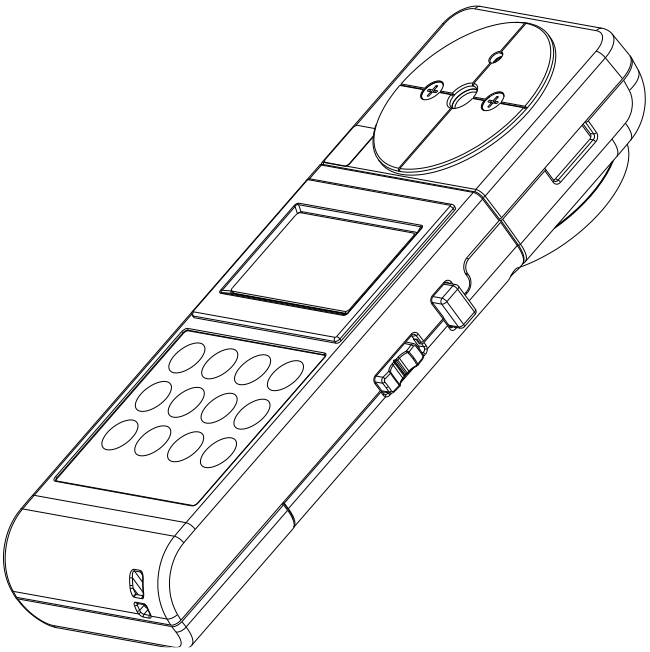
TOPCON



INSTRUCTION MANUAL

Phosphorescence luminance meter

BM-100

Rev.8

INTRODUCTION

Thank you so much for your purchasing our TOPCON TECHNOHOUSE Phosphorescence luminance meter BM-100 series.

This manual describes an outline, basic operation procedure and specifications regarding the Phosphorescence luminance meter BM-100. Read this instruction manual carefully before using this instrument.

HANDLING PRECAUTIONS

- Be sure to use the designated AC adapter for this instrument. The use of any AC adapter which is not designated here in may result in failures. The input power voltage is AC 100V to 240V, and its frequency is 50Hz or 60Hz.
- Be sure to turn off the power switch before connecting/disconnecting the detector unit and/or USB, AC adapter.
- Do not bring any radio communication unit such as transceivers, etc. close to this instrument. This may cause the readout to be unstable.
- Do not use this instrument in an area with a lot of dust, very high humidity and possibly corrosive gases.
- Do not use this instrument in an area where the ambient temperature changes rapidly. This instrument has a built-in temperature compensation circuit, but in some cases, stable measurements may not be possible under an environment with a rapidly changing temperature.
- Do not subject to strong shock caused by falling, etc. to this instrument, and do not use or store the instrument in or on a place with continuous vibration. This instrument contains precision components which may be damaged under such conditions.
- The instrument operates at temperatures from −10°C to +40°C, but display response slows down when used in a range of –10°C to +0°C.
- Do not store the instrument at a place having at temperatures over +60°C or below -20°C.
- Remove the battery to avoid leakage and store the instrument when unused for a month or more.
- When the detector window has got dirty, any measurement error may occur. Wipe off the detector with a dry cloth.
- The instrument case is made of plastic. Do not wipe with any chemicals (acetone, thinner, etc.). Do not bring it near any place whose temperature exceeds 60°C.
- To maintain required measurement accuracy, Contact your dealer or TOPCON TECHNOHOUSE and have the instrument calibrated at least once every three years.
- On calibration, the correction factors memorized in this instrument are deleted. Conduct back-up recording of necessary measured data before requesting calibration.
- When the power switch is turned on, the battery is consumed because the instrument repeatedly conducts measurement for as long as the turning on the power. Please turn off the power switch for power saving when you do not use it.
- For energy saving, when you do not use the instrument for a long time, unplug the power plug from the socket.
- Keep the instrument away from water and liquid. This instrument is not water-resistant.
- This instrument is made of recyclable materials. When you dispose of this instrument, please consign this instrument to recycle dealer.

SAFETY INDICATIONS

Warnings and Cautions are indicated on this instrument and in the instruction manual to prevent injury to users and others, prevent damage to property or the like, and to ensure safe use of this instrument.

After fully understanding the following indications and symbols, carefully read the section "Safety Precautions," and observe all precautions.

Display	Meaning of display
 **Warning**	This display indicates that incorrect handling with disregard for this display may cause danger resulting in death or severe injury.
 **Caution**	This display indicates that incorrect handling with disregard for this display may cause accidents resulting in injury*1 ,or damage to property*2.

*1: This refers to injury such as burns, electric shock or the like that does not require hospitalization or long-term medical attention.

*2: Damage to property means considerable damage to a building, furniture, livestock or pets.

Diagram	Meaning of display
	This icon indicates Prohibition. Specific content is expressed with words or an image located close to the icon.
	This icon indicates Mandatory Action. Specific content is expressed with words or an image located close to the icon.
	This indicates Hazard Alert (Warning). Specific content is expressed with words or an image located close to the icon.

SAFETY PRECAUTIONS

⚠Warning

Prohibited

Do not use this instrument near flammable or combustible gases (gasoline, etc.).

Failure to do so might cause fire.

Prohibited

Keep the instrument away from water and liquid.

Doing so might cause fire or electric shock.

Prohibited

Do not disassemble or modify this instrument.

Doing so might cause fire or electric shock.

Mandatory

Be sure to use the authorized AC adapter.

AC adapter malfunctions may result in fire or electric shock.

Prohibited

Do not disassemble the AC adapter.

Doing so might cause fire or electric shock.

Mandatory

Remove dust or moisture from the AC adapter plug.

Failure to do so might cause fire.

Mandatory

If you notice strange noise, smell or smoke from this instrument, immediately turn the instrument OFF and unplug the AC adapter from the power outlet.

Continued use of this instrument in this state might cause fire.

Contact your dealer or Topcon Technohouse Corporation.

⚠Caution

Prohibited

Insert the batteries with current polarity position.

Otherwise, battery leakage may occur, resulting in personal injury or product failure.

Prohibited

Do not place this instrument on an unstable stand or uneven surface.

Failure to do so might cause the instrument to fall or tip over.

Prohibited

Do not bring any goods with a static charge near to ESD mark.

Otherwise, it may cause failures or incorrect measurements.

Mandatory

Use only specified screws when using the tripod.

Do not tighten the screws any more necessary. Doing so might cause internal breakage.

DISCLAIMER

- TOPCON TECHNOHOUSE accepts no responsibility for any damages resulting from fires, earthquakes, deeds of any third party and other accidents, as well as damages caused by the user's intentional or negligent actions, erroneous usage and other usage of the instrument under abnormal conditions.
- TOPCON TECHNOHOUSE accepts no responsibility for any incidental damages such as loss of business and discontinuance of business caused by use or out of commission of this instrument.
- TOPCON TECHNOHOUSE accepts no responsibility for any damages caused by use other than that instructed in the instruction manual.
- TOPCON TECHNOHOUSE accepts no responsibility for any damages caused by erroneous equipment behavior due to use in combination with other equipment or apparatus.

USER MAINTENANCE

Conduct maintenance work only as instructed in this manual. Never conduct any other maintenance work which is to be done by our service staff for safety and maintaining performance. The following maintenance work can be carried out by the user. The details of maintenance work are indicated in this manual.

Cleaning of body and detector window

Remove dirt on the body cover and detector window with a soft cloth with thin mild detergent, and then wipe the detergent off with a dry, soft cloth.

When the detector unit has got dirty and got oil adhesion such as fingerprints, any measurement error may occur. Wipe off the detector methodically.

Do not use solvents such as thinner, benzene or acetone. Such products may change the surface color.

CONTENTS

NOTATIONS IN THIS MANUAL

The following notational conventions are used in this manual:

Notation	Description
[CALL]、[⊿]	Means a menu title shown on a keyboard and the display of the instrument.
☞‘ ’	Indicates a text referred to in this manual.
☞“ ”	Indicates other instruction manual to be referred to.
Request	Explains matters to be acknowledged or to be considered for the operation of this instrument.
Memo	Explains matters to be referred to or to be useful for the operation of this instrument.

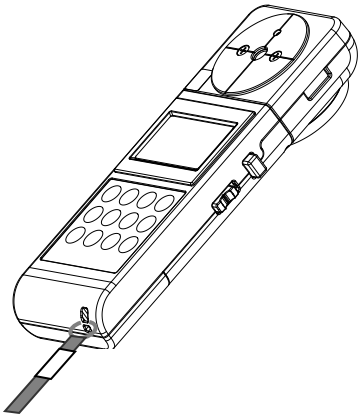
1. BEFORE USE

1.1 CHECK OF MAIN BODY AND ACCESSORIES

Check that all the following items are included.
If not complete, please contact your dealer or TOPCON TEHCHNOHOUSE.

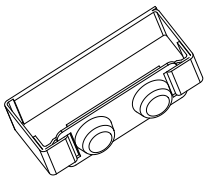
Instrument

• BM-100 1

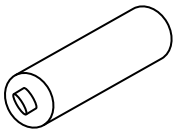


Accessories

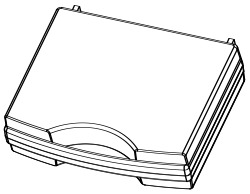
• Quick Manual	1
• Inspection report	1
• Height adjustment rubber band	1
• AA battery (For operation check) (Separately sold parts)	2
• Carrying Case	1
• USB Driver/Instruction manual/Measurement program（CD-ROM）	1
• USB 2.0 cable 1.5m	1
• Cap	1
• Cushion sponge（spare）	1



