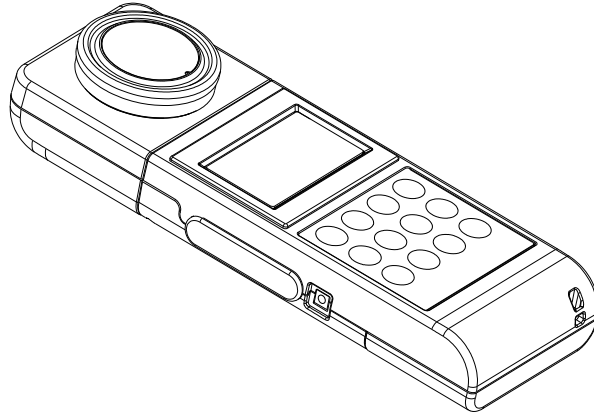


# TechnoOptis



INSTRUCTION MANUAL

**DIGITAL ILLUMINANCE METER**

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***IM-600 / IM-600M***

Rev. 11



# INTRODUCTION

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Thank you so much for your purchasing our product, Digital Illuminance meter IM-600 series.

This manual describes an outline, basic operation procedure and specifications regarding the Digital Illuminance meter IM-600/IM-600M. Read this instruction manual carefully before using this instrument.




The IM-600M has the same function as the IM-600 other than Detector unit. About IM-600M, this manual describes the point of difference from IM-600.

## HANDLING PRECAUTIONS

- Be sure to use the designated AC adapter for this instrument. The use of any AC adapter which is not designated herein 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.
- Never use this instrument in the place which is dusty or humid or generates corrosive gas.
- Never use this instrument in a place where the temperature tends to vary rapidly. Although this instrument is equipped with a temperature compensating circuit, it may not perform the stabilized measurement under the environment where the temperature tends to vary rapidly.
- 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 can operate within a temperature range from  $-10^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ , but it is delayed a little responding with the liquid crystal display panel when used in a range of  $-10^{\circ}\text{C}$  to  $+0^{\circ}\text{C}$ .
- Do not store the instrument at a place having a temperature either of more than  $+60^{\circ}\text{C}$  or less than  $-20^{\circ}\text{C}$ .
- 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  $60^{\circ}\text{C}$ .
- To maintain the measurement precision, be sure to perform the calibration at least once a year. For the calibration adjustment, consult the local retailer from which you purchased the instrument or us.
- 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 this instrument will not be used for an extended period of time, disconnect the power plug from the outlet.
- Keep the instrument away from water and liquid. This instrument is not water-resistant.




# 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
 <b>Danger</b>	This display indicates that incorrect handling with disregard for this display may cause imminent danger resulting in death or severe injury.
 <b>Warning</b>	This display indicates that incorrect handling with disregard for this display may cause danger resulting in death or severe injury.
 <b>Caution</b>	This display indicates that incorrect handling with disregard for this display may cause accidents resulting in injury <sup>*1</sup> , or damage to property <sup>*2</sup> .

\*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

**Never use the system in flammable or explosive vapor- floated (gasoline, etc.) place.**  
This may cause the fire.



Prohibited

**Keep the instrument away from water and liquid.**  
This may cause the fire and electric shock.



Prohibited

**Never disassemble or modify the device.**  
This may cause the fire and electric shock.



Mandatory

**Be sure to use the dedicated AC adapter.**  
This may cause the fire and electric shock.



Prohibited

**Never disassemble AC adapter.**  
This may cause the fire and electric shock.



Mandatory

**Be sure to remove the dust or moisture around the outlet.**  
This may cause the fire.



Mandatory

**If abnormal sound, unusual smell, or smoke are found in the device, turn off the power quickly and pull out the AC adapter cable from the outlet.**  
Continued use of this instrument in this state might cause fire.

## **Caution**



Prohibited

**Insert the batteries with current polarity position.**  
Otherwise, battery leakage may occur, resulting in personal injury or product failure.



Prohibited

**Never pull out or insert the plug by wet hand.**  
This may cause you electric shock.



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

## DISCLAIMER

- We are not responsible for the damages caused by various problems such as, fire, earthquake, behaviors by other persons, other accidents, intentional or negligent or wrong use of the device by the operator, and the use of the device under abnormal conditions.
- We are not responsible for incidental damages arising from the use or the unavailability of the device (loss of business income, business interruption, etc.).
- We are not responsible for the damages caused by the uses other than specified in the Instruction Manual.
- We are not responsible for the damages caused by the malfunction due to the combination with the connecting devices.

## 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.





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# NOTATIONS IN THIS MANUAL

The following notational conventions are used in this manual:

Notation	Description
[CALL] , [Δ]	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.
 <b>Request</b>	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

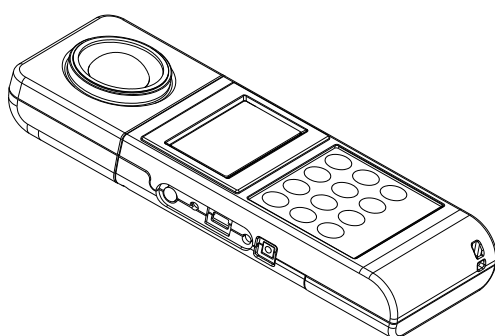
## 1.1 CHECK OF MAIN BODY AND ACCESSORIES

Check that all the following items are included.

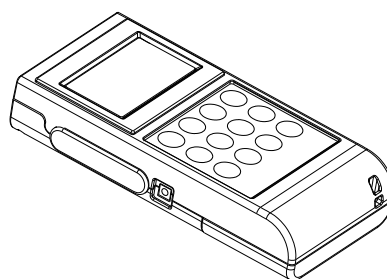
If not complete, please contact your dealer or us.

- Instrument (IM-600 or IM-600M)

1



IM-600



IM-600M

### Accessories

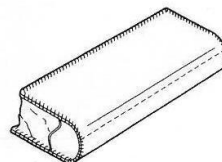
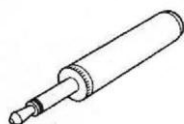
- Cap 1
- USB Driver / instruction manual / Measurement program(CD-ROM) 1
- Leather case 1
- IM-600/IM-600M start user manual 1
- Analog output plug 1
- Inspection Report 1
- Detector unit(IM-600M Only) 1



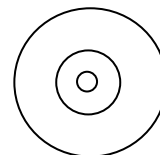
Cap



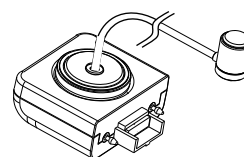
Analog output plug



Leather case



CD-ROM

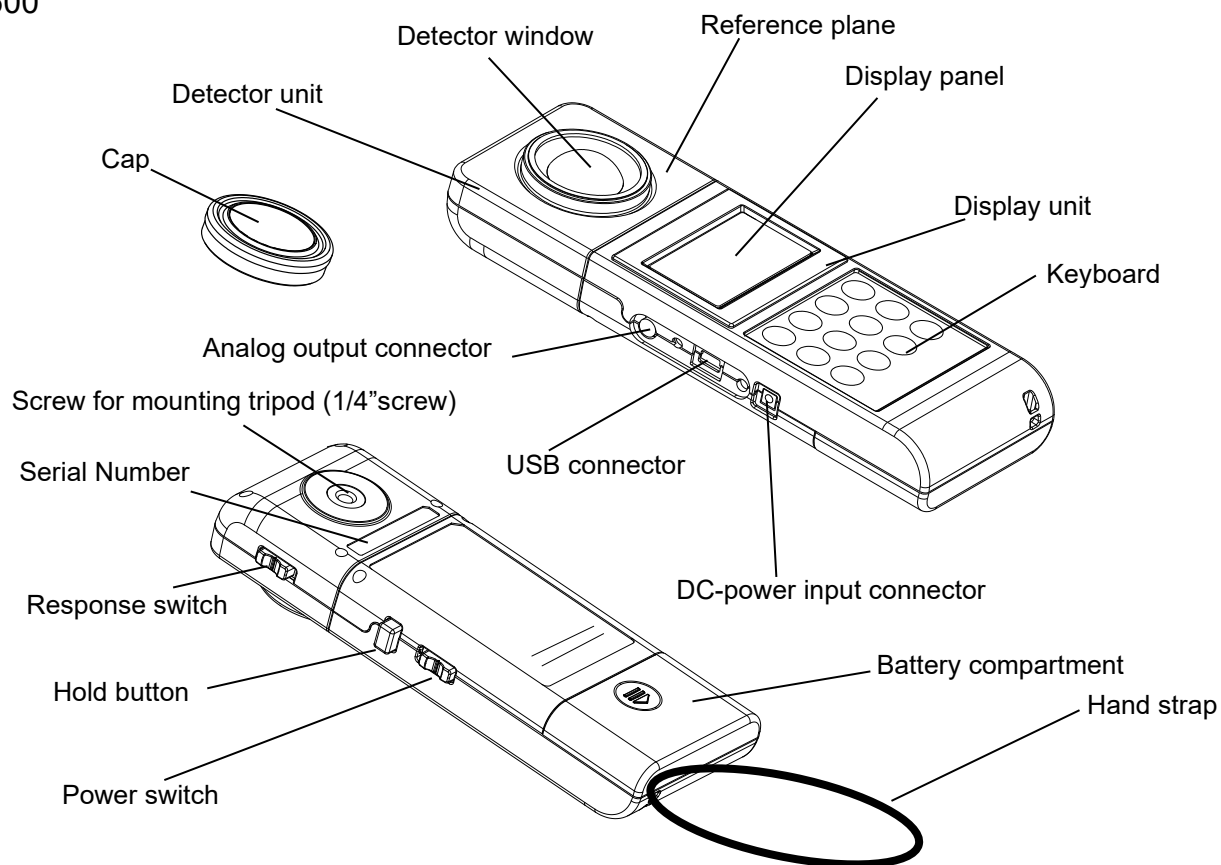


Detector unit (IM-600M)

