card in the battery compartment to which measured values can be saved either automatically or manually. Manual saving is selected as a default setting. The respective memory modes can be selected in the memory menu (see section 4.6). Measured values are saved in the CSV data format, which can be opened with Excel and other programs for convenient further processing.

3.4.1 Saving Measured Values

DATA	Manual saving	Briefly pressing the DATA key saves the values from the last measurement.
M	Automatic saving	The value is saved automatically after measurement has been completed.

A CSV file using a continuous number **M_xxxxxx.CSV** or with the time of day as a file name **hh-mm-ss.CSV** is saved to the respective day folder **yy-mm-dd.** The selection of the file name type can be done in the MENU - Memory, see section 4.6.

3.4.2 Loading and Deleting Saved Measured Values

DATA	The memory menu is opened or exited by pressing and holding the DATA key.			
micro SDHC card yy-mm-dd	Navigate to the folder with the ring controller. M Briefly pressing measurement key opens the folder. M Long pressing measurement key accesses the menu for opening or deleting the folder.	.. **hh-mm-ss.CSV** **hh-mm-ss.CSV** **hh-mm-ss.CSV**	Navigate to file with the ring controller. M Press the measurement key. The menu for loading or deleting the file appears. M	Navigate with ring controller to command M **load** **load as reference** **delete** … and confirm by measurement key. M load: measurement will be displayed load as ref.: measurement will be loaded as reference delete: measurement will be deleted

3.4.3 Quick Load Function

DATA +	Quick Load Function	When the DATA key is held down, the stored measurements of the selected folder can be displayed one after the other via the ring controller in the measured value window. Thus, a simple view of the stored measurements is possible

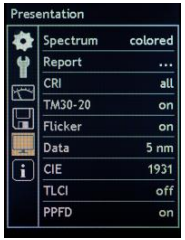
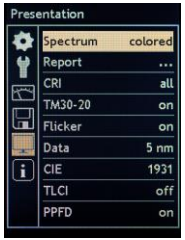
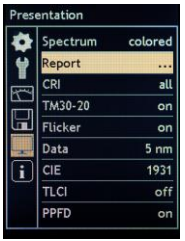
4 MENU

This chapter expands upon the above described functions and explains the great variety of options for default settings and presets offered by the MAVOSPEC BASE.

4.1 Overview

	General	Default Setting	Options		Information
	LCD Brightness (%)	100	100 - 90 - 80 - 70 - 60 - 50		Serial No.
	Display off (min.)	2	5 - 4 - 3 - 2 -1 - 0.5 - off		Sensor No.
	Device off (min.)	4	10 - 5 - 4 - 3 - 2 - 1 - off		Software Rev.
	Language	English	English - German		Hardware Rev.
	Time / Date	00:00 01.01.2015			Product ID
	Settings				Temperature
	Units	lx / °C	fc / °F - lx / °C		Batt. Voltage
	Decimal separator	, (comma)	. (point) - , (comma)		
	Hour format	24h	24h - 12h		
	Date format	dd	dd.mm.yyyy - mm/dd/yyyy - yyyy-/mm/dd		
	Default settings		abort - reset		
	Measurement				
	Auto Int. Time	on	off - on		
	Int. time		10 to 3000 ms in 10 ms steps		
	Notification	sound	graphic - sound		
	Reference mode	off	off - on		
	Memory				
	Auto saving	off	off - on		
	Spectrum	5 nm	off – 5 nm - native		
	Filename	number	time - number		
	Flicker Trend	off	off - on		
	Presentation				
	Spectrum	colored	off - colored - simple		
	Report	E vis - CCT - CRI Ra - Flicker Index - % - Hz	E vis, Ee, LER, CCT, Duv, CIE1931 x, CIE1931 y, CIE1960 u, CIE1960 v, CIE1976 u‘, CIE1976 v‘, CRI Ra, CRI Re, CRI GAI, TM30-20 Rf, TM30-20 Rg, λ peak, λ dominant, Purity, Flicker Index, Flicker [%], Flicker [Hz], PPFD		
	CRI	all	off - all - bars – table - web		
	TM30-20	off	off - on		
	Flicker	on	off - on		
	Data	5 nm	off - 5 nm - native		
	CIE	1931	off - 1931 - 1976		
	TLCI	off	off - on		
	PPFD	off	off - on		