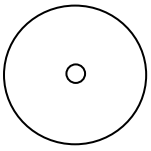
Height adjustment Rubber band



AA battery

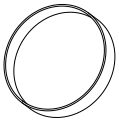


Carrying Case

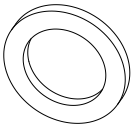


USB Driver/Instruction manual/ Measurement program（CD-ROM）

USB 2.0 cable 1.5m



Cap

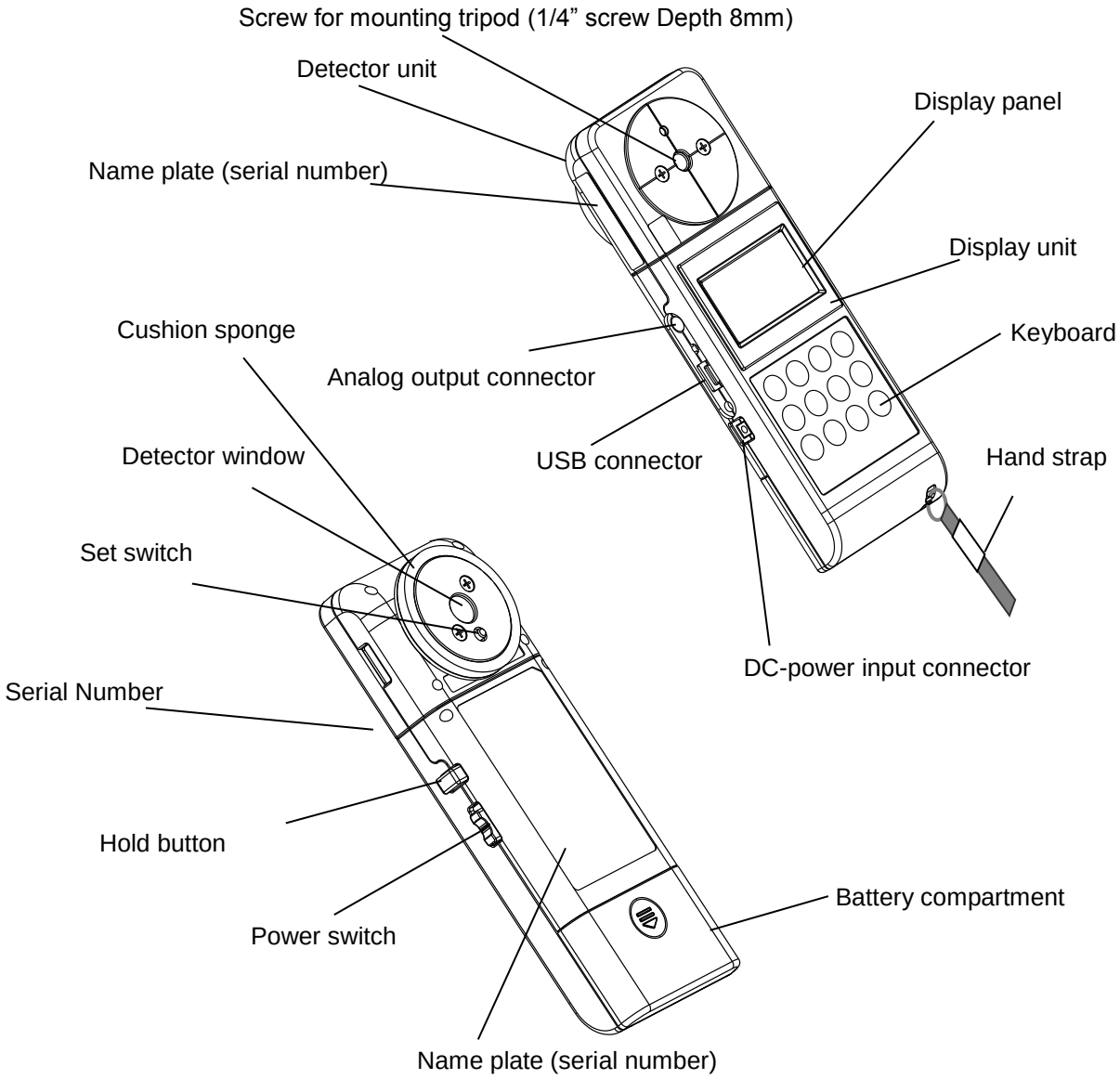


Cushion sponge

1.2 NAMES AND FUNCTIONS

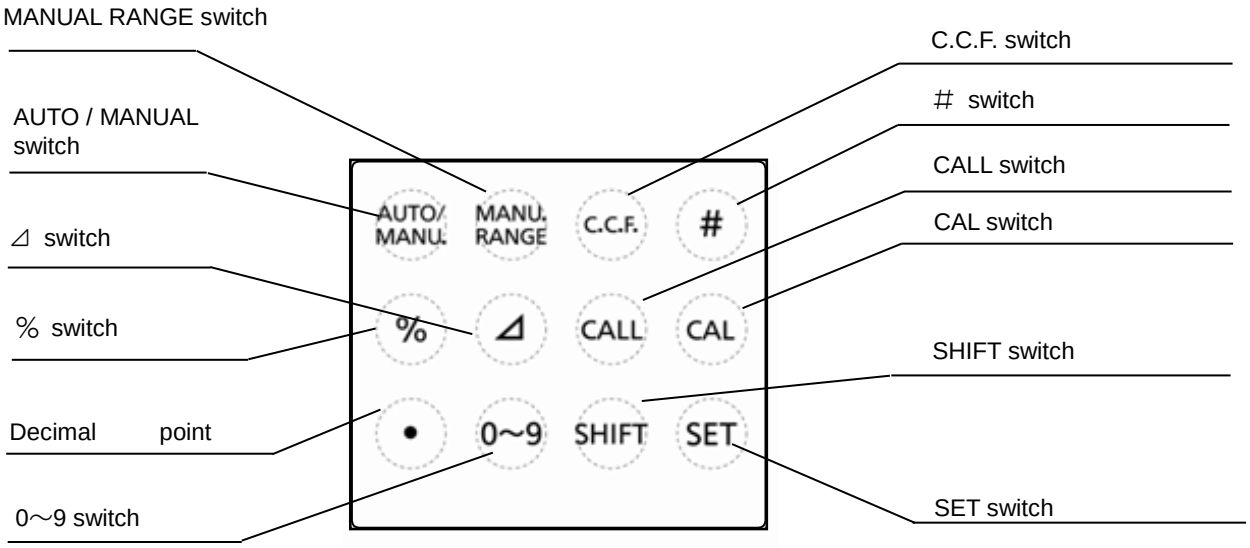
■Main body

BM-100



Name	Description
Display panel	Various kinds of information such as measurement and measuring condition is shown on the display panel.
Keyboard	This keyboard is to select functions and to input numeric value.
USB connector	This connector is used to connect the instrument to PC in remote measurement. Connecting PC ☞'1.3.4 Connecting PC'
External power Connector	Connector for designated AC adapter (optional accessory).
Detector window	The sensor of this instrument. Light should be uniformly distributed over whole surface of the detector window.
Hold switch	By pushing this hold switch during luminance measurement, the mode will change from luminance measurement to Phosphorescence luminance prediction. By pushing this hold switch during illuminance and UV measurement, Measurement is paused and readout is fixed.
Power switch	Power switch for this instrument.
Tripod screw	A screw hole to fasten the instrument to a tripod. Specification : 1/4-UNC (depth 8mm)

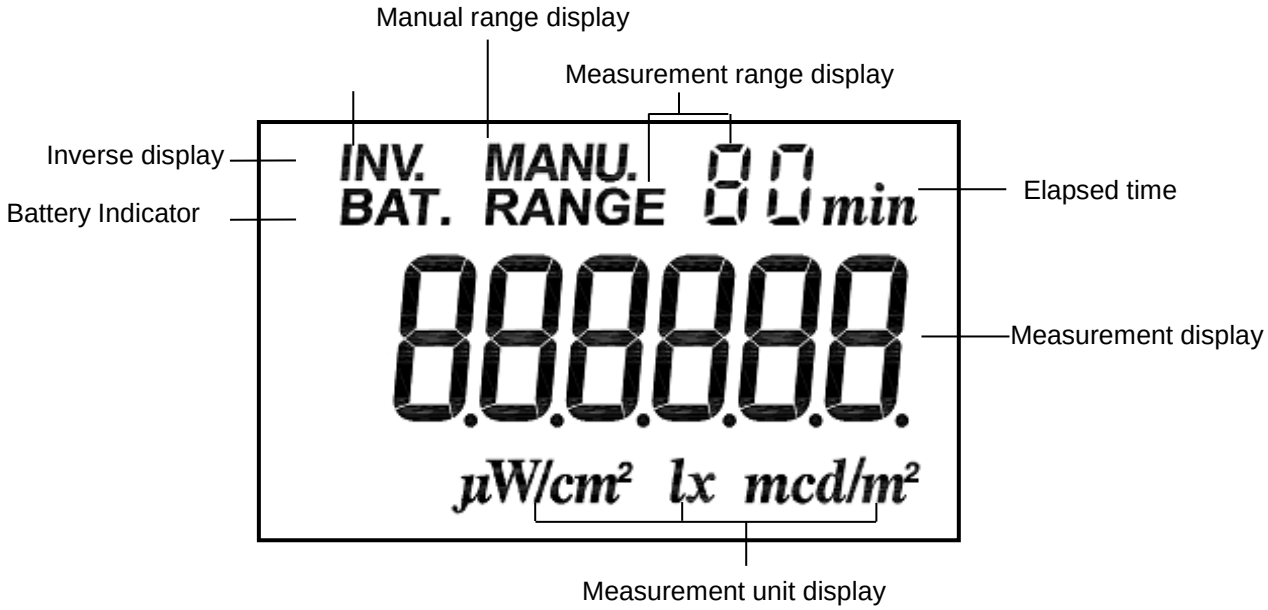
■Names and functions of keyboard



The function of each switch is as follows:

Switch	Description
[AUTO/MANU.] Auto/Manual	Switch for selection between [AUTO] and [MANU]. [AUTO]: Optimum measurement range is automatically selected according to illuminance level. [MANU.]: Measurement range is manually set. Display range ☞'2.2 Auto-range measurement and display range'
[MANU. RANGE] Manual Range	Changes the measurement range to the next manually. Measurement range are switched in turn as follows; 1→2→3→4 Display range ☞'2.3 Manual-range measurement and display range'
[C.C.F.] Color Correction Factor	Sets and confirms the value of the Color correction factor. The BM-100 can memorize one correction factor data.
[#] Sharp	Stops readouts on the display. (Luminance mode)
[%]	Unused.
[⊿]	Unused.
[CALL]	Unused.
[CAL]	Shifts to standby status of pre-measurement for user-specified material calibration in phosphorescence luminance prediction mode.
[●]	Sets decimal point when entering the Color correction factor.
[0 - 9]	Increments the numerical value in inputting Color correction factor.
[SHIFT]	Moves the cursor in Color Correction factor setting. Shifts to the selection of phosphorescent material setting menu. Selects the phosphorescent material. Selects the elapsed time from 20 min, 60 min, and 90 min in Phosphorescence luminance prediction mode.
[SET]	Confirms your entry in color correction factor setting, and confirm your selection of the phosphorescent material.

■Names of parts on display screen



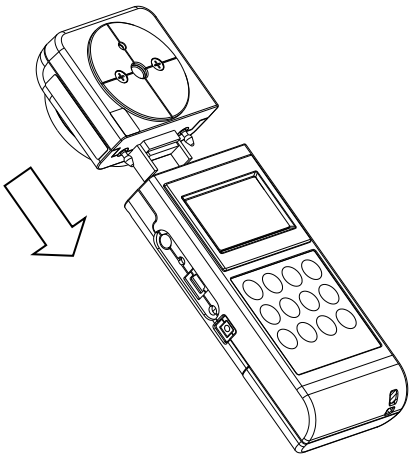
Displayed letters	Description
[CAL]	Appears during operating zero-adjustment and standby of pre-measurement for user-specified material.
[MANU.]	Appears during operating zero-adjustment and manual range mode.
[RANGE+1234]	Shows the currently used range.
[BAT.]	Appears when battery capacity is low. Replace batteries as soon as possible when this letter appears.
Measurement display	Displays readout.
[INV.]	Appears when the set switch is released during prediction of Phosphorescence luminance.
[mcd/m^2] [cd/m^2]	A unit for luminance. Appears when the system is luminance measurement mode and as the measurement value increase, the system automatically changes unit from mcd/m^2 to cd/m^2.
[lx]	Appears in illuminance measurement mode. [Detector for illuminance (optional accessory) is required]
[µW/cm^2]	Appears in UV measurement mode. [Detector for UV (optional accessory) is required]
[20min][60min][90min]	Shows elapsed time in Phosphorescence luminance prediction mode.
[0][1][2][3][4]	Shows five pre-measurement data for user-specified material calibration.

1.3 PREPARATION

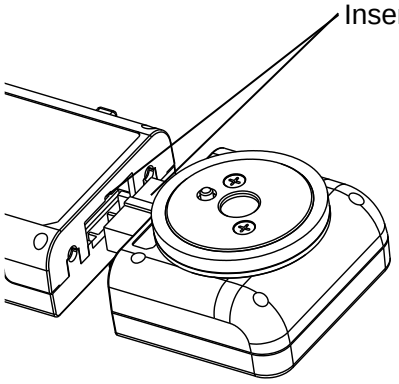
1.3.1 HOW TO MOUNT THE DETECTOR UNIT

Push in the detector along with the connector guide in the arrow direction.

Be sure to turn off the power switch before connecting disconnecting the detector unit.



BM-100



Request	・ Combine the Detector unit and the Display unit having the same serial number, otherwise measured value may not be correct. ・ Do not turn on power when the detector unit is not mounted correctly to the display unit.

Memo

・ Make sure that the Detector unit is mounted to the Display unit.

1.3.2 HOW TO INSERT A BATTERY

Two AA batteries are required.
Those for operation check do not attach at the time of shipment.
Purchase those at your dealer.

1 Turn the power switch off and uncover the battery compartment.

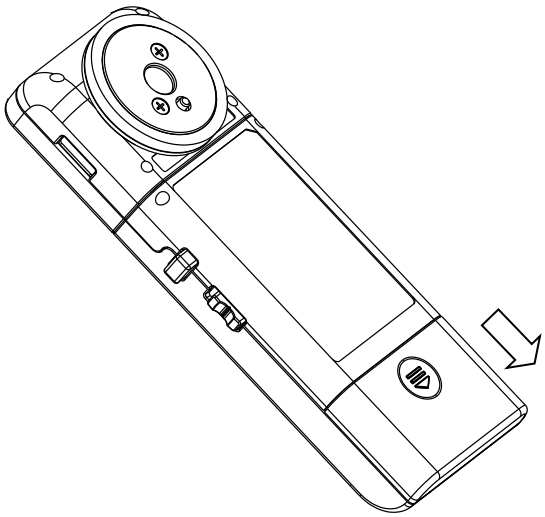
2 Insert a battery according to a polar indication shown on the battery compartment.

3 Mount the battery compartment.

Battery life at room temperature

	Not using USB communication	Using USB communication
Battery life	70 hours or more	35 hour or more

（Using alkaline cell）



Request	・ When you conduct continuous measurement long time, pay attention to battery life or use AC adapter (optional accessary). ・ If battery go dead during pre-measurement, the measured data are not saved and lost.

