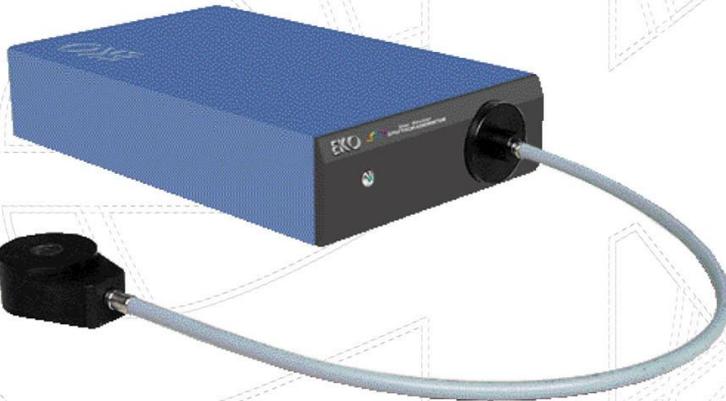


---

## *Solar Simulator Spectroradiometer*

---

### *LS-100*



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Thank you very much for using EKO products.

Before operating this system, you should first thoroughly read this manual.

Keep this manual on hand to read when necessary.

# 1

## Safety precautions

Our products are designed and manufactured in consideration of safety. However, they would invite unexpected accident according to the circumstances of users. You should thoroughly read this manual and operate the system according to the directions.



### Warnings/Cautions

Neglecting this sign will invite serious or fatal accidents.



### Prohibitions

This sign notifies that you must not do it.



### Obligations

This sign notifies that you must do it.



## Warnings

### Installation

Put LS-100 and a PC on the installation base that endures enough load and vibration. The drop of LS-100 or a PC causes the unexpected accidents.



## Cautions

### Power supply

Confirm the input voltage of the AC adaptor of LS-100 is matched to the voltage of mains power supply. Turn on the power of LS-100 after confirming the voltage.

### Instruction Manual

This manual contains instructions for the basic and critical operations of the system. Before operating this system, thoroughly read and understand this manual. Keep this manual at hand so that you can use it anytime.

### Handling precautions

Remove the optical fiber from the LS-100 body when you set up the optical head. Fix the optical fiber at the proper point, and connect the fiber to the LS-100 body. When the optical head is set up with an optical fiber, which is connected with the LS-100 body, the fiber could be damaged due to the twist or bend.

When the optical head is illuminated for long time by the solar simulator etc., the optical head becomes very hot. Do not touch the optical head directly, without using gloves etc. It could get hands burned.

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## 3-1. General description

Solar simulator spectroradiometer LS-100 is developed for the spectral irradiance measurement of the solar simulator, which is mainly used for the evaluation of the photovoltaic cells.

The compact grating spectrometer is integrated in the body to measure the spectral irradiance by using photodiode array. The obtained data is downloaded to PC, and the spectral irradiance is calculated by the attached software. Attached software 1) compares the obtained data with the Reference solar radiation at AM1.5 provided by JIS C 8941, 2) calculate the cumulative spectral irradiance in the specified wavelength, JIS C8912 spectral mismatch, and the deference/ratio comparing to the Reference data.

JIS C 8941-2009 Secondary reference crystalline solar cell

JIS C 8912-2011 Solar simulator for crystalline solar cells and modules

---

## 3-2. Characteristics

### 1. Long Stability

The less aging diffuser, grating spectrometer and diode-array are adopted in LS-100. LS-100 is durable because there is no movable part to change the wavelength. This is accomplished by the adoption of photodiode-array.

### 2. Substantial software functions

LS-100 software automatically determines the optimal shutter opening time for the spectral measurement based on the intensity of the light source. It saves the obtained measured spectral data as the Reference data, and compares it with the other data.

Both "Catalogue View" of the plural spectral data and the "Detailed View" of the single spectral data are available by LS-100 analysis software. The measured data of 1nm or 5nm interval can be saved by the setting of this software. The obtained data can be compared with the standard solar radiation provided by JIS.

### 3-3. Block diagram

Block diagram of solar simulator spectroradiometer LS-100 Hardware is shown below.

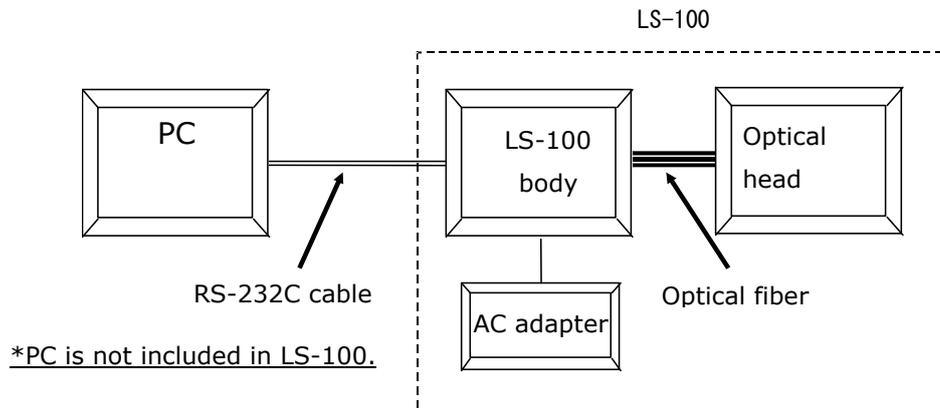


Fig. 3-1. Hardware block diagram

The incident radiation goes into the integrated spectrometer through the optical head. The spectral data is saved in the internal memory at the processing unit.

The data can be downloaded to PC through RS-232C or USB cable, and displayed/saved/converted by the attached software.