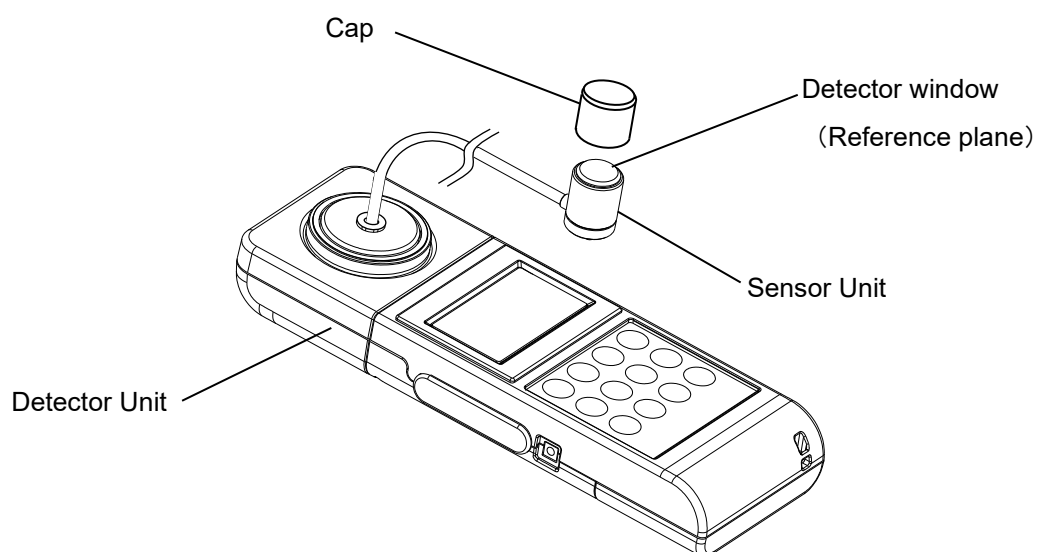
# 1.2 NAMES AND FUNCTIONS OF PARTS


## ■ Main body


IM-600



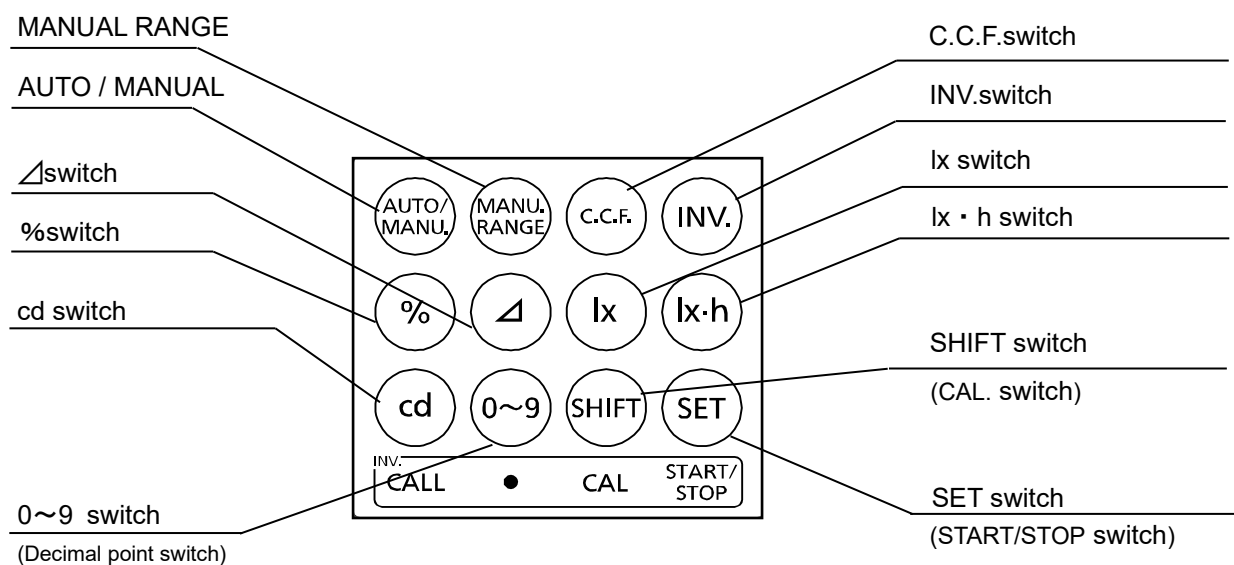
IM-600M




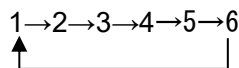

Name	Description																			
Detector window	The sensor of this instrument. Light should be uniformly distributed over whole surface of the detector window.																			
Display panel	Various kinds of information such as measurement and measuring condition is shown on the display panel.																			
Response switch	<div>The response time can be changed. Select either “FAST” or “SLOW” according to the target light source.</div> <table><tr><td>Response switch</td><td>Range</td><td>Response speed (90%)</td></tr><tr><td rowspan="6">FAST</td><td>1</td><td>About 60 ms</td></tr><tr><td>2</td><td>About 6 ms</td></tr><tr><td>3</td><td>About 0.6 ms</td></tr><tr><td>4</td><td>About 0.6 ms</td></tr><tr><td>5</td><td>About 0.6 ms</td></tr><tr><td>6</td><td>About 0.6 ms</td></tr><tr><td>SLOW</td><td>1 - 6</td><td>About 4 s or less</td></tr></table>	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 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																		
Hold switch	By pushing this hold switch during measurement, Measurement is paused and readout is fixed.																			
USB connector	This connector is used to connect the instrument to PC in remote mode. Connecting PC  ‘1.3.4 Connecting PC’																			
Tripod screw	A screw hole to fasten the instrument to a tripod. Specification : 1/4-UNC (depth 5mm)																			
Keyboard	This keyboard is to select functions and to input numeric value.																			
Power switch	Power switch for this instrument.																			
External power Connector	Connector for designated AC adapter (optional accessory).																			

 <b>Request</b>	<p>Use only specified screws when using the tripod screw and screw holes for jig attachment. Do not tighten the screws any more than necessary. Doing so might cause internal breakage.</p>
-------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

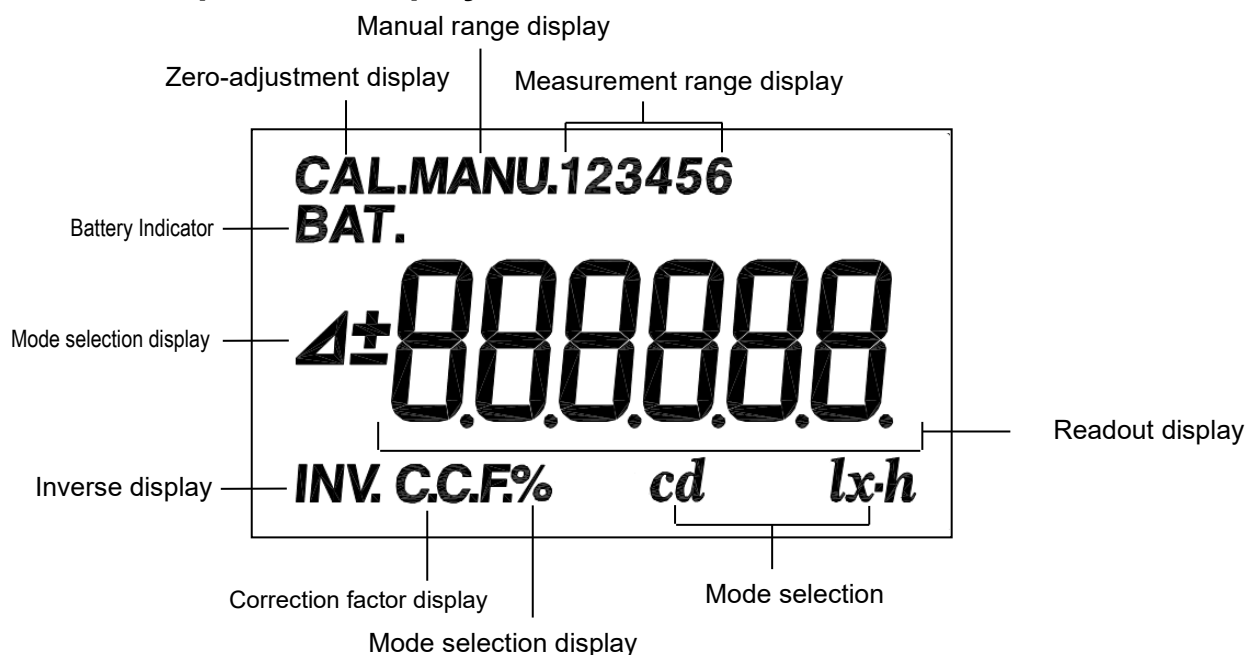
## ■ Names and functions of keyboard



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  '2.1 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; <div style="text-align: center;">  </div> Display range  '2.2 Manual-range measurement and display range'
[C.C.F.] Color Correction Factor	Sets and confirms the value of the correction factor in correction factor mode. The IM-600 can memorize one correction factor data.
[INV.] Inverse	Changes the assignment of function to keys. ([cd] to [CALL], [0 ~ 9] to [●], [SHIFT] to [CAL.], [SET] to [START/STOP])
[%]	Switches to percent mode in which the instrument measure the ratio of the difference between measured illuminance data and reference illuminance data. (% mode) In addition, sets reference illuminance data.
[Δ]	Switches to illuminance difference measurement mode in which the instrument measure the difference between measured illuminance data and reference illuminance data. (Δ mode) In addition, sets reference illuminance data.
[lx]	Enters illuminance measurement mode. (lx mode)
[lx · h]	Enters integral illuminance measurement mode. (lx · h mode)
[cd]	Enters luminous intensity mode (cd mode).
[0 - 9]	Increments the numerical value when inputting reference data and correction factor.
[SHIFT]	Moves the cursor down digit when inputting reference data and correction factor.
[SET]	Confirms your entry by pressing this button in each setting.
[CALL] ([INV.] + [cd])	In the % and the Δ mode, shows entered reference illuminance data for 3 seconds. In the cd mode, shows entered distance data for 3 seconds.
[●] ([INV.] + [0 - 9])	Sets decimal point when entering the reference illuminance data, distanced data, and correction factor in each mode.
[CAL.] Calibration ([INV.] + [SHIFT])	Starts zero-adjustment manually. Zero-adjustment provides constant sensitivity of photo detector and steady measurement. Each time turning on the power, zero-adjustment starts automatically without pushing the [CAL.] switch.
[START/STOP] ([INV.] + [SET])	Starts or stops integral illuminance measurement in the lx · h mode.

## ■ Names of parts on display screen



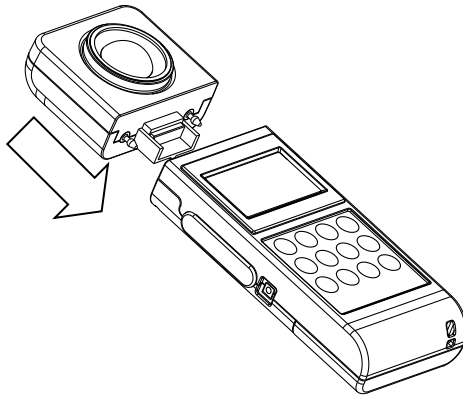
Displayed letters	Description
[CAL.]	Appears during operating zero-adjustment.
[MANU.]	Appears during operating zero-adjustment and manual range mode
[123456]	Shows the currently used range
[BAT.]	Appears when battery capacity is low. Replace batteries as soon as possible when this letter appears.
[Δ]	Appears during measurement and inputting reference values in the illuminance difference measurement mode (Δ mode).
[±]	Either [+] or [-] appears to mark the difference from the reference value in the Δ mode.
[%]	Appears during measurement and inputting reference values in the % mode.
Measurement display	Displays readout.
[INV.]	Each time Pushing the [INV.] switch turns the display on and off. Displayable only when the [INV.] switch is enable.
[C.C.F.]	Appears when the correction factor is set and enable.
[lx]	A unit for illuminance. Appears when lx mode and during inputting reference value in % mode, Δ mode.
[lx · h]	A unit for integrated illuminance.
[cd]	A unit for luminous intensity.

## 1.3 PREPARATION

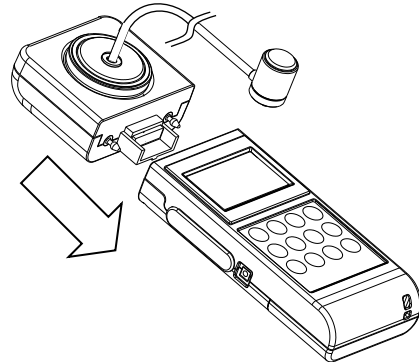
### 1.3.1 HOW TO MOUNT THE DETECTOR UNIT

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

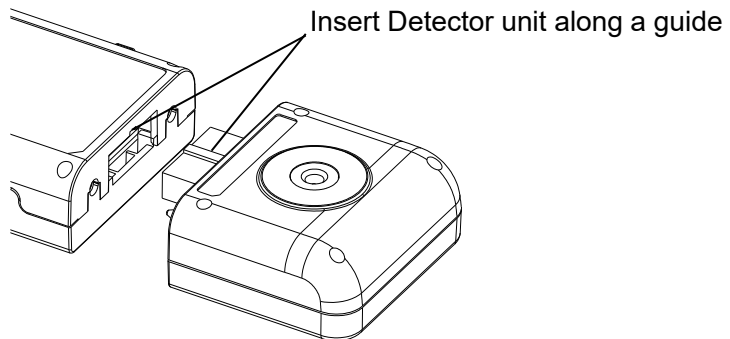
Be sure to turn off the power switch before connecting/disconnecting the detector unit.