1.3.3 CONNECTION OF AC ADAPTER

(Separately sold optional accessory)

Compulsory

Only use the designated AC adapter.

Unapproved AC adapters may cause fire or electric shock.

Compulsory

Be sure to remove dust and water at the plug and receptacle for the AC adapter.

Otherwise, it may cause fire.

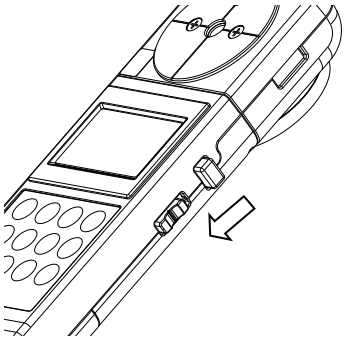
Prohibition

Do not remove or insert the plug with wet hands.

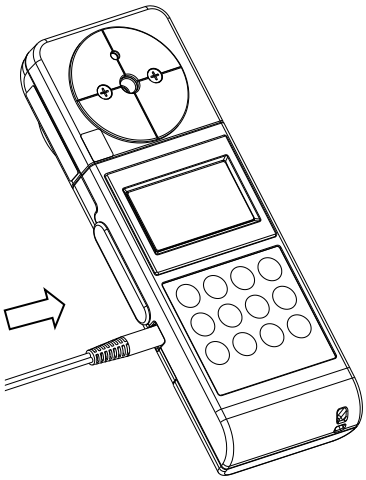
Otherwise, it may cause electric shock.

Procedure for connection of the AC adapter to this instrument is as follows:

1 Be sure that the power switch of this instrument is turned to OFF.



2 Insert the connector of the AC adapter to the instrument.



3 Insert the plug of the AC adapter to the receptacle.

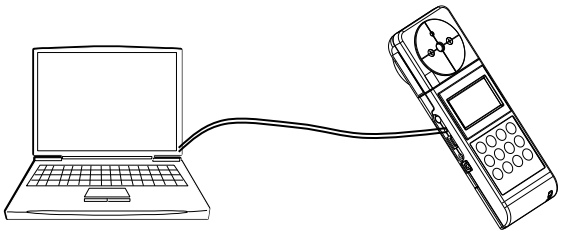
1.3.4 CONNECTING TO PC

Use the standard accessory USB cable (Cable Type: A connector – mini B connector) to connect to the PC.

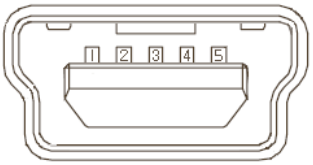
Memo

• For connection to a PC, refer to your PC manual as well.

Request	・Never plug any connectors in or out while the instrument power is on.



■Connector Pin Assignment



Mini USB connector

B type female (5 pin)

Instrument side

Pin No.	Signal
1	VBUS
2	D–
3	D+
4	GND
5	GND

■Communication parameters

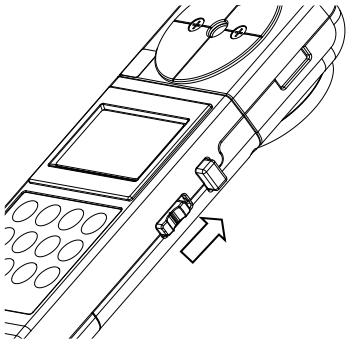
This instrument conducts USB communications through a virtual COM port. When you prepare your own communication programs the following communication parameters should be set.

Communication parameters

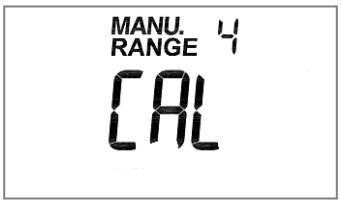
Baud rate	38400
Data length	7
Parity	ODD (odd number)
Spread bit	1

1.3.5 HOW TO TURN POWER ON/OFF

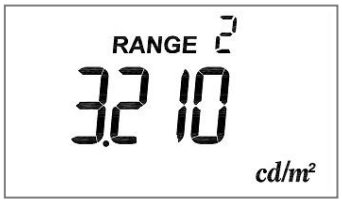
1 Push the power switch to the ON position to turn on power.



2 The mark [CAL] is displayed and the zero-adjustment starts.



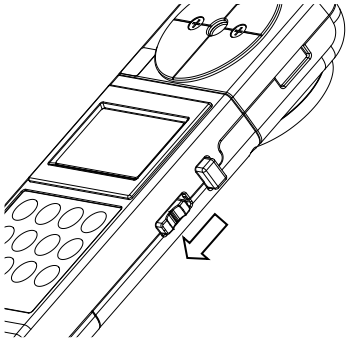
3 After zero-adjustment complete, the current measured value appears.



Memo

- No Cap is required in Zero adjustment.

4 To turn off power, push the power switch to the OFF position.

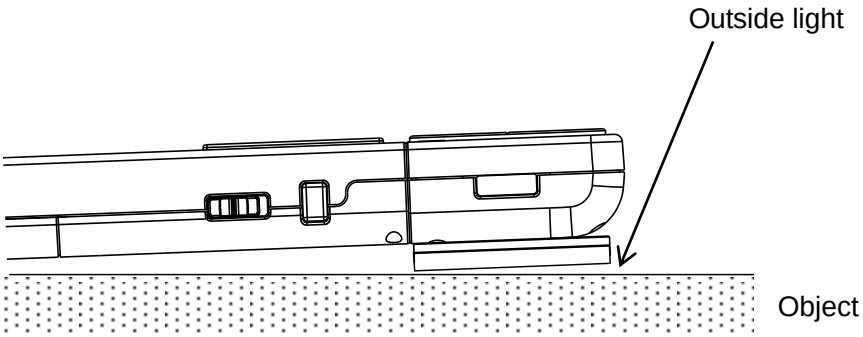


1.4 MEASUREMENT OF PHOSPHORESCENCE LUMINANCE

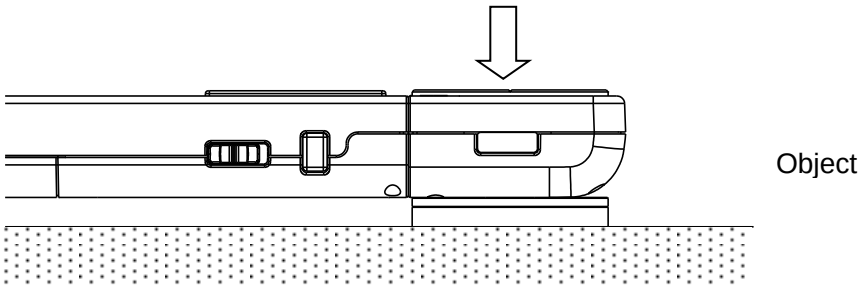
1.4.1 HOW TO MEASURE PHOSPHORESCENCE LUMINANCE

When measuring Phosphorescence Luminance, prevent intrusion of light into detector window.

When the instrument is tilt during measurement, the light intrudes from gap between detector unit and object. The incident light might affect results.



Press the detector unit against the object perpendicularly not to make a gap.



Memo

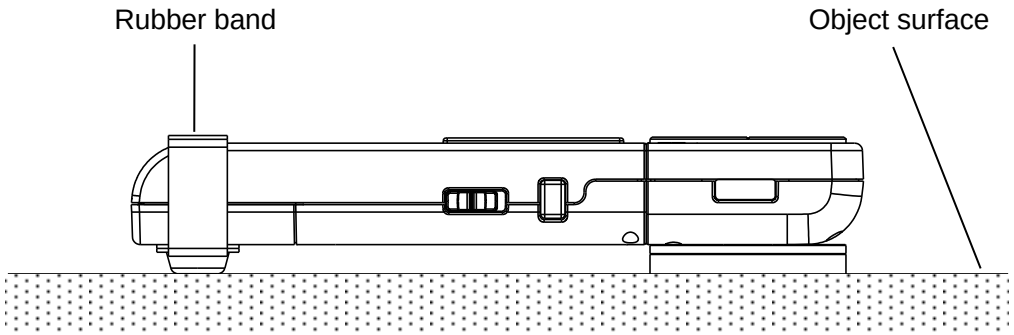
- Use height adjustment rubber band to set appropriate height.

☞'1.4.2 USE HEIGHT ADJUSTMENT RUBBER BAND'

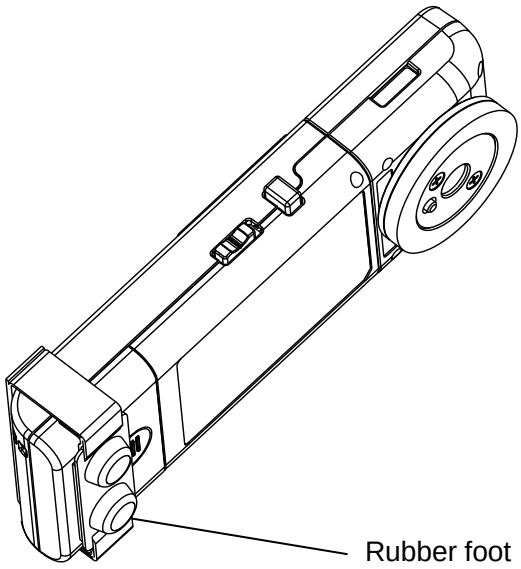
Request	- BM-100 cannot obtain correct luminance of objects, which are covered with transparent material such as glass and coating due to the light leaking into detector through the transparent material. In this case, cover BM-100 with dark cloth to prevent from incoming light.

1.4.2 USE HEIGHT ADJUSTMENT RUBBER BAND

Use the height adjustment rubber band to set Detector unit and display unit to the same height.



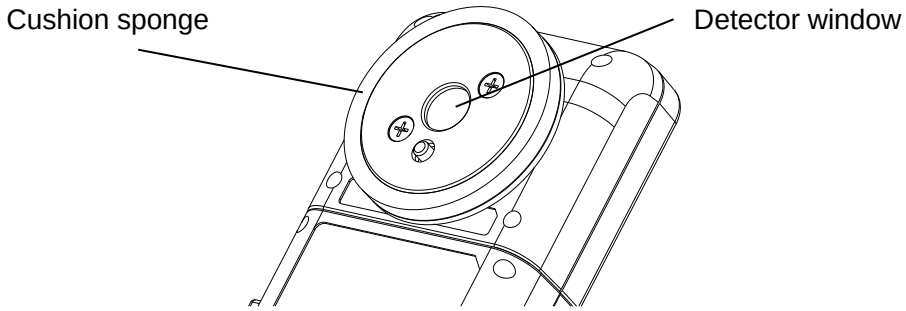
Set rubber foot to face toward object, and fix the rubber band by Velcro fastener.



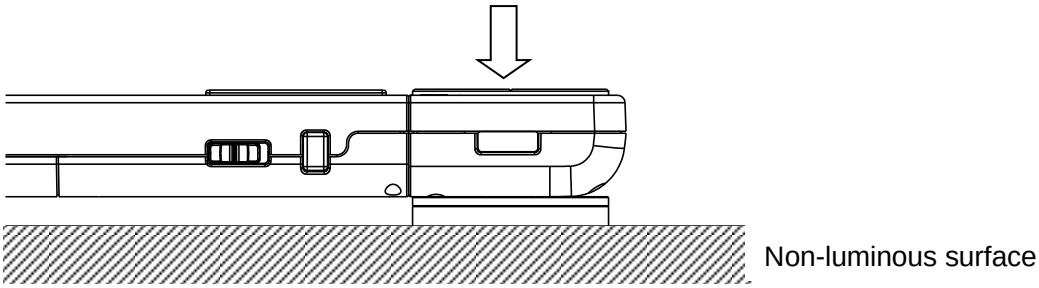
1.4.3 REPLACEMENT OF CUSHION SPONGE

When you press detector unit to object, Cushion sponge around detector window prevents light from intruding.

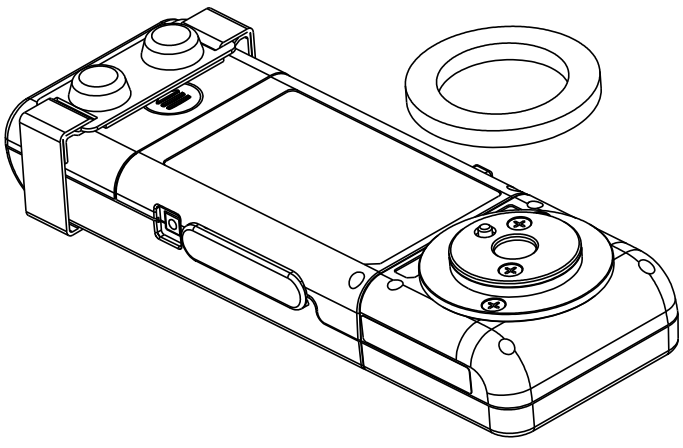
When cushion sponge is deteriorated and can not prevent light from intruding, please replace the cushion sponge to new one.