4.2 Navigation – Setup

MENU	Press the MENU key to open the main menu.				
	Use the ring controller ... to select the desired menu.		Use the ring controller ... to navigate through the user settings.		Use the ring controller ... to select a submenu.
	Use the ring controller ... to display values.		Use the ring controller ... to select the desired value.		Use the ring controller ... to navigate through the value settings.
	Use the ring controller ... to select the desired setting.		Use the measurement key ... to acknowledge.		Use the ring controller ... to return to the submenu.
MENU	Press the menu key to exit the main menu at any time.				

4.3 MENU – General

LCD Brightness (%)

Display brightness can be adjusted to suit the respective requirements. Minimal display brightness results in low current consumption and increases availability of the meter during battery operation.

- LCD Brightness (%) 100 - 90 - 80 - 70 - 60 - 50

Display off (min.)

In order to further extend battery operating time, a display shutdown time can be selected. If none of the meter's controls are activated during this time, LCD brightness is automatically reduced to 50%. Activation of any key returns LCD brightness to the level selected as described in section 4.3.1. All measured values and settings are retained.

- Display off (min.) 5 - 4 - 3 - 2 - 1 - 0.5 - off

Device off (min.)

The meter is switched off if none of the controls are activated during the selected period of time. All measured values and settings are fist saved and are retained until the meter is switched back on again by pressing the measurement key, M.

- Device off (min.) 10 - 5 - 4 - 3 - 2 - 1 - off

Language

The meter's menu can be set to the desired language.

- Language English - German

Time / Date

The meter displays time of day in the status line and uses it as a file name for the measured value memory, which additionally uses the date as a designation for the day file. If the battery is depleted or removed for the purpose of replacement, the integrated real-time clock continues to run for approximately 12 hours before it stops. In order to assure that date and time are retained for as long as possible, it's advisable to recharge the battery after lengthy periods of use.

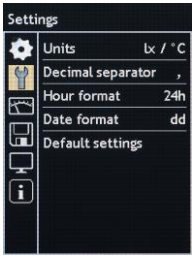
- Time / Date 00:00 01.01.2016 to 23:59 31.12.2099

4.4 MENU – Settings

All settings apply to the display at the device as well as the stored measured value file. Where the decimal separator and date are concerned, country specific adaptation may be required in order to assure that the CSV file is read in correctly by the respective software program.

Units

Units of measure can be switched from the metric system to the imperial system. Illuminance in Lux (lx) is then changed to foot-candles (fc) and temperature is changed from degrees Celsius (°C) to degrees Fahrenheit (°F).



- Units fc / °F - lx / °C

Decimal separator

The decimal comma (,) is used in some countries as the decimal separator, and the decimal point (.) in others.

- Decimal separator . (point) - , (comma)

Hour format

Some countries use a 24 hour clock (24h), and others use a 12 hour clock (12h) together with the abbreviations a.m. (ante meridiem) for before noon and p.m. (post meridiem) for afternoon.

- Hour format 24h - 12h

Date format

The date is written differently in the various countries. The following settings are possible:

- Date format dd.mm.yyyy (day.month.year) - mm/dd/yyyy (month/day/year) - yyyy/mm/dd (year/month/day)

Default settings

The meter is reset to the default settings described in section 4.1 but date and time are retained.

- Default settings abort - reset

4.5 MENU – Measurement

The measuring range, and thus the sensitivity of the spectrometer, are controlled by means of integration time, i.e. the time during which the sensor collects light. The brighter the light source, the shorter integration time must be, and vice versa. In this respect it must be assured that the sensor is not saturated even during the shortest integration time. It may be necessary to increase distance to the light source.

