Data Management Software
CA-S25w
Ver. 1.1

Instruction Manual

KONICA MINOLTA

⚠ Safety Precautions

Before using the software, be sure to read this instruction manual and manuals for the instrument and PC for ensuring correct and safe operation.

Formal designations of application software used in this manual

(Designation in this manual)	(Formal designation)
Windows, Windows XP	Microsoft® Windows® XP Professional Operating System
Windows, Windows 7	Microsoft® Windows® 7 Professional Operating System
Windows, Windows 8	Microsoft® Windows® 8 Pro Operating System
Excel	Microsoft® Excel®
Word	Microsof® Word®

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Notes on this manual

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- The contents of this manual are subject to change without notice.
- Every effort has been made to ensure the accuracy of the contents of this manual. However, should you have any questions or comments, or find an error or missing section, please contact your local sales office.
- Konica Minolta accepts no responsibility for consequences resulting from failure to follow the instructions outlined in this manual, the condition above notwithstanding.

Introduction

CA-S25w is data management software that allows connection of the 2D Color Analyzer CA-2500 (or CA-2000) to a PC and graphic representation of the measured data on the PC.
This installation guide assumes that the reader has a basic familiarity with the Windows operating system.

Notes on Instruction Manual

- The Instruction Manual is also installed in PDF form with a shortcut in the start menu during the software installation.
  To read the manual, go to Start Menu ® All programs → KONICA MINOLTA → Data Management Software CA-S25w → Manual PDF file.
- The Instruction Manual of 2D Color Analyzer CA-2500 Series is also included on the installation CD-ROM.
- You will need Adobe Reader® from Adobe Corporation. The latest Adobe Reader® can be downloaded for free from the Adobe website. Also, it is possible to use the Adobe Reader® installer included on the installation CD-ROM.
  (Example) When the CD-ROM is in E drive E:\Adobe Reader\ENG
- To access this instruction manual when using the software, click "Help" on the menu bar and select "Software Manual" from the dropdown menu.

Software License Provisions

The software license provisions are contained in the Software License Agreement that will appear online during installation of this software. The software cannot be installed unless you agree to accept the terms and conditions of this Agreement.

Notes on Use

- This software is an application running on the Windows XP or Windows 7 or Windows 8 operating system. Please be noted that any OS is not included in this software package.
- Make sure either of the operating systems listed above has been installed on the PC before installing this software.
- When inserting the CD-ROM/DVD-ROM into the CD-ROM/DVD-ROM drive, note the correct orientation of the disc. Insert it gently.
- Keep the CD-ROM/DVD-ROM clean and free from scratches. If the recorded surface becomes dirty or the label surface is scratched, a read error may result.
- Avoid exposing the CD-ROM/DVD-ROM to rapid temperature changes and condensation.
- Avoid leaving it in locations where it may be exposed to high temperatures from direct sunlight or heaters.
- Do not drop the CD-ROM/DVD-ROM or subject it to strong impact.
- Keep the CD-ROM/DVD-ROM away from water, alcohol, paint thinners, and other such substances.
- Remove the CD-ROM/DVD-ROM from the CD-ROM/DVD-ROM drive while the computer is turned on.

Notes on Storage

- After using the CD-ROM/DVD-ROM, return it to its case and store in a safe place.
- Avoid leaving the CD-ROM/DVD-ROM in locations where it may be exposed to high temperatures from direct sunlight or heaters.
- The CD-ROM/DVD-ROM should not be kept in areas of high humidity.

☆ Every effort has been made to ensure the accurate operation of this software. However, should you have any questions or comments, please contact a KONICA MINOLTA -authorized service facility.

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A.General

B.Operation guide

C.Others

A

General

1. System Configuration

1.1 System Requirements

OS

Windows XP Professional SP3
Windows XP Professional x64 Edition SP2
Windows 7 Professional 32 bit (x86)
Windows 7 Professional 64 bit (x64)
Windows 8 Pro 32 bit (x86), Windows 8 Pro 64 bit (x64)
(English, Japanese, or Chinese (Simplified) version of the above OS)
The PC must meet the system requirements specified by the applicable OS or listed below, whichever is higher.

CPU

Equivalent to Pentium 4, 2.8 GHz or better

Memory

1024 MB or more

Hard disk drive

At least 80 MB of available disk space is required on the system drive (drive where the OS is installed).
To install the calibration data, the following disk space is required for each lens:
• For a standard lens: approximately 540 MB
• For a wide angle lens: approximately 470 MB
• For a telephoto lens: approximately 1.3 GB.
To save measurement data on the hard disk, you need to reserve the following additional space on the hard disk:
• For example, approximately 110 MB is required to save 10 pieces of measurement data with 980 × 980 resolution.
• About 1 MB is required for configuration files such as the spot setting file and measurement condition file.

Display

Display hardware capable of displaying 1280 × 768 pixels / 65,536 colors (High Color: 16-bit color) or better

Other

CD-ROM drive Required for installation 1 DVD-ROM drive Required for installation of calibration data.
* In place of the above two drives, you can use a single drive that is capable of reading both CD-R and DVD-R media.

USB port (for connection to the instrument)

1.2 Compatible Instruments

Instrument

CA-2000, CA-2500

1.3 Language

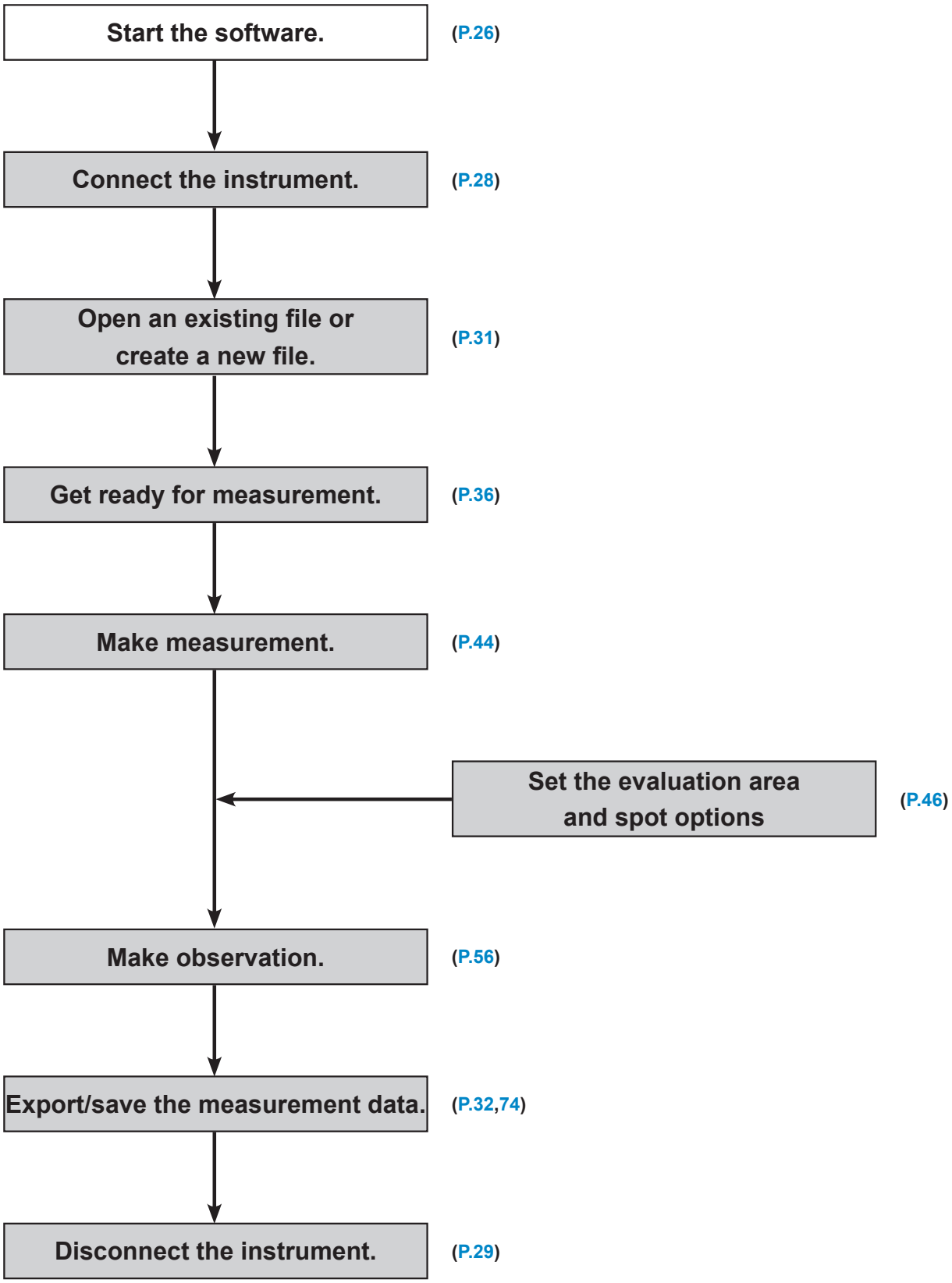
Display language

English, Japanese, Chinese (simplified font)
(Select one during installation)

2. Major Functions

Instrument control functions	Measurement, Synchronous Measurement, Acquisition of Measurement Data, Measurement Condition (Exposure) Setting
Measurement flow	Normal Measurement, Spot Measurement
Number of measurement points	980×980
Color space mode	XYZ, Lvxy, Lvu'v', T⊿ uv, T⊿ uv (JIS), Dominant Wavelength, Excitation Purity, Ev
Display	Pseudo color, RGB image, chromaticity diagram, spot, section view, color shift (3D diagram, histogram, multi-screen available only when CA-S20w is used)
Data management	Document (measurement data) files are loaded/saved in a specific format (with an extension of .pca). Graphic representation settings can be saved. Files in other specific formats (spot setting files, user calibration coefficient files, and measurement condition files) can be loaded/saved. Data files created with older versions (CA-S20w Ver. 1.3 and Ver. 2.3 or later) can also be loaded. Files can be managed in respective folders.

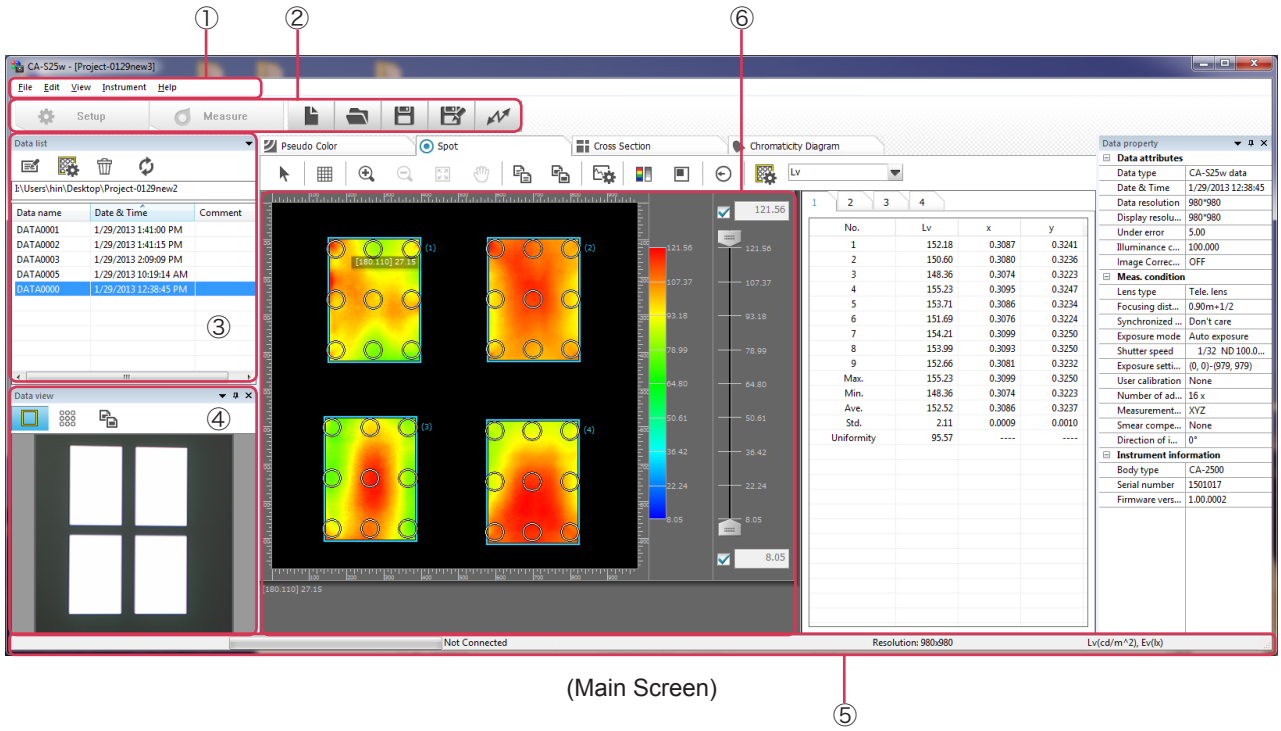
3. Operation Flow



4. Main Screen Layout

4.1 Main Screen Layout

The main (observation) screen layout is as shown below:



(Main Screen)

① Menu bar (see 4.2)

The menu bar consists of several menu items.