Judge the timing of the replacement from the measured data.
Press the BM-100 to non-luminous surface and make a measurement. If measured data is higher than 0, please replace the cushion sponge to new one.



The cushion sponge is fixed to the detector unit by double-sided tape.
When you replace the cushion sponge, remove cushion sponge and then mount new one by double-sided tape.



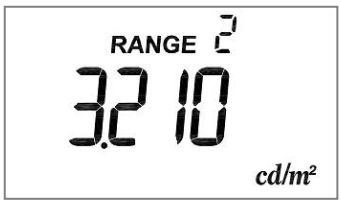
2. MEASUREMENTS PROCEDURES

2.1 SETTING OF MEASUREMENT MODE

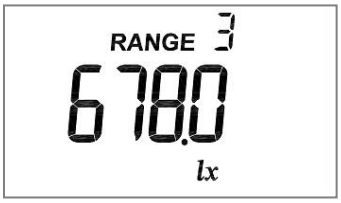
BM-100 can measure luminance, illuminance and UV by changing detector unit.
(Detector for illuminance and Detector for UV are optional accessary).

1 Turn off the power, and change the detector unit and turn on the power.

2 After zero-adjustment complete, the measurement value associated detector unit is displayed.



Luminance measurement mode



Illuminance measurement mode
Equipped with IM-600 DETECTOR
(optional accessory)

UV measurement mode
Equipped with UD-400P
(optional accessory)

Memo

- The detector units of illuminance and UV sold separately.
- Available operations are different for each measurement mode.

2.2 AUTO-RANGE MEASUREMENT AND DISPLAY RANGE

Associated mode: Luminance / Illuminance / UV mode

1 After zero-adjustment complete, auto-range measurement automatically start.

■Display range and resolution in auto-range (Luminance mode)

Range	Effective measuring range			Unit	Resolution
	MIN		MAX		
Range 1	1	～	1,350	[mcd/m^2]	1[mcd/m^2]
Range 2	1.125	～	13.50	[cd/m^2]	0.01[cd/m^2]
Range 3	11.25	～	135.0	[cd/m^2]	0.1[cd/m^2]
Range 4	112.5	～	1,350	[cd/m^2]	1[cd/m^2]

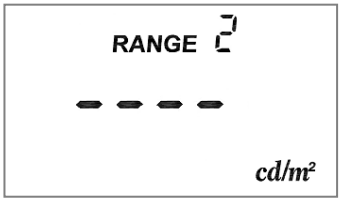
■Display range and resolution in auto-range (Illuminance mode) Unit: lx

Range	Effective measuring range			Resolution
	MIN		MAX	
Range1	0.005	～	9.990	0.005～0.750 ：0.005
				0.750～9.990 ：0.01
Range2	7.50	～	99.90	0.10
Range3	75.0	～	999.0	1.0
Range4	750	～	9,990	10
Range5	7,500	～	99,900	100
Range6	75,000	～	999,000	1,000

■Display range and resolution in auto-range (UV mode) Unit: μW/cm^2

Range	Effective measuring range			Resolution
	MIN		MAX	
Range1	0.1	～	280.0	0.1
Range2	200	～	2,800	1
Range3	2,000	～	28,000	10
Range4	20,000	～	280,000	100

2 Following remark appear at the moment range change to another step.



Memo

- If the readout is over 1,350cd/m^2, a error code [E5] appears. (Luminance mode : when correction factor is off.)
- If the readout is over 999,000lx, a error code [E5] appears. (Illuminance mode : when correction facto is off.)
- If the readout is over 280,000μW/cm^2, a error code [E5] appears. (UV mode : when correction factor is off.)
- If the measured value is smaller than 1 mcd/m^2, the figure [0] appears.

☞'5.1 INSTRUMENT ERROR CODE'

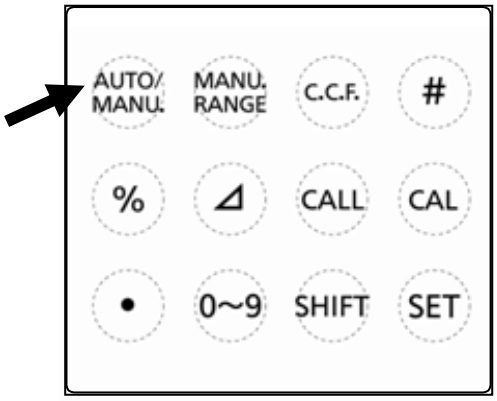
2.3 MANUAL-RANGE MEASUREMENT AND DISPLAY RANGE

Associated mode: Luminance / Illuminance / UV mode

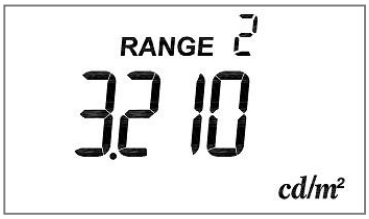
1 Turn on the power, start auto-range measurement.

2 Push the [AUTO/MANU.] Switch on the keyboard.

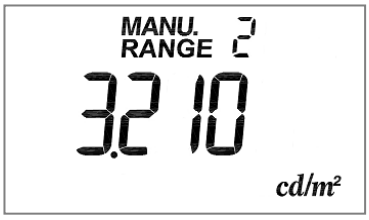
The system switches to manual range.



Luminance mode

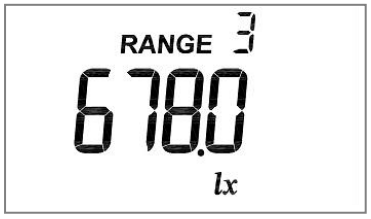


Auto range

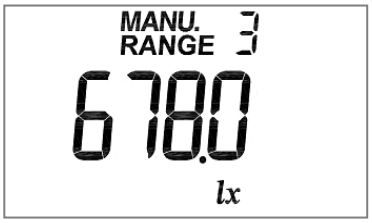


Manual range

Illuminance mode

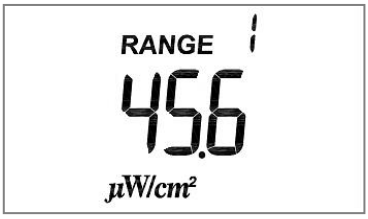


Auto range

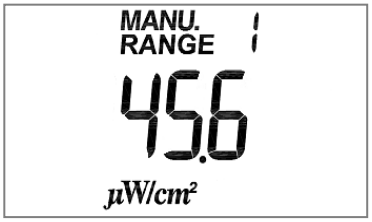


Manual range

UV mode

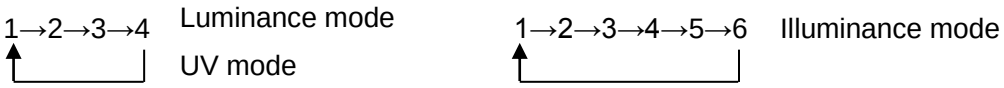


Auto range



Manual range

3 Pushing the [MANU. RANGE] switch to advance to the range as follows:



4 Pushing the [AUTO/MANU.] switch to return auto-range measurement.

■Display range and resolution in manual-range (Luminance mode)

Range	Effective measuring range			Unit	Resolution
	MIN		MAX		
Range 1	1	～	1,350	[mcd/m^2]	1[mcd/m^2]
Range 2	0.01	～	13.50	[cd/m^2]	0.01[cd/m^2]
Range 3	0.1	～	135.0	[cd/m^2]	0.1[cd/m^2]
Range 4	1	～	1,350	[cd/m^2]	1[cd/m^2]

■Display range and resolution in manual-range (Illuminance mode)

Range	Effective measuring range			Resolution			
	MIN		MAX				
Range1	0.005	～	9.990	0.005	～	0.750	：0.005
				0.750	～	9.990	：0.01
Range2	0.05	～	99.90	0.05	～	7.50	：0.05
				7.50	～	99.90	：0.10
Range3	0.5	～	999.0	0.5	～	75.0	：0.5
				75.0	～	999.0	：1.0
Range4	5	～	9,990	5	～	750	：5
				750	～	9,990	：10
Range5	50	～	99,900	50	～	7,500	：50
				7,500	～	99,900	：100
Range6	500	～	999,000	500	～	75,000	：500
				75,000	～	999,000	：1,000

■Display range and resolution in manual-range (UV mode)

Range	Effective measuring range			Resolution
	MIN		MAX	
Range1	0.1	～	280.0	0.1
Range2	1	～	2,800	1
Range3	10	～	28,000	10
Range4	100	～	280,000	100

Memo

- If the measured value is exceeds the display range, a code [E5] appears.
- If the readout is smaller than 1 mcd/m^2, the figure [0] appears.

☞'5.1 INSTRUMENT ERROR CODE'

2.4 PHOSPHORESCENCE LUMINANCE PREDICTION

Associated mode: Luminance mode

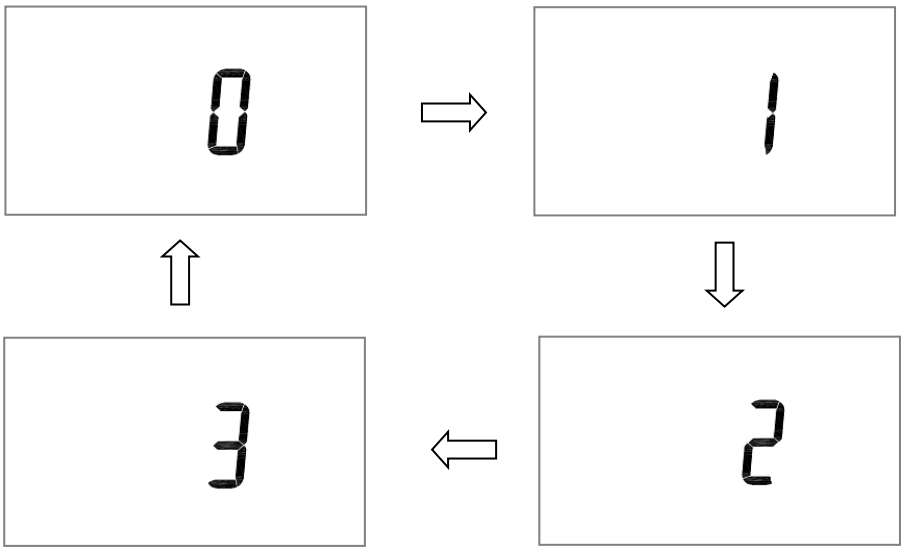
2.4.1 THE MATERIAL SELECTION FOR PHOSPHORESCENCE LUMINANCE PREDICTION

1 Push the [SHIFT] switch in luminance measurement mode.

2 Material data number is displayed.

Each time you press [SHIFT] switch, material data number change in order of [0], [1], [2], [3], [0]….

3 Push the [SET] switch to complete setting.



0: Material data number 0: User-specified material

1: Material data number 1: Material corresponding to G300 of Nemoto & Co., Ltd.

2: Material data number 2: Material corresponding to GLL300 of Nemoto & Co., Ltd.

3: Material data number 3: Material corresponding to BG300 of Nemoto & Co., Ltd.

Request	・ Even when you measure phosphorescence material containing material No.1, 2, or 3, measured data would vary from the amount of phosphorescence material constituent.

2.4.2 PHOSPHORESCENCE LUMINANCE PREDICTION

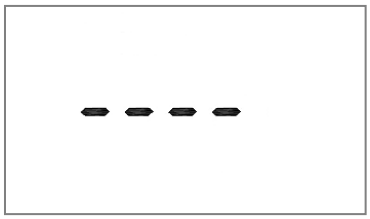
The function of Phosphorescence luminance prediction can predict afterglow luminance of phosphorescence at elapsed time of 20, 60, and 90 minutes from the start of measurement based on 60 seconds measurement.