Auto Int. Time

The meter can automatically adjust integration time, and thus the measuring range as well, to prevailing measuring conditions. Automatic determination of integration time should only be deactivated by experienced users, after which integration time must selected manually.

- Auto Int. Time off - on

Int. Time

The integration time used for the last measurement is displayed in this menu, and is continuously overwritten if automatic selection of integration time has been activated. When automatic selection of integration time is deactivated, integration time is selected manually in this menu.

- Int. Time (ms) 10 to 3000 ms in 10 ms steps

Notification

The beginning of each measurement can be indicated by a brief acoustic signal, or by the appearance of a red hourglass at the display. A long acoustic signal is generated at the end of the measurement, or a green hourglass is displayed briefly. Sound or graphic can be selected depending on the respective requirements.

- Notification graphic - sound

Reference Mode

In reference mode you can compare two measurements.

- Reference mode off - on

4.6 MENU – Memory

Data storage to the micro SDHC memory card offers the following setting options.

Auto. saving

The measured values for the last measurement are saved either manually by briefly pressing the DATA key, or automatically after every measurement. The auto save function can be activated in this menu.

- Auto. saving off - on

Spectrum

Storage of the spectral power distribution to the file can be either deactivated, or it can be interpolated to 5 nm steps or with native sensor resolution.

- Spectrum off – 5 nm - native

Filename

The measured values for the last measurement are saved either manually by briefly pressing the DATA key, or automatically after every measurement. As filename could be selected either the time hh-mm-ss.csv or a continuous number M_xxxxxx.csv.

- Filename Time - Number

Flicker Trend

Storing the flicker trend to the file can either be activated or deactivated.

- Flicker Trend off - on

4.7 MENU – Presentation

The content and the availability of the individual measured value windows can be adapted to the user's own specific requirements.

Spectrum

The following settings are available for the "Spectrum" measured value window:

- Spectrum off - colored - simple

Report

The individual measured quantities can be shown or hidden for the "Report" measured value window. For the CIE values, a change in one value affects both related values.

- E vis, Ee, LER, CCT, Duv, CIE1931 x, CIE1931 y, CIE1960 u, CIE1960 v, CIE1976 u', CIE1976 v', CRI Ra, CRI Re, CRI GAI, TM30-20 Rf, TM30-20 Rg, λ peak, λ dominant, Purity, Flicker Index, Flicker [%], Flicker [Hz], PPFD, TLCI off - on

The calculation of TM30 after the measurement is a very complex procedure who needs approx. 3 s. If TM30 is not required, this time could be saved by deactivating the measuring values in the report as well as deactivating the measuring window.

CRI

Various display formats can be selected for the CRI measured value window. The measured value window can be hidden, all display formats can be shown, or just one selected display format can be shown.

- CRI off - all - bars - table - web

TM30-20

The measured value window TM30-20 includes several graphics and can be hidden or activated.

- TM30-20 off - on

The calculation of TM30 after the measurement is a very complex procedure who needs approx. 3 s. If TM30 is not required, this time could be saved by deactivating the measuring values in the report as well as deactivating the measuring window.

Flicker

The measured value window Flicker contains various display forms and can be shown or hidden.

- Flicker off - on

Data

The “Data” measured value window can be hidden, or spectral power distribution can be displayed either interpolated to 5 nm steps or with native sensor resolution.

- Data off – 5 nm - native

CIE

Various display formats can be selected for the CIE measured value window. The measured value window can be hidden, all CIE standard color systems can be shown, or just one selected CIE standard color system can be shown.

- CIE off - 1931 - 1976

TLCI

The measured value window TLCI contains various display forms and can be shown or hidden.

- TLCI off - on

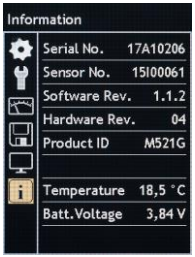
PPFD

The measurement value window PPFD contains various display formats and can be shown or hidden..