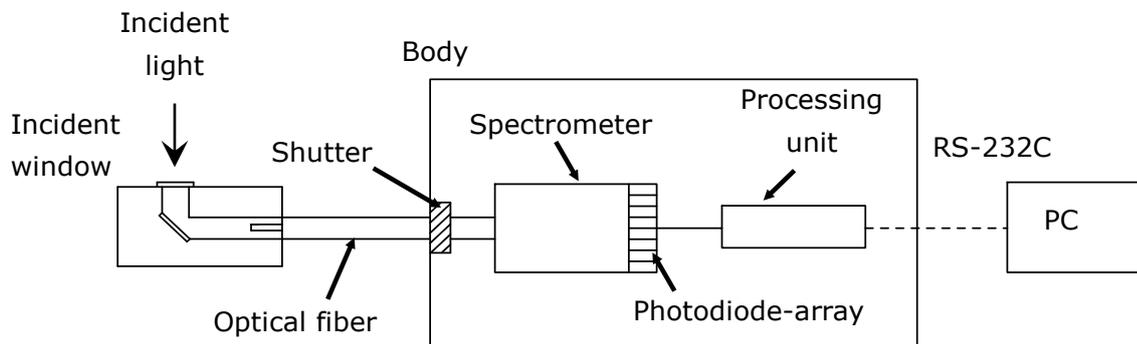


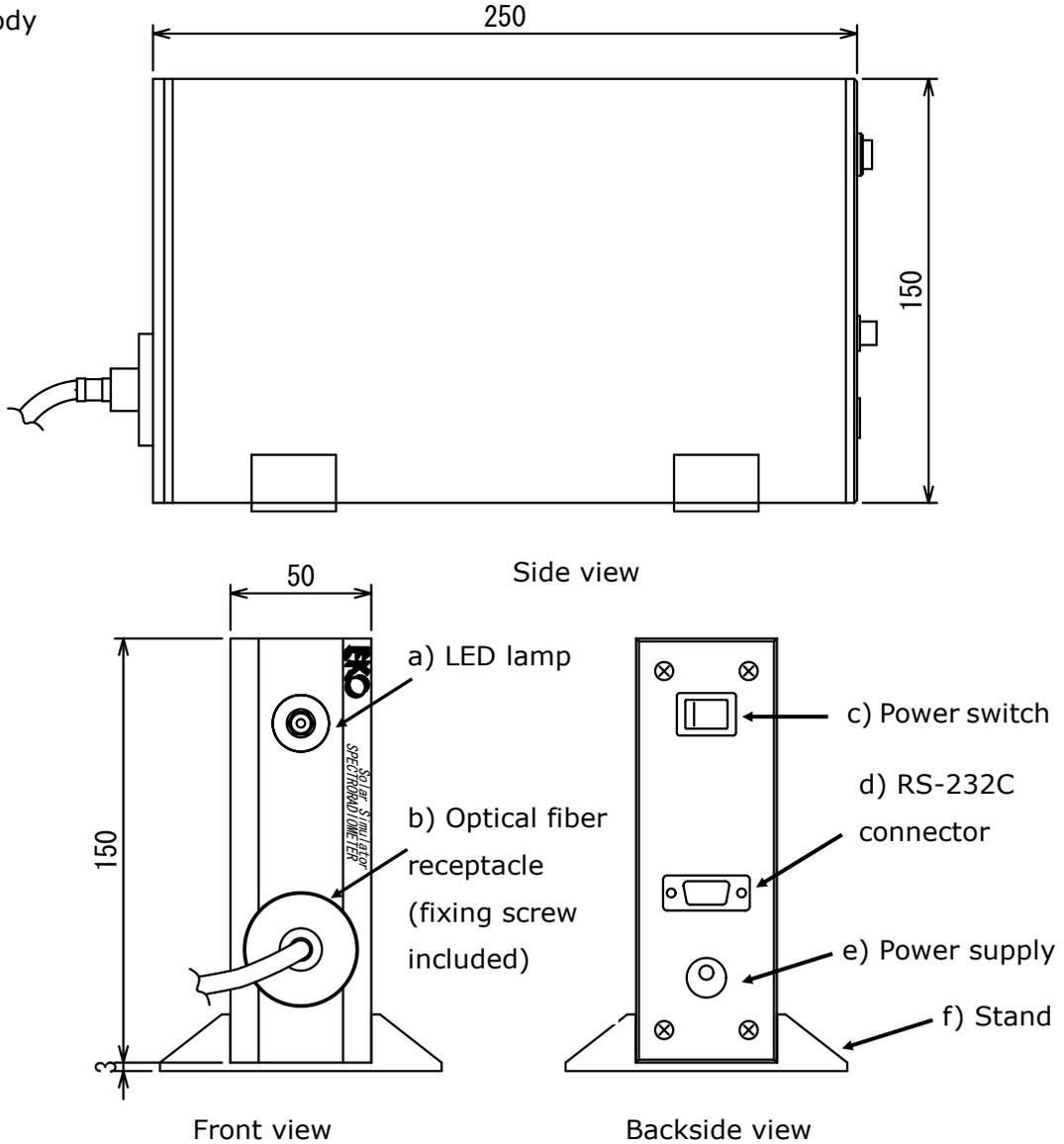
Fig. 3-2. LS-100 structure

# 4

# Descriptions of components

The names and functions of LS-100 components are shown in Fig. 4-1. and Table. 4-1

- Body



\* Vertical installation is possible with the optional stand.

- Optical head

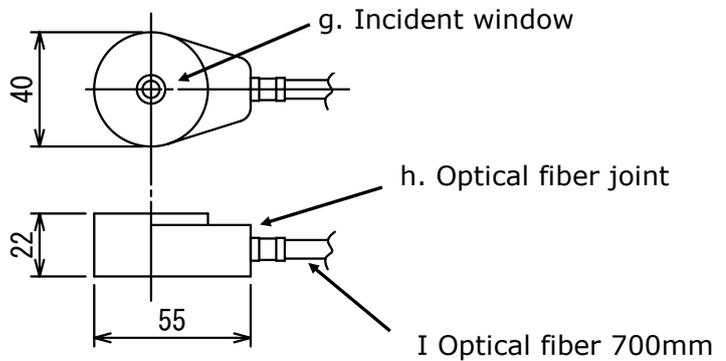


Fig. 4-1. Schematic diagram

Table 4-1. Functions (Body)

Part	Description	Function
a	LED lamp	For the power supply status Blink during the measurement
b	Optical fiber receptacle	Connect the optical fiber with the fixing screw
c	Power switch	Set the switch to the side of "I" to turn on the power Set the switch to the side of "●" to turn off the power
d	RS-232C connecting connector	Connect the RS-232C cable for PC connection
e	Power supply connector	Connect the output plug of the attached AC adapter (Input:AC100-240V, Output:DC12V, 0.8A)
f	Stand	Use when the LS-100 is set vertically. LS-100 can be used horizontally without stand.

Table 4-2. Functions (Optical head)

Part	Description	Function
g	Incident window	Transfer the incident radiation
h	Optical fiber joint	Connect the optical head and optical fiber Cannot be dismantled
i	Optical fiber	Transfer the radiation to the body

**\*Do not bend or twist the optical fiber smaller than 40mm radius. The measurement cannot be performed if the optical fiber is broken.**

## 5-1. Notes

1.

Grating solar simulator spectroradiometer LS-100 perform the spectral measurement of the manufactured light. Remove the block out objects in the range of aperture angle.

2.

Keep away from the water and dust, and set on the stable basement. It could be the cause of failure.

---

## 5-2. Before use

### 1. Install the optical head

Remove the optical fiber from the body.  
Fix the optical head at the measurement point.

### 2. Install the body

The body can be set horizontally and vertically with the stand for the measurement.

---

## 5-3. Connection

### 1. Connect the optical fiber

Connect the optical fiber to the body.  
Fix the optical fiber connector with the fixing screw to connect the optical fiber to the body.



#### **For optical fiber handling**

- 1) Do not bend or twist the optical fiber smaller than 40mm radius.**
- 2) Do not twist the optical fiber.**

### 2. Connect the power supply cable

Connect the DC output cable of the AC adapter cable to the DC5V terminal. Make sure the power supply is AC100V~240V, the frequency is 50Hz/60Hz. Connect the AC adapter to the AC power supply socket.

### 3. Connect the communication cable

Connect the PC COM port and RS-232C port at the backside of the body via RS-232C cable.

---

## 6-1. General description

The software only used for LS-100 Solar Simulator Radiometer performs measurement and analysis. Fig. 6-1 shows the concept of LS-100 Software.

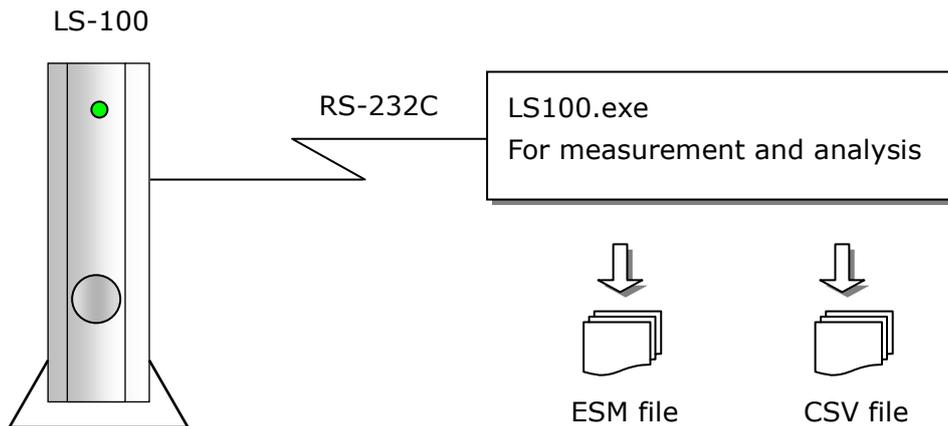


Fig.6-1 Concept of LS-100 software

## 6-2. Installation

1. Click "Setup.exe" in the attached CD-ROM "Solar Simulator Spectroradiometer LS-100 software".
2. Select "Agree a software license" in "License agreement" window.



Fig.6-2 License agreement window

3. Select "LS-100" in "Selection of a package" window.



Fig.6-3 Selection of a package window

4. Select the folder for software installation in "Setup" window. Shortcut to the software can be made on desktop and/or start menu by checking the checkboxes.

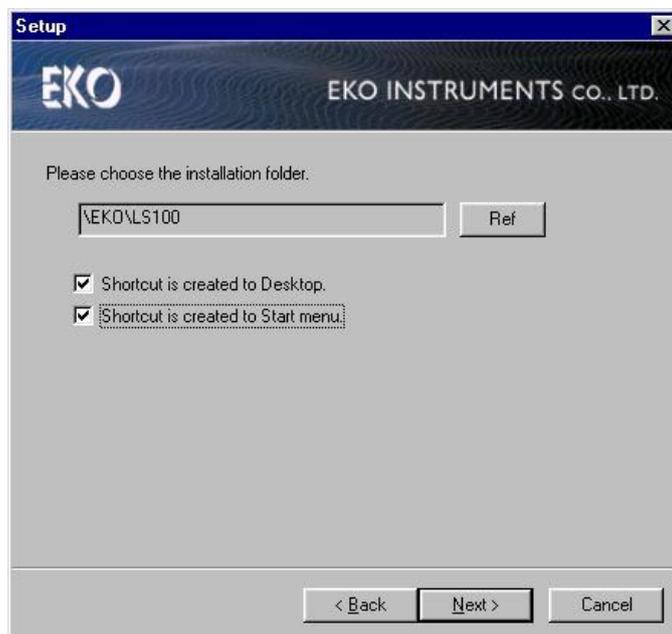


Fig.6-4 Setup window

5. Confirm the installed program and settings, and click "install".



Fig.6-5 Confirmation window

6. Fig.6-6 is displayed when installation is finished. Click "End" to close the window.



Fig.6-6 Install completion window

---

## 6-3. Uninstallation

To uninstall the software, select "Add or Remove Programs (or "Add or Remove Application")" of control panel. Control panel is in "Settings" of "Start" menu. Then, uninstall "LS-100". Shortcut to this software is deleted at the same time.

---

## 6-4. Data file format

The following data file formats are available for LS-100 software.