1 Turn on the power, start auto-range measurement.

2 Turn on the HOLD switch to enter the Phosphorescence luminance prediction mode.

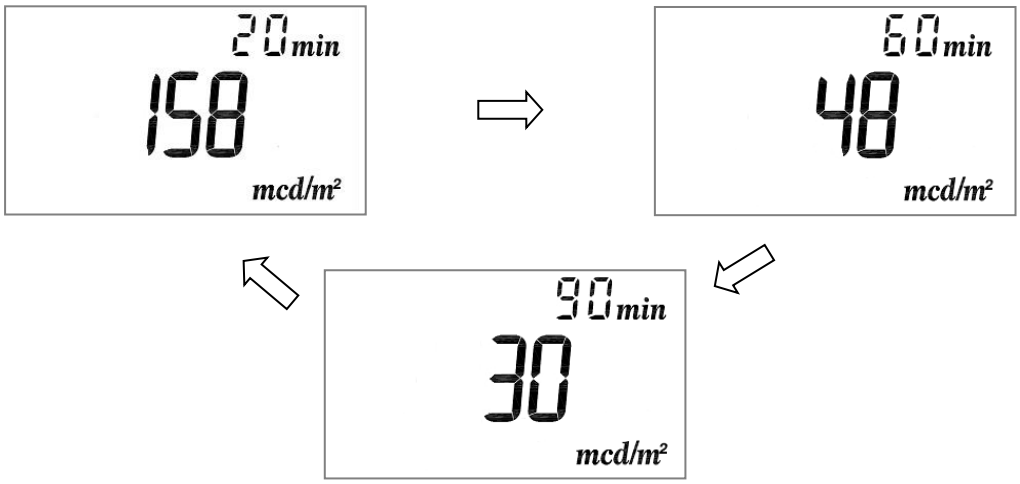
3 Before turning on the HOLD switch, if the set switch is pushed, the [E9] error is displayed.

4 When there are not the results of previous prediction, standby screen is displayed.

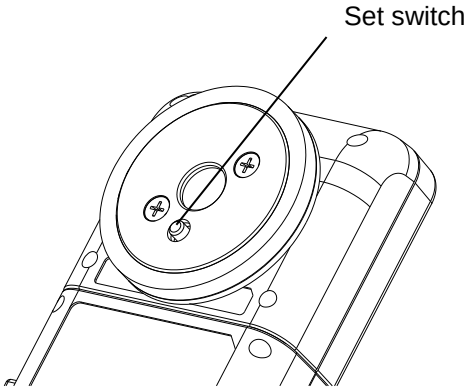


☞'5.1 INSTRUMENT ERROR CODE'

When the results of previous prediction exist in the BM-100, the prediction results are displayed. Each time you press [SHIFT] switch, you can see previous prediction results in order of [20min], [60min], and [90min].



5 Press the detector window against the object. The measurement start after the set switch is pressed, and then 60 seconds countdown starts.



6 The prediction results is displayed after 60 seconds countdown finish. Each time you press [SHIFT] switch, you can see the prediction results in order of [20min], [60min], and [90min].

7 Turn off HOLD switch to return to luminance measurement mode.

Request	・ The prediction data are determined for selected phosphorescent material. If you select wrong material, select correct material and operate again. ・ When the set switch is released during measurement, [INV.] appears after measurement. Check the measurement condition and conduct measurement again. ・ Phosphorescence Luminance Prediction is calculated under excitation conditions described in JIS Z 9096:2012. When you measure materials on excitation condition other than JIS Z 9096:2012, the error would increase. In this case, determine luminance after the elapse of 20, 60, and 90 minutes by actual measurement. And correlate the actual measured data with the prediction data.

2.5 CALIBRATION FOR PHOSPHORESCENCE LUMINANCE PREDICTION

Associated mode: Luminance mode

2.5.1 INTRODUCTION

The function of the Calibration for phosphorescence luminance prediction can calibrate the BM-100 for user-specified phosphorescent material. Based on the results of the calibration, the BM-100 can predict phosphorescence luminance of user-specified material at elapsed time of 20, 60 and 90 minutes by 60 seconds measurement.

☞‘2.4 PHOSPHORESCENCE LUMINANCE PREDICTION’

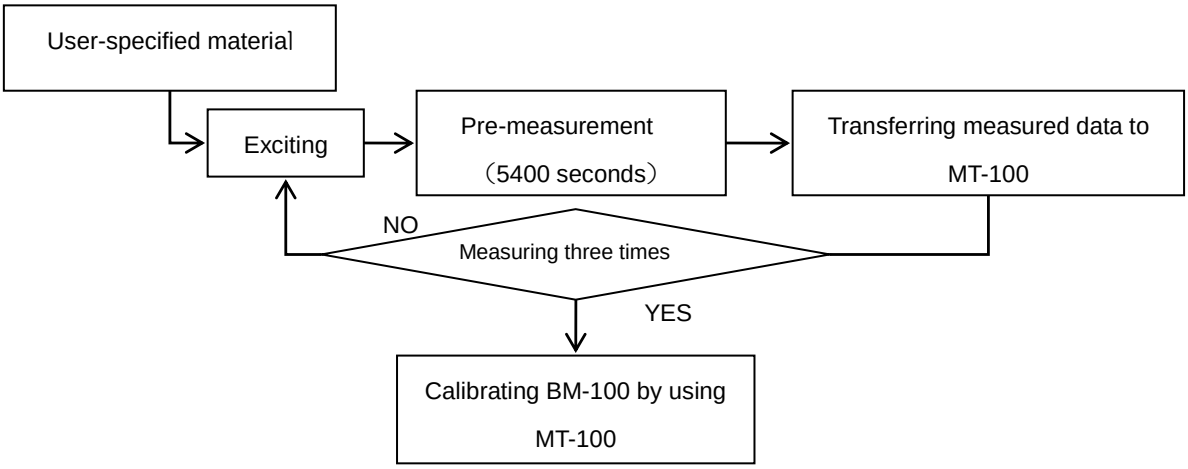
Exciting user-specified material by three different intensity of illuminance and Measuring phosphorescence luminance of user-specified material at each intensity of illuminance, and then calibrating the BM-100 by using Measurement program MT-100.

☞“MT-100 4.3 Calibration for Phosphorescence luminance prediction”

When you predict phosphorescence luminance of user-specified material after calibration, select material number 0 (User-specified material) in the material selection menu.

☞‘2.4.1 THE MATERIAL SELECTION FOR PHOSPHORESCENCE LUMINANCE PREDICTION’

Calibration for phosphorescence luminance prediction



Request	・ By using three different illuminance, excite phosphorescent materials for each of three times pre-measurements. ・ Illuminance which is use to excite phosphorescent materials should be large difference among three times pre-measurements. (ex: 50lx, 100lx, 200lx) ・ Excite phosphorescent materials with the same amount of time in three times pre-measurements. ・ One of three illuminance should be higher than illuminance in actual condition you expect. One should be lower than that. Three intensity of illuminance should be satisfied with followings; Lowest illuminance of three ≦ illuminance in actual condition you expect ≦ Highest of three

2.5.2 OPERATION PROCEDURE

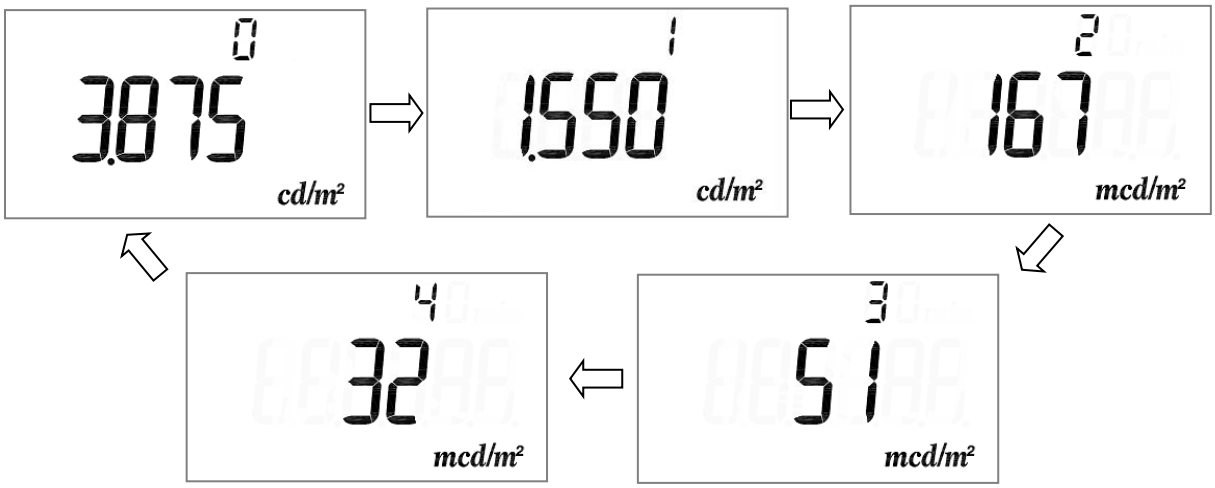
1 Turn on the power, start auto-range measurement.

2 Turn on the HOLD switch to shift to phosphorescence luminance prediction mode.

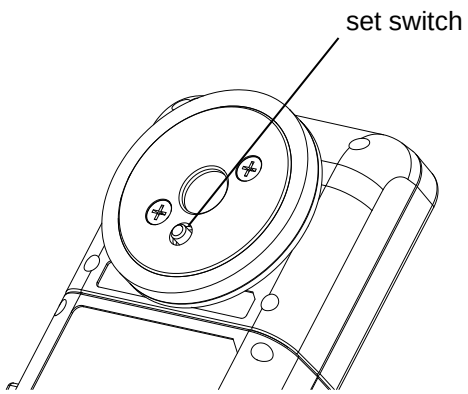
3 Pushing [CAL] switch in standby screen of phosphorescence luminance prediction.

4 When there are not the results of previous calibration, standby screen is displayed.

When the results of previous pre-measurement exist in the BM-100, the results of pre-measurement is displayed. Each time you press [SHIFT] switch, you can see previous pre-measurement results in order of [1], [2], [3], [4], [0] …..



5 Press the detector window against the object. The measurement start after the set switch is pressed, and then 5,400 seconds countdown starts.
If an error occurs during measurement, the measurement is stopped and an error code is shown.



6 The pre-measurement results are displayed after finishing 5,400 seconds countdown. Each time you press [SHIFT] switch, you can see pre-measurement results in order of [0], [1], [2], [3], [4], [0]…..

7 Turn off HOLD switch to return luminance measurement mode.

Memo

- If phosphorescence luminance of the object do not decay, a code [E12] appears.
- Code [E13] appear, when the battery is low and you shit to the calibration for phosphorescence luminance prediction mode.
- If the set switch is released during measurement, a code [E14] appears.

☞'5.1 INSTRUMENT ERROR CODE'

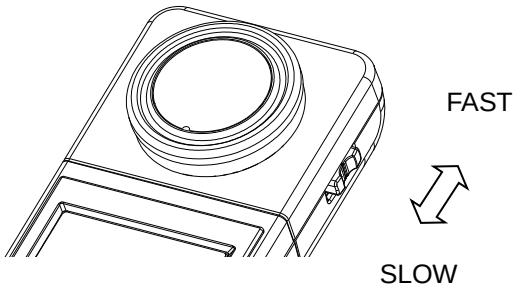
Request	• Only one pattern data can be saved in the BM-100. Each time one set of pre-measurement for each pattern succeed, old pattern data in the BM-100 is overwritten with new data. • So, each time one set of pre-measurement for each pattern succeed, transfer the pattern data to the PC by using the MT-100, or make a note of three patterns data and enter them into the MT-100 manually. • When you conduct pre-measurement, pay attention to battery life. If battery go dead during pre-measurement, the measured data are not saved and lost.

2.6 SETTING RESPONSE SWITCH

Associated mode: illuminance / UV mode

This setting is available only to Detector for Illuminance and UV (optional accessory)

Changes the response switch [FAST] or [SLOW] suited to light source.



FAST : for general light source
SLOW : for flicker light source

■Response speed in Illuminance mode

Response switch	Range	Response speed (90%)
FAST	1	About 60 ms
	2	About 6 ms
	3	About 0.6 ms
	4	About 0.6 ms
	5	About 0.6 ms
	6	About 0.6 ms
SLOW	1 - 6	About 4 s or less

■Response speed in UV mode

Response switch	Range	Response speed (90%)
FAST	1	About 30 ms
	2	About 3 ms
	3	About 0.3 ms
	4	About 0.03 ms
SLOW	1 - 4	About 4 s or less

2.7 FIXING THE READOUT

Associated mode: Luminance / Illuminance / UV mode

The operation for each measurement mode is different.