② Tool bar (see 4.3)

The tool bar contains icons representing common functions.

③ Data list window

Shows the list of measurement data. Data selected from the list can be managed/observed.

④ Data view window

Shows an RGB image of the data selected from the data list. This window allows you to check the image and the display range of the observation screen.

⑤ Status bar (see 4.4)

⑥ Observation screen

4.2 Menu bar

The menu bar is on the top of the screen, as in the case of other applications running on Windows. The following lists items in the menu bar and shows the number of the page on which each item is described.

Menu	Function	
File (F)		
New (N)	Use to create a new project (See II Detailed Guide 2.5)	Ctrl+N
Open (O)...	Use to open an existing project (See II Detailed Guide 2.4)	Ctrl+O
Close (C)	Use to close the project.	
Save (S)	Use to overwrite and save the project (See II Detailed Guide 2.5.2) Inoperative when no file is open.	Ctrl+S
Save as (A)...	Use to save the project with a new name (See II Detailed Guide 2.5.2) Inoperative when no file is open.	
Import (I)...	Use to import a file created with CA-S20w (See II Detailed Guide 8.3)	
Start screen (T)...	Use to go to the start screen (See II Detailed Guide 2.4)	
Recent Project	Use to list recent files.	
Exit (X)	Use to quit the application.	
Edit (E)		
Data output (A)...	Use to make output settings for copying/pasting numerical data or exporting them in text format (See II Detailed Guide 8.4)	
Options (O)...	Use to set the reference folder path and the unit of brightness (See II Detailed Guide 1.2)	
View(V)		
☑ Data properties (P)	Use to select Show or Hide (See II Detailed Guide 4.3)	
☑ Data view (I)	Use to select Show or Hide (See II Detailed Guide 4.2)	
☑ Data list(L)	Use to select Show or Hide (See II Detailed Guide 4.1)	
☑ Toolbar (T)	Use to select Show or Hide (See 4.3)	
☑ Status bar (S)	Use to select Show or Hide (See 4.4)	
Instrument (I)		
Connect (C)...	Use to connect to the instrument (See II Detailed Guide 2.1) Inoperative when the instrument is in connected state.	F5
Disconnect (D)	Use to disconnect from the instrument.(See II Detailed Guide 2.2) Inoperative when the instrument is in disconnected state.	Shift+F5
Measurement setup (S)...	Use to make setting for measurement (See II Detailed Guide 5.1) * Inoperative when no file is open or the instrument is in disconnected state.	F2
Measure (M)...	Use to start the measurement (See II Detailed Guide 5.2) * Inoperative when no file is open or the instrument is in disconnected state.	F4
User calibration (U)...	Use to create the user calibration data (See II Detailed Guide 8.6)	
Instrument information (I)...	Use to view information on the instrument. * Inoperative when the instrument is in disconnected state.	
Help (H)		
About (A)...	Use to view the software version (See II Detailed Guide 8.1)	
Software Manual (S)...	Use to go to the CA-S25w instruction manual.	
Hardware manual (H)...	Use to go to the CA-2500 operation manual.	

4.3 Tool bar

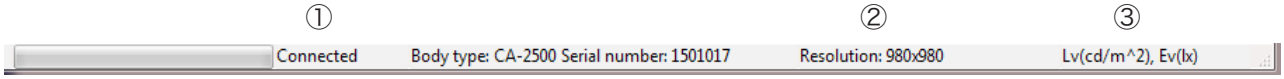
The tool bar contains icons representing common functions of this software. Just clicking an icon allows you to perform the corresponding command.

Putting the mouse pointer on an icon will show the description of the function corresponding to that icon.

①**Setup**	Opens the "Measurement setup" screen.
②**Measure**	Make a measurement.
③**New**	Creates a new project.
④**Opens**	Opens an existing project.
⑤**Save**	Saves the project file.
⑥**Save As**	Saves the project file with a new name.
⑦**Connect·Disconnect**	Use to select Connect or Disconnect.

4.4 Status bar

Shows the status of this software.



①**Connection status**	Shows Connected or Disconnected. In connected state, the model name and serial No. of the instrument are indicated.
②**Resolution**	Show the display resolution of the current data.
③**System of unit**	Shows the unit of brightness.

B

Operation guide

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□Let's try to use the system

I Quick guide

This guide shows a typical operation flow and provides basic description of each step in the flow.
(It is assumed here that software CA-S25w and the USB driver for CA-2500/CA-2000 have already been installed in the PC.)

[Operation flow]

1. Making measurement — Make measurement to gain data.

↓

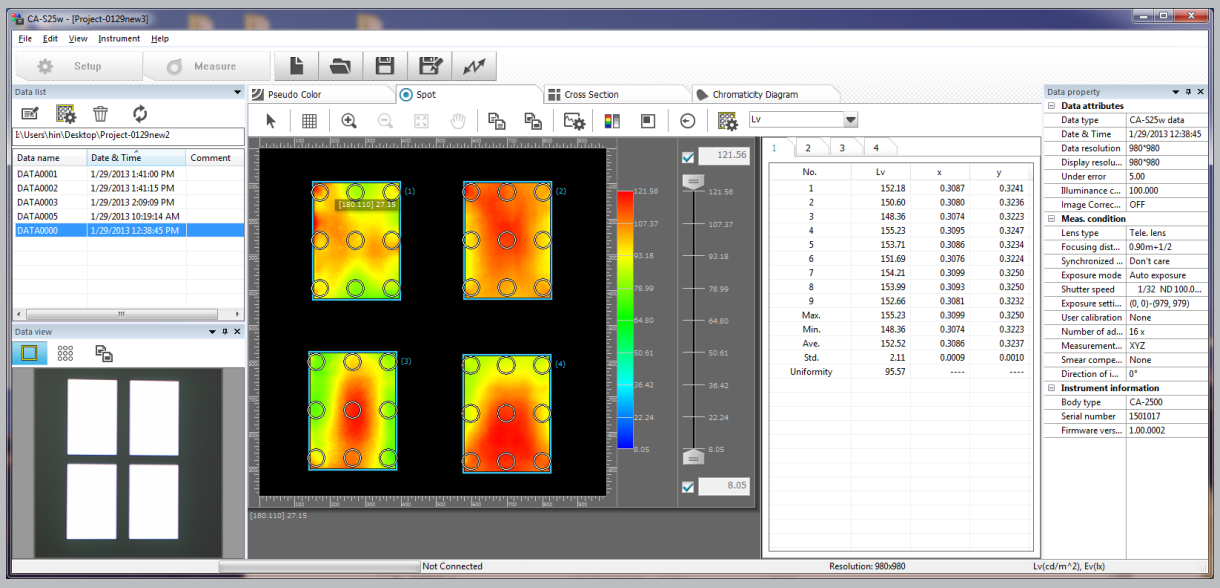
2. Observing the image in pseudo color — Check and observe the data image in pseudo color.

↓

3. Obtaining the spot value and observing the section views — Check the spot value and observe the section views.

↓

4. Exporting measurement data to Excel — Export measurement data to Excel and analyze or document the data, as appropriate.



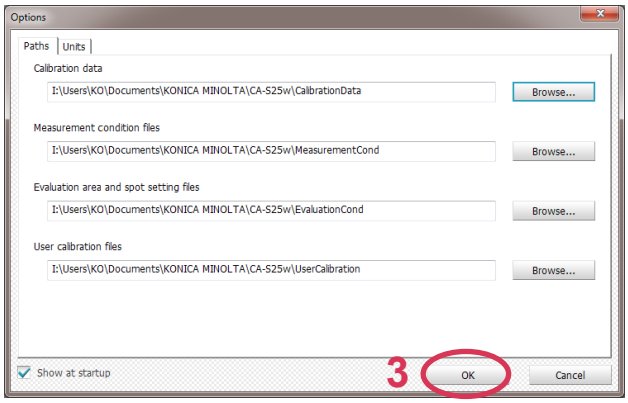
1. Making measurement

① Connection

1 **Power on the instrument and start up CA-S25w.**

The "Options" dialog will appear.

*(See II Detailed Guide 1.2)



2 **Use a USB cable to connect instrument CA-2500 (or CA-2000) to the PC in which CA-S25w has been installed.**

3 **Click [OK] button.**

The "Connect" dialog will appear when the instrument is connected properly.

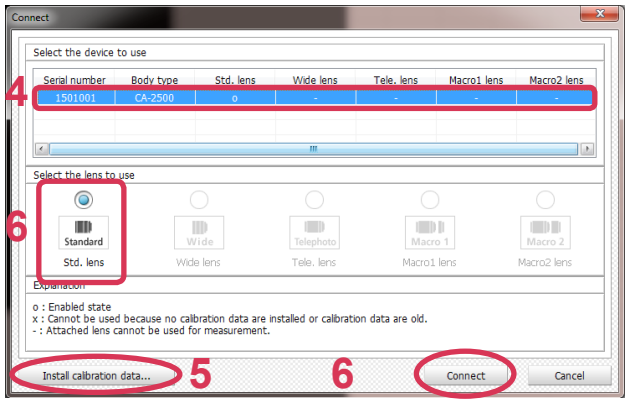
*(See II Detailed Guide 2.1)

4 **If multiple instruments have been connected, select one you wish to use by clicking its serial No.**

5 **If the lens of the instrument you wish to use is marked with " △ ", insert an appropriate calibration data DVD corresponding to your instrument serial number into the DVD drive and click [Install calibration data...] button.**

The installation will take place automatically.

* See the CA-S25w installation guide for details on how to install the calibration data.

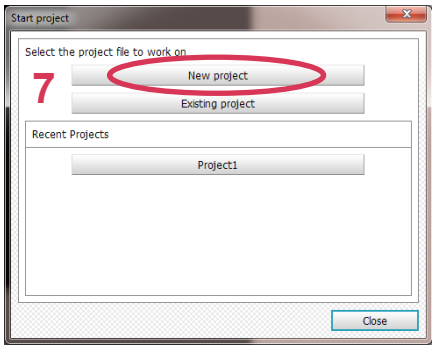


6 **Select the same lens type as one installed on the instrument; then click [Connect] button.**

If the "Instrument information" dialog appears, close it simply.

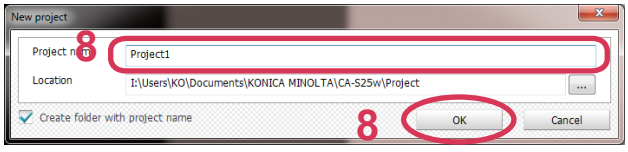
The "Start project" dialog will appear.

7 **Click [New project] button.**



8 **Enter a project name and click [OK] button.**

The main screen will appear.

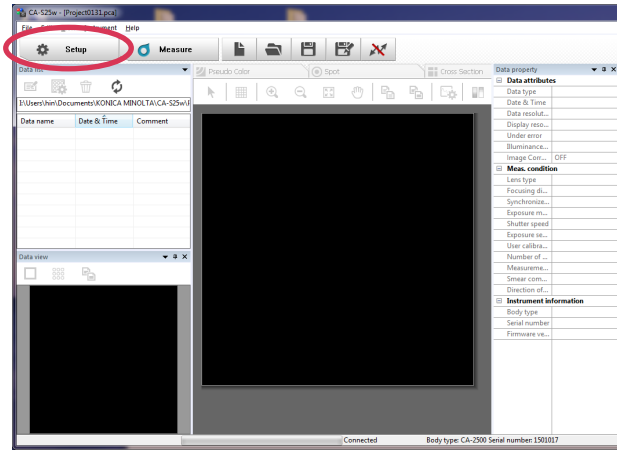


Results from the above steps : Connection complete
New project created

② Positioning and focusing

1 **Click** Setup **[Setup] button at the upper left of the main screen.**

The "Measurement setup" screen will open.

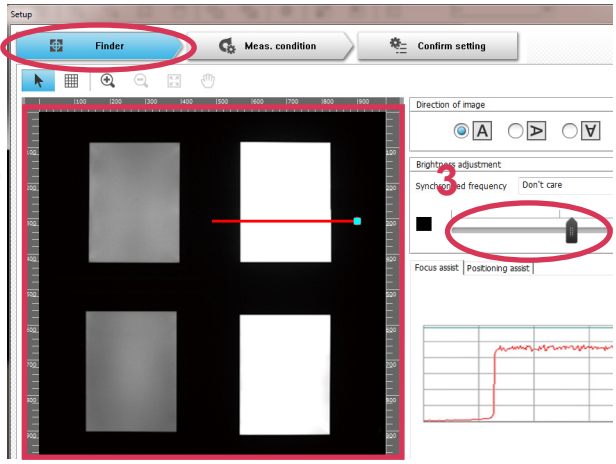


2 **Click the** Finder **[Finder] tab.**

3 **Move the brightness adjustment slide bar to adjust the brightness of the finder.**

4 **While seeing the image in the finder, adjust the position of the measuring object. Then turn the focus ring of the lens connected to the instrument until the lens comes into focus.**

*(See II Detailed Guide 5.1.1.1).