IM-600



IM-600M



 <b>Request</b>	<ul style="list-style-type: none"><li>Combines the Detector unit and the Display unit having the same serial number.</li></ul> <p>If you combine the Detector unit and the Display unit having different serial number, measured value may not be correct.</p>
-------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



#### 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.

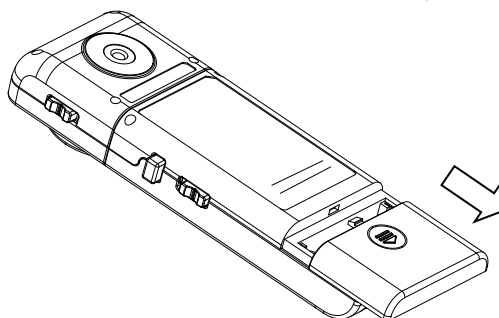
Purchase those at your dealer.

- 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	Using USB
Battery life	70 hours or more	35 hour or more

(Using alkaline cell)





### 1.3.3 CONNECTION OF AC ADAPTER (Separately sold optional accessory)



**Mandatory**

**Be sure to use dedicated AC adapter.**

It may cause the fire and electric shock.



**Mandatory**

**Be sure to remove the dust or moisture around the outlet.**

Such behavior may cause the fire.



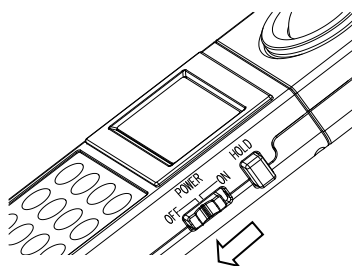
**Prohibition**

**Never pull out or insert the plug by wet hand.**

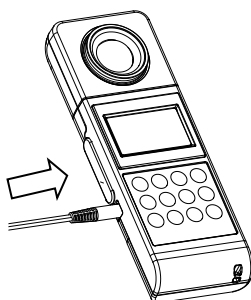
This may cause you electric shock.

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.



#### Memo

- When the AC adapter is plugged into the instrument, the AC adapter will be the power source and will take priority, regardless of whether batteries are inserted or not.
- If the AC adapter is plugged into the instrument but is not being powered, power will not be supplied to the instrument, regardless of whether a battery is inserted or not.

### 1.3.4 ILLUMINANCE UNIT “lx” AND “fc”

---

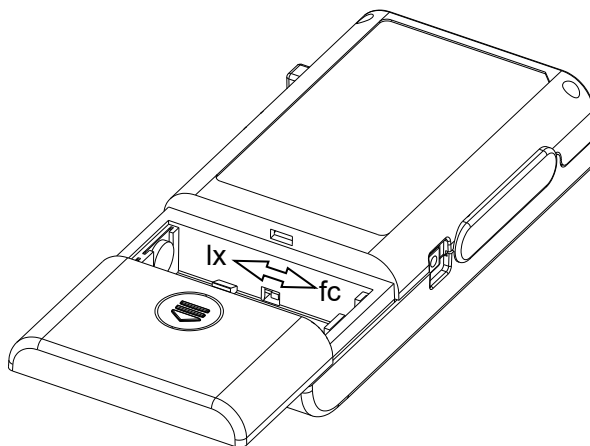
In this instrument, “Lux”(lx) or “Foot candle”(fc) can be selected by setting the Dip switch.

There is a following relation between Lux and Foot candle.

$$1[\text{lx}] = 0.0929[\text{fc}]$$

The internal operation of this instrument is done on Lux. the value of Lux is converted into Foot candle while “fc” unit appears,

This manual describes instruction on “lx”. Convert it according to the above formula if necessary.



## 1.3.5 CONNECTING TO PC

To use this instrument with a PC, use a USB cable (Cable Type: A connector – mini B connector) to connect to the PC.



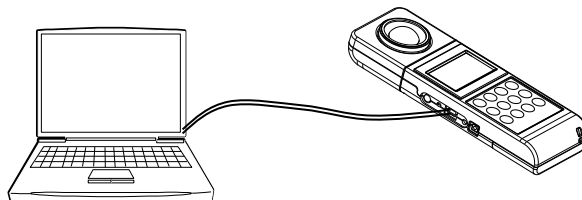
### Memo

- The USB cable is not included with standard package. Please purchase it separately.
- For connection to a PC, refer to your PC manual as well.

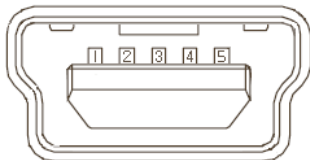


### Request

- 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.

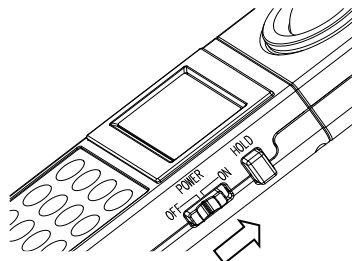
### Communication parameters

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

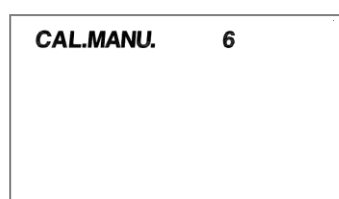
## 1.3.6 HOW TO TURN POWER ON/OFF

---

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




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



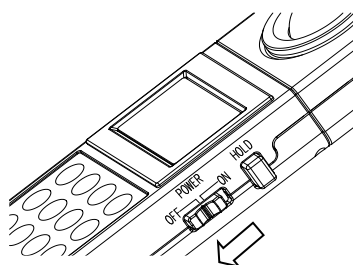
- 3 After zero-adjustment complete, the current measured value appears.



### Memo

- Response switch can be selectable before and after zero-adjustment.  
Response switch  '1.2 Names and functions of parts'
- The time required to complete zero adjustment differs depending on the setting of the response switch. FAST: about 15 seconds; SLOW: about 50 seconds.
- No Cap is required in Zero adjustment.

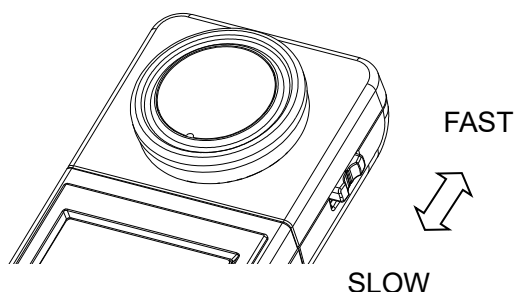
- 4 To turn off power, push the power switch to the OFF position.



## 2. MEASUREMENTS PROCEDURES

### 2.1 SETTING RESPONSE SWITCH

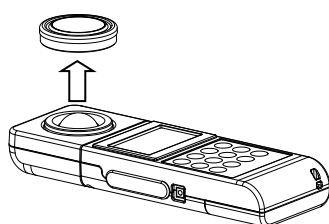
Changes the response switch FAST or SLOW suited to light source.



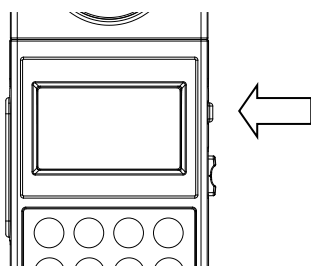
FAST : for general light source  
SLOW : for flicker light source

### 2.2 AUTO-RANGE MEASUREMENT AND DISPLAY RANGE

- 1 Remove the cap and start measurement.



- 2 The readout appears on the panel. When the readout is stabilized, read the value.  
Turn on the HOLD switch, and the readout will be held.



- 3 Turn off the HOLD switch, and restart measurement.

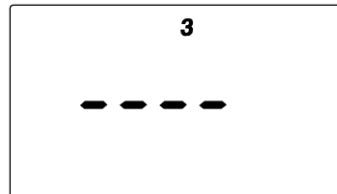
IM-600 Display range and resolution in auto-range unit: lx

Range	Effective measuring range		Resolution
	MIN	MAX	
Range 1	0.005~	9.990	0.005~0.750 : 0.005
			0.750~9.990 : 0.01
Range 2	7.50~	99.90	0.1
Range 3	75.0~	999.0	1
Range 4	750~	9990	10
Range 5	7500~	99900	100
Range 6	75000~	999000	1000

IM-600M Display range and resolution in auto-range unit: lx

Range	Effective measuring range		Resolution
	MIN	MAX	
Range 1	0.005~	9.990	0.005
Range 2	7.50~	99.90	0.05
Range 3	75.0~	999.0	0.5
Range 4	750~	9990	5
Range 5	7500~	99900	50
Range 6	75000~	999000	500

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



#### Memo

- Light should be uniformly distributed over whole surface of the detector window, otherwise measured data may not be correct.
- The sensitivity is not uniform over the whole area of the detector.
- If the readout exceeds 999,000lx, a code "E2" appears.
- By switching the response switch, you can select the detector responding speed. Select the responding speed [FAST] or [SLOW] depending on the light source to be measured.

Response '1.2 Names and functions of parts'

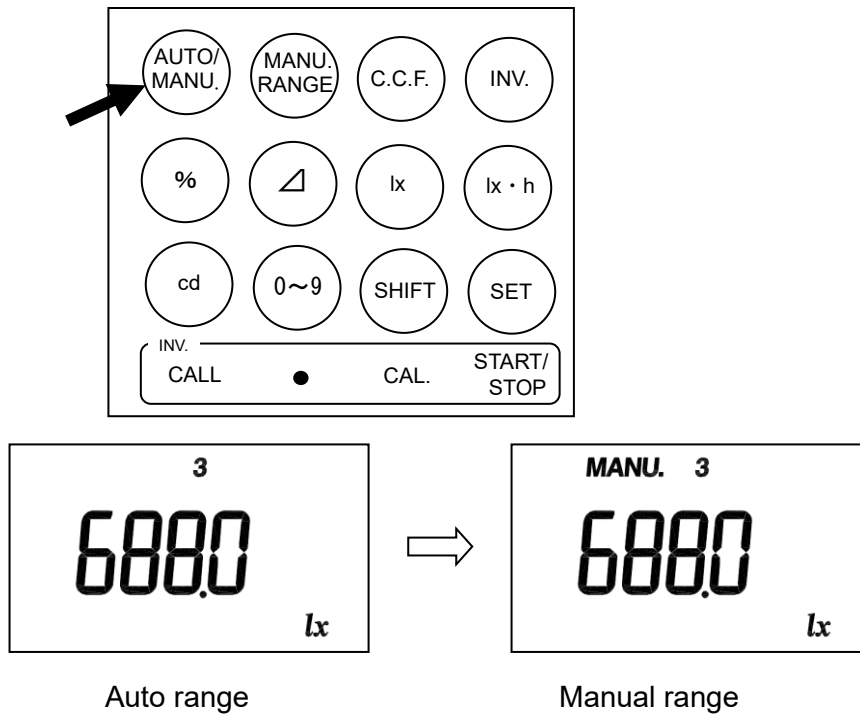
- If the readout is smaller than 0.005lx, the figure "0" appears.
- When the unit is "fc", the measurement range and resolution are obtained by multiplying the above values by 0.0929.

## 2.3 MANUAL-RANGE MEASUREMENT AND DISPLAY RANGE

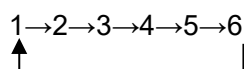
---

- 1 Remove the cap and start measurement.
- 2 Push the [AUTO/MANU.] switch on the keyboard.

The system switches to manual range.

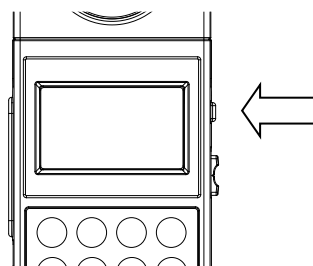


- 3 Pushing the [MANU. RANGE] switch to advance to the range as follows:



- 4 A measured value appears in the display, read the value when it becomes stable.