Table 6-1 File format

Symbol	File type	Binary/ASCII	Wavelength interval
A	ESM file	Binary	According to LS-100 specifications
B	CSV file	ASCII	According to LS-100 specifications
C			1nm or 5 nm interval

### 1. EMS file (Binary data)

ESM file is composed as binary format. The spectral irradiance of wavelength interval, which is according to LS-100 specifications, is saved in EMS file.

### 2. CSV file (ASCII data)

CSV file is composed as ASCII format. The spectral irradiance of wavelength interval, which is according to LS-100 specifications, is saved in CSV file. Furthermore, the spectral irradiance of 1nm or 5nm interval can be saved in CSV file.

CSV file data is easily converted to other formats including Microsoft Excel.

LS100.exe automatically determines the optimal shutter opening time for spectral measurement based on the respective spectral intensity, and saves measured data.

LS100.exe calculates integral value of measured data as well as determines spectral coincidence instantaneously.

---

## 7-1. Start-up

### 1. Start-up

Start "LS100.exe" after checking the connection between LS-100 and PC. Then, Fig.7-1 "Measurement config" window is displayed.

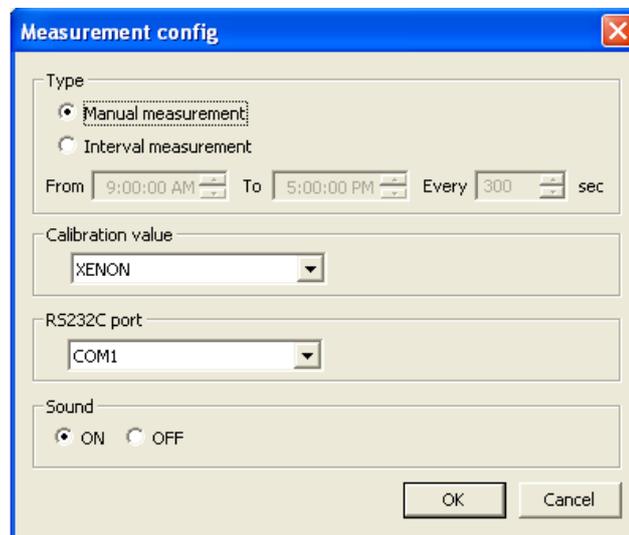


Fig.7-1 Measurement config window

Select "Manual measurement" or "Interval measurement" for "Type".

Set measurement start time and measurement end time for "Interval measurement".

Note) Set the interval measurement time longer than 20 seconds because it approximately takes 15 seconds for LS-100 one time measurement.

"XENON" or "HALOGEN(Optional)" for "Calibration value".

Select PC COM port number, which is selected to LS-100 for "RS232C port".

Select "ON" or "OFF" for "Sound". When "ON" is selected, the sound at the end of measurement is "ON".

To finish Measurement config window, click "OK". Then, LS100.exe setting window will be displayed.

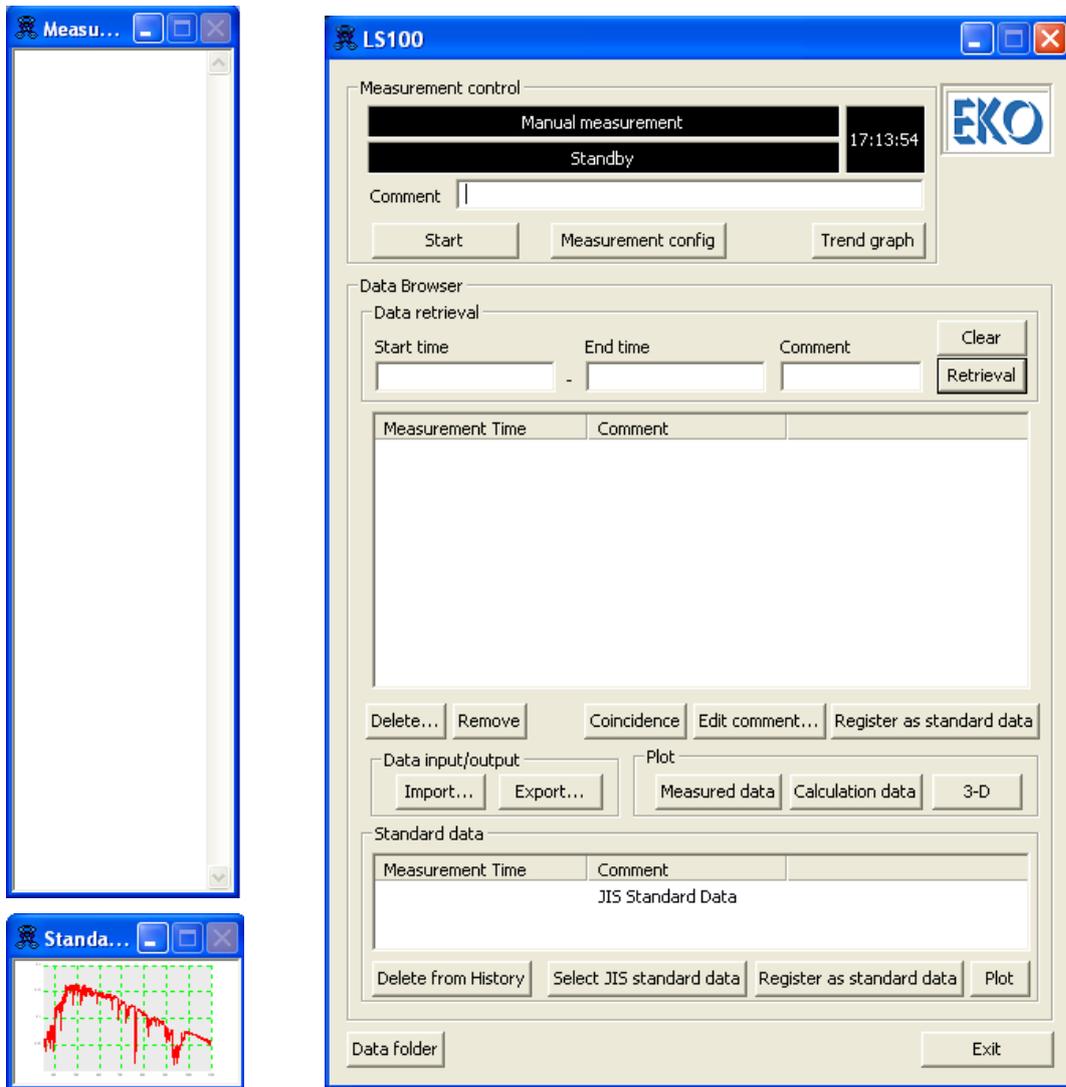


Fig.7-2 LS100.exe setting window

In Fig.7-2, the right window is Main dialogue, upper left window is thumbnail window showing measurement data, and lower left window is thumbnail window showing standard data.

## 2. Before starting measurement

Specify "Saved data folder" before starting measurement. Fig.7-3 "Data folder config" window is shown by clicking "Data folder config" Button at the lower left of main dialogue window of Fig.7-2.

Click "Ref." to specify saved data folder. "Filename ID" is the ID to be input at the top of ESM file name. Default value is "SPC".

After measurement is started, "measurement date" is placed at the end of file name: "Filename ID\_yyyymmdd.esm". Filename ID can be changed in order to identify the files.



Fig.7-3 Data folder config window

---

## 7-2. Measurement control window

Measurement settings shall be input in "measurement control" window of main dialogue.

### 1. Measurement control

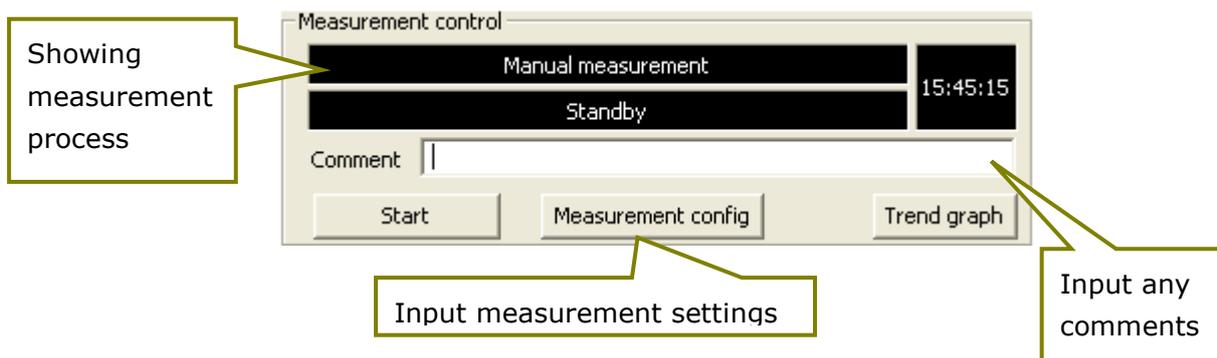


Fig.7-4 Measurement control window

Click "Measurement config" to display Fig. 7-1 "Measurement config".

When "Manual measurement" was selected, "Standby" status become "Measuring" and "Start" status become "Stop" status by clicking "Start" button.