Results from the above steps : Positioning between the measuring object and the instrument complete
Focusing complete

③ Setting measurement conditions

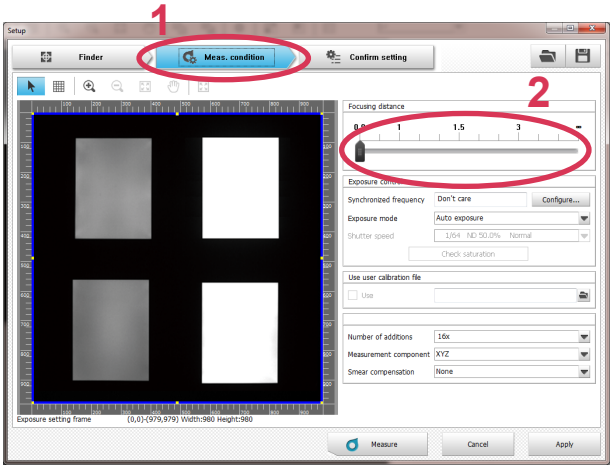
1 **Click the** Meas. condition **[Meas. condition] tab.**

*(See II Detailed Guide 5.1.2.1)

2 **Adjust the slide bar so that it matches the distance indicator of the focus ring of the lens connected to the instrument.**

3 **Leave other measuring conditions as default.**

Synchronization frequency :	Don't care
Exposure mode :	Auto exposure
User calibration :	Disable
Number of additions :	1
Measurement configuration :	XYZ
Smear correction :	None

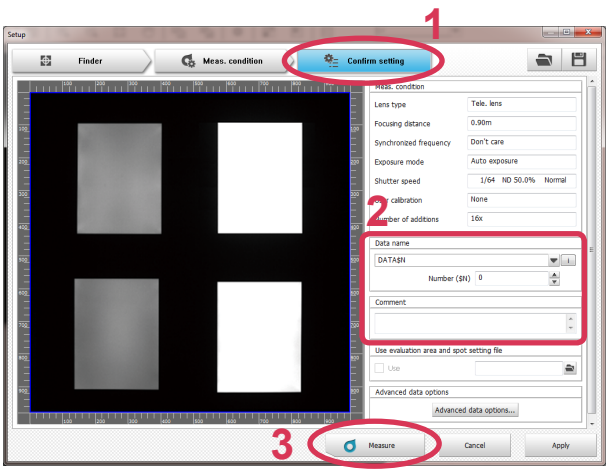


Results from the above steps : Measurement conditions established

④ Checking the measurement condition settings

1 **Click the Confirm setting "Confirm setting" tab.**

*(See II Detailed Guide 5.1.3.1)

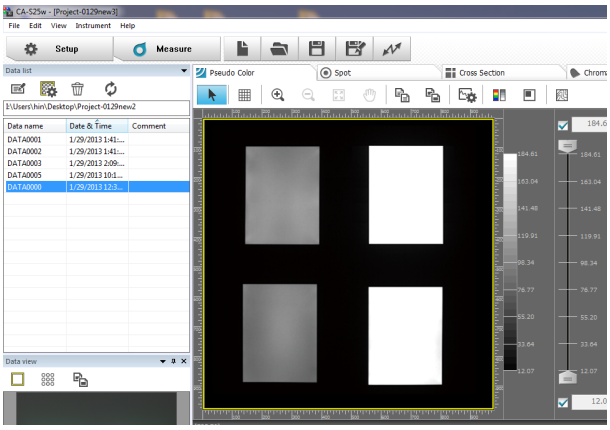


2 **Enter the data name and comments if any.**

3 **Click Measure [Measure] button.**

The measurement will take place.

4 **The "Setup" screen will close automatically when the measurement is complete.**



Results from the above steps : Data name, comments
Measurement data

2. Observing the image in pseudo color

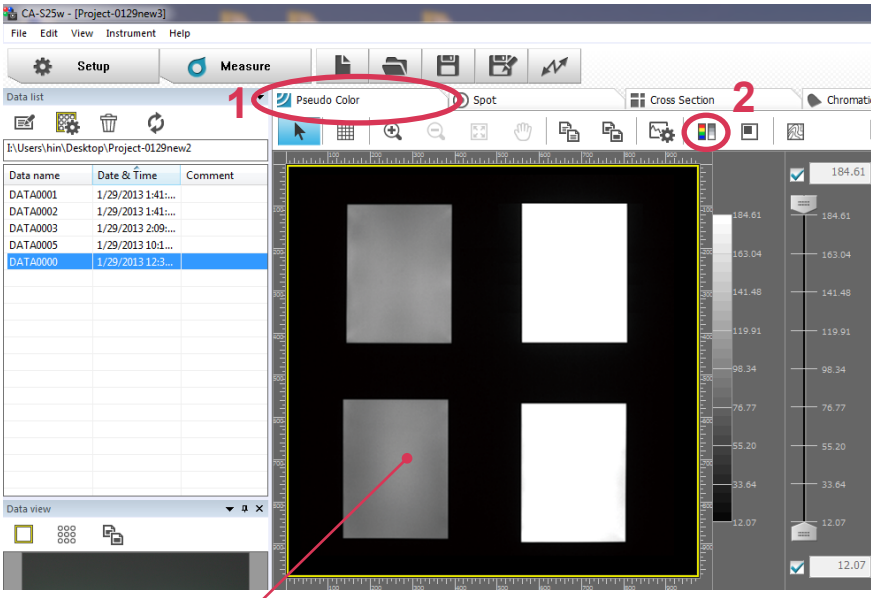
Check the measurement data using the Pseudo Color [Pseudo color] tab on the observation screen. The Pseudo color tab provides the measurement data (image) in pseudo color.

1 **Click the Pseudo Color [Pseudo color] tab on the observation screen.**

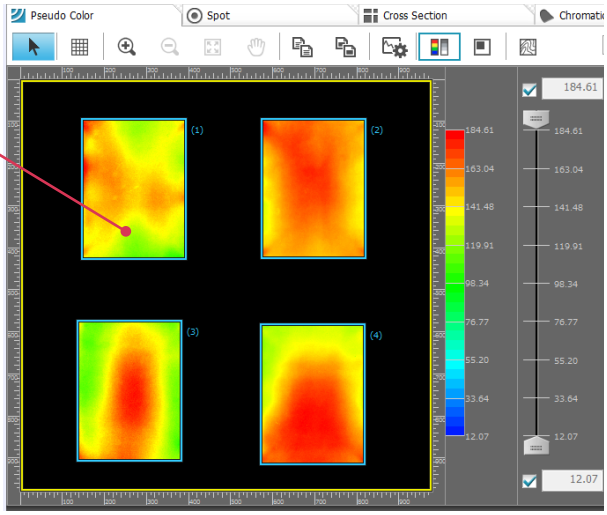
*(See II Detailed Guide 7.2.1)

2 **To switch from Monochrome to Color or vice verse, click [Pseudo color mode] button in the tool bar.**

[Monochrome]



[Color]



These images allow you to check that the measurement data has been acquired correctly. The presence and/or degree of mura can also be determined.

Results from the above steps : Judgment of whether or not the measurement was made correctly
Degree of mura

3. Obtaining the spot value and observing the section views

After checking the data images using the Pseudo Color [Pseudo color] tab, proceed to the following steps:

① **Obtaining the spot value** To evaluate the brightness evenness and document the measurement data

② **Observing the section views** To analyze the degree of mura in detail

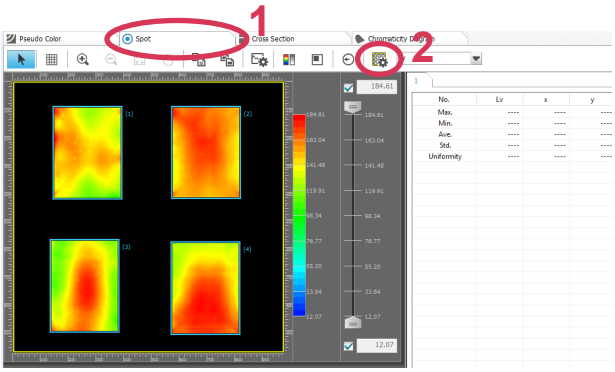
Go to

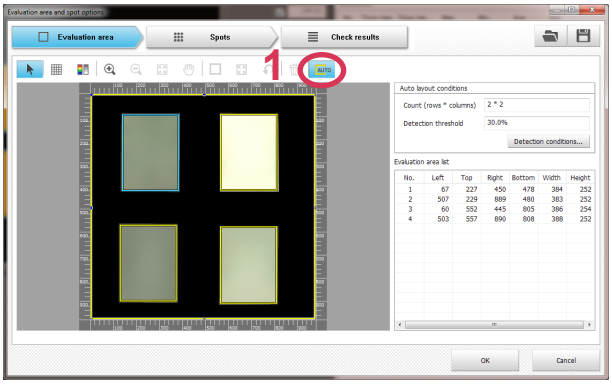
① Obtaining the spot value

1 **Click the Spot [Spot] tab.**

2 **Click [Evaluation area and spot options] button in the tool bar.**

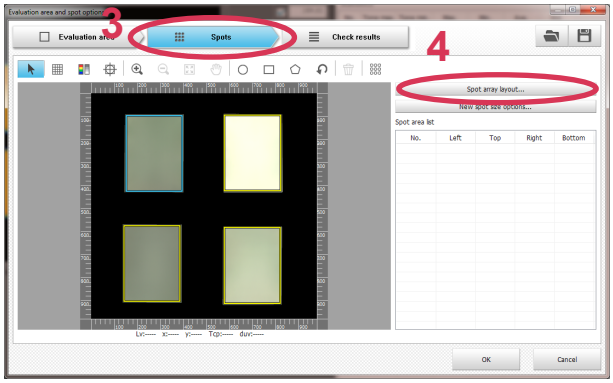
The "Evaluation area and spot options" screen will appear.





3 **Click the Spots [Spot] tab on the "Evaluation area and spot options" screen.**

*(See II Detailed Guide 6.2.1)



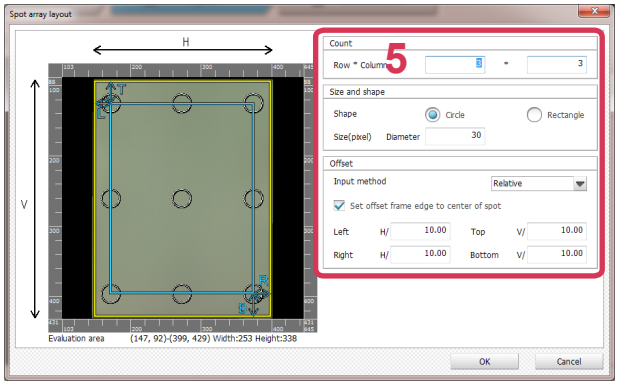
4 **Click [Spot array layout] button.**

The "Spot array layout" screen will appear.

5 **Specify the count, size and shape or the like of spots and click [OK] button.**

You will go back to the "Evaluation area and spot options" screen. Click the [OK] button. The screen will close.

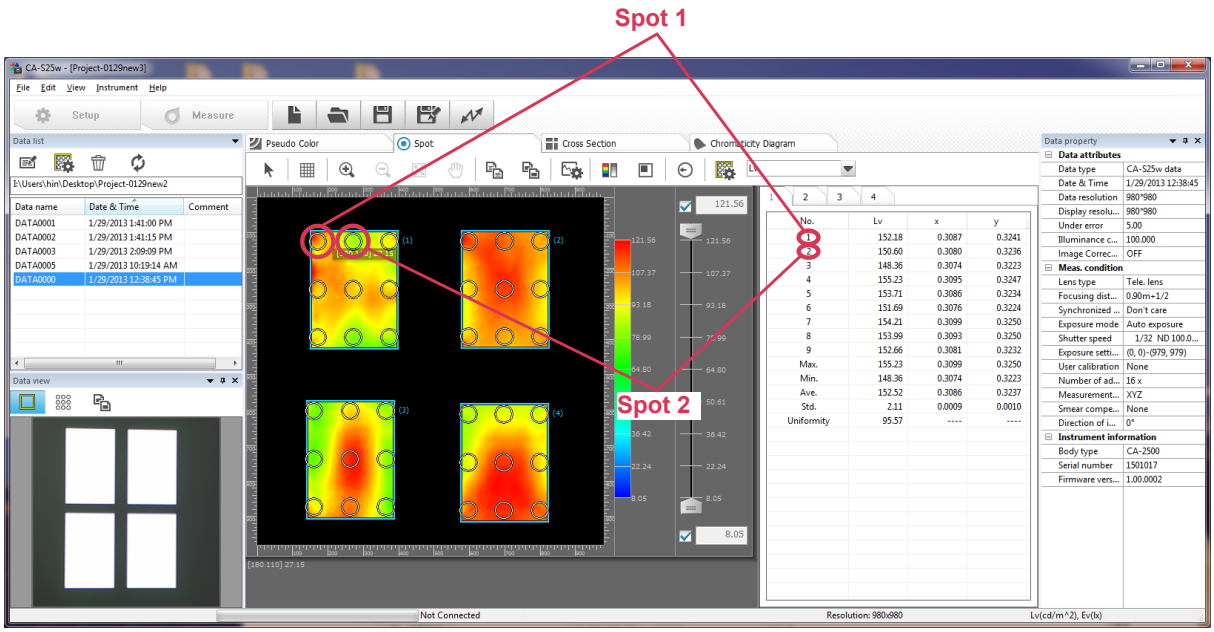
The following description assumes that you have specified nine (3 x 3) circular spots.