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



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

IM-600 Display range and resolution in manual-range unit: lx

Range	Effective measuring range		Resolution	
	MIN	MAX		
Range 1	0.005~	9.990	0.005~ 0.750	: 0.005
			0.750~ 9.990	: 0.01
Range 2	0.05~	99.90	0.05~ 7.50	: 0.05
			7.50~ 99.90	: 0.1
Range 3	0.5~	999.0	0.5~ 75.0	: 0.5
			75.0~ 999.0	: 1
Range 4	5~	9990	5~ 750	: 5
			750~ 9990	: 10
Range 5	50~	99900	50~ 7500	: 50
			7500~ 99900	: 100
Range 6	500	999000	500~ 75000	: 500
			75000~ 999000	: 1000



IM-600M Display range and resolution in manual-range unit: lx

Range	Effective measuring range		Resolution			
	MIN	MAX				
Range 1	0.005~	9.990	0.005			
Range 2	0.05~	99.90	0.05	~	9.990	: 0.005
			9.990	~	99.90	: 0.05
Range 3	0.5~	999.0	0.5	~	9.990	: 0.005
			9.990	~	99.90	: 0.05
			99.90	~	999.0	: 0.5
Range 4	5~	9990	5	~	9.990	: 0.005
			9.990	~	99.90	: 0.05
			99.90	~	999.0	: 0.5
			999.0	~	9990	: 5
Range 5	50~	99900	50	~	99.90	: 0.05
			99.90	~	999.0	: 0.5
			999.0	~	9990	: 5
			9990	~	99900	: 50
Range 6	500~	999000	500	~	999.0	: 0.5
			999.0	~	9990	: 5
			9990	~	99900	: 50
			99900	~	999000	: 500



#### Memo

- If the readout exceeds the display range, a code "E2" appears.
- By switching the response switch, you can select the detector responding speed. Select the responding speed [FAST] or [SLOW] depending on the measuring light source to be measured.

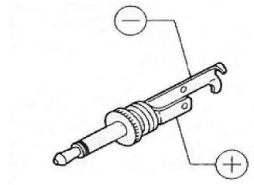
Response '1.2 Names and functions of parts'

- If the readout is smaller than 0.005lx, the figure "0" appears.
- When the unit is "fc", the measurement range and resolution are obtained by multiplying the above values by 0.0929.

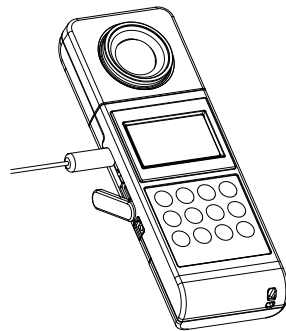
## 2.4 HOW TO USE THE ANALOG OUTPUT CONNECTOR

---

- 1 The analog output plug has a polarity as shown in the figure. Connect the analog output plug with a shield line by soldering and connect it with an outer recorder.



- 2 Insert the analog output plug into the analog output connector.  
The output impedance of the instrument is not more than 100 ohm.



### Memo

- The analog output voltage is calibrated to 1.998V at peak. The resolution varies depending on the range.
- The maximum output voltage is up to 3 V in manual range. Therefore, with analog output and manual range, values exceeding the readout on the display can be measured. For example, the illuminance from 0.005 to 15 lx can be measured at range 1. When analog output voltage exceeds 1.998V, E2 appears on the display.

# 3. SETTING PROCEDURES

## 3.1 NUMERIC VALUE ENTRY

Entering numeric values in the C.C.F. setting, the % mode, the  $\Delta$  mode, and the cd mode.

- 1 Select the numeric value entry screen in the C.C.F. setting, the % mode, the  $\Delta$  mode or the cd mode



- 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, first push the [INV.] switch and then the [.] ([0 - 9]) switch.



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

## 3.2 ILLUMINANCE MEASUREMENT (Ix MODE)

- 1 Turn the slide switch in battery box to the left
- 2 When you turn on the power, the instrument enter Ix mode automatically.
- 3 To enter the Ix mode from another mode, push the [Ix] switch.

### 3.3 ILLUMINANCE MEASUREMENT(fc MODE)

---

- 1 Turn the slide switch in battery box to the right.
- 2 When you turn on the power, the instrument enter fc mode automatically.
- 3 To enter the fc mode from another mode, push the [ix] switch.

### 3.4 CORRECTION FACTOR (C.C.F. setting)

---

Push the [C.C.F.] switch and the currently entered C.C.F. value is displayed.  
(C.C.F. means Color Correction Factor)



Correction factor having been entered

If no correction factor is entered, "0000" is displayed and the screen turns to the screen for numeric value entry.

#### Change of correction factor (C.C.F.)

- 1 Push the [C.C.F.] switch.



- 2 Enter numeric value and push the [SET] switch to activate the correction factor.
- 3 After displaying the correction factor for 3 seconds, the system returns to the previous measuring mode.

Entering numerical value → '3.1 NUMERIC ENTRY'



### Memo

- Enter the correction factor in the range 0.001 to 1000.
- To cancel the correction factor, enter 1.000 as the correction factor.
- After completion of the C.C.F. setting mode, the system returns to the previous measuring mode.
- Once correction factor is activated, Readout is multiplied by the correction factor.  
Readout = raw measured value x Correction factor (C.C.F.).
- If the readout exceeds 999900 due to entering too large a correction factor, the code E4 appears.
- During measurement of the integral illuminance, the correction factor cannot be changed.
- Correction factor data is saved after turning off.

## 3.4.1 SETTING PROCEDURE (Ex: To enter 1.2)

- 1 The currently entered correction factor appears for 3 seconds after pushing [C.C.F.] switch.



- 2 Push the [C.C.F.] switch again within 3 second after the above process, then the screen turns to the screen for numeric value entry.



- 3 Push the [0 - 9] switch to change the blinking digit to 1.



- 4 Push the [INV.] switch, and check if the mark INV appears.



- 5 Push the [●] ([0 - 9]) switch to set the decimal point.



- 6 Push the [SHIFT] switch to move the blinking digit to a lower position.



- 7 Push the [0 - 9] switch to change the blinking digit figure to 2.



- 8 Push the [SET] switch to complete setting.

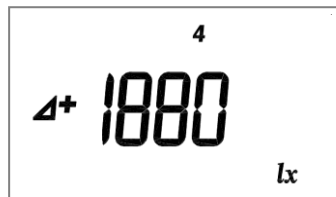


- 9 Returning to the measurement mode and the correction factor take effect



## 3.5 DIFFERENCE MEASUREMENT ( $\Delta$ MODE)

Press the [ $\Delta$ ] switch to enter the  $\Delta$  mode. In this mode, the difference between the reference value and measured value appears.



(An example showing that the difference is +1880lx)

Difference = (C.C.F. x Illuminance value) – Reference value

(C.C.F. x Illuminance value): Readout in the lx(fc) mode



### Memo

- If a reference value is not entered, the screen changes to the numeric entry screen for reference value.

### How to enter a reference value (based on the measured value)

- 1 In the lx mode, make measurement of illuminance for the reference illuminance data.
- 2 When measured value becomes stable, push the hold switch to ON, and fix the display.
- 3 Push the [SET] switch. The measured value is set as the reference value.
- 4 Push the hold switch to OFF.
- 5 Push the [ $\Delta$ ] switch to shift to  $\Delta$  mode.

### How to enter the reference value (setting a given value as reference)

- 1 Push the [ $\Delta$ ] switch to shift to  $\Delta$  mode.
- 2 Enter a numerical value and push the [SET] switch to activate the reference value.



### Memo

- Reference value might be entered from 0.001 to 999,900.
- If the value 0 is entered as the reference value, a code E7 appears.
- Once the reference value is entered, it continues to be active until it is changed or the power is turned off.

Entering numerical value '3.1 NUMERIC ENTRY'

Setting procedure '3.4.1 SETTING PROCEDURE'

### 3.5.1 ENTRY PROCEDURE (eg: Entering 100.0 as the reference value)

---



Memo

- The entry procedure is common to the  $\Delta$ , cd, and % mode. The example is the  $\Delta$  mode. To set the cd mode, push the [cd] switch. To set the % mode, push the [%] switch.

- 1 The currently entered reference value appears for 3 seconds after pushing [ $\Delta$ ] switch.



Memo

- If no reference value is entered, the "0000" appears and the screen changes to the numeric entry screen.

- 2 Push the [ $\Delta$ ] switch within 3 seconds after the above process to shift to the numeric entry screen.



- 3 Push the [0 - 9] switch to change the blinking digit figure to 1.



- 4 Push the [SHIFT] switch to move the blinking digit to a lower position.





- 5 Push the [SHIFT] switch again to move the blinking digit to a lower position.



- 6 Push the [INV.] switch, and check if the mark INV appears.



- 7 Push the [●] ([0 - 9]) switch to set the decimal point.



- 8 Push the [SET] switch to complete the setting.



#### Memo

- To amend the entered value before completing the setting, push the [SHIFT] switch a few times to specify the digit to be amended. The only figure able to be entered in the 5th and 6th digit is 0 (zero).
- When the reference value is set with the [SET] switch, the reference value appears for about 3 seconds and then the system returns to the previous mode.

## 3.5.2 HOW TO CHECK THE SETTING

Push [INV.] switch and then push [CALL] switch to confirm the entered reference illuminance data and distance data in each mode.

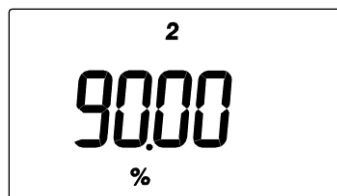


#### Memo

- The reference values for the  $\Delta$  mode are the same as for the % mode.
- [CALL] is valid only during operating in  $\Delta$ , %, and cd mode.

## 3.6 PERCENT MEASUREMENT (% MODE)

Push the [%] switch to enter the % mode, the readout shows the ratio of the measured illuminance value to the reference illuminance value.



(Example: The deviation is expressed as 90%)

$$\text{Percent} = ((\text{C.C.F.} \times \text{Illuminance}) / \text{reference illuminance value}) \times 100$$

### How to enter the reference value (on the basis of measurements)

- 1 Push the [Ix] switch to enter the lx mode, and measure illuminance for reference illuminance data.
- 2 When the measured value on the display becomes stable, push the hold switch to ON to fix the display.
- 3 Push the [SET] switch to enter the measured value as the reference illuminance value.
- 4 Push the hold switch to OFF.
- 5 Push the [%] switch to shift to the % mode.

### How to enter the reference value (setting a given value as standard)

- 1 Push the [%] switch to shift to % mode.
- 2 Enter a numerical value and push the [SET] switch to activate the standard value.



#### Memo

- The entry value range is from 0.001 to 999900.
- If the value 0 is entered as the standard value, a code E7 appears.
- The set value is hereafter held until the reference value is changed or the power switch is turned off.
- The reference illuminance data is deleted after turning off.

Entering numerical value → '3.1 NUMERIC ENTRY'

Setting procedure → '3.5.1 SETTING PROCEDURE'

## 3.7 LUMINOUS INTENSITY MEASUREMENT (cd MODE)

---

Push [cd] switch to enter cd mode in which Luminance intensity value appears.



(An example showing that the Luminance intensity is 338.0cd)

Luminous intensity = (C.C.F. × illuminance) × L<sup>2</sup>

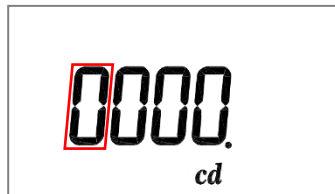
L : the distance from light source to the illuminance meter

(lx...[m],fc...[feet])

If the distance data has not been entered, the distance data entry screen appears.

### How to enter distance data

- 1 Push [cd] switch to enter cd mode.



- 2 Enter numerical value and push [SET] switch to activate the distance data.  
The distance unit is "m (meter)" for "lx", and "ft (feet)" for "fc"
- 3 Distance data you entered appears for 3 sec. and then, cd mode start.