"Dark measuring" means the status of dark current measurement.

Measuring - [500msec]

Fig.7-5 Measuring status window

Dark measuring - [5000msec]

Fig.7-6 Dark measuring status window

To start interval measurement, select "Interval measurement" in "Measurement config", and click "start" button. Then Fig.7-7 window is displayed.

Interval measurement 09:00:00 - 17:00:00, 300 sec interval  
Waiting - Start at 16:00:00

Fig.7-7 Interval measurement stand-by window

In case calibration value is not specified in "Measurement config" window, Fig.7-8 will be displayed.

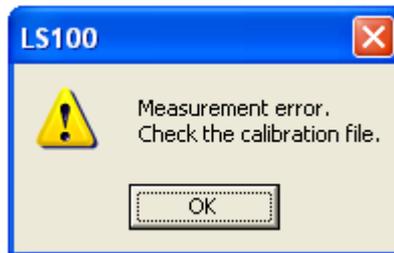


Fig.7-8 Measurement error window

To add any comments to the measurement data, input comments in "Comment" section before starting the measurement.

To display the latest measured data, click "start" button when "Trend graph" window is opened.

## 7-3. Measurement display window

Data retrieval, graph display, file output etc. can be operated on “Measured data display” window of main dialogue. Addition to that, outline graph is displayed on Data thumbnail window according to the data displayed in Data view list.

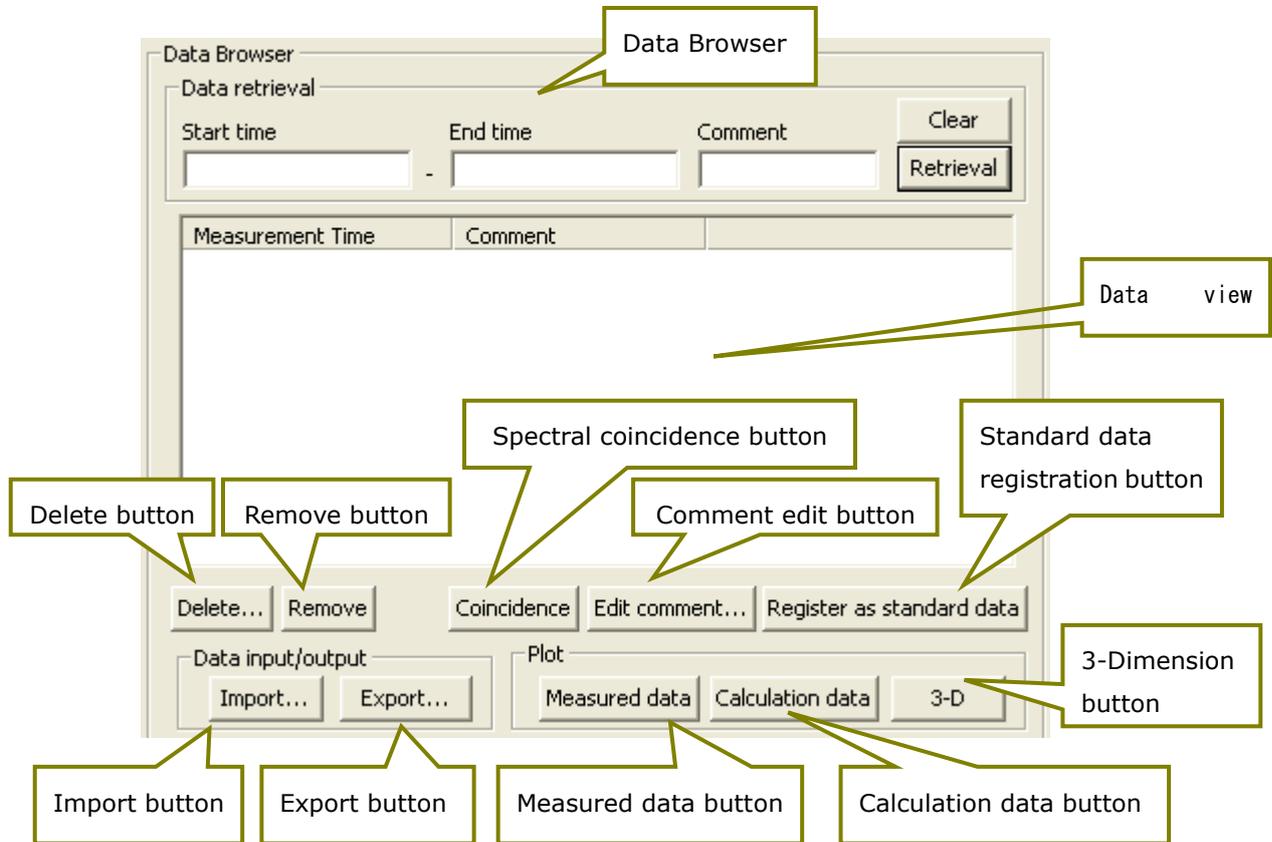


Fig.7-9 Measured data display window

### 1. Retrieve the displayed data

To retrieve the displayed data, input start time and end time. Time can be input in “YYYY/MM/DD HH:MM:SS”, “YYYY/MM/DD” or “YYYY/MM”. The data can be retrieved based on the comments also.

To retrieve all measured data in ESM file, which meet “Ref” and “Filename ID” conditions, click “Retrieval” button when no data are input in “Start time”, “End time” and “Comment”.

To delete date and comments, click “Clear” button.

To keep input date and comments for next measurement, finish the program with the date and comments left.

Note) PC operation could become slow when large numbers of data are listed on Data view list.

## 2. Delete the data

To delete the data, specify the data to be deleted, and click "Delete" button. Then, Fig.7-10 "Delete confirmation" window is displayed, and the data are completely deleted by clicking "Yes".

To select consecutive plural data, drag the data with pushing "Shift" key. To select any plural data, specify plural data with pushing "Ctrl" button.

To select all displayed data, push "Ctrl + A".

Note) Please note the deleted data can not be displayed again on "Data view list" although the data in ESM file are still saved at the specified folder in PC.

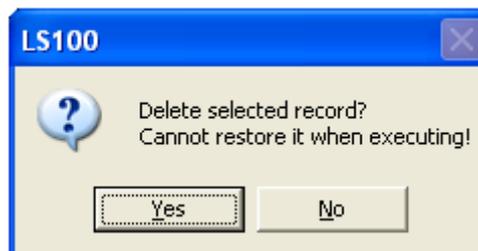


Fig.7-10 Delete confirmation window

## 3. Exclude the data

To exclude the data from Data view list for data analyzing, select the data to be excluded, and click "Remove" button.

To select consecutive plural data, drag the data with pushing "Shift" key. To select any plural data, specify plural data with pushing "Ctrl" button.

To select all displayed data, push "Ctrl + A".

Note) To display the excluded data on Data view list again, retrieve the data again.

## 4. Spectral coincidence

Select "JIS C8912" or "JIS C8933" to display spectral coincidence. JIS C8912 is for the solar simulator of crystalline solar cell evaluation, and JIS C8933 is for the solar simulator of amorphous solar cell evaluation.

"JIS C8912" is applied for spectral solar irradiance in the wavelength range between 400-110nm.

"JIS C8933" is applied for spectral solar irradiance in the wavelength range between 350-750nm.



Fig.7-11 Spectral coincidence type window

A window titled "Spectral coincidence(JIS C8912)" with a close button (X) in the top right corner. It contains a table with four columns: "Wavelength", "Standard solar radiation[%]", "Measured data[%]", and "Spectral coincidence[%]". Below the table is a "Grade" section with four buttons: "A ( 0.75 - 1.25 )", "B ( 0.6 - 1.4 )", "C ( 0.4 - 2.0 )", and "Out of Grade". A "Cancel" button is located at the bottom right.