- PPFD off - on

4.8 MENU – Information

Important device information is summarized in this menu. It includes the sensor number, the serial number, the software version and the hardware version. This information is necessary if any questions regarding the product should arise, or if a malfunction should occur. Battery voltage and the temperature of the measuring probe appear in this menu as well.



5 USB Port

The meter's USB port is located on the bottom of the housing. The meter is connected to a PC via the USB interface cable, and the PC detects the integrated micro SDHC memory card as a removable data storage medium. The measurement files stored in CSV format can then be easily opened, copied, moved or deleted. As long as the meter is connected to the PC, it's supplied with electrical power via the USB port and is not switched off.

If the meter is connected to the power pack via the USB interface cable, the integrated battery is charged as described in section 1.3. Charging via the PC's USB port takes a long time and is not recommended.

The open protocol for device control and data communication permits incorporation into the user's own applications. The interface description and an associated demo application can be downloaded from the MAVOSPEC BASE product page at www.gossen-photo.de.

6 Firmware Update

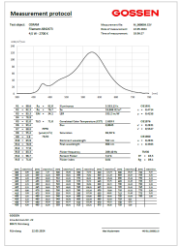
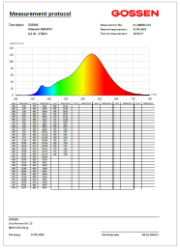
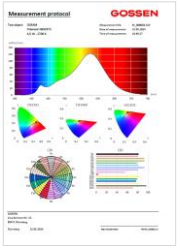
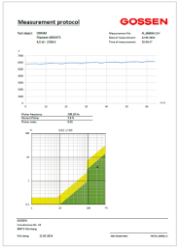
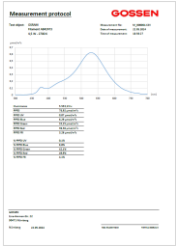
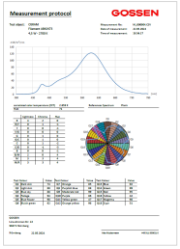
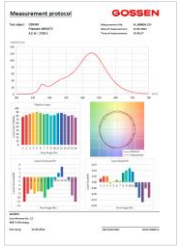
The sustainable device concept is open to future function expansions and amendments to the applicable standards. If necessary, new firmware versions will be made available by GOSSEN, which the customer can install to the device himself. After updating the firmware, the meter is then fully up to date. User settings remain unchanged. Updating instructions and new firmware can be downloaded from the MAVOSPEC BASE product page at www.gossen-photo.de.

7 EXCEL Templates

The built-in microSDHC memory card contains the following templates for Microsoft EXCEL. The current versions are available on the MAVOSPEC BASE product page at www.gossen-photo.de and can be downloaded from there. The templates are already supplied with sample data and can also be viewed without a connected device. The templates work under Microsoft Office for Windows 32-bit / 64-bit version, Excel. The execution of macros must be activated.