#### Memo

- Enter the distance data from 0.001 – 1000.
- Error code E7 appears if you enter 0 as reference illuminance data.
- Error code E3 appears if the calculated value is over the measurement range.
- Push [cd] switch twice to reset distance data.
- Distance data is deleted after turning off.
- Distance data once you entered is saved till reenter the distance data or turning off.
- Reference plane is the front of IM-600 body or tip of sensor window of IM-600M

Entering numerical value → '3.1 NUMERIC ENTRY'

Setting procedure → '3.5.1 SETTING PROCEDURE'

## 3.8 INTEGRAL ILLUMINANCE MEASUREMENT (lx·h/fc·h MODE)

Press the [lx · h] switch to enter Integral illuminance mode. In this mode, Integral illuminance and integral time appear.

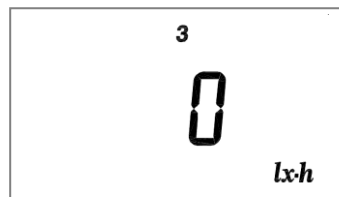


Memo

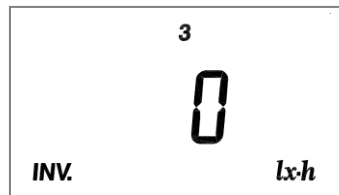
- When you select fc mode, the unit of fc · h is used in integral illuminance mode.

### Start of integration

- 1 Push the [lx · h] switch to shift to the lx · h mode.



- 2 Push the [INV.] switch.



- 3 Push the [START/STOP]([SET]) switch, then integration will start.



Example: Irradiation 1388lx



Example: Integration time one hour



Memo

- The display alternately shows the integral illuminance and integration time at 2-second intervals.
- Even after switching to another measurement mode, the integration is continued. If the [lx · h] switch is pushed again, then an integral illuminance is displayed.
- It is not possible to change the C.C.F. value during integration.

## Integration stop

- 1 If the instrument is in other than the  $\text{lx} \cdot \text{h}$  mode, push the  $[\text{lx} \cdot \text{h}]$  switch to shift to the  $\text{lx} \cdot \text{h}$  mode.
- 2 Push the  $[\text{INV.}]$  switch, and then push the  $[\text{START/STOP}]$  switch to stop integration.



### Memo

- The value of integral illuminance until stop integration show after stop measurement.
- To check the integral illuminance and integration times by the time measuring stop, push the hold switch to ON. The integral illuminance and integral time appear alternately for a half second each.
- Push the  $[\text{INV}]$  switch and  $[\text{START/STOP}]$  switch, and then the IM-600 will start integration from 0  $\text{lx} \cdot \text{h}$  and 0 second.
- Even when the mode changes to another mode after integration stops, integral illuminance and integral time are displayed after selecting  $[\text{lx} \cdot \text{h}]$  mode again and push the HOLD switch to ON. Both “integral illuminance” and “integration time” are alternately displayed at 1 sec. intervals.

## Range of integration

The maximum indication of integral illuminance is 1,000,000,000  $\text{lx} \cdot \text{h}$  and values over 999900  $\text{lx} \cdot \text{h}$  are expressed using exponents. The upper limit of the integration time is 9999 hours.



Example: Integral illuminance 10,000,000  $\text{lx} \cdot \text{h}$



### Memo

- When integral illuminance values exceed the upper limit, a code E5 appears.
- When integral time values exceed the upper limit, a code E6 appears.
- If you measure the integral illuminance for a long time, we recommend you use AC adapter.

## Suspension of integral illuminance measurement

If the HOLD switch is turned On during the integral illuminance measurement, the integration will stop, then the value of integral illuminance and integration time until the time when integration stop is alternately displayed at 1 second intervals.

If the HOLD switch is turned OFF, integral illuminance measurement resumes.

## 3.9 ZERO ADJUSTMENT (CAL MODE)

---

Zero adjustment start after pushing the [INV.] switch and then [CAL.] ([SHIFT]) switch.



### Memo

- When turning ON, the system automatically conducts a zero adjustment.
- The time required for a zero adjustment differs depending on the setting of the response switch. FAST: about 15 seconds; SLOW: about 50 seconds.
- It is possible to conduct a zero adjustment even if you remove the cap.

# 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 IM-600/IM-600M on user own.

The following are the communication commands:

Command name	Function
STR0	Sets measurement range to the auto, and obtains measured data.
STRn	Sets measurement range to the manual and designates a range, and then obtains measured data n: 1 – 6
ISR0	Sets measurement range to the auto, and starts integral illuminance measurement.
ISRn	Sets measurement range to the manual, and starts integral illuminance measurement. n: 1 – 6
ISTR0	Sets measurement range to the auto, and obtains the current status data (illuminance, integral illuminance, integration time, and measurement range)
ISTRn	Sets measurement range to the manual, and obtains the current status data (illuminance, integral illuminance, integration time and measurement range) n: 1 – 6
IEND	Stops integral illuminance measurement.
CA	Starts a zero adjustment.
WHO	Reads product name ("IM-600" is read out for IM-600/IM-600M).
VER	Reads software version.
SRL	Reads product serial number.
SCCF_####	Writes correction factor (C.C.F.) into EEPROM of the IM-600. Enters correction factor with decimal notation #### or #.### or exponent notation #.###E±## Range to enter: 0.001 – 1000
RCCF	Reads correction factor (C.C.F.) #.###E±##

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

When PC send a communication command to the IM-600/IM-600M, the IM-600/IM-600M returns "OK" as a receipt acknowledgment. When the IM-600/IM-600M receive improper command, the IM-600/IM-600M returns "NG".



### Memo

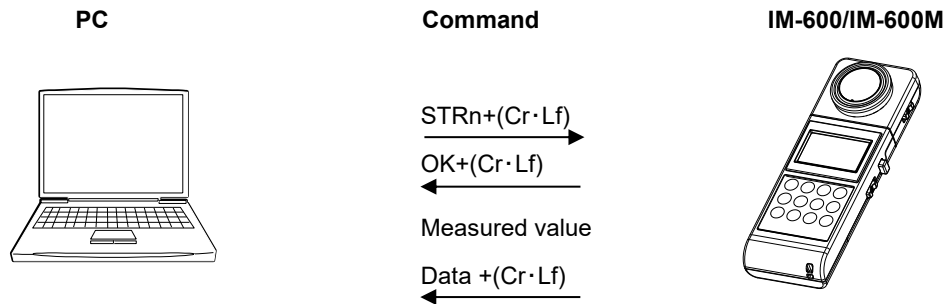
- No command can be accepted during zero adjustment. Send commands after completing the zero adjustment.

## 4.1.1 STRn COMMAND

When the IM-600/IM-600M receive this command, the IM-600/IM-600M returns measured data in a text format.

n: 0 (Auto range)

n: 1 – 6 (Manual range)



If error codes ERR01\_RX, ERR10, or ERR11\_RX appear:

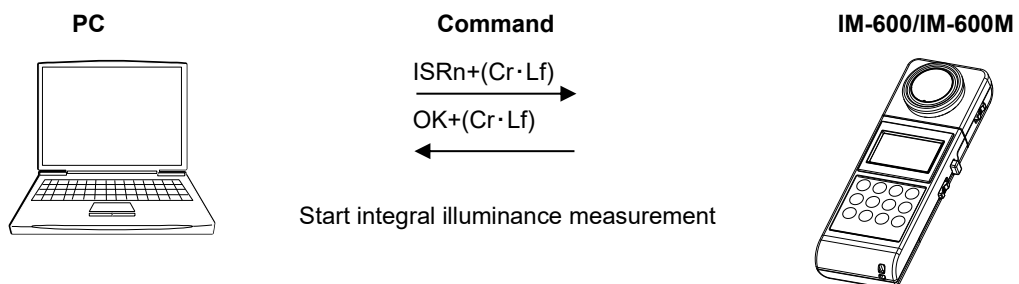
➡ '5.2 COMMUNICATION ERROR CODE'

## 4.1.2 ISRn COMMAND

When the IM-600/IM-600M receives this command, IM-600/IM-600M starts integral illuminance measurement. If the integration measurement has already been working before the IM-600/IM-600M receive this command, this command is invalid.

n: 0 (Auto range)

n: 1 – 6(Manual range)





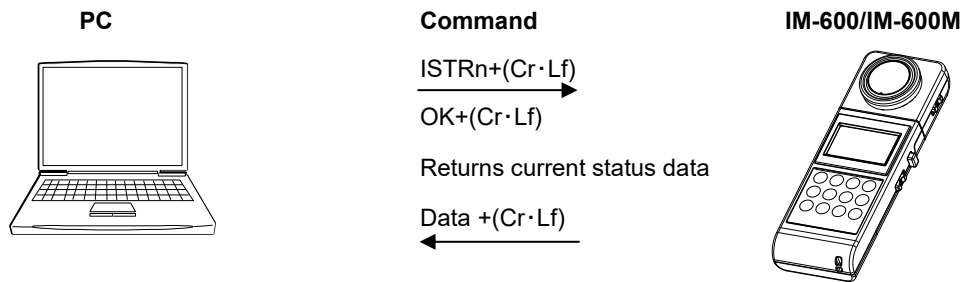
### 4.1.3 ISTRn COMMAND

When the IM-600/IM-600M receive this command, the IM-600/IM-600M returns the current status data of integral illuminance measurement.

The IM-600/IM-600M returns measured data to PC after the instrument change measurement range.

n: 0 (Auto range)

n: 1 – 6 (Manual range)

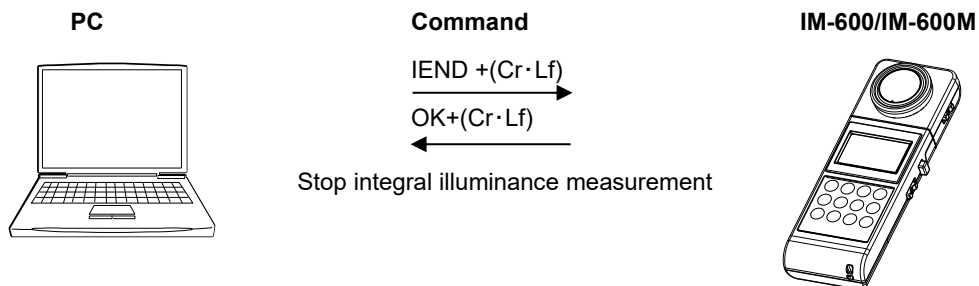


If error codes ERR01\_RX, ERR02\_RX, ERR04\_RX, ERR05\_RX, ERR06\_RX, ERR10\_RX and ERR11\_RX appear:

➞ '5.2 COMMUNICATION ERROR CODE'

### 4.1.4 IEND COMMAND

When this IM-600/IM-600M receive this command, the IM-600/IM-600M stops integral illuminance measurement. The instrument does not return measured data.

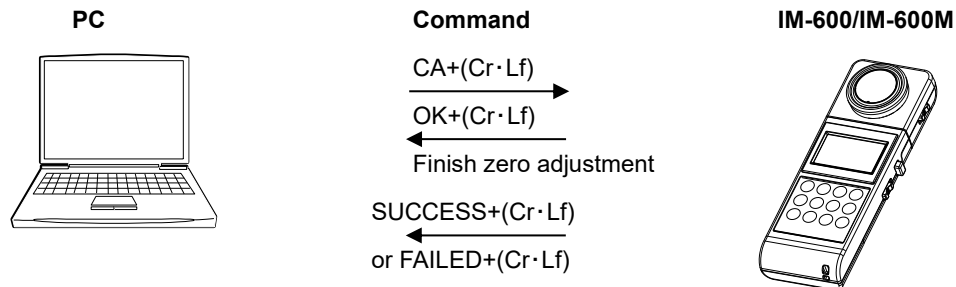


## 4.1.5 CA COMMAND

---

When the IM-600/IM-600M receive this command, the IM-600/IM-600M starts zero adjustment.