Wavelength	Standard solar radiation[%]	Measured data[%]	Spectral coincidence[%]
400 - 500	18.4	16.5	89.7
500 - 600	19.9	16.9	84.7
600 - 700	18.4	16.4	89.2
700 - 800	14.9	15.4	103.4
800 - 900	12.5	16.2	129.9
900 - 1100	15.9	18.6	116.8
400 - 1100	100.0	100.0	

Grade

A ( 0.75 - 1.25 )   **B ( 0.6 - 1.4 )**   C ( 0.4 - 2.0 )   Out of Grade

Cancel

Fig.7-12 JIS C8912 Spectral coincidence window

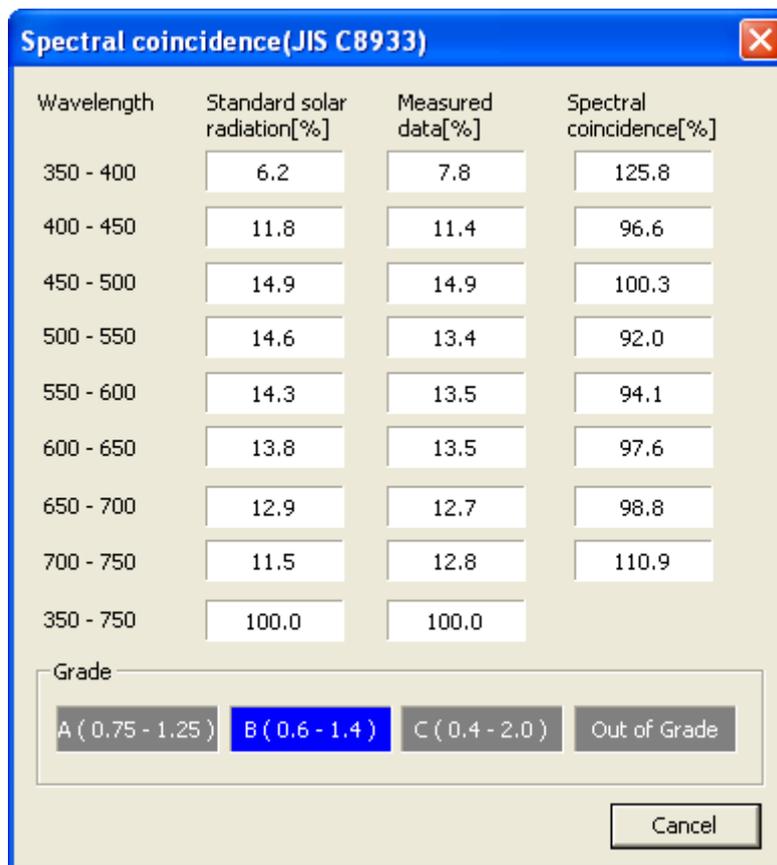


Fig.7-13 JIS C8933 Spectral coincidence window

Spectral coincidence of each wavelength is calculated according to the following formula.

$$M_i = \frac{\int E_s(\lambda) d\lambda}{\int E_o(\lambda) d\lambda}$$

$M_i$  : Spectral coincidence

$\lambda$  : Wavelength(nm)

$E_o(\lambda)$  : Spectral irradiance of reference solar irradiance at the wavelength  $\lambda$

$E_s(\lambda)$  : Spectral irradiance of solar simulator irradiance at the wavelength  $\lambda$

## 5. Edit the comments

To add any comments for measured data, click "Edit comment" button and input the comments in Fig.7-14 "Edit comment" window. Those comments are reflected in Data view list and CSV file.

When plural data are selected, comment is reflected in all selected measured data.

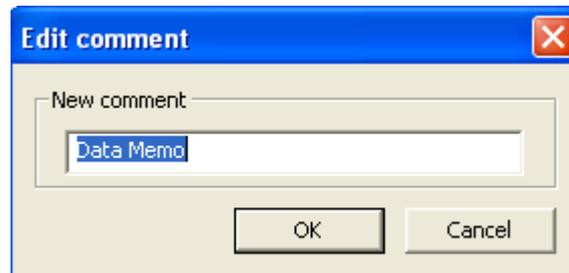


Fig.7-14 Edit comment window

## 6. Register the standard data

To register the standard data, select one of measured data, and click "Register as standard data" button. The recorded data is added to "Standard data view list", as well as the standard data graph is displayed in "Standard data thumbnail" window.

The standard data default value is set as JIS C8941reference solar irradiance.

## 7. Display the data graph

To display data graph window, select the data and click "Measured data" button in "Plot", or double click the data. Or, double click the measured data at "display Data thumbnail window" next to the main dialogue.

(1) When one of measured data is selected, Fig.7-15 is displayed.

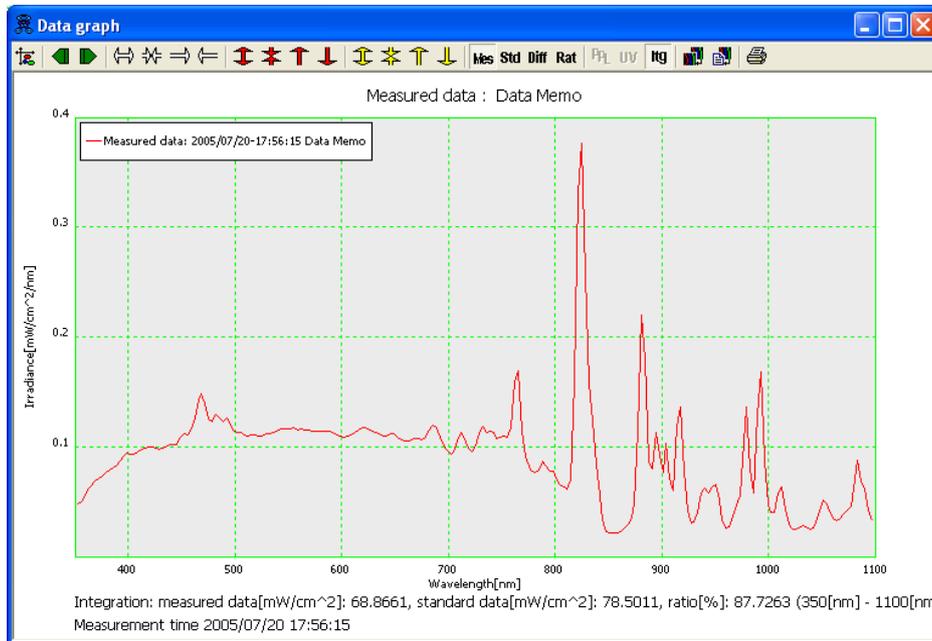


Fig.7-15 Data graph display window



Fig.7-16 Tool bar

Graph settings, graph zoom in/out and data display on/off can be edited with tool bar on the top of data graph display.

The following functions are available at Fig.7-16 tool bar.

From the left;

- "Graph configuration"
- "Previous data"
- "Next data"
- "Zoom-in Wavelength"
- "Zoom-out Wavelength"
- "Shift right - Wavelength"
- "Shift left - Wavelength"
- "Zoom-in Irradiance"
- "Zoom-out Irradiance"
- "Shift up Irradiance"
- "Shift down Irradiance"
- "Zoom-in Ratio data"
- "Zoom-out Ratio data"

- "Shift up Ratio data"
- "Shift down Ratio data"
- "Plot measured data"
- "Plot standard data"
- "Plot difference data"
- "Plot ratio data"
- "Show integration"
- "Copy to clipboard"
- "Save as bitmap file" and "Print".

For X axis setting, minimum value is 350nm and maximum value is 1100nm.

For Y axis setting, make "Auto" button on, then set minimum and maximum value. When making "Auto" button off, any scale can be set in the text box at the right of minimum and maximum value.

"mW/cm<sup>2</sup>/nm" or "photon/cm<sup>2</sup>/s/nm" is available for the unit of Spectral irradiance. Spectral photon irradiance (photon/cm<sup>2</sup>/s/nm) is also available.

"Difference data" function is used to display the difference between standard data and measured data.

"Ratio data" function is used to set the scale of Ratio data between standard data and measured data. This function is valid when "Ratio data" button is on.

"Interval integration" function is available when "Integration" button in Display menu. In this time, any wavelength range can be set. Integrated value is displayed at the bottom of the graph, and the unit is mW/cm<sup>2</sup>.

"Measured data" is displayed in red, "Standard data" is in Green, "Difference data" is in violet, "Ratio data" is in blue. To change the color, click "Color" part of each item.

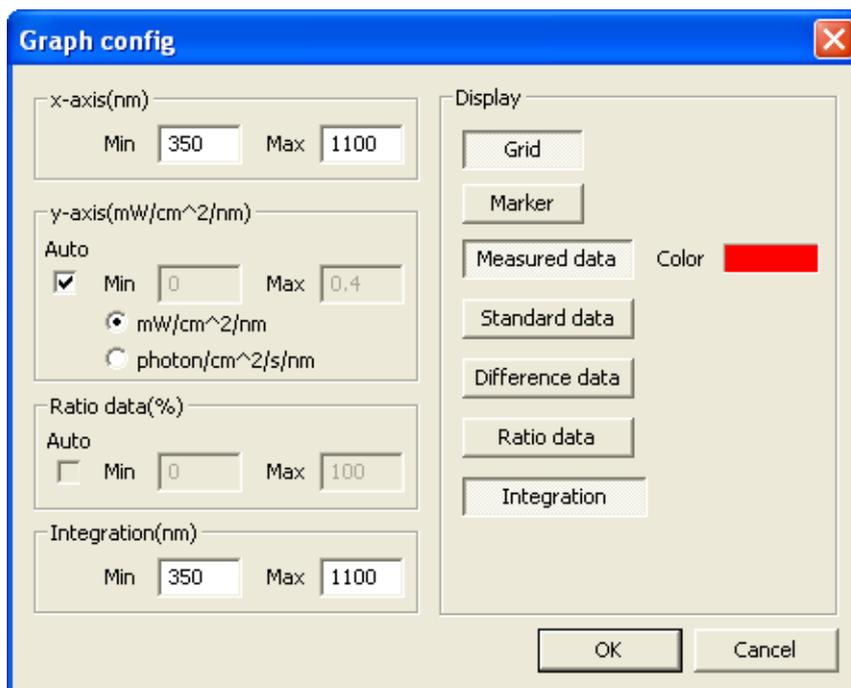


Fig.7-17 Graph config window (when only one data is selected)

“Measured data display” at tool bar is generally on. To display the graph of standard data, click “Standard data display”.