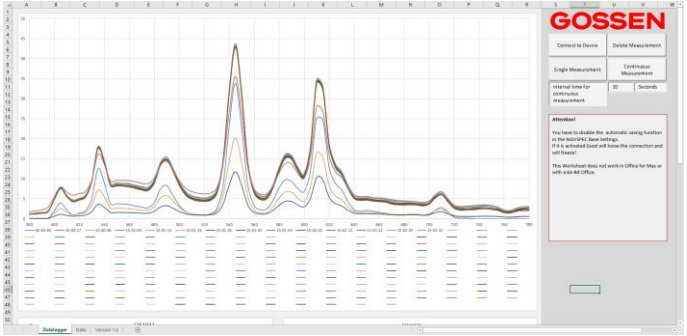
7.1 Documenting Measured Values

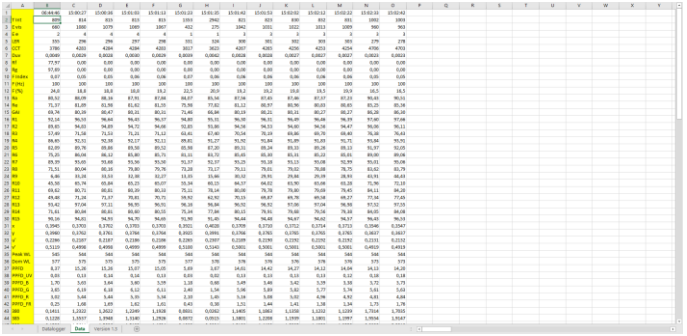
The Microsoft Excel template “Auswertung Vx.xx.xlms” provides various sample templates for reports. The individual elements can be adapted as desired, and new templates can be created. They access the “Data” spreadsheet, into which the stored measured value files can be read in automatically after clicking a button, or a measurement can be started with the connected meter. The reference comparison worksheet can additionally read in a measurement as a reference and then all read or executed measurements are compared with this reference and the deviations are displayed. The report can then be saved as a PDF file by clicking a button.

7.2 Data Logger

Das EXCEL template „Datenlogger Vx.xx.xlsm“ provides a data logger function. Either individual measurements or continuous measurements with adjustable measuring interval can be carried out and stored in the data worksheet. The respective spectral curve appears in the graphic display and below the positions are displayed in the CIE 1931 and CIE 1976 color space. The datalogger can be used in conjunction with the measuring device to record the measured values over the course of the day, which is particularly advantageous when checking luminaires or systems of biologically effective lighting (Human Centric Lighting) or in greenhouse lighting.





8 Practical Tips

A broad range of information regarding measured quantities, measuring methods, applications and photometry standards, as well as support in selecting a suitable meter, is included in the **Photometry Compendium**. It can be downloaded from the MAVOSPEC BASE product page at www.gossen-photo.de under Downloads Catalogs or requested as a printed version from GOSSEN.

9 Factory Calibration

The MAVOSPEC BASE with intuitive user interface is one of the most accurate and reliable spectrometers in its class, and reflects the most up-to-date technology available on the market. Like all other precision light meters, this product also requires regular maintenance, recalibration and firmware updates in order to continuously fulfil performance capabilities within the tolerances and specifications stipulated by the manufacturer. Depending on conditions of use, a calibration interval of 12 to 24 months is recommended.

10 Service

The device does not require any special maintenance if used in accordance with the operating instructions. If the outside of the device becomes contaminated during use, clean the surface of the housing with a slightly moistened cloth. Avoid the use of cleansers, abrasives or solvents.

If at any time your meter does not function to you full satisfaction, please contact us or send it to us at:

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Phone: +49 911 800621-0 I Fax: +49 911 800621-29 I e-mail: info@gossen-photo.de I www.gossen-photo.de

Customers outside of Germany are requested to contact their authorized dealer, whose address can be found on our website.

11 Error Messages

The error messages listed below may appear during operation and are displayed in the information bar.

Error Message	Situation	Cause	Elimination
Faulty calibration data	Initial window	Calibration data memory illegible or faulty	If this error occurs several times after a restart, please send the meter for repair.
Device not calibrated	Measured value window	No calibration data available	
SD card error	Initial window or save/load measurement	SD card cannot be accessed	Insert the SD card or examine it at the PC and reformat it if necessary (FAT16).
File error	Save/load measurement	File cannot be accessed	
Folder error		Folder cannot be accessed	
Saving not permitted	Save measurements	The measurement has already been saved or is outside of the valid measuring range.	
Signal too weak	After performing a measurement	The measurement signal is too weak.	Reduce distance to the light source.
Signal too strong		The measurement signal is too strong.	Increase distance to the light source.
Battery almost dead	Measured value window	Battery has not been charged on time.	Charge the battery or supply the device with electrical power from the power pack of the PC.
3 brief acoustic signals	Any time	Battery dead	