6 Check the spot value.

Go back to the observation screen. You will see the spot value as an average in the spot area.

*(See II Detailed Guide 7.3.1)



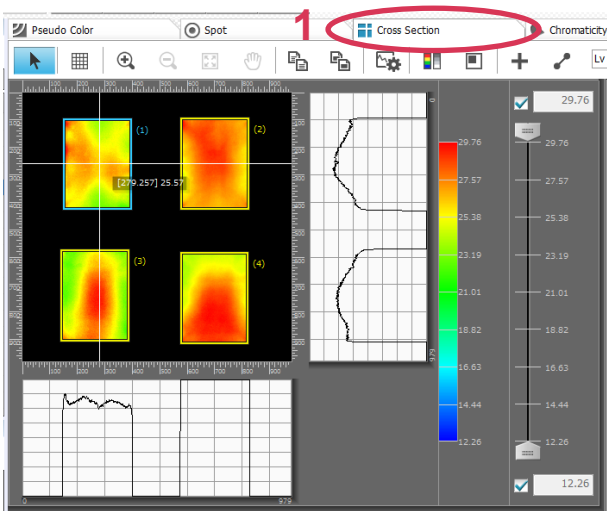
Results from the above steps : Spot array layout
Average (spot value) in the spot area

② Observing the section views

1 **Click the Cross Section [Cross Section] tab.**

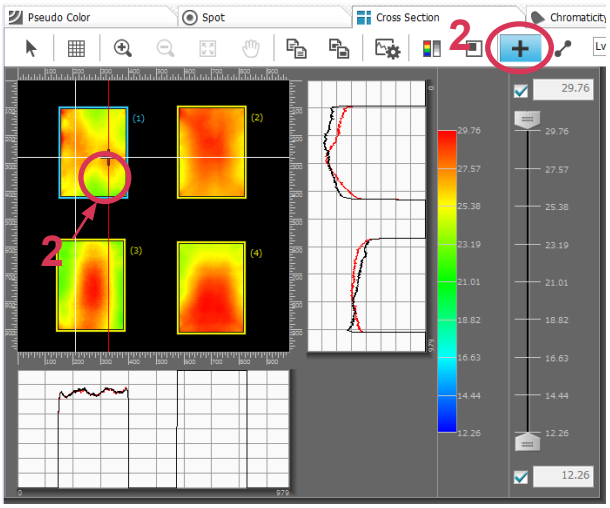
You can see the longitudinal and cross section views at the point or straight line you have specified.

*(See II Detailed Guide 7.4.1)



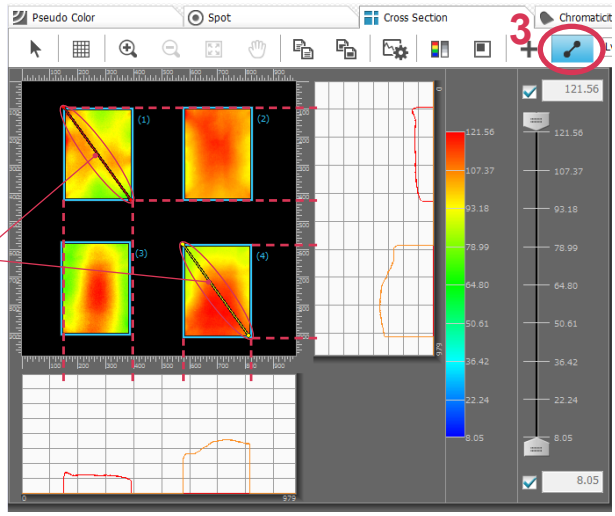
2 **To specify the point whose section views you want to see, select the [+] [Mark] button and click that point in the finder area. The longitudinal and cross section views at the point marked with "+" will be indicated on the screen.**

*(See II Detailed Guide 7.4.2.2)



3 **To specify the straight line whose section views you want to see, select the [Lines] button and drag that line in the finder area. The longitudinal and cross section views at the dragged line will be indicated on the screen.**

*(See II Detailed Guide 7.4.2.3)



Note The brightness level of section vies is an absolute value. Hence if multiple evaluation areas has been created, the image in pseudo color may not be consistent with the brightness level of section views.

Results from the above steps : Section views at the specified point or straight line

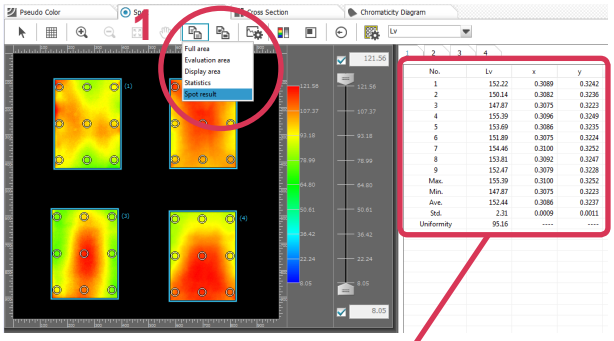
4. Exporting measurement data to Excel

Text and image data appearing on the "Pseudo color", "Evaluation area and spot options" and "Section views" screens can be exported to Excel for detailed analysis and data documentation.

① Exporting numerical data

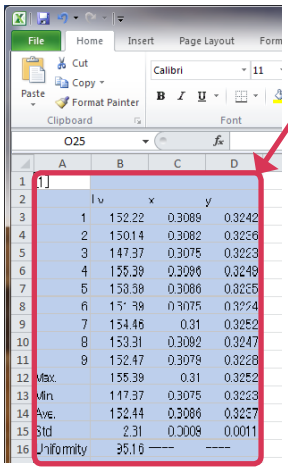
Text and image data appearing on the various screens can be exported to Excel or Word.

1 **Click the [numerical copy] button in the tool bar of the observation screen and select the data you wish to export from the dropdown menu.**



2 **Paste the data to Excel.**

The figure to the right shows an Excel spreadsheet to which the exported data has been pasted.
The spreadsheet allows you to arithmetically analyze the data in more details.

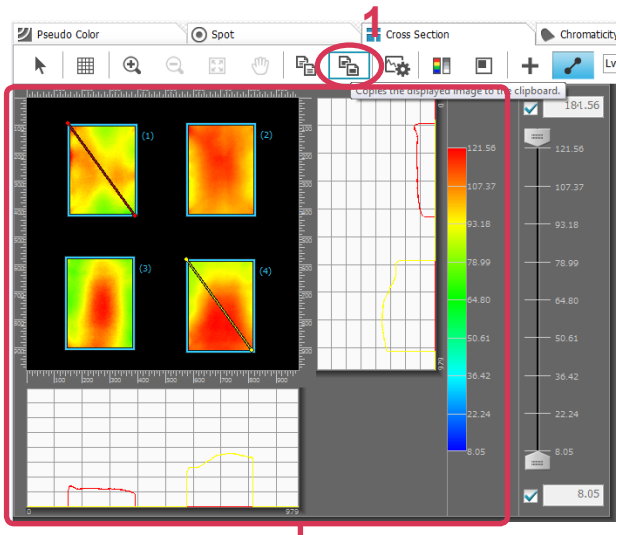


Results from the above steps : Exporting numerical data in text format

② Exporting image data

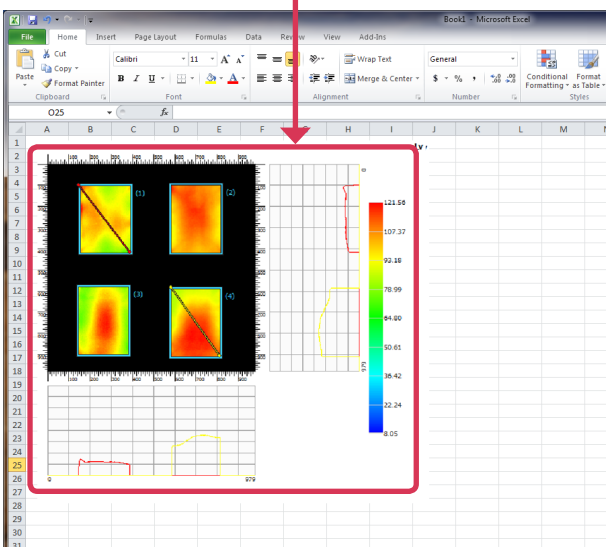
Image data appearing on screens can be exported to Excel or Word.

1 **Click the [image copy] button in the tool bar of the observation screen and select the image you wish to export. The image is saved on the clipboard.**



2 **Paste the data to Excel or Word.**

The figure to the right shows a Word file to which the exported section views have been pasted.
The data export feature will enable you to easily document the data.



Results from the above steps : Copying the image selected

To save measurement conditions defined with CA-S25w, click the [overwrite and save] button to save the project.

Tip **What is "project"?**

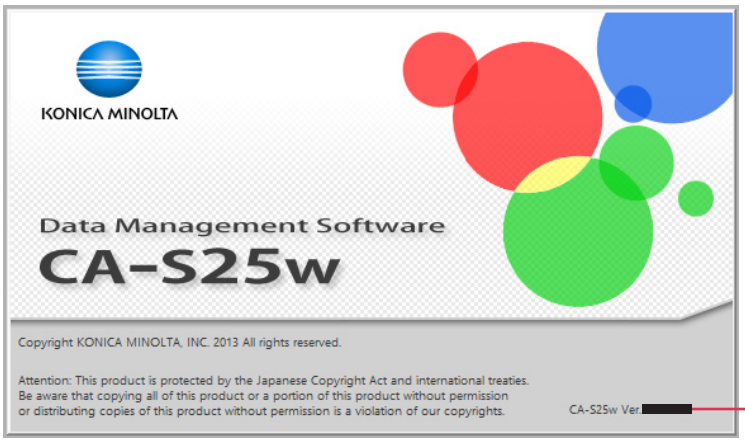
For the purpose of this software, "project" refers to a concept for managing various pieces of information, including measurement conditions and data saving scheme.

*(See II Detailed Guide 3.1)

II Detailed Guide

1. Starting Software

See the CA-S25w installation guide for how to install the software.
To start up the software, select data management software CA-S25w from the start menu. Directly selecting a the project file also allows you to start up the software. When the software starts up, the following splash screen will appear.



1.1 Starting up the software for the first time

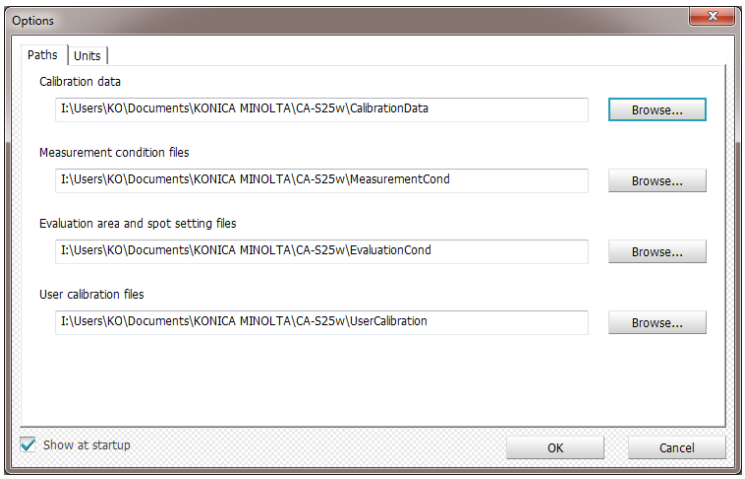
Starting up the software for the first time will cause the "Options" dialog to appear first.

1.2 "Options" dialog

This dialog allows you to specify default directories for various files and to set the brightness unit.
Click the "Paths" or "Units" tab to navigate between the "Reference" and "Unit" pages.

☐Show at startup ☑Uncheck the checkbox if you do not want to open the dialog at the subsequent start up.

Tip Clicking "Edit" in the menu bar and selecting "Options" also allows you to access the "Options" dialog.



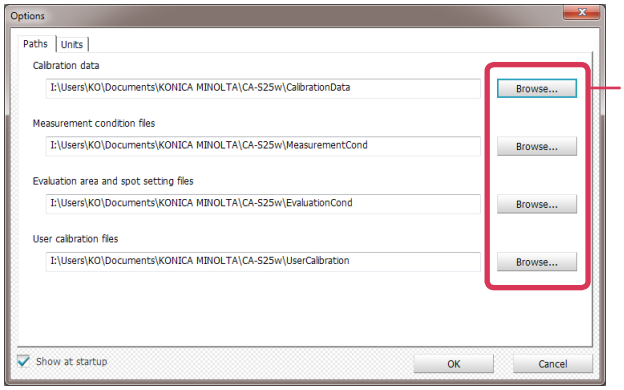
1.2.1 "Paths" page

Calibration data Shows the path of the folder in which the calibration data provided on DVD has been stored. The calibration data is referenced via this path.

Measurement condition files Shows the path of the folder in which measurement condition files are located.

Evaluation area and spot setting file Shows the path of the folder in which evaluation area and spot setting files are located.

User calibration files Shows the path of the folder in which user calibration files are located. See 8.6 for setting of user calibration files.