To display the graph showing the difference and ratio, click “Difference data display” or “Ratio data display” respectively.

To display integrated value in the specified wavelength in “Data graph”, click “Interval integration display”. Then, it is displayed at the bottom of the graph.

In this time, the ratio between standard data and measured data is also displayed.

## (2) When plural measured data are selected

When select plural data from Data view list, the graph is overwrite and displayed. The data can be simultaneously selected up to 10.

Different from the case of only one data is selected, graph can be displayed in Measured data, Difference data or Ratio data.

Not to display any graph, make the button of this data off in Fig.7-19 Graph config window.

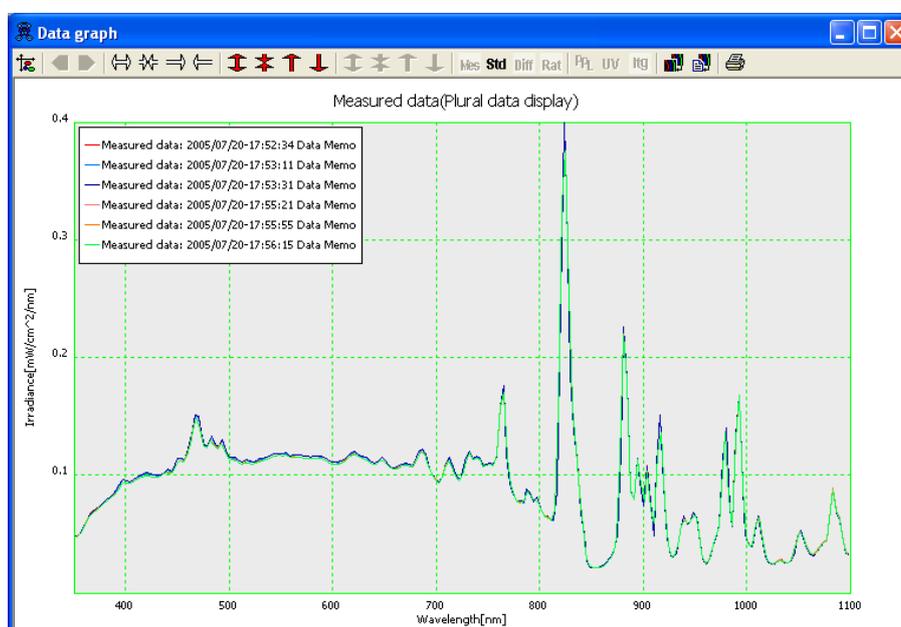


Fig.7-18 Data graph display window (when plural data are selected)

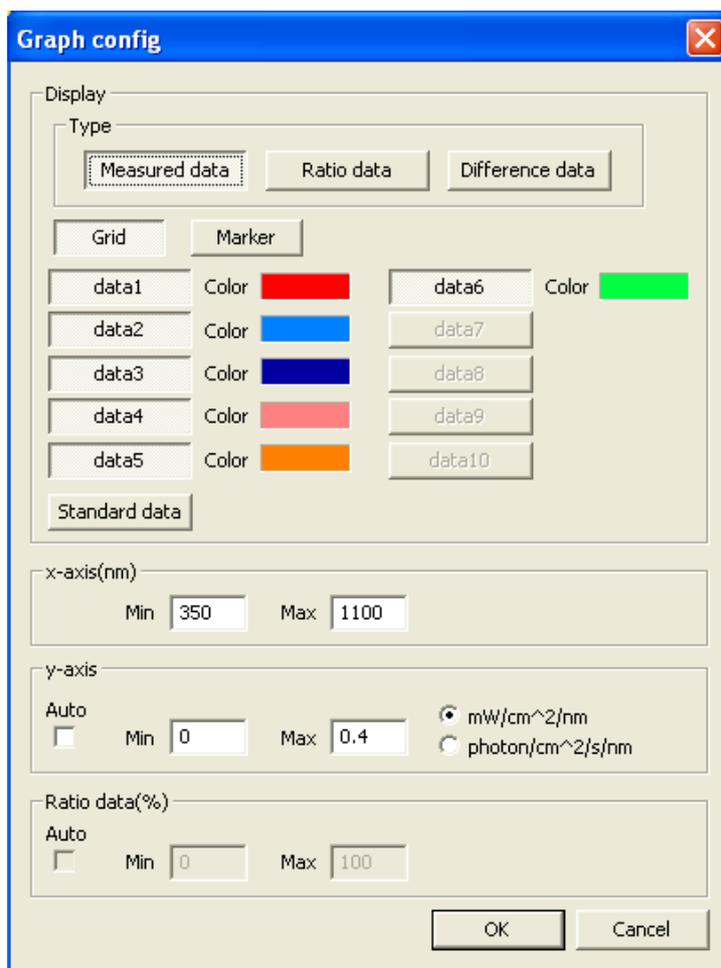


Fig.7-19 Graph config window (when plural data are selected)

## 8. Display Calculation data graph

To display Fig.7-20 calculation data window, select plural data from Data view list, and click "Calculation data" button.

Calculation data graph shows integration value in Y axis, and time in X axis. So, integrated value of measured data is shown in time series.

To display the measurement time and integrated value of partial data, drag corresponding data. Integration interval is displayed under calculation data graph.

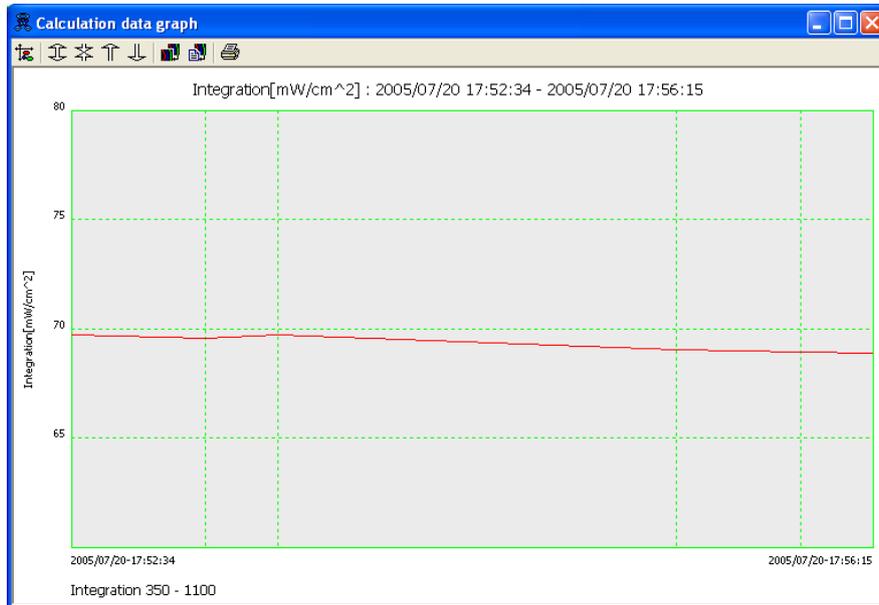


Fig.7-20 Calculation data graph window

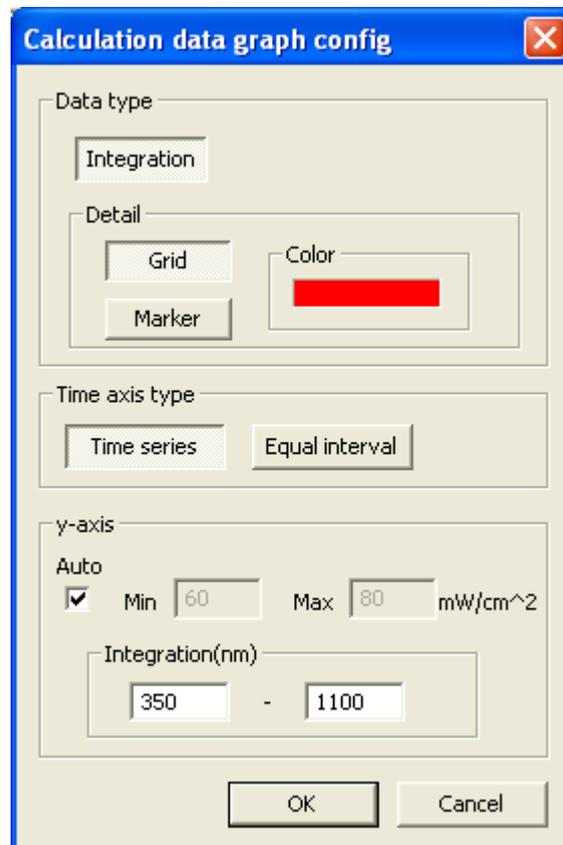


Fig.7-21 Calculation data graph config window

"Time series" and "Equal interval" are available for Time axis type.

## 9. 3-D Graph display

To display 3-D graph, click "3-D" button in Fig.7-2 LS100.exe setting window.