12 Technical Data

Sensor Technology, Measuring Uncertainty		
Sensor	CMOS image sensor, 256 pixels	
Diffusor light-entry surface	7 mm diameter	
Distance, diffuser to surface to be measured	25 mm	
Error limit, cosine correction	≤ 3% (comparable with the f2 failure of a class B device according DIN 5032-7)	
Spectral range	380 … 780 nm	
Full width at half maximum (FWHM)	≤ 15 nm (typically 12 nm)	
Physical resolution	~ 1.72 nm	
Digital resolution	16 bit	
Wavelength reproducibility	± 0.5 nm	
Integration time	Automatic, manual, 10 … 3000 ms in 10 ms steps	
Signal-to-noise ratio	1000:1	
Spurious light	-25 dB	
Dark stream compensation	Automatic with integrated temperature sensor	
Measurement uncertainty, illuminance	Standard light type A, 2856 K @ 1000 lx	± 3 %
Measurement uncertainty, chromaticity		
Reproducibility, chromaticity		± 0.0005
Measurement uncertainty, CCT		± 2%
Measurement uncertainty, TM30-20		± 1.5%
Measurement uncertainty, CRI		± 1.5%
Measurement uncertainty, flicker		± 1.5%
Photometry		
Measuring functions	Illuminance Evis	10 … 100,000 lx
	Irradiance Ee	
	Luminous Efficacy Ratio LER	
	Color temperature (K)	1600 K … 50000 K (Duv ≥ -0,1)
	Duv – color temperature difference relative to the Planckian locus	(1600 K ≤ CCT ≤ 50000K)
	TM30-20 Fidelity Index Rf, Gamut Index Rg	IES TM-30-20
	Color rendering indices Ra, Re, R1 to R15	CIE 13.3
	Gamut Area Index	
	λpeak – peak wavelength	
	λdominant – dominant wavelength	CIE 15
	Purity – color purity	CIE 15

	Chromaticity coordinates	CIE 1931 [x,y], CIE 1960 [u,v], CIE 1976 [u',v']
	Flicker index	0.00 … 1.00 (f ≤ 400Hz und Flicker % ≥ 1 %)
	Flicker as percentage (%)	1,0 % … 100 % (f ≤ 400Hz)
	Flicker frequency (Hz)	2 Hz … 6000 Hz (Flicker % ≥ 1 %)
	TLCI	EBU TECH 3355
Measuring function PAR	PPFD	µmol/m²s (400 - 700 nm PAR)
	PPFD_UV	µmol/m²s (380 - 400 nm)
	PPFD_Blue	µmol/m²s (400 - 500 nm)
	PPFD_Green	µmol/m²s (500 - 600 nm)
	PPFD_Red	µmol/m²s (600 - 700 nm)
	PPFD_FR	µmol/m²s (700 - 780 nm)
Units of Measure	lx / °C - fc / °F, selectable	
Operation, Interfaces, Memory		
Display	2.1" TFT color display, 320 x 240 pixels, brightness adjustable from 50% to 100%, shutdown adjustable from 0.5 … 5 min. or off	
Controls	3 keys, ring controller	
Languages	German, English	
Interface	USB 2.0, data transmission, battery charging, open interface protocol	
Data storage	4 GB micro SDHC memory card, manual and automatic memory modes, CSV data format, memory occupancy per measurement: 2 kB, per thousand measurements: 2 MB	
Power Supply		
Mains power pack	100 … 240 V AC (50/60 Hz) 0.15 A, USB socket: 5 V DC, 1 A	
Rechargeable battery	Li-ion, 3.7 V, 1100 mAh, replaceable - 100% compatible with Nokia battery BL-5B	
Charging time with power pack	1.5 hours	
Operating time with rechargeable battery	≥ 8 hours continuous operation	
General		
Dimensions	139 x 60 x 30 mm	
Weight	150 g (meter with battery and memory card)	
Operating temperature	+5 to +40° C	
Storage temperature	-20 to +70° C	
Scope of delivery	Meter, sensor cover cap, 4 GB micro SDHC memory card, V070A rechargeable battery, power pack, USB interface cable, aluminum case, neoprene sheath, carrying strap, calibration report, operating instructions in German and English	
Optional Accessories		
Replacement battery (V070A)	Li-ion, 3.7 V, 1100 mAh - 100% compatible with Nokia battery BL-5B	

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