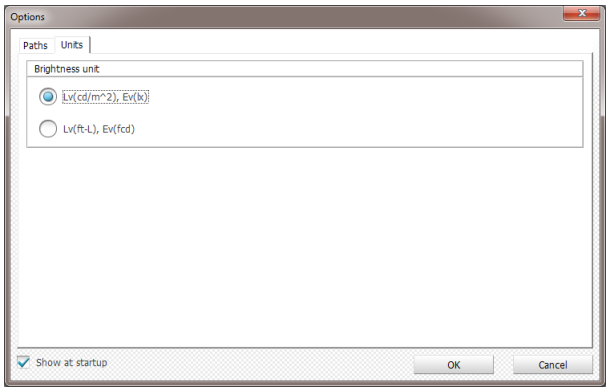


Browse...

Browse... Click to open the "Folder reference" dialog. Click "OK" to update the path.

1.2.2 "Units" page

Brightness unit Select "Lv (cd/m^2), Ev (lx)" or Lv (ft-L), Ev (fcd).

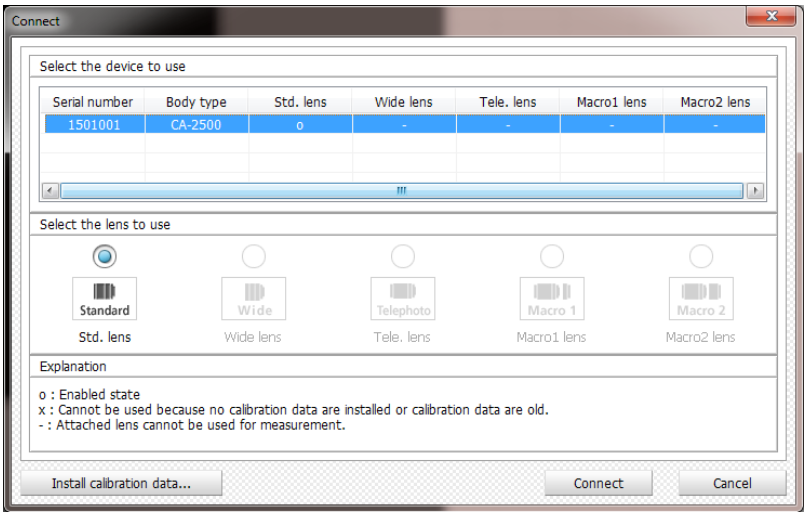


2. Connection and disconnection

2.1 Connection

When starting the software, you will see the "Connection" dialog box as long as CA-2500/CA-2000 has been connected to the PC via a USB cable and the USB driver has been installed. Proceed to 2.4 “Start screen” if no instrument is connected to the PC.

Tip Click to open the "Folder reference" dialog.



Information in the "Connect" dialog

Connection table

The connection table lists the following information items:

Serial No.	Instrument serial No.
Body type	CA-2000, CA-2500
Standard Wide-angle Telephoto Macro1 Macro2	The lens availability falls into the following three categories on the basis of whether or not the calibration data has been installed.

○	Enabled state
×	Cannot be used because no calibration data are installed or calibration data are old.
—	Attached lens cannot be used for measurement.

[Install calibration data...]

Before using CA-2500 or CA-200 for the first time, install the calibration data (provided on DVD).

Otherwise, the instrument will not be recognized.

To install the calibration data, insert the calibration data DVD into the DVD drive and click "Install the calibration data". The instillation will proceed automatically.

When the installation finishes successfully, the lens availability is marked with a circle or triangle in the connection table and at the same time, the "Connect" button becomes operative.

Note The instrument stores the calibration date and time. If these do not match the date and time recorded on the calibration data DVD, the connection table shows a triangle indicating that the calibration data is invalid.

Repair, inspection, or calibration of an instrument done by the manufacturer could result in an update of the calibration data in the instrument. Be sure to reinstall the calibration data (provided on DVD) before using such an instrument.

Lens type

Select the lens you wish to use for measurement from those marked with a circle (availability: yes). Your possible options include the following five types:

Standard", "Wide-angle", "Telephoto", "Macro 1, and "Macro 2"

Browse... CA-2500 and CA-2000 have a specific calibration coefficient for each objective lens and use such a coefficient to calculate measurement data. Select the same lens type as that installed in the instrument in order to gain correct measurement data with a correct calibration coefficient.

[Connect]

Before clicking the [Connect] button, make sure that the serial No. of the instrument you wish to use is selected in the connection table and that a proper lens type is selected.

2.2 Disconnection

This section describes how to disconnect the instrument.

Procedure

1 **Click "Instrument" in the menu bar and select "Disconnect".**

2 **Double-click the "Safely removing hardware" icon at the lower right of the screen.**

The "Safely removing hardware" dialog will appear.

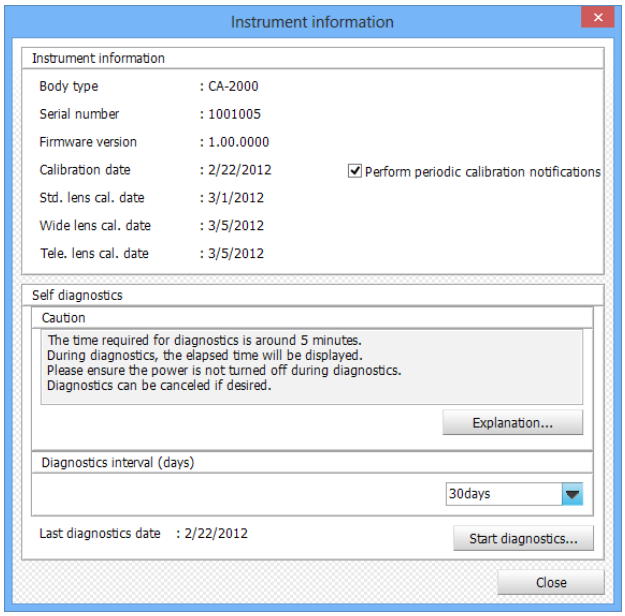
3 **Select the drive to which the instrument is connected.**

The instrument is disconnected from the PC and you can remove (the USB cable connected to) the instrument.

Note Be sure to follow the above instructions when removing the USB cable.

2.3 Instrument information

If the specified diagnostic interval is exceeded, the "Instrument information" screen will appear at the start up.
This screen allows you to check the date of previous calibration and to perform self-diagnostics of the instrument.
Clicking "Instrument" in the menu bar and selecting "Instrument information" also allows you to access this screen.



Description of the "Instrument information" dialog

Instrument information

Instrument information consists of the model name, serial No. and the date of the last calibration.
The date of the last calibration defaults to that of the factory calibration before shipping.
When the instrument is subjected to maintenance by the manufacturer, the date of the last calibration changes to that of the maintenance.

Self diagnostics

When instrument is connected to the PC, clicking [Explanation...] button allows you to view a detailed description on the Instrument diagnostic feature.

Diagnostics interval (days)

You can set the diagnostic interval to "30" or "90" days.
The diagnostic interval defaults to "30" days. If this interval is exceeded, the "Instrument information" screen will appear at the next start up.

Last diagnostics data

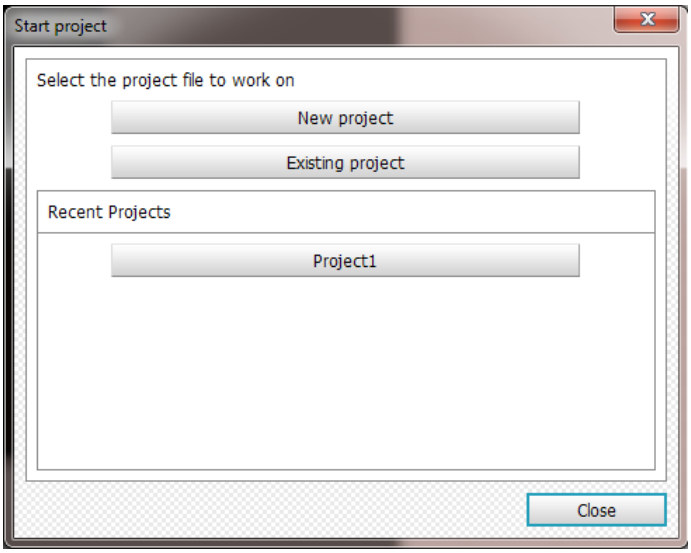
Shows the date of the last diagnostics.
If no diagnostics has been performed at all since the date of purchase, this field shows the date of the factory calibration.
Click [Start diagnostics] button to start self-diagnostics. (See 8.5 Self diagnostics)
Before starting diagnostics, make sure that the lens cap is put onto the lens mount and the instrument is securely connected to the PC.

☐Perform periodic calibration notifications

When the checkbox is checked ☑, you will be alerted with a message on the screen when calibration is due.
(See 8.5.4 Periodic calibration notification)

2.4 Start screen

The "Project start" dialog will appear at the start up. When you use the instrument for the first time, select "New project". At the subsequent start up, you can select one among "New project", "Existing project" and "Recent project".



Description of the "Start project" dialog

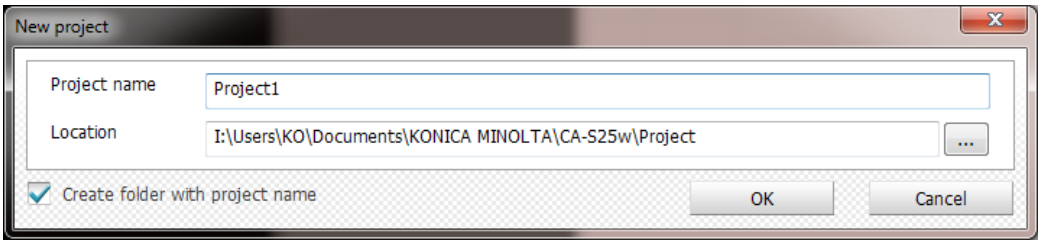
[New project]	Click this button to create a new project. You will go to the "Creating a new project" dialog (see 2.5.1)
[Existing project]	Click this button to open an existing project.
Recent Projects	Up to five files last used are listed here. You can select one among them.

Tip Clicking "File" in the menu bar and selecting "Start project" also allows you to access the "Project start" dialog.

2.5 Creating a project

2.5.1 Creating a new project

Selecting "New project" in the "Project start" dialog allows you to go to the "New project" dialog.



Description of the "New project" dialog

Project name	Enter a project name in this field.
Location	Click this [...] button to display the location where the project is stored.
☐Create folder with project name	When the checkbox is checked, a folder with the project name is created at the specified location.
[OK]	Click to go to the "General" screen (See 7.1).

2.5.2 Saving a project

Clicking "File" in the menu bar and selecting "Save as" displays the location where the project is stored.

* Only the project file is stored in this location and data files are not stored.
To overwrite and save the project, click "File" in the menu bar and select "Save".

3. Project (file)

3.1 General

For the purpose of software CA-S25w, "project" refers to a concept for managing various pieces of information, including measurement conditions and data saving scheme.
"Project file" refers to a file in which measurement setup is contained.
Measurement data is automatically stored as a data file in the folder in which the project file is stored.
A data file is created per each measurement.

A project file references to a data file in the same folder, making images on the "Observation" screen.
A project file itself does not contain measurement data.

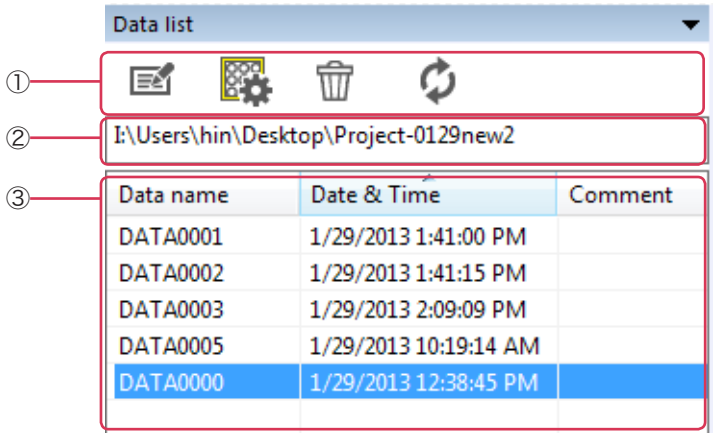
Project

- Measurement setup — Settings on the "Measurement setup" screen
- Evaluation area and spot setting file — Settings on the "Measurement setup" screen
- User calibration data — Settings on the "Measurement setup" screen
- Graphic setting
- Other settings

4. Data

4.1 Data list window

Clicking "Display" in the menu bar and selecting "Data list" will open the data list window.
This window lists data files located in the specified folder.



① Toolbar

The following four tools are available: Putting the mouse pointer on a tool icon will open a tooltip for that icon.

Advanced data options — Click to go to the "Advanced data options" screen (see 5.3).

Evaluation area and spot options — Click to go to the "Evaluation area and spot options" screen (6.1.1) (6.2.1).

Delete — When this button is clicked, a dialog will appear asking "Are you sure you want to delete the selected files?"
Click "OK to continue.

Update list — Click to update the list of data files located in the specified path.
A progress bar appears in the status bar during updating the list.
Tip Using Explorer also allows you to manipulate (delete or copy) data files. After manipulating data files with Explorer, update the data file list.

② Path in which project files are stored

Shows the path in which project files are stored. Project files are stored in the folder located in this path. Putting the mouse pointer on an icon will open a tooltip for that icon.

③ Data file list

Opening a project will list data files contained in the folder in which that project file is stored.