■Luminance mode

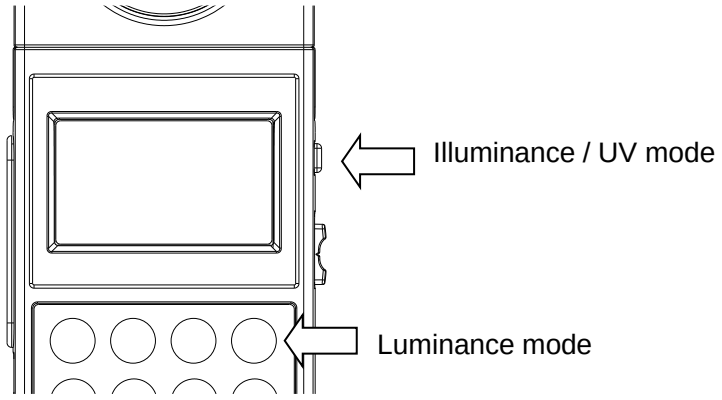
1 Press [#] switch during measurement to fix measured value.

2 Press [#] switch again to restart measurement.

■Illuminance / UV mode

1 To fix the readout, set the hold switch to ON.

2 For continuous measurement, set the hold switch to OFF, and restart measurement.



Memo

- When pressing the hold switch in luminance mode, the instrument changes from luminance mode to Phosphorescence luminance prediction mode.

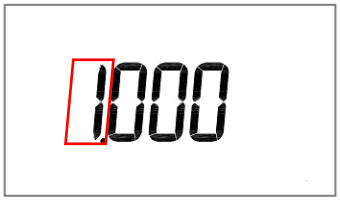
3. SETTING PROCEDURES

3.1 CORRECTION FACTOR(C.C.F. setting)

Associated mode: Luminance / Illuminance / UV mode

When other than 1.000 is entered, correction factor is active, When 1.000 is entered, correction factor is inactive.

1 Push the [C.C.F.] switch to enter the Color correction factor setting.



2 Enter a numeric value through the [0 – 9] switch.

3 To shift the digit, push the [SHIFT] switch.
To change the numeric value after shifting the digit, repeat procedure 2.

4 To enter a decimal point, push the [●] switch.

4 Push the [SET] switch to activate the entered numeric value.

Memo

- Enter the correction factor in the range 0.001 to 1,000.
- After completion of the C.C.F. setting mode, the system returns to the measuring mode.
- Once correction factor is activated, Readout is multiplied by the correction factor. Readout = raw measured value x Correction factor (C.C.F.).
- Maximum reading value in correction factor ON is as below:
  Luminance measurement mode : 999,900 cd/m^2
  Illuminance measurement mode : 999,900 lx
  UV measurement mode : 999,900 $\mu W/cm^2$
- If the readout exceeds valid range due to entering too large a correction factor, a code [E5] appears.
- Correction factor data is saved after turning off.

4. COMMUNICATION WITH PC

4.1 COMMUNICATION COMMAND

This instrument can communicate with PCs. This chapter describes the commands for creating communication program with the BM-100 on user own.

The following are the communication commands:

Command name	Function
STRn	Sets measurement range to the auto or manual and specify a range, and then obtains measured data. n: 0 – 4 for luminance and UV measurement mode n: 0 – 6 for illuminance measurement mode
CAL	Starts a zero adjustment.
WHO	Reads product name.
VER	Reads software version.
SRL	Reads product serial number.
ERR	Obtains latest error number.
RCCF	Reads correction factor (C.C.F.)　#.###E±##
SCCF_####	Writes correction factor (C.C.F.) into the instrument. Enters correction factor with decimal notation #### or #.### or exponent notation #.###E±## Valid value range: 0.001 – 1,000
RPMT	Reads the specified material data number.
PMTn	Sets the material data number. n：0 - 3
PR	Reads results of phosphorescence luminance prediction.
CRP	Reads results of calibration for phosphorescence luminance prediction.

The "_" mark means a space.　"**####**" is a numerical value.

When PC send a communication command to the BM-100, the BM-100 returns "OK" as a receipt acknowledgment.　When the BM-100 receive improper command, the BM-100 returns "NO".

When an error occurred while processing command, the Instrument returns "NG". In this case, send a command "ERR" to BM-100 and check the error code.

Memo

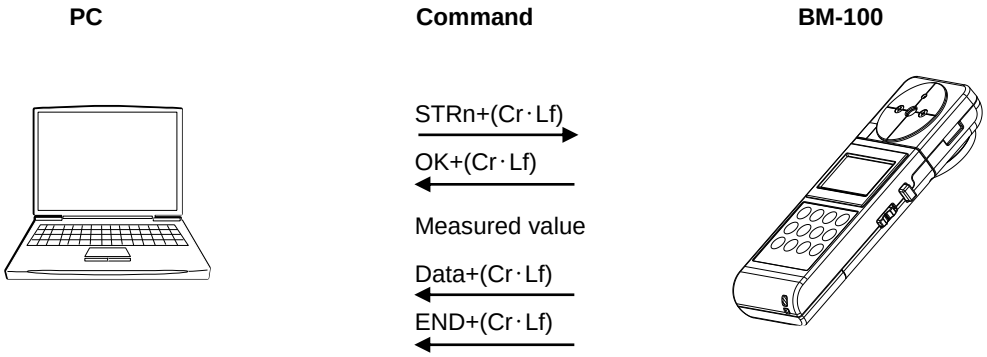
- No command can be accepted during zero adjustment. Send command after completing the zero adjustment.
- Some commands can not be used in illuminance and UV measurement mode.

☞'5.1 INSTRUMENT ERROR CODE'

4.1.1 STRn COMMAND

Associated mode: Luminance / Illuminance / UV mode
When the BM-100 receive this command, the BM-100 returns measured data in a text format.

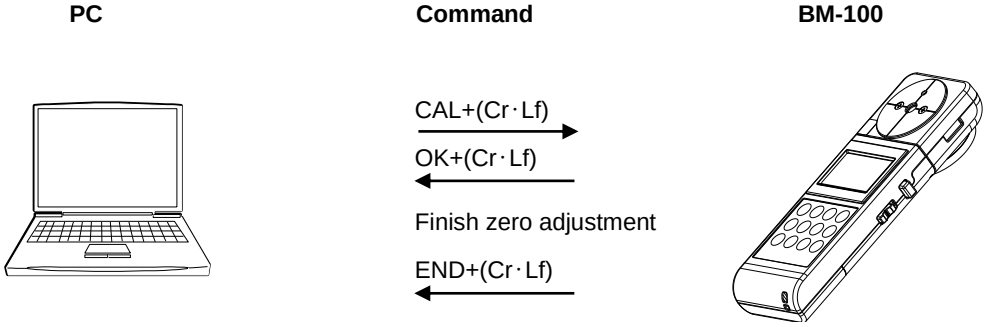
n: 0 (Auto range)
n: 1 – 4 (Manual range, Luminance / UV mode)
n：1 - 6 (Manual range, Illuminance mode)



If message “NG” returned ☞‘5.1 INSTRUMENT ERROR CODE’

4.1.2 CAL COMMAND

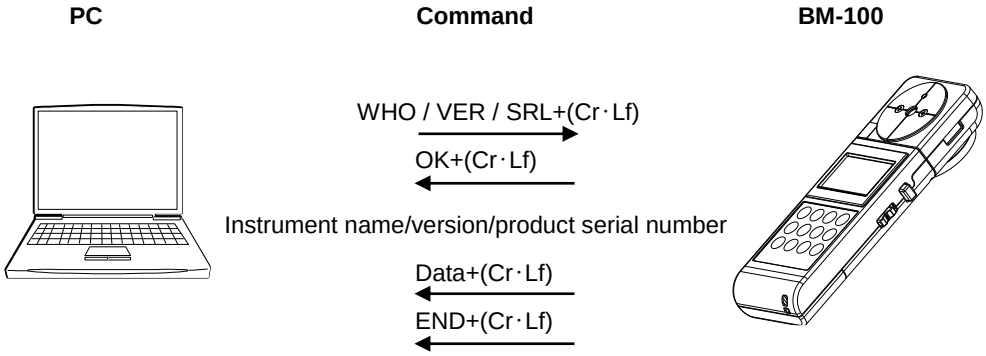
Associated mode: Luminance / Illuminance / UV mode
When the BM-100 receive this command, the BM-100 starts zero adjustment.



4.1.3 WHO/VER/SRL COMMAND

Associated mode: Luminance / Illuminance / UV mode

When the BM-100 receive this command, the BM-100 returns the name of this instrument, program version, and product serial number.

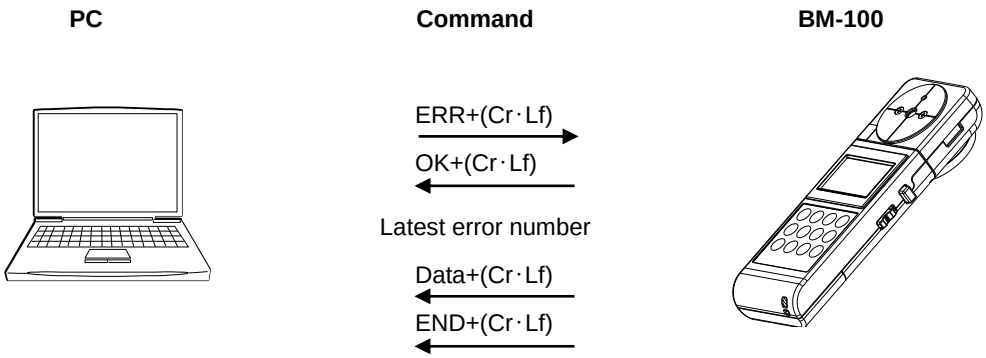


4.1.4 ERR COMMAND

Associated mode: Luminance / Illuminance / UV mode

When the BM-100 receive this command, the BM-100 returns latest error code.

0 returns if an error is encountered.

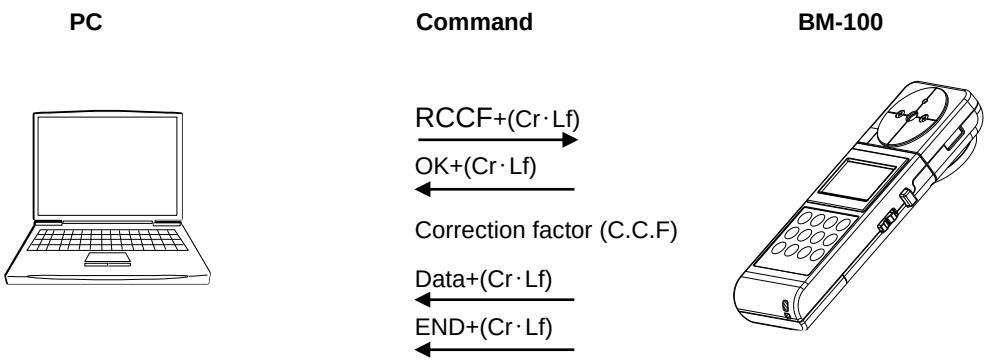


For the error code ☞ '5.1 INSTRUMENT ERROR CODE'

4.1.5 RCCF COMMAND

Associated mode: Luminance / Illuminance / UV mode

When the BM-100 receive this command, BM-100 returns correction factor (C.C.F.).



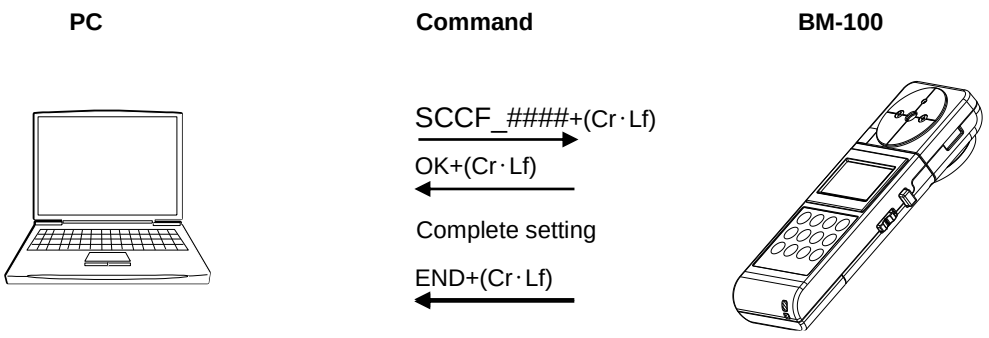
4.1.6 SCCF COMMAND

Associated mode: Luminance / Illuminance / UV mode

When the BM-100 receives this command, the BM-100 writes C.C.F. into EEPROM of the BM-100.

Valid values range from 0.001 to 1,000.