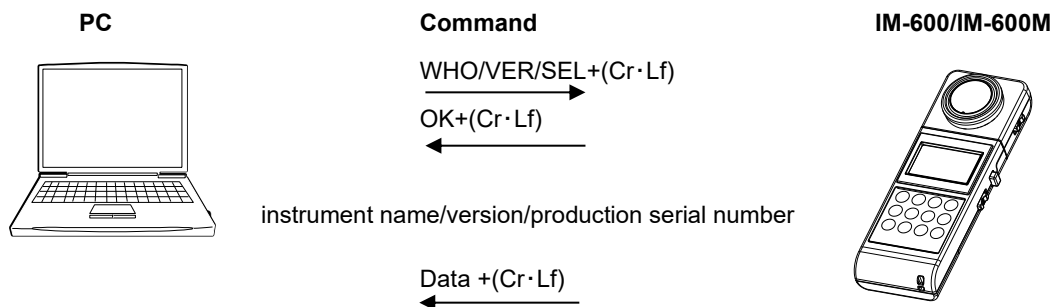
When IM-600/IM-600M receives this command during integral illuminance measurement, entering reference value, or entering C.C.F, the IM-600/IM-600M returns "FAILED".



## 4.1.6 WHO/VER/SRL COMMAND

---

When the IM-600/IM-600M receive this command, The IM-600/IM-600M returns the name of this instrument, program version, and production serial number.



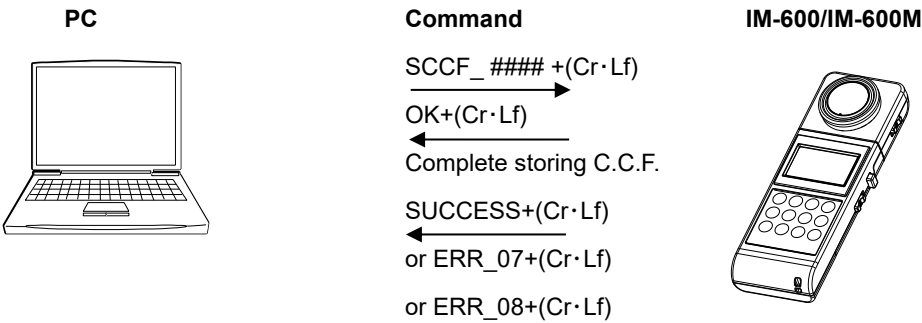
# 4.1.7 SCCF COMMAND

When the IM-600/IM-600M receives this command, the IM-600/IM-600M writes C.C.F. into EEPROM of the IM-600/IM-600M.

Valid values range from 0.001 to 1000.

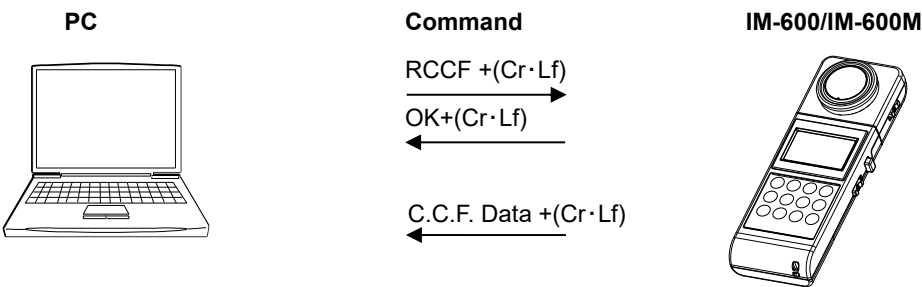
When a value is over or under 0.001-1,000, the IM-600/IM-600M returns the error code ERR\_07.

If the IM-600/IM-600M fails to store the C.C.F. data in the EEPROM, the IM-600/IM-600S returns code E8.



# 4.1.8 RCCF COMMAND

When the IM-600/IM-600M receive this command, IM-600/IM-600M returns C.C.F. data.



## 4.2 OUTPUT FORMAT

### 4.2.1 OUTPUT FORMAT FOR REMOTE MEASUREMENTS

Output format list

Name of command	Format type
STRn	#.###E±##_R#UL (Resolution in the output format is the same as that in LCD.) <Example> When measured value in illuminance is 1.0lx at Range 1, output data will be "1.000E+00_R1UL"; "R1UM" means Range: 1 UL : illuminance (lx)
ISTRn	#.###E±##_#.###E±##_#.###E±##R# Displayed in the order of; illuminance, integral illuminance(integrated value), integration time(sec.), range
VER	###
WHO	IM-600 (Even when IM-600M is connected, "IM-600" shows.
SRL	##### Displays production serial number in 8 digits
RCCF	#.###E±## Displays correction factor with exponent

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

## 4.3 USB Driver

---

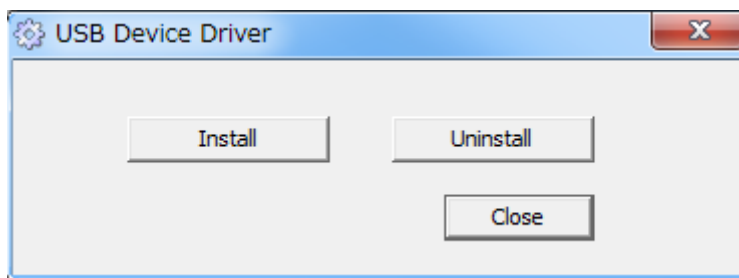
The following describes the procedure for installing the USB drive into PCs.

- 1 Insert the CD-ROM supplied with the IM-600/IM-600M into CD-ROM drive
- 2 Select [USBDeviceDriver.exe] in the [Driver] folder in the CD-ROM drive, right-click and click [Run as administrator].

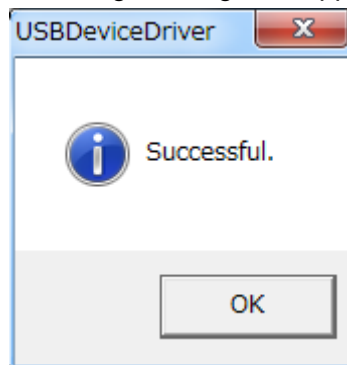
OS	Windows® 10 Pro(32bit／64bit) Windows® 11 Pro(64bit)
----	--------------------------------------------------------

※ 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	Zero adjustment does not complete adequately.	Check the connection between Display unit and Detector unit. If no problem is found, contact your dealer or us.
E2	The measured value exceeds measurable range.	Check the measurement range and use upper range.
E3	Improper calculation. 1. The value exceeds 9999% in the % mode. 2. The value exceeds 999000cd in cd mode.	1. The difference between measured value and reference value is too large. 2. Check that the distance data is correct.
E4	The value affected by correction factor exceeds the display range 999900 lx.	Check if the correction factor is correct.
E5	Measured value of integral illuminance exceeds 1,000,000,000 lx · h.	Do not exceed the limit of integral illuminance.
E6	Integration time exceeds 9999 hours.	Do not exceed the limit of integration time.
E7	Reference values, distance data, or correction factors exceed the limit of entry.	Check the entry range.
E8	The instrument fails to write or read data.	Contact your dealer or us.
E10	The response switch is pushed 3 times or more during a zero adjustment.	Don't touch the response switch during a zero adjustment.

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

## 5.2 COMMUNICATION ERROR CODE

When an error occurs on the instrument, which communicate with PC, following error messages is sent to your PC.

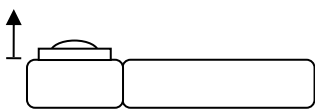
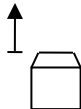
Error code	Explanation	Action
ERR01_Rx	Zero adjustment does not complete adequately.	Check that the detector is connected to the display unit correctly. If no problems are found, contact your dealer or us.
ERR02_Rx	The measured value exceeds measurable range.	Check the measurement range.
ERR04_Rx	The value reflected by correction factor exceeds the display range 999900 lx.	Check the measurement range and use upper range.
ERR05_Rx	Measured value of integral illuminance exceeds 1,000,000,000 lx · h.	Do not exceed the limit of integral illuminance.
ERR06_Rx	Integration time exceeds 9999 hours.	Do not exceed the limit of integral time.
ERR07	The values of reference data, distance data, or correction factor exceed the limit of entry.	Check the entry value.
ERR08	The instrument fails to write or read data.	Contact your dealer or us.
ERR10	The response switch is pushed 3 times or more during a zero adjustment.	Don't touch the response switch during a zero adjustment.
ERR11_Rx	STRn or ISTRn command is sent to the IM-600 while HOLD switch is ON and measurement range is being changed.	Check that the hold switch is turned OFF during communication.
ERR12	Commands are sent during a zero adjustment.	Send commands after completing the zero adjustment.
NG	A command is not proper.	Check that the entered command is correct.
FAILD	Command for start or stop of integration time, or command for a zero adjustment is failed.	Start/stop of integration time or zero adjustment cannot be set during integral illuminance measurement. Try it again after completing integration illuminance measurement.



# 6. APPENDIX

## SPECIFICATIONS AND PERFORMANCE

### IM-600/IM-600M Specifications and performance

	IM-600	IM-600M
Measurement range	0.005~999000lx (0.005~92807fc) Auto/manual 6-step range	
Display	4-digit LCD Read	
Linearity	$\pm 2\%$ of rdg.; $\pm 1$ digit (Auto range)	
Cosine Response $f_2$	$\pm 3\%$ or less	$\pm 3\%$ or less
$V(\lambda)$ Mismatch $f_1'$ (Deviation from spectral luminous efficacy)	6% or less	
UV Response $u$	2% or less	
IR Response $r$	2% or less	
Fatigue $f_F$	$\pm 1\%$ or less	
Temperature Dependence $f_6$	Within $\pm 3\%$ (-10 to 40°C; against 23°C)	
Humidity Test $f_H$	Within $\pm 3\%$	
Characteristics for intermittent light : $f_C$	$\pm 2\%$ or less	
Analog signal output	0 – 1998mVmax	
Interface	USB (Virtual COM port)	
Power supply	AA battery $\times 2$	
Operating conditions	Temperature: -10 to +40°C Humidity: 85% RH or less	
Dimensions	Approx. 188 $\times$ 65 $\times$ 34 mm (without protruding portion)	Approx. 188 $\times$ 65 $\times$ 34 mm (without protruding portion) Sensor: $\phi 16 \times 21$ mm Cable : 1m
Weight	Approx. 200 g (excluding batteries)	Approx. 230g (including sensor unit, excluding batteries)
Reference plane	Surface of the front case 	The tip of detector window 
Responsivity uniformity of the detector	The responsivity of the detector are not even whole area of the surface.	
Effective distance for range Inverse square law	50cm or longer from the reference plane	
Detection element	Silicon photodiode	