Data name	File name. The name can be changed directly.
Date & Time	Date and time of measurement.
Comment	Comments can be changed directly.

Multiple data files can be selected and processed at a time. The data displayed during data setting is from the top one from selected data files.

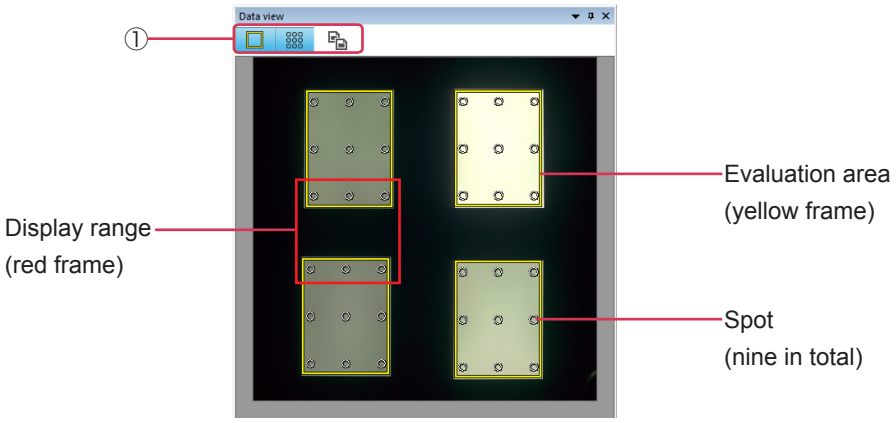
4.1.1 Right-click menu

Putting the mouse pointer on the list window and right-clicking will cause the following menu to appear.

- **Evaluation area and spot options** — Select to go to the "Evaluation area and spot" screen (6.1.1)(6.2.1).
- **Advanced data options...** — Select to go to the "Advanced data options" screen (see 5.3).
- **Copy numeric value** — Use to copy numeric values on the clipboard in "All area", "Evaluation area", or "Spot measurement results" mode.
- **Save text...** — Use to open the "File save" screen and save numeric values as text in "All area", "Evaluation area", or "Spot measurement results" mode.
- **Delete** — Use to delete the selected data files.

4.2 Data view window

Clicking "Display" in the menu bar and selecting "Data view" will open the data view window.
This window shows an RGB image (a monochrome image when a reference filer is measured) of the data selected from the data list.
The size of the display range frame varies depending on the display range in the observation screen.



① Toolbar

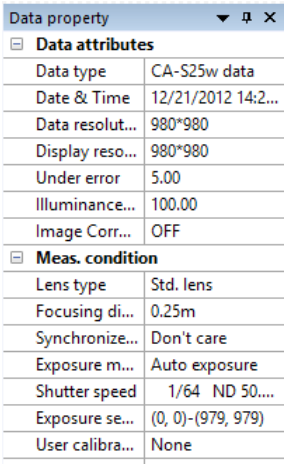
The following three tools are available. Putting the mouse pointer on a tool icon will open a tooltip for that icon.

- **Evaluation area mode** — Click to turn on or off the evaluation area mode (red frame).
- **Spot mode** — Click to turn on or off the spot mode.
- **Copy image** — Use to copy an image on the clipboard.

4.3 Data property window

Clicking "Display" in the menu bar and selecting "Data property" will open the data property window.
The data display window shows various information items including data attributes, measurement conditions, and instrument information, for each data file.

To copy properties, right-click to open the right-click menu.



5. Measurement setup

You can make measurement setup on the "Main" screen ("Observation" screen).

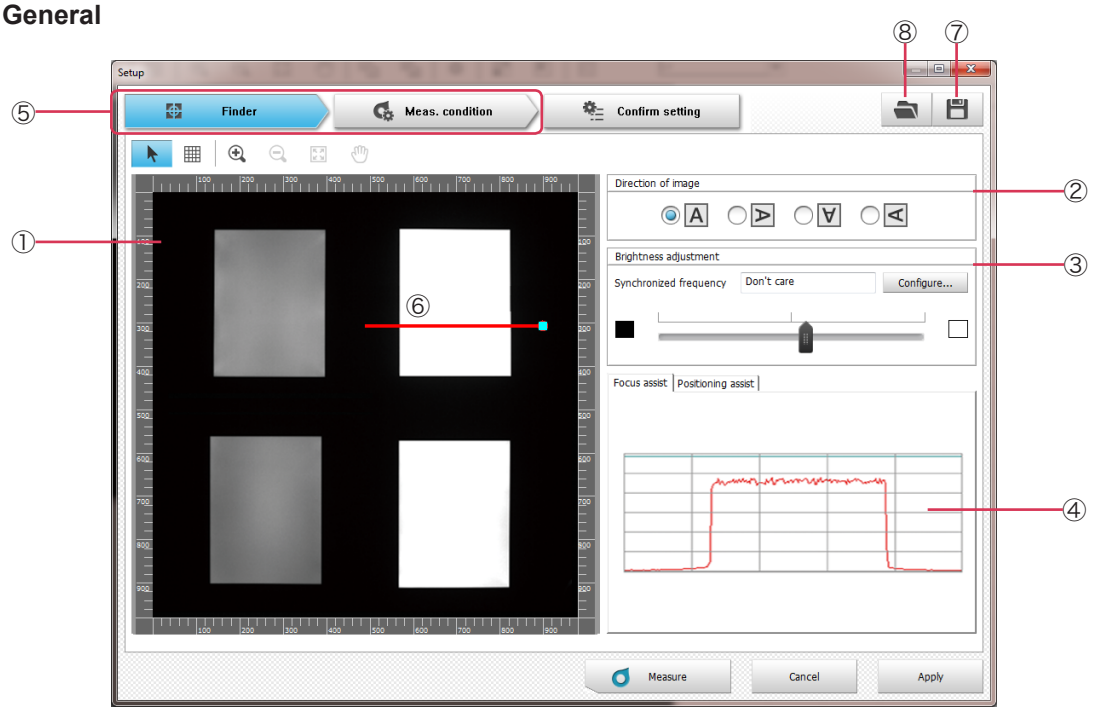
5.1 "Measurement setup" screen

Clicking the [Measurement setup] button on the "Main" ("Observation") screen will open the "Measurement setup" screen consisting of the "Finder", "Measurement conditions", and "Confirm setting" plates.

Note When you click the [Measurement setup] button for the first time, you will see the "Dark measurement in progress" screen before the "Measurement setup" screen.

5.1.1 "Finder" plate

5.1.1.1 General



① Finder area

Shows a captured image in real time.

② Direction of image

Select one to change orientation of the image on the finder. The measurement data also changes according to your selection.

A	**None**	Normal
⋗	**90°**	Select to orient the image 90 degrees clockwise.
∀	**180°**	Select to orient the image 180 degrees clockwise.
≺	**270°**	Select to orient the image 270 degrees clockwise.

③ Brightness adjustment

Brightness adjustment	Move the brightness control slide bar to adjust the brightness of the finder. You can also click any position on the scale to adjust the brightness.
Synchronized frequency	When the measuring object emits flashing light such as flickering light, the image on the finder may also show flickering. In such a case, you should make a synchronized measurement. Click [Setting] button to go to the "Synchronization frequency setting" screen (See 5.1.1.2).

④ Focus assist / Positioning assist

Focus assist — Clicking this tab will open the "Assist focusing " page where the section line and the corresponding section views are indicated. (See 5.1.1.3)

Positioning assist — Clicking this tab will open the "Positioning assist" page showing a fine-adjustment frame and an image corresponding to the frame.(See 5.1.1.4)

⑤ Toolbar

The toolbar contains the following tool icons.

Putting the mouse pointer on a tool icon will open a tooltip for that icon.

Select — Use to select and edit the exposure setting area.
Use to select and edit a section line or positioning frame.

Grid — Use to turn on or off the grid in the finder area.

Zoom in — When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom in" mark. You can specify the range to enlarge by dragging the mouse pointer. The enlarged image of the range will be displayed.
Left-clicking the mouse allows you to enlarge the image up to 32 times.
(Left-clicking the mouse while holding down the Shift and Ctrl keys also allows you to enlarge the image size.)

Zoom out — When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom out" mark.
Left-clicking the mouse several times allows you to go back to the "All area" display mode.
(Right-clicking the mouse while holding down the Shift and Ctrl keys also allows you to reduce the image size.)

All area — Use to go back to the "All area" mode.

Move — When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Move" mark. You can grasp the image where you click the mouse and move it by the distance the mouse has dragged.
(Dragging while holding down the space key also allows you to move an image.)

⑥ Section line

The section line displayed is of longitudinal section or cross section, whichever is longer.

⑦ Saving a measurement condition file

Use to save a measurement condition file. Items to be saved are as follows:

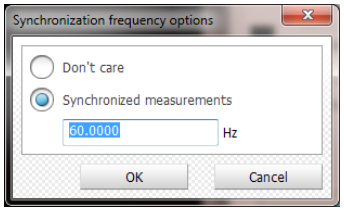
- Direction of image
- Whether or not to use user calibration
- Smear compensation
- Focusing distance
- Number of additions
- Exposure setting frame
- Exposure settings
- Measurement configuration
- Evaluation criteria

⑧ Loading a measurement condition file

Use to load a measurement condition file. Items to be loaded are as follows:

- Direction of image
- Whether or not to use user calibration
- Smear compensation
- Focusing distance
- Number of additions
- Exposure setting frame
- Exposure settings
- Measurement configuration
- Evaluation criteria

5.1.1.2 "Synchronization frequency options" screen



You can enter a synchronization frequency in this window.

Synchronized frequency

The allowable synchronization frequencies range from 4.0000 to 2,000.0000 Hz.

Note A change in synchronization frequency setting will open the "Dark measurement in progress" screen and reload the exposure time table. The image brightness on the finder may also vary. In such a case, readjust the brightness as appropriate.

Tip If the measuring object emits periodic flashing light, as in the case of display monitors or fluorescent lighting, the image on the finder may look flickering due to difference between refresh or flashing rate and exposure rate. In such a case, synchronizing the exposure rate with the refresh or flashing rate prevents or minimizes flickering of the image on the finder. When the measuring object is a display monitor, matching the exposure rate to the vertical refresh rate of the monitor will generally prevent flickering of the image on the finder (thus improving the measurement stability).

5.1.1.3 Focus assist

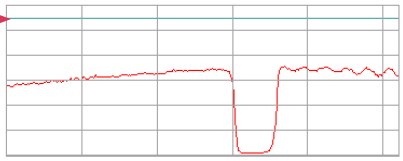
The "Assist focusing" feature helps you bring the object into focus.
While viewing the image on the monitor, turn the focus ring of the lens to your desired position (usually until the object just comes into focus).
At this time, Clicking the "Assist focusing" tab will allow you to check the contrast of the image.

Out of focus : The section view has dull edges even at positions with different brightness.
In focus : The section view has sharp edges at positions with different brightness.

Tip Using the "Finder" page in conjunction with the section view will make it easier to bring the object into focus.

The section view appearing during focusing represents the brightness of the section line indicated with red on the finder.
The position, size, and orientation of the section line can be edited with the mouse (default line: center positioned and horizontally oriented).
The section line is not needed to contain the entire angle of view. A part of the line can be selected and enlarged.

The blue line represents the peak in current brightness setting.



5.1.1.4 Positioning assist

The "Assist positioning" feature allows you to easily adjust the position, tilt, or swing of the instrument.

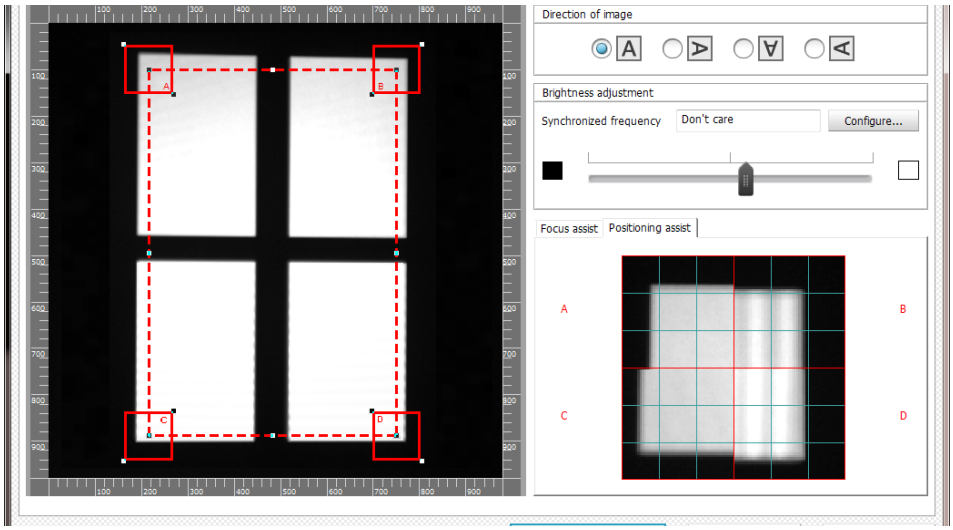
Procedure

1 **Click the [Grid] button in the toolbar to turn on the grid.**

This is to make positional adjustment of the object with reference to the grid.