In 3-D graph, Y axis is for Spectral Irradiance, X axis for Wavelength, and Z axis for time (see Fig.7-22 and Fig.7-23).

Argument  $\theta$  shows plane angle of Wavelength (X axis) and Time (Z axis), argument  $\phi$  shows plane angle of Time (Z axis) and Irradiance (Y axis).

To change the viewpoint, drag the graph.

As well as measured data graph display, graph settings and editing is available for calculation data graph.

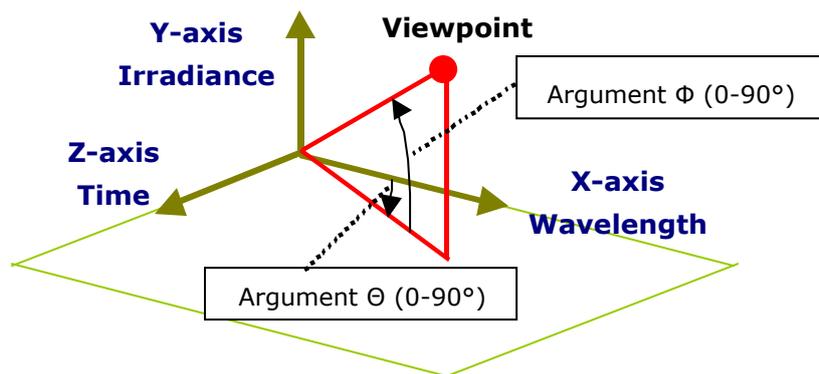


Fig.7-22 3-D data outline

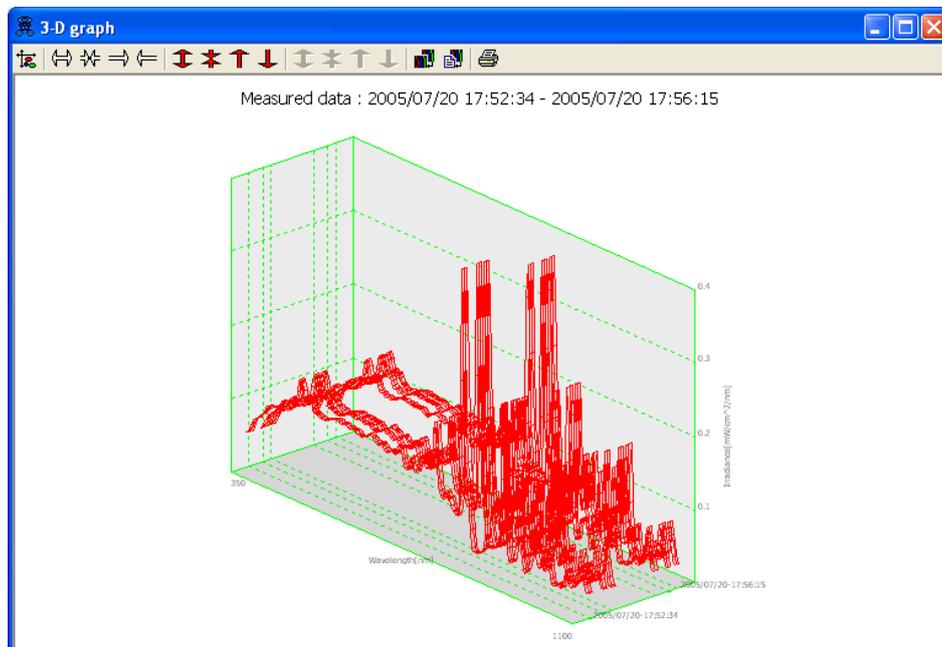


Fig.7-23 3-D graph display window

Argument  $\Theta$  (0-90°) and Argument  $\Phi$  (0-90°) can be input by user in "Viewpoint". The range is from 0 to 90°.

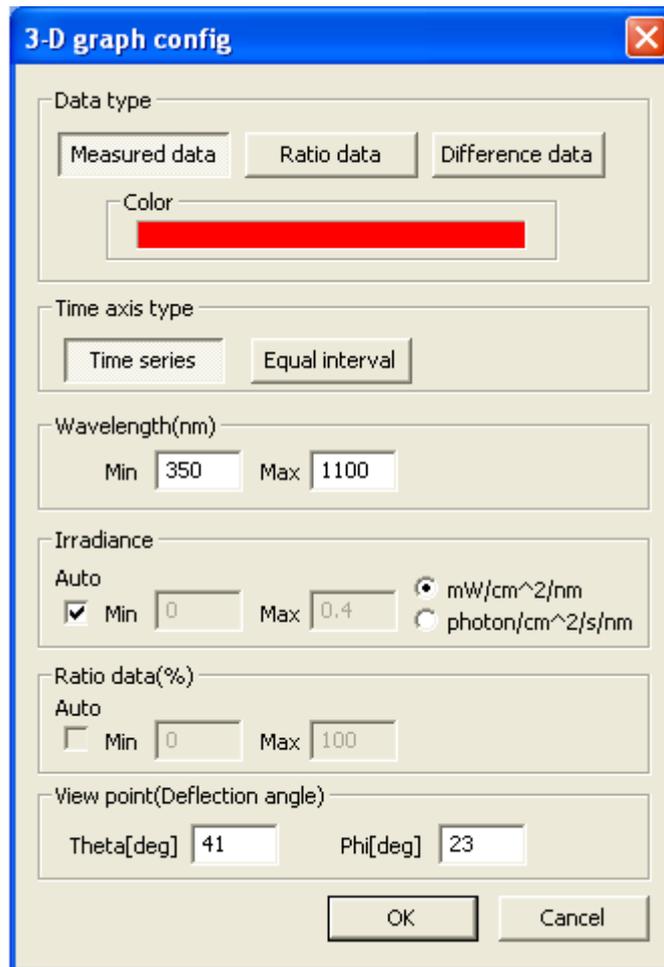


Fig.7-24 3-D graph setting window

## 10. Import

"Import" function is used to import RAD file (Binary data) from the old version software LS100.exe.

Imported data is exchanged to ESM file (Binary data). Imported file is named as Filename ID\_yyyymmdd.esm, and saved at the folder, which is specified in Fig.7-3 Data folder config window.

To overwrite the same time record, click "Overwrite same time record" check box.

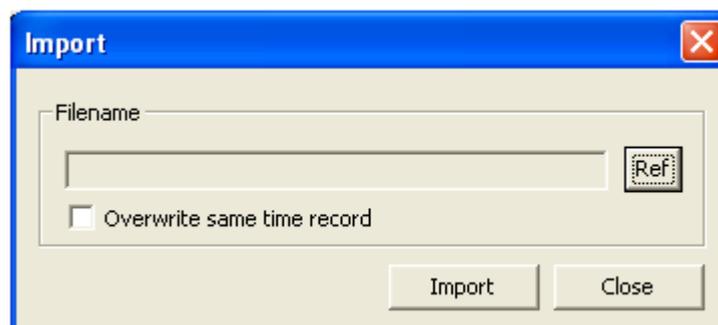


Fig.7-25 Import window

## 11. Export

“Export” function is used to exchange measured data in CSV file. To display Fig.7-26 Export window, select one or plural data from Data view list, and click “Export” button.

For Integration, specify integration range of measured data. Default value is minimum 350 and maximum 1100. The value smaller than 350 and bigger than 1100 can not be set.

Note) Maximum number of data, which can be selected for export, is 256.

The screenshot shows the 'Export' dialog box with the following settings:

- Type:** Output spectral data and calculation data
- Unit:** mW/cm<sup>2</sup>/nm
- Integration[nm]:** Min: 350, Max: 1100
- Wavelength:** Original, 1nm step, 5nm step; Wavelength range[nm]: Min: 350, Max: 1100
- Output filename:** (empty field)

Fig.7-26 Export window

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## 7-4. Standard data display

Standard data view list in Fig.7-27 Standard data display window shows measured data recorded as standard data.

Graph display and History function is also available. Graph is displayed on Standard data thumbnail window according to measured data, which is recorded as standard data.

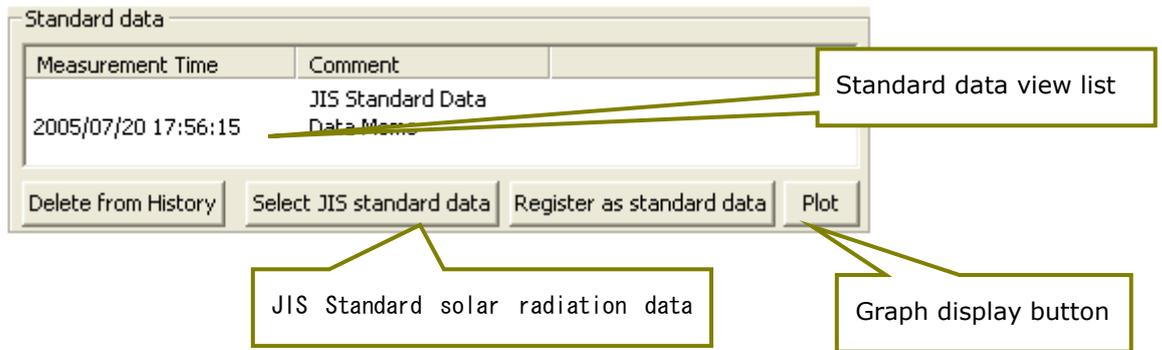


Fig.7-27 Standard data display window

### 1. Register Standard data

To update standard data, select the corresponding data from Standard data view list. The latest standard data shall be moved to the top of Standard data view list.