# COLOR CORRECTION FACTOR

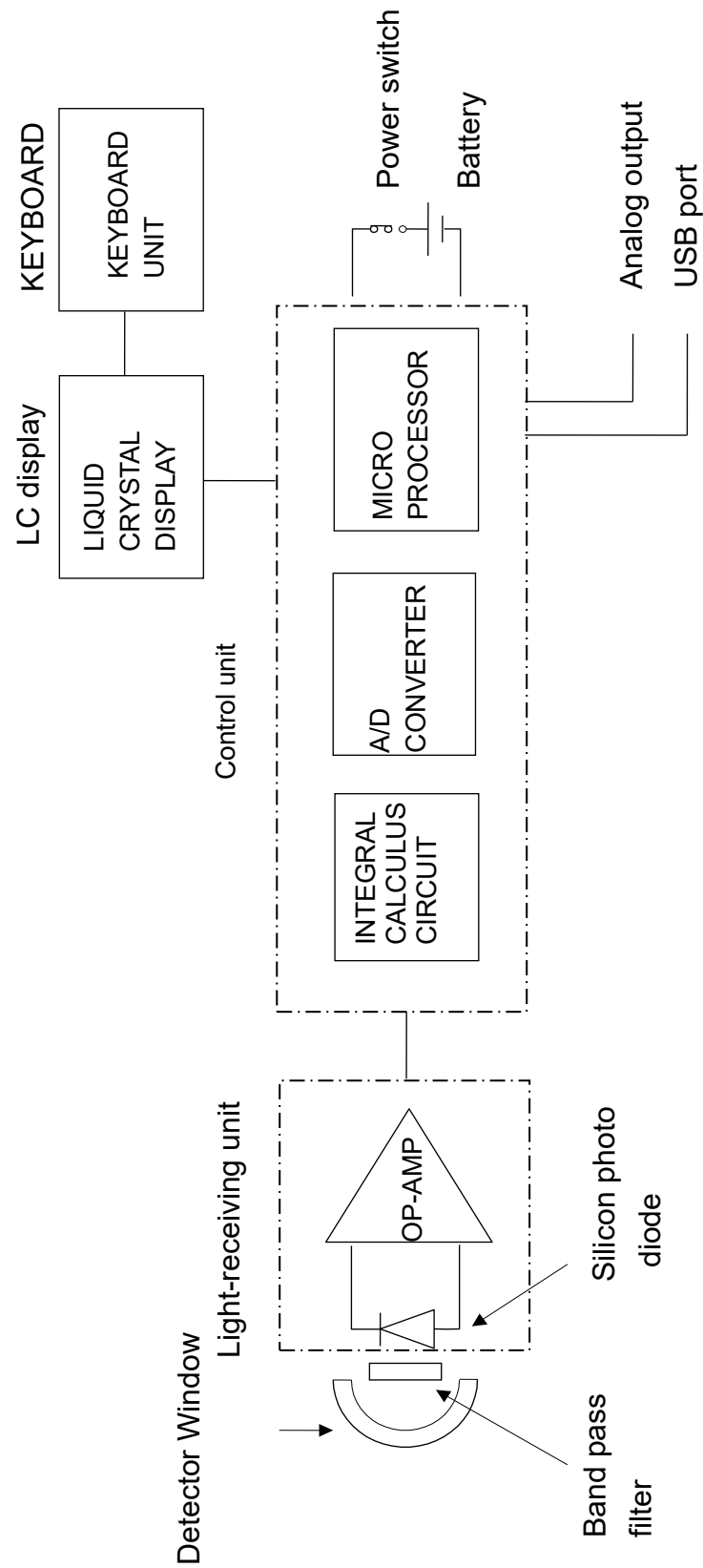
Light Source		Correction factor
Equi-Energy Spectrum	400~760nm	0.985
	450~500nm	0.997
	500~550nm	0.996
	550~600nm	1.001
	600~650nm	0.996
	650~700nm	0.999
Colored Light (Standard Illuminant A)	R-61	1.107
	O-55	1.023
	Y-48	1.013
	G-54	0.993
	B-46	0.996
	T-44	1.003
Lamps	Fluorescent lamp( F6)	0.989
	Fluorescent lamp (F8)	0.989
	Fluorescent lamp( F10)	0.992
	High pressure sodium lamp (NAV-TS70W SUPER)	0.993
	Mercury fluorescent lamp(HF400X)	0.997
	High pressure mercury lamp(H-400)	0.991
Standard illuminant B		0.987
Standard illuminant C		0.981