2 **Click the "Assist positioning" tab. The four corners of the rectangular object will be enlarged. Move and arrange the object so that its four corners fall within the red square frames, as shown in the figure below.**

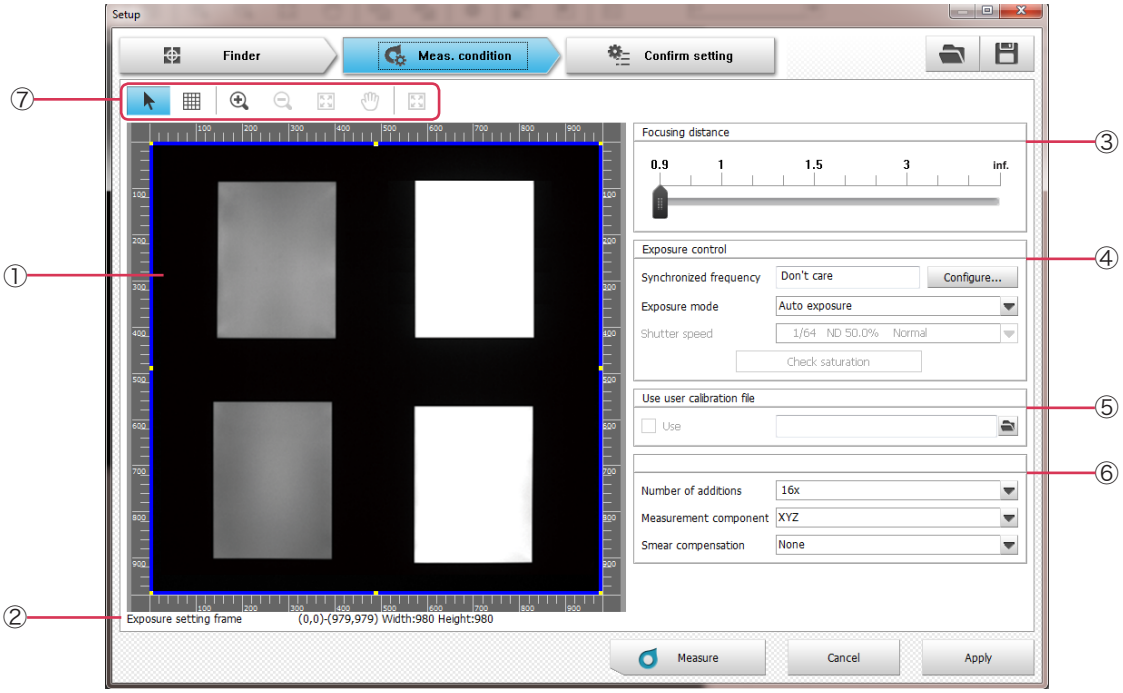
Tip Also see "1. Getting ready for measurement (focusing/positioning)" of III Supplementary Description of Major Functions.



5.1.2 "Measurement conditions" screen

5.1.2.1 General

After exiting the "Finder" page, click the [Measurement condition] button.
The "Measurement conditions" page will appear.



① Finder area

Shows the exposure area.
By default, the exposure setting area is "All area". Clicking and dragging the blue frame with the mouse allows you to adjust the area. This will minimize the affect of any external light reflecting into the area to be measured.

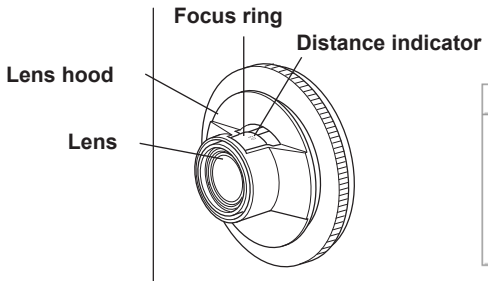
② Exposure setting Frame

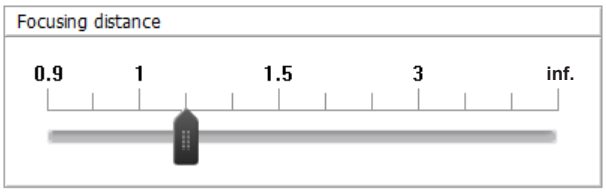
Shows information on the exposure area.

③ Focusing distance

After adjusting the focus of the instrument, move the slide bar until its position corresponds to the distance indicator of the focus ring.

Tip CA-2500 and CA-2000 have a specific calibration coefficient for each objective lens distance indicator and use such a coefficient to calculate measurement data. Be sure to set the distance corresponding to the distance indicator in order to gain correct measurement data with a correct calibration coefficient.





④ Exposure control

Synchronized frequency If the measuring object emits flashing light, resulting in measurement data being unstable, perform a synchronized measurement.
Clicking [Set...] button will open the "Synchronization frequency options" screen (see 5.1.1.2).

Exposure mode The following three modes are available.

▶ **Auto exposure** The instrument determines an appropriate exposure automatically depending on the brightness of the measuring object.
Select this mode usually.

▶ **Manual exposure** Use this mode when you wish to fix the exposure, no matter how bright the measuring object is.
Set the exposure via shutter speed.

Note The manual exposure mode may result in inaccurate measurement due to overexposure or underexposure.

Tip This mode will be helpful when you are going to measure the same object repeatedly. This is because the fixed shutter speed eliminates the need for looking for the optimal exposure, thus reducing the time needed for the measurement.

▶ **Multiple exposure** In this mode, measurements are made several times with different exposures, measurement data with the optimal exposure is automatically selected per pixel, and such data are superimposed so that the measurement accuracy is ensured.

Tip If the measuring object has mixed bright and dark regions, such as speedometers for automobiles, adjusting the exposure with reference to bright regions will result in a lack of exposure for dark regions. In such a case, the multiple exposure mode is helpful.

Tip This mode takes a lot of time due to several times of measurement to be done. If you wish to reduce the time needed for measurement, decrease the number of additions.
Tip The auto or multiple exposure mode permits the exposure control area (exposure setting area) to be adjusted.

Shutter speed Options are provided only when the manual exposure mode is selected.

Check exposure This button is operative only when the manual exposure mode is selected.
Click to check the exposure at the currently selected shutter speed.
A progress window will appear during exposure checking.
When exposure checking is complete, a message will appear indicating results from the check (number of overflowed pixels and appropriate shutter speed).

⑤ Use user calibration file

Use Check the checkbox to enable user calibration.
You can use a user calibration file if it already exists.
See "8.6 User calibration" for how to create user calibration data.

⑥ Others

Number of additions You can set the number of signal additions in order to reduce the affect of noise.
Select one among "1", "4", "16", "64", and "256" or enter any value ranging from 1 to 256.
Measurement will be repeated N times (N = Number of additions you specified) and measurement results be averaged.
Increase the number of additions: Measurement takes longer time with higher stability of measurement data.
Decrease the number of additions: Measurement takes shorter time with lower repeatability (stability) of measurement data.

Measurement component The following four modes are available.

▶ **XYZ** All of the three kinds of filters (X, Y, Z) installed in the instrument are used for measurement.
This mode provides both of brightness and chromaticity data. The performance of the instrument announced in the catalogue assumes that these three kinds of filters are all used. Select this mode usually.

▶ **X** Only the X filter is used for measurement.

▶ **Y** Only the Y filter is used for measurement.

▶ **Z** Only the Z filter is used for measurement.

A single-filter mode can shorten the measurement time.
It can provide information on light amount but not on chromaticity.

Note X/Y/Z values determined in XYZ mode do not correspond to those determined in X, Y, and Z modes.

Tip Select XYZ mode if you wish to obtain accurate data or both of brightness and chromaticity data. Select X, Y, or Z mode if you wish to obtain light amount data (relative value) only with shorter measurement time.

Smear compensation The following three modes are available.

"Disable", "Simple compensation", "Approximate compensation"
When a very bright light source is within the lens coverage, mura shaped like streaks may occur from the light source to the up and down directions, due to characteristics of CCD sensors. Such a mura is called smear.
The CCD sensor used for the CA-2500/CA-2000 has pixels for compensating smear. These smear compensation pixels reduce the affect of smear to measured values.
The performance of the instrument announced in the catalogue assumes that the smear compensation feature is disabled.

▶ **None** Smear compensation is disabled.

▶ **Simple** The data of smear compensation pixels is used as is for compensation calculation in order to reduce the affect of smear. Noise ingredients of the smear compensation pixels may cause minor mura shaped like steaks to occur on the image after compensation.

▶ **Linear** The data of smear compensation pixels is smoothed and then used for compensation calculation in order to reduce the affect of smear. Compared to the simple compensation, this mode suppresses the generation of mura shaped like streaks after compensation. If the light amount significantly differs between adjacent pixels, however, mura shaped like streaks may occur in the vicinity of those pixels, due to the smoothing process.

⑦ Toolbar

The toolbar contains the following tool icons.
Putting the mouse pointer on a tool icon will open a tooltip for that icon.

 **Select** Use to select and edit the exposure setting area.
Can be edited the exposure area.

 **Grid** Use to turn on or off the grid in the finder area.

 **Zoom in** When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom in" mark. You can specify the range to enlarge by dragging the mouse pointer. The enlarged image of the range will be displayed.
Left-clicking the mouse allows you to enlarge the image up to 32 times.
(Left-clicking the mouse while holding down the Shift and Ctrl keys also allows you to enlarge the image size.)

 **Zoom out** When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom out" mark.
Left-clicking the mouse several times allows you to go back to the "All area" display mode.
(Right-clicking the mouse while holding down the Shift and Ctrl keys also allows you to reduce the image size.)

 **All area** Use to go back to the "All area" mode.

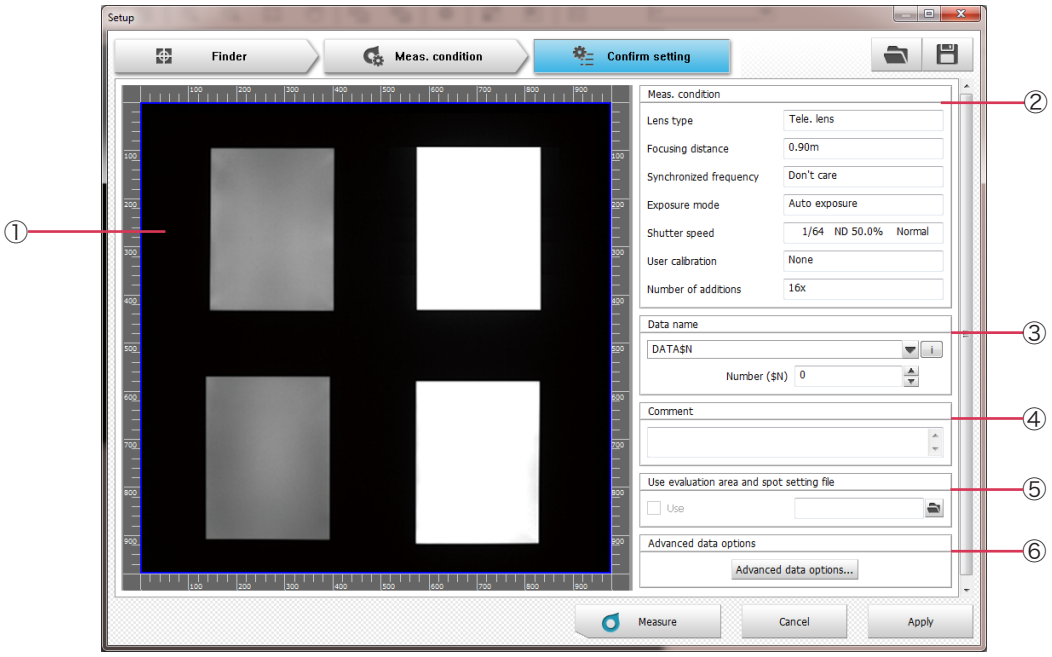
 **Move** When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Move" mark. You can grasp the image where you click the mouse and move it by the distance the mouse has dragged.
(Dragging while holding down the space key also allows you to move an image.)

 **All area** Use to set the exposure setting area to "All".

5.1.3 Setting confirmation page

5.1.3.1 General

After exiting the "Measurement conditions" page, click the [Confirm setting] button.
The "Setting confirmation" page will appear.



① Finder area

Shows a captured image in real time.

② Meas. condition

Shows measurement conditions defined so far. Editing measurement conditions is not allowed on this page.
To edit the conditions, go back to the "Measurement conditions" screen (see 5.1.2).

③ Data name

This area allows you to specify the name that is automatically given to the measurement data.
Enter the name you wish to give to the measurement data. The character strings in the left column of the table shown below are treated as special symbols, and are translated into the character strings in the right column.
Among them, "DATA$N"and "$Y-$M-$D-$m-$s" are available as sample formats, and can be selected from the pull-down combo box.
The name may be arbitrary provided that it is not more than 50 characters long.

[i]

Putting the mouse pointer on this button will show you the following table.

$N	Measurement data No. (serial No.) given automatically (The start No. can be set to any value ranging from 0 to 9999.)
$Y	Year of measurement
$M	Month of measurement
$D	Day of measurement
$h	Hour of measurement
$m	Minute of measurement
$s	Second of measurement

Number ($N)

Can be edited only when the data name is prefixed with symbol "$N".
The number can be set to any value ranging from 0 to 9999.
When the number reaches the upper limit, it will return to 0.

④ Comment

This field allows you to enter a comment that is not longer than 256 characters.