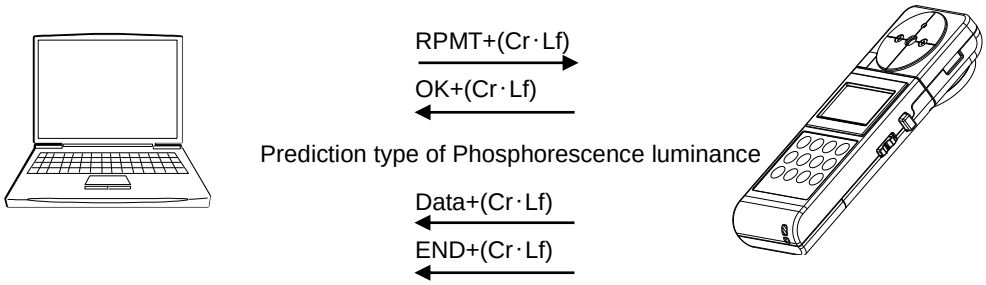
####: 0.001 – 1000.0



4.1.7 RPMT COMMAND

Associated mode: Luminance mode

When the BM-100 receive this command, the BM-100 returns prediction type of Phosphorescence luminance.

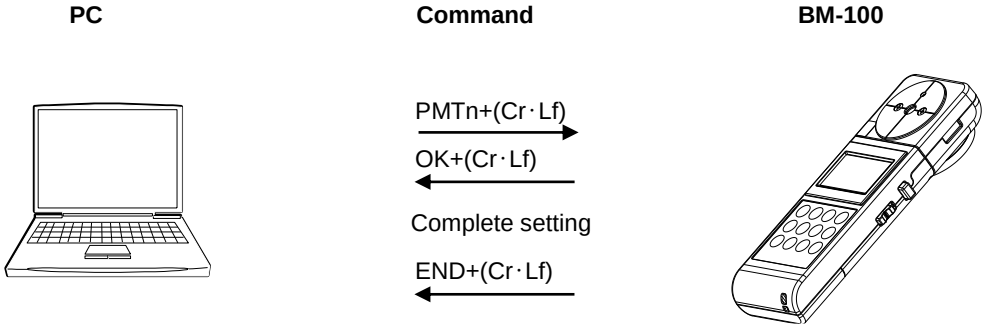


4.1.8 PMTn COMMAND

Associated mode: Luminance mode

When the BM-100 receive this command, the BM-100 sets the material for prediction type of Phosphorescence luminance.

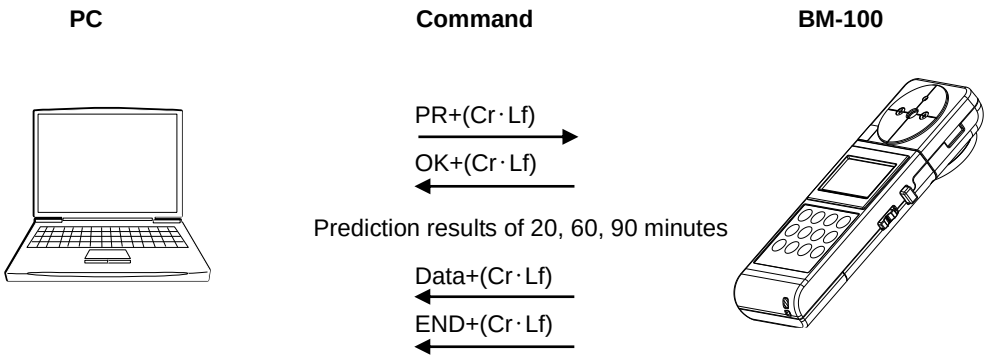
n: 0 - 3



4.1.9 PR COMMAND

Associated mode: Luminance mode

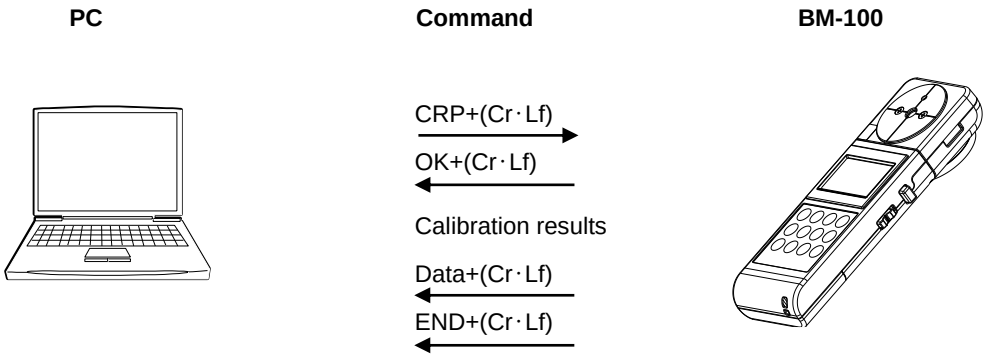
When the BM-100 receive this command, the BM-100 returns the prediction results of 20, 60, and 90 minutes later.



4.1.10 CRP COMMAND

Associated mode: Luminance mode

When the BM-100 receive this command, the BM-100 returns five pre-measurement data results.



4.2 OUTPUT FORMAT

4.2.1 OUTPUT FORMAT FOR REMOTE MEASUREMENTS

Output format list

Name of command	Format type
STRn	#.###E±##_R#U#_#.## (Resolution in the output format is the same as that in display unit. <Example> When measured value in Luminance is 3.210cd/m^2 at Range 2, output data will be “3.210E+03_R2UM_0.0”; “R2UM” means Range: 2, Unit: mcd/m^2 UM : Luminance (mcd/m^2), UL : Illuminance (lx), UW : Ultra violet Intensity (μW/m^2)) “0.0” represents following information; Amount time of Phosphorescence luminance (in luminance measurement mode) Elapsed times : 0.0-60.0 (in Phosphorescence luminance prediction mode) Elapsed time :0.0-5400.0 (in Pre-measurement)
WHO	Luminance measurement mode: BM-100 Illuminance measurement mode: BM-100-IM UV measurement mode: BM-100-UVR
VER	#.## ：Software version
SRL	######## Displays production serial number in 8 digits
ERR	# ：Error code
RCCF	#.###E±## : Value of correction factor
RPMT	# ：Specified Material data Number
PR	#.###E±## #.###E±## #.###E±## Displayed in the order of: prediction results of 20, 60 and 90 minutes later.
CRP	#.###E±## × 5 Pre-measurement data from No. 0 to No. 4. Each data is delimited with single spaces. Unit : mcd/m^2

The mark “_” means a space. “####” is a numerical value.

4.3 USB DRIVER INSTALLATION

The following describes the procedure for installing the USB drive into PCs.

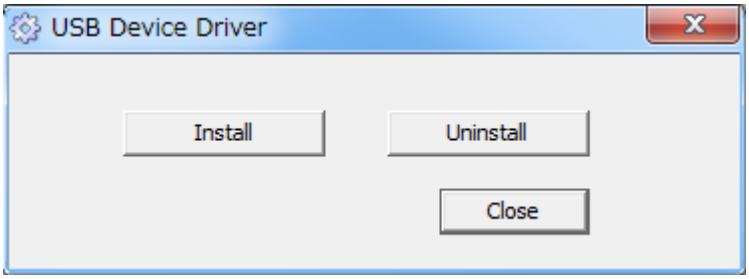
1 Insert the CD-ROM supplied with the BM-100 into CD-ROM drive.

2 Select [USBDeviceDriver.exe] in the [Driver] folder in the CD-ROM drive, right-click and click [Run as administrator].

OS	Windows® XP Professional Service Pack2 or later(32bit) Windows® XP Home Edition Service Pack2 or later(32bit) Windows® Vista Ultimate(32bit) Windows® 7 Ultimate(32bit／64bit) Windows® 7 Professional(32bit／64bit) Windows® 8.1 Pro(32bit／64bit) Windows® 10 Pro(32bit／64bit) ※ XP mode in Windows® 7 64bitOS is not available

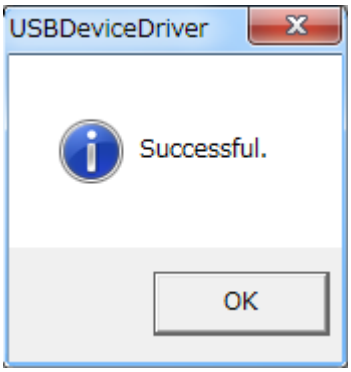
※ Windows is trademark and registered trademark by Microsoft Corporation

3 Following dialog will appear



4 Click [Install] button.

5 Following message will appear after completing driver install. Click [OK] button.



6 Click [Finish] button to finish.

Memo

To uninstall, click [Uninstall] button for step 4 above.

Memo

The following 2 types of drivers are installed.

- Serial converter
- Serial port

5. ERROR MESSAGE

5.1 INSTRUMENT ERROR CODE

Error code	Explanation	Action
E1	The instrument cannot recognize the detector connected.	Check if the detector unit is connected to the display unit correctly.
E2	The instrument cannot complete zero adjustment because of over-range occurred during the zero adjustment.	
E3	The instrument cannot complete zero adjustment, because of failed to retry.	Turn on the power switch again. Do not switch response switch during zero adjustment.
E4	The measured value exceeds measurable range.	Check the measurement range and use upper range.
E5	The measured value exceeds the display range.	Check the measurement range and use upper range.
E6	The instrument fails to write or read data.	Restart the instrument and check if error reappears again.
E7	The correction factor is invalid. The value entered in communication is invalid.	Check the input range of entered command.
E8	The HOLD switch was pushed during range switching.	Do not turn on HOLD switch during switching range.
E9	The measurement procedure of prediction of Phosphorescence luminance is incorrect.	Check the measurement procedure.
E10	The command sent when the system cannot accept.	Check that the system can accept communication command.
E11	The instrument failed to phosphorescence luminance prediction.	Check if appropriate material data number is selected. Calibration for user-specified material is required before prediction of user-specified material.
E12	The measured values in phosphorescence luminance prediction and pre-measurement do not decay.	Check if the measurement target is phosphorescent material.
E13	The battery is low when the system transition to calibration for phosphorescence luminance prediction.	Check the battery level.
E14	The set switch is released during pre-measurement .	Check the measurement environment.

●If an error message is still displayed even after you take above action, repair may be required.
Contact the dealer where you purchased this instrument or TOPCON TECHNOHOUSE.

6. APPENDIX

SPECIFICATIONS AND PERFORMANCE

	BM-100
Detection element	Silicon photodiode
Measurement range	1～1350000 mcd/m^2 Auto/manual 4-step range
Measurement diameter	ϕ11mm
Display(Significant digit)	4-digit LCD Read
Linearity	± 2% ± 2 digit (Auto range)
Repeatability	0.5%+1digit 、2σ(n10)、(Auto range)
Linearity（Prediction accuracy）	± 10% ± 2 digit (After 20 minutes) ± 15% ± 2 digit (After 60 and 90 minutes) (measuring Topcon Technohouse standard phosphorescent material excited by D65 light for 20 minutes)
V(λ) Mismatch f_1' (Deviation from spectral luminous efficacy)	8% or less
UV Response u	2% or less
IR Response r	2% or less
Fatigue f_F	±1% or less
Temperature Dependence f_6	Within ±3% (-10 to 40˚C; against 23˚C)
Humidity Test f_H	Within ±3%
Characteristics for intermittent light : f_C	±2% or less
Analog signal output	0 – 2700mV / Maximum display value, 0 – 3000mVmax
Interface	USB (Virtual COM port)
Power supply	AA battery × 2 / AC adapter (optional accseeory)
Operating conditions	Temperature: -10 to +40˚C Humidity: 85% RH or less
Dimensions	Approx. 187 × 70 × 35 mm (without protruding portion)
Weight	Approx. 270 g (excluding batteries)

■Description about accuracy

“digit” means minimum resolution.