To register JIS C 8941 reference solar irradiance, click "Select JIS standard data" button. Default standard data is Reference solar irradiance.

### 2. Display graph

To display the graph of standard data, select one of standard data from the list, and click "Plot" button.

### 3. Delete Standard data record

To delete data, specify the data to be deleted, and click "Delete from History" button. This function deletes the data from the History, but the data itself is not deleted from the memory.

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## 7-5. Others

### 1. Version

To check software version, click on the tab on the top of Main dialogue.

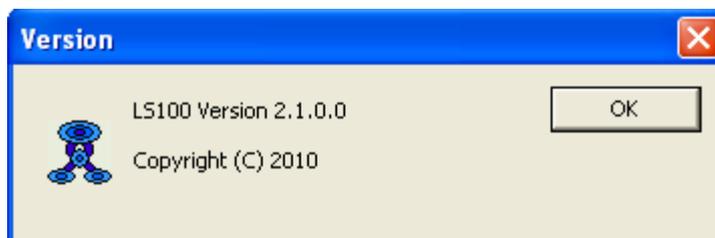


Fig.7-28 Software version window

### 2. EKO web site

To display EKO home page, click "EKO" logo on the right up at the main dialogue with the PC connected Internet.

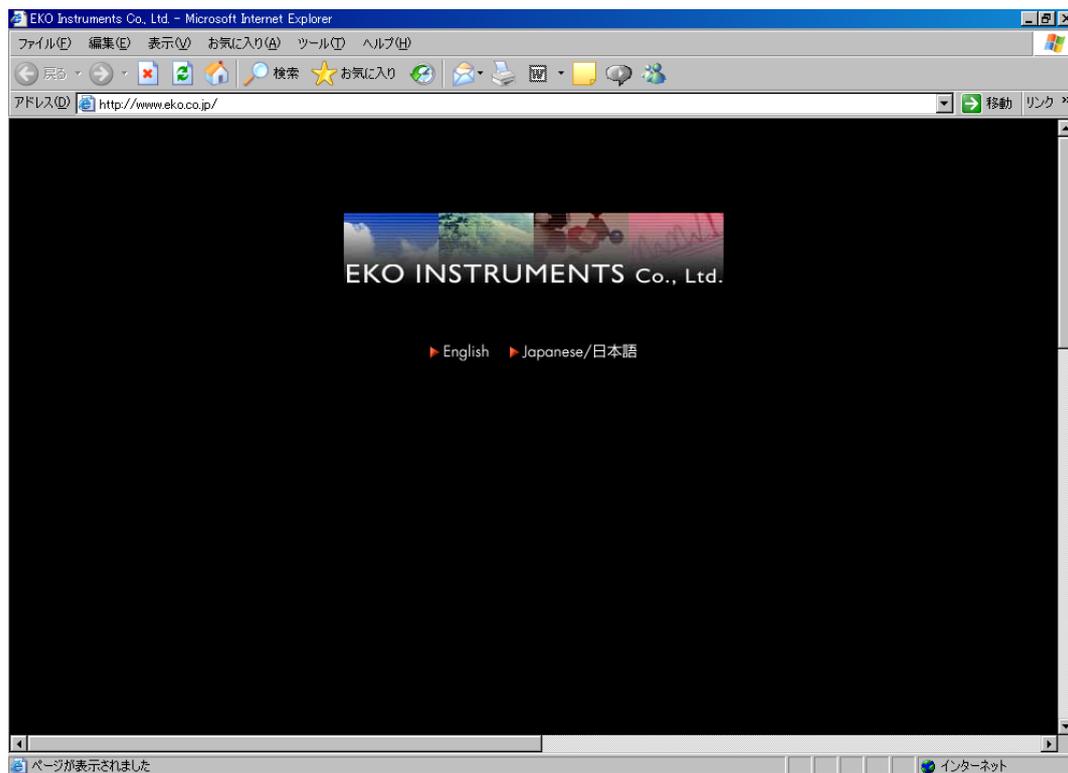


Fig.7-29 EKO home page

## Periodic maintenance

### 1. Optical head

In order to Keep the sensitivity at the satisfactory level, keep the incident window clean by wiping with the soft cloth at the every measurement. Hard cloth could damage the surface of the diffuser.

### 2. Optical fiber

\*Do not bend or twist the optical fiber smaller than 40mm radius. The measurement can't be performed if the optical fiber is broken.

### 3 Restart of the PC

When the performance of the PC is not satisfactory, restart it.

Read through the following description before contact to EKO Instruments

Troubles	Measures
-LS-100 operation does not work.	<p>Communication between the PC and LS-100 body could have problems.</p> <ol style="list-style-type: none"> <li>1) Check if the communication cable between the PC and the LS-100 body is correctly connector. And check if the optical fiber is correctly connected to the LS-100 body and the optical head.</li> <li>2) Check if the power of the PC and the LS-100 body are on.</li> <li>3) Check if the PC COM port is correctly connected.</li> <li>4) Reboot the software to make sure the connection between the PC and the LS-100 body, and check if the PC operation works for the LS-100 operation.</li> </ol>
-Abnormal measurement results - Bad S/N measurement results	<ol style="list-style-type: none"> <li>1) Check if the diffuser is clean.</li> <li>2) Optical fiber could be damaged. In this case, please call to the "12. After-sales service".</li> </ol>
-Abnormal software work	Reboot the PC.

## 10-1. Specifications

Hardware	
Body, Optical head	LS-100
Wavelength range	350 ~ 1,100nm (Xenon lamp) 350 ~ 1,050nm (Light source other than xenon lamp)
Wavelength interval	3.3nm
Wavelength resolution	10nm
Wavelength accuracy	Less than 3nm
Aperture angle (FOV)	30°
Stray light	Less than 0.15%
Repeatability	±1% (Wavelength range : 330nm ~ 830nm, Spectral irradiance : more than 1.20E-3 mW/cm <sup>2</sup> /nm)
Output unit	mW/cm <sup>2</sup> /nm
Measurement time	Approximately 15sec
Power supply	DC12V, 0.8A (with the attached adapter of AC100V)
Size	W50 x D250 x H150 (mm)
Weight	Approximately 1.8kg
Communication	RS-232C (between the LS-100 body and the PC)
Working conditions	Temperature : 0~+40°C, Humidity : 0~90%RH No condensation
Software	
Program	Measurement software : LS100.exe Analysis software : LSMan.exe
OS	Microsoft Windows 98Second Edition/2000/XP
Interface	RS-232C
Functions	Measurement software : LS100.exe; Perform the measurement (automatic control of the shutter opening time) Display the data (including the ref. data and the JIS reference solar radiation) Save the data (RAD binary format, CSV format) Analysis software : LSMan.exe; Display the data (Catalogue view/Detailed view) Save the data (CSV format) Analyze the data (Spectral mismatch)
PC (Recommendation)	
CPU	Pentium 500MHz or higher
Memory	256MB or more
Hard disc	10GB or more
Screen	1024 x 768 or more
Others	CD-ROM drive, RS232C port

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## 10-2. Standard accessories

Description	Q'ty	Remarks
LS-100 body	1	
Optical head	1	Including the optical fiber(700mm)
AC adapter	1	
Stand	2	
RS-232C cable	1	1.5m
Floppy disc	1	Including the software (LS100.exe and LSMan.exe)
Instruction manual	1	

Option ListDescription	Q'ty	Remarks
Calibration factor with Halogen lamp	1	

\* Please check all parts are not damaged at the beginning.

## 11 After-sales service

Please read through "10. Trouble shooting" before contacting us.

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### Contact Address

If you have any questions-feel free to call, fax or e-mail to EKO or your local distributor.

EKO Instruments Co., Ltd.

Head Office 1-21-8, Hatagaya, Shibuya-ku, Tokyo 151-0072 JAPAN

Tel:(03)3469-6713

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**Homepage :** <http://www.eko.co.jp/>

**E-mail :** [Info@eko.co.jp](mailto:Info@eko.co.jp)

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### Warranty

The warranty period is 2 years after the invoice date. Please contact us for more detailed information.

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# Instruction manual

Please inform us when any questions and wrong descriptions on this manual are found.  
Please note the contents of this manual could be changed without notice.

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## Renewal Record

December 2003	First edition	Ver.1.00
February 2010	Revision of part	Ver.1.10
February 2011	Revision of part	Ver.1.20
May 2011	Revision of part	Ver.2
June 2012	Head Office contact information change	Ver.2



<http://www.eko.co.jp/>