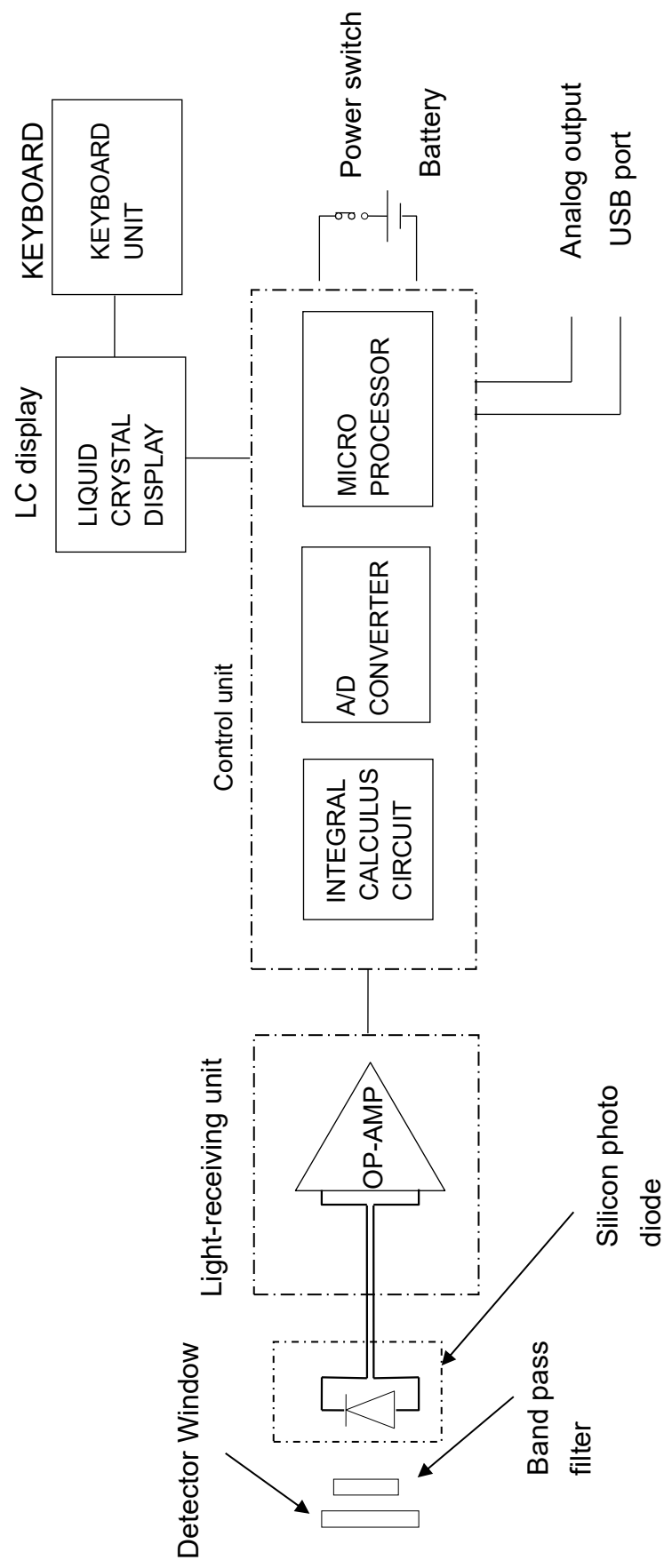
## Memo

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


# BLOCK DIAGRAM

■IM-600

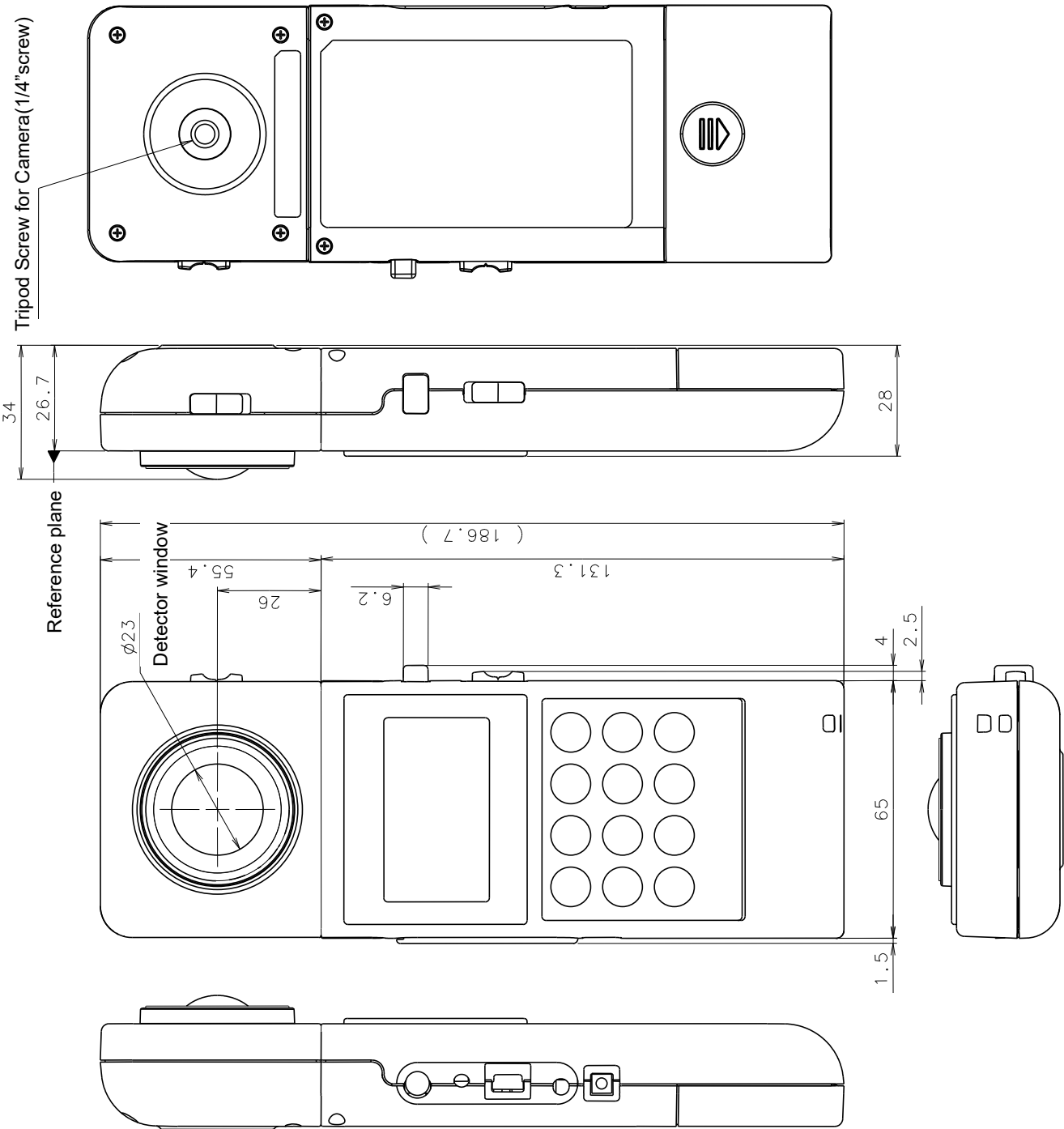




# OUTLINE DIMENSION

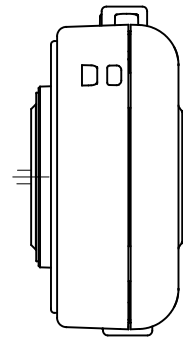
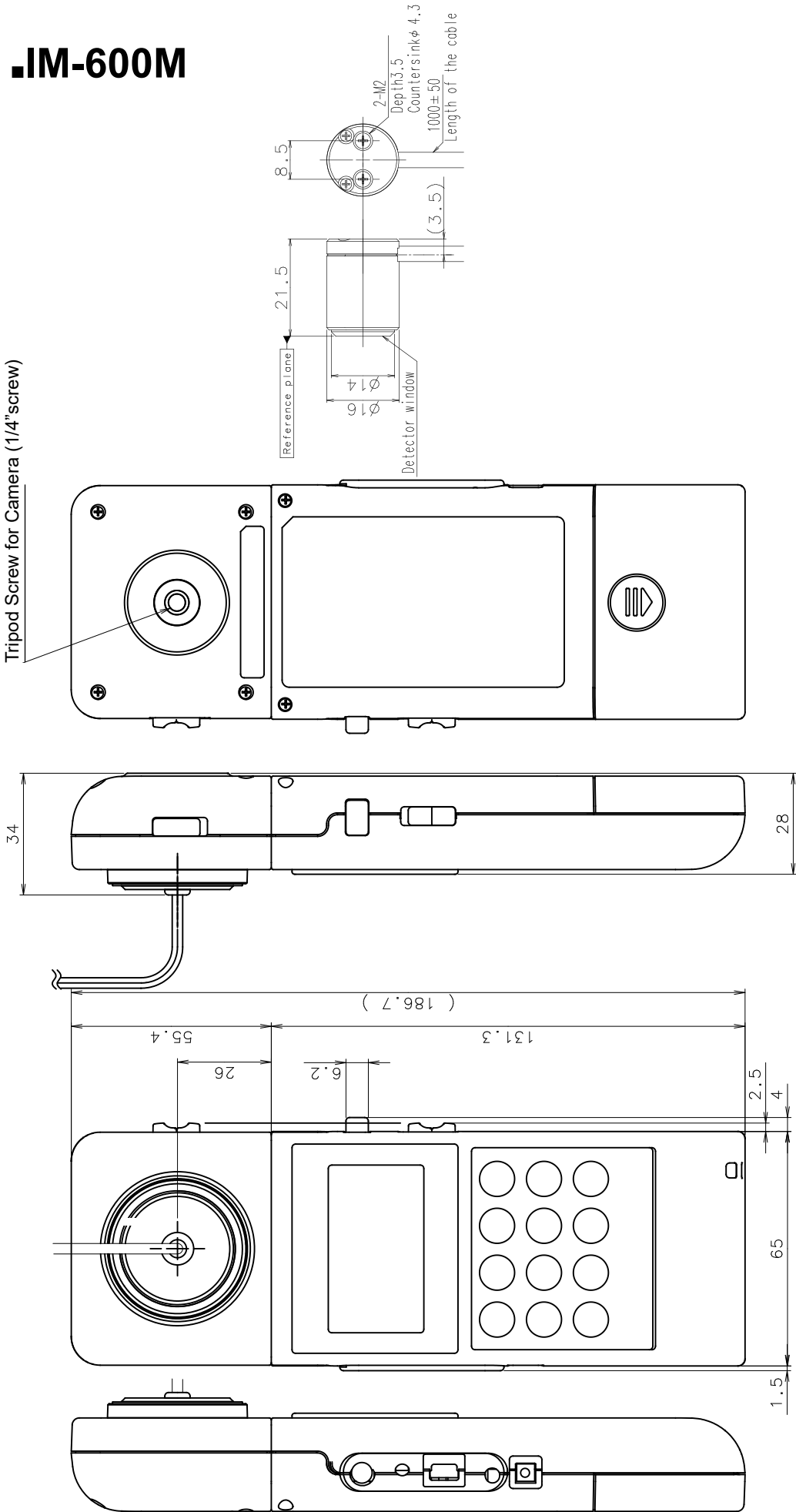
<div>  <p>Request</p> </div>	<p>Use only specified screws when using the tripod screw and screw holes for jig attachment. Do not tighten the screws any more than necessary. Doing so might cause internal breakage.</p>
---------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

## IM-600



# IM-600M

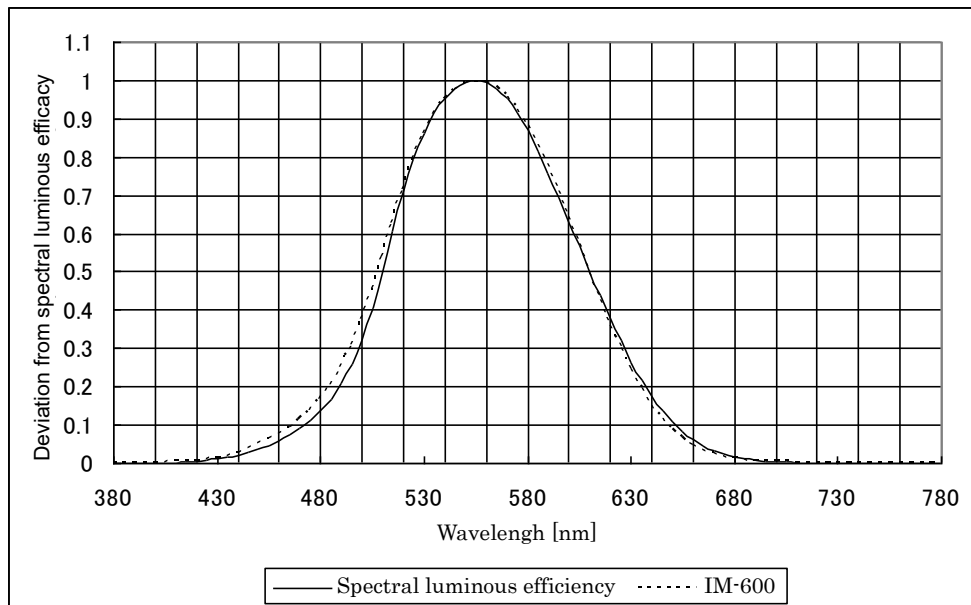
Tripod Screw for Camera (1/4" screw)



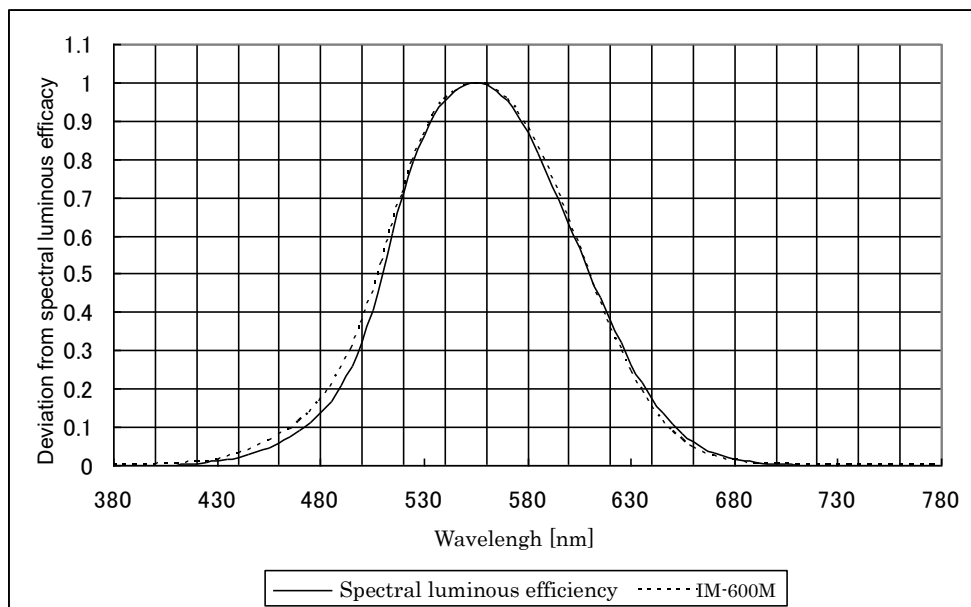
# GRAPH

## Deviation from spectral luminous efficacy

### ■IM-600

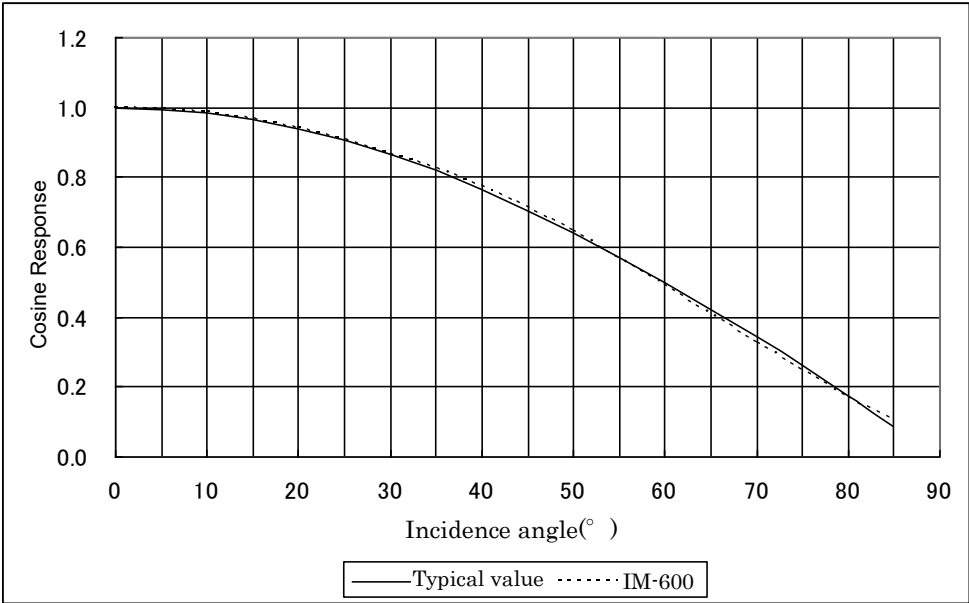


### ■IM-600M

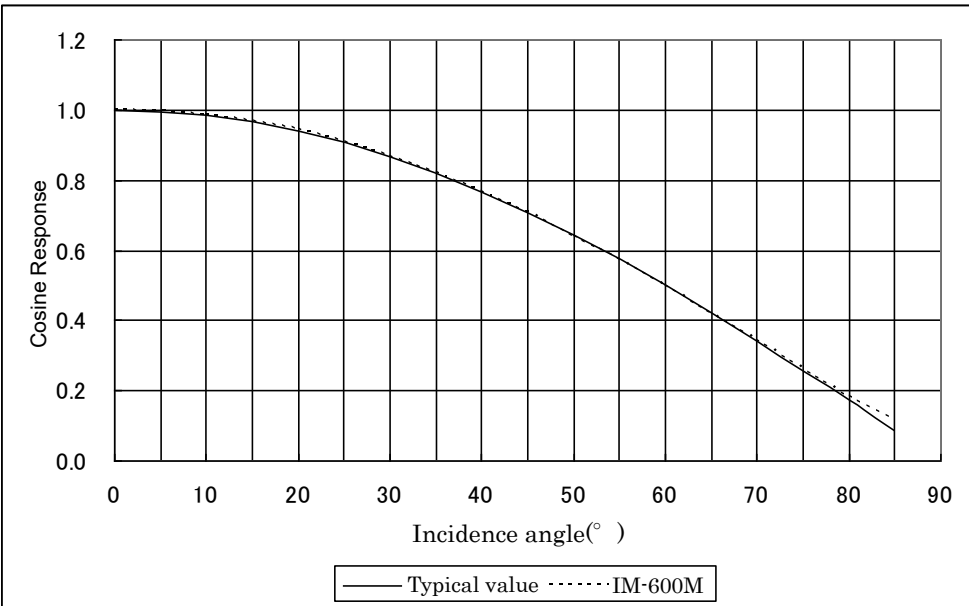


# Cosine Response

## IM-600



## IM-600M







## 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 beneath 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 PERIOD**

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**

The repair parts (\*1) are retained by us for eight years (\*2) after purchase.

This period is the repairable period. However, please contact your dealer or us 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) We 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.

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

- |                        |                                                                              |
|------------------------|------------------------------------------------------------------------------|
| ▪ Product serial No.   | Listed on the ratings 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    | Please let us know in detail as far as possible.                             |

Contact	See the back cover of this Instruction Manual.
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# DIGITAL ILLUMINANCE METER

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## ***IM-600 / IM-600M***

### Contact Information

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DIGITAL ILLUMINANCE METER IM-600/IM-600M INSTRUCTION MANUAL

Publication date: October 2011 1st edition

April 2026 11th edition

Published by: TechnoOptis Co., Ltd.

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