Ex）When measured value is 100[mcd/m^2] at Range 1 (Resolution1 [mcd/m^2], error in linearity is ;

100[mcd/m^2] × ±2% ＝ ±2[mcd/m^2]

1[mcd/m^2] × ±2digit ＝ ±2[mcd/m^2]

Therefore, accuracy is ±4[mcd/m^2]

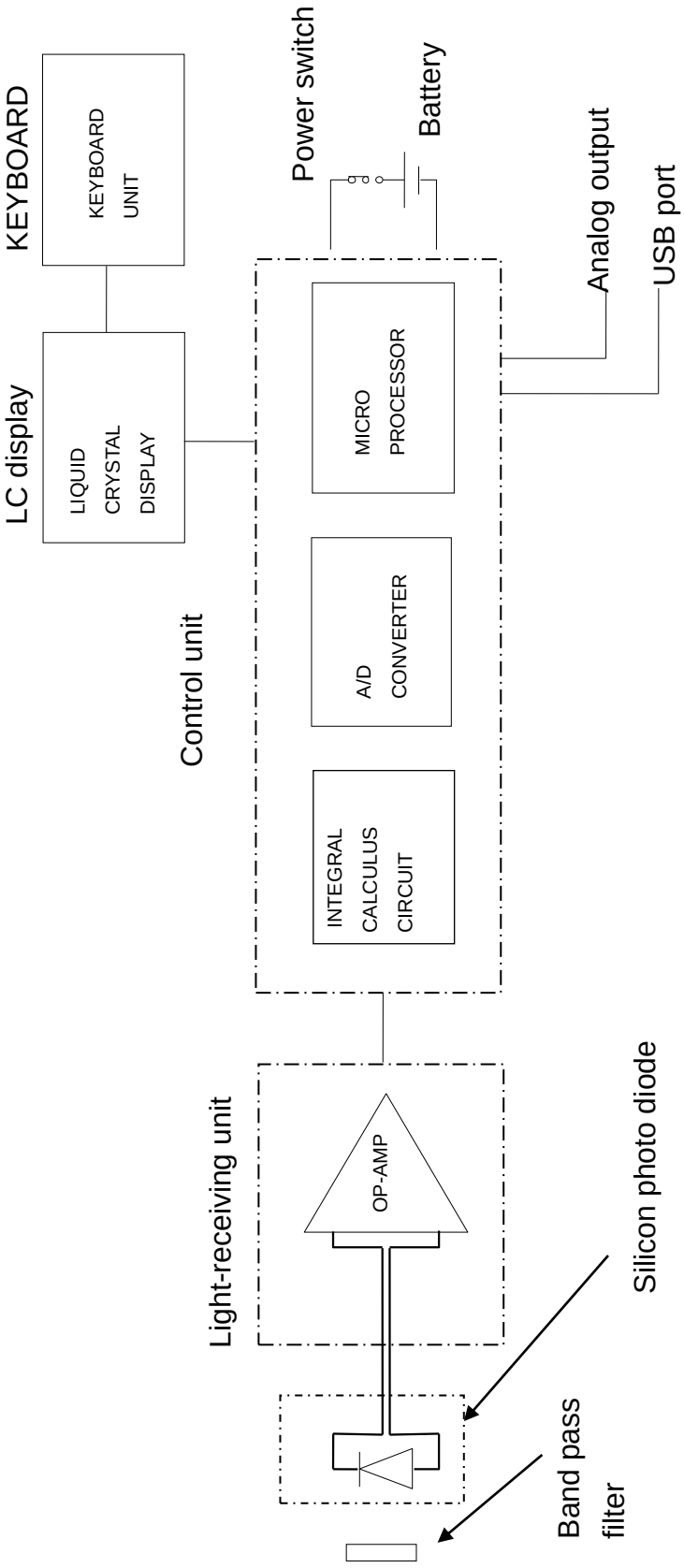
Resolution is vary from the measurement range. Refer to following section in details.

☞‘2.2 AUTO-RANGE MEASUREMENT AND DISPLAY RANGE’

☞‘2.3 MANUAL-RANGE MEASUREMENT AND DISPLAY RANGE’

BLOCK DIAGRAM

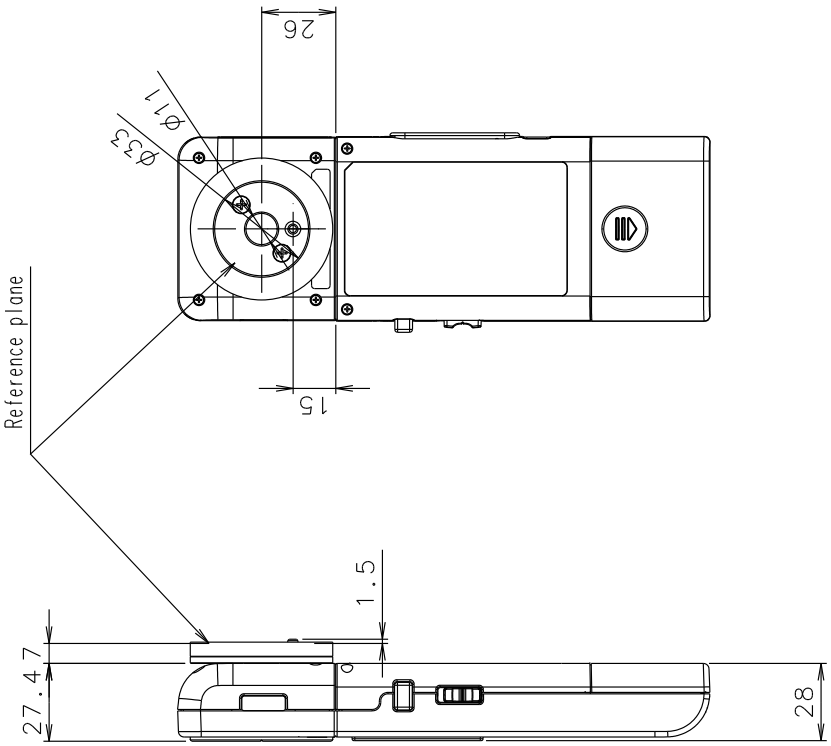
■BM-100

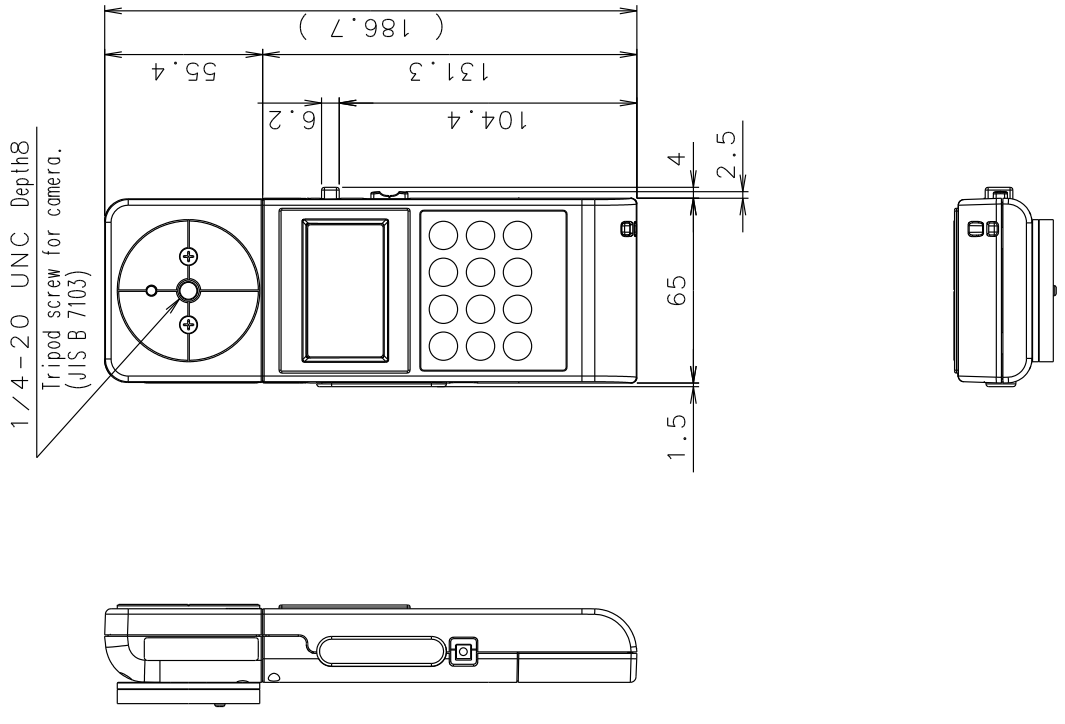


OUTLINE DIMENSION

■BM-100

(unit: mm)

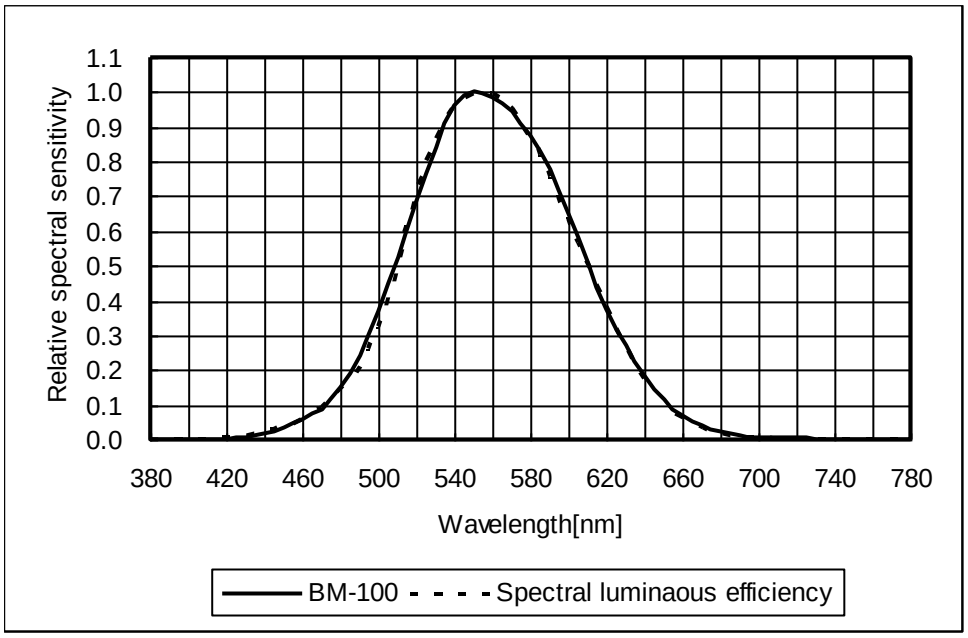




GRAPH

Deviation from spectral luminous efficacy

■BM-100



Memo

- The above data are obtained by a sample of this instrument. There are some differences in the characteristics between the products.

EXPLANATION OF TERMS

Relative Spectra Responsivity Characteristics:

The human eye has the sensitivity to the light with wavelengths ranging from 380nm to 780nm, and has most strong sensitivity at 555nm. (Spectral luminous efficiency) The relative spectral responsivity of the BM-100 closely matches the spectral luminous efficiency. The difference between spectral luminous efficacy and Relative spectral response of the BM-100 is evaluated according to JIS C1609 : 2006.

INFORMATION ABOUT OVERSEAS REGULATION

FCC Compliance Information

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:
(1) the device may not cause interference, and
(2) the device must accept any interference, including interference that may cause undesired operation of this device.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expence.

Republic of Korea	KC:Class A	해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다 A급 기기 (업무용 방송통신기자재) 이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다

EU Battery Directive

This symbol is applicable to EU members states only.

Battery users must not dispose of batteries as unsorted general waste, but treat properly.
If a chemical symbol is printed bebeath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows:
Hg: mercury(0.0005%), Cd: cadmium(0.002%), Pb: lead(0.004%)

These ingredients may be seriously hazardous to human and the global environment.

WARRANTY PRERIOD

One year from the date of shipment.

REPAIR DURING WARRANTY PERIOD

Failure occurs to the instrument when the instrument has been operated according to the instruction manual, and the failure caused by design or manufacture will be repaired free of charge.

REPAIR AFTER WARRANTY PERIOD

After the warranty period, the cost of repair shall be paid in full by the customer.

MAINTAINABLE PERIOD

Parts for maintenance and repair (1*) are kept in stock for 8 years (2*) after the date of manufacture. This period is the repairable period. However, please contact your dealer or Topcon Technohouse for repairs even after the repairable period in case that repair may be still available.

(*1) “Maintenance and repair parts” mean the parts that are necessary to maintain the function of the product.

(*2) Topcon Technohouse make our most effort to keep maintenance and repair parts in stock for the complete repairable period, however, due to some unexpected occurrence, the repairable period may have to be shortened.

DISPOSAL

Disposal of this instrument should be conducted in accordance with the disposal and recycling ordinances by your local government.

When you inquire or consult us, please let us know about following information

・Product serial No.	Specified on the name plate at the bottom of this instrument.
・Operating period	The date of purchase and calibration.
・Operating conditions	Kind of light source, setting, measured data, and status of this instrument.
・Trouble situation	Let us know in detail as far as possible.

Contact See the back cover of this Instruction Manual.

Phosphorescence luminance meter

BM-100

Contact Information

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