⑤ Use evaluation area and spot setting file

☑ Use — You can load an existing evaluation area and spot setting file.
If you can open the file successfully, rename the file and check the checkbox.

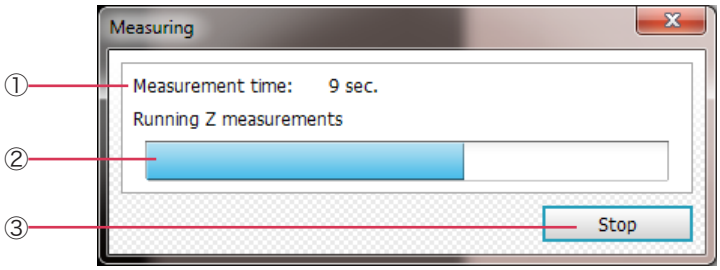
⑥ Advanced data options

[Advanced data options...] — You can carry out the setting on the measurement data resolution, under error, and image correction, and reflection factor for Illuminance calculation.
Click to go to the "Data setting" page.
Data setting is allowed even after the measurement data is captured.

* See “5.3 Advanced data options” for how to set the data.

5.2 Performing the measurement

A progress window will appear during measurement.



① Measurement time

Shows an approximate time taken for measurement.

* This time varies depending on the performance of the PC.

② Progress bar

Shows the progress of measurement.

③ Stop

[Stop] Click to cancel the measurement.

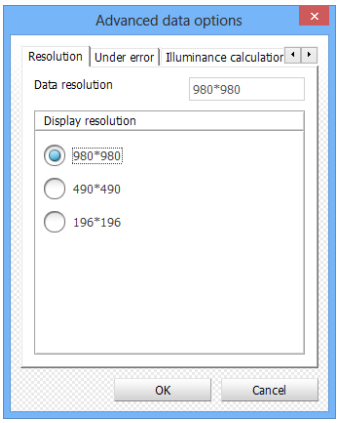
5.3 Advanced data options

Clicking "Advanced data options" in the toolbar of the data list window also allows you to access the "Advanced data options" screen.

Make settings on this screen after acquisition of the measurement data.

5.3.1 "Resolution" page

[Data resolution] Click to open the "Resolution" tab.
This page allows you to select the image resolution among the following three ones: "980 x 980", "490 x 490", "196 x 196" (units in pixel)

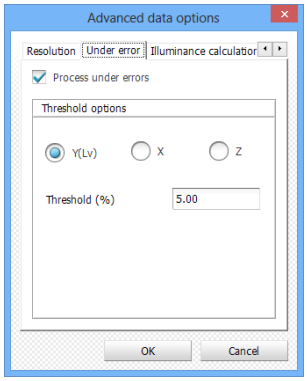


5.3.2 "Under error" page

[Under error] Click to open the "Under" tab.

If the measuring object has mixed bright and dark regions in the evaluation area, such as speedometers for automobiles, adjusting the exposure with reference to bright regions will result in a lack of exposure for dark regions and thus in a hard-to-view image of the object.

The under error feature allows the regions where the light amount does not reach a certain "threshold" to be treated as "under error" regions. Pixels in these regions are not subject to calculation of brightness and chromaticity, and are ignored when an image is captured. Statistic operation also excludes these pixels.



☐Process under errors Check the checkbox if you wish to enable the under error feature.

Threshold options Select one among Y(Lv), X, and Z.

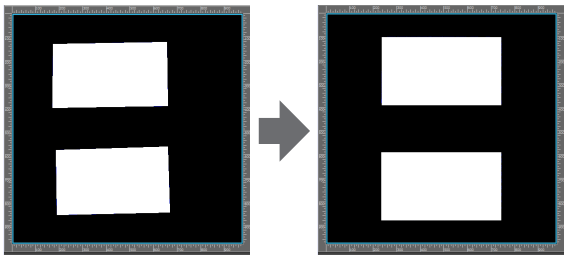
Enter a threshold (%) ranging from 0.01 to 100.00 to the second decimal place.

If the threshold is set to 100%, the pixels in the evaluation area will all be ignored. If it is set to 0%, the pixels having a pixel value of 0 will only be ignored.

5.3.3 "Image correction" page

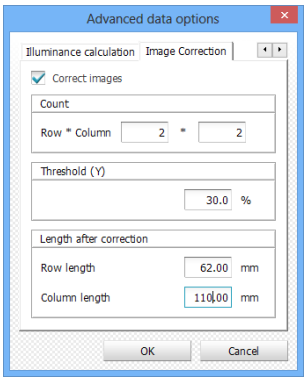
Use this page when measuring a rectangular object such as a display. Image correction involves compensation calculation based on the aspect ratio of the rectangle. The image correction feature works even if the object tilts to such an extent that allows the software to properly recognize the aspect ratio from the uncorrected image.

Note Divide the screen evenly depending on the number of objects (Count) and arrange each object almost at the center of each area. The higher display resolution (980 x 980 pixels) is better.



[Example of count: row 2 x column 1]

☐Correct images Check the checkbox if you wish to enable the image correction feature.



Count Enter integers ranging from 1 to 12 into column and row fields.

Threshold (Y) Enter a value ranging from 0.1 to 100.0 to the third decimal place.

Length after correction Enter values ranging from 0.01 to 10,000.00 to the second decimal place into column and row fields.

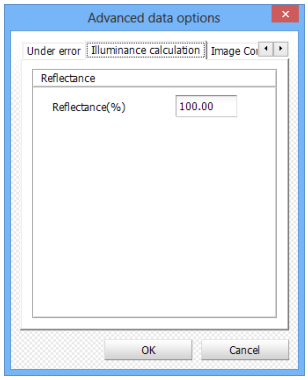
Note The image correction feature is disabled when:

- The distance indicator of the focus ring is at infinite, or.
- The measurement data has been imported in CSV format.

5.3.4 "Illuminance calculation" page

[Illuminance calculation] Click to open the "Illuminance calculation" tab.

The "Illuminance calculation" feature allows you to convert the brightness measured with the instrument into illuminance.



Reflectance(%) This page allows you to set a reflection factor to be used for Illuminance calculation. Enter a reflection factor of the target surface of the measuring object ranging from 0.01 to 100.00 to the second decimal place.

* The illuminance is given by the following formula:

Illuminance (Ev) = Brightness (Lv) x π / Reflection factor

6. Evaluation area and spot

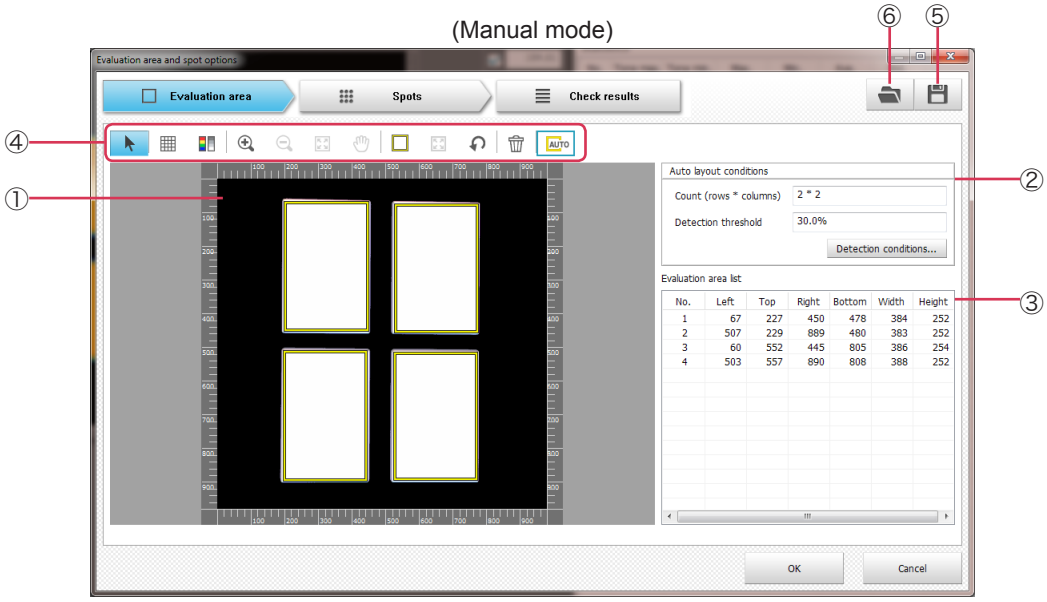
You can set the evaluation area (rectangular) or spots for existing measurement data.
Clicking "Evaluation area and spot options" in the toolbar of the data list window will open the "Evaluation area and spot options" screen consisting of the "Evaluation area", "Spots", and "Result confirmation" pages.

6.1 Evaluation area setting

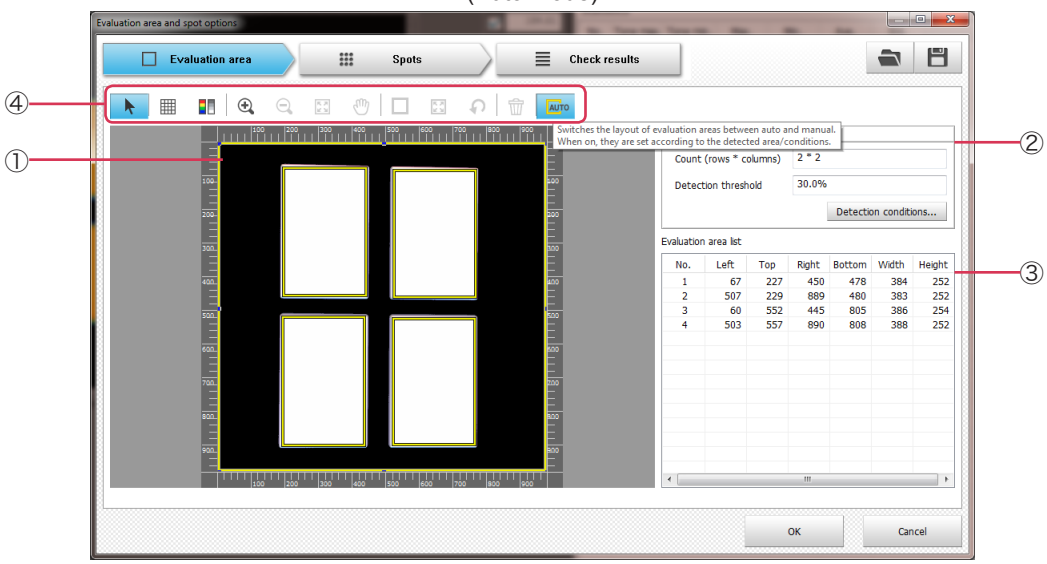
Click the [Evaluation area] button in the "Evaluation area and spot options" screen.

6.1.1 General

(Manual mode)



(Auto mode)



① Data view

Shows an RGB image of the measuring object.

A monochrome image can be selected.

② Auto layout conditions

Use to arrange the evaluation areas automatically.

* See 6.1.2 Auto layout condition options screen for how to set the evaluation areas.

③ Evaluation area list

Lists the evaluation areas already defined. Selection of multiple areas is allowed.

Items indicated in the list are follows:

"Data No." **"Coordinates"** **----** "Left", "Top", "Right", "Bottom" **"Width"** **"Height"**

④ Toolbar

The toolbar contains the following tool icons.

Putting the mouse pointer on a tool icon will open a tooltip for that icon.

Select	Use to select and edit the evaluation areas. Can be edited the evaluation area.
Grid	Use to turn on or off the grid in the data area.
Use to switch between color and monochrome.	Use to switch between color and monochrome.
Zoom in	TWhen you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom in" mark. You can specify the range to enlarge by dragging the mouse pointer. The enlarged image of the range will be displayed. Left-clicking the mouse allows you to enlarge the image up to 32 times. (Left-clicking the mouse while holding down the Shift and Ctrl keys also allows you to enlarge the image size.)
Zoom out	When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom out" mark. Left-clicking the mouse several times allows you to go back to the "All area" display mode. (Right-clicking the mouse while holding down the Shift and Ctrl keys also allows you to reduce the image size.)
All area	Use to go back to the "All area" mode.
Move	When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Move" mark. You can grasp the image where you click the mouse and move it by the distance the mouse has dragged. (Dragging while holding down the space key also allows you to move an image.)
Create new	Use to create a new evaluation area in manual mode (“6.1.4 Manual arrangement of evaluation areas”)
All area	Use to go to the "All area" mode.
Undo	Use to undo the last action. You can undo up to the last 20 actions.
Delete	Use to delete the selected area.
Arrangement mode	Use to arrange the evaluation area automatically depending on the auto arrangement frame and measurement conditions.

⑤ Save evaluation area and spot setting file

Use to save an evaluation area and spot setting file, which can later be loaded and used for measurement.

⑥ Load an evaluation area and spot setting file

Use to open and load an existing evaluation area and spot setting file.

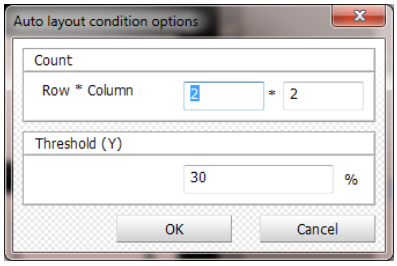
6.1.2 Auto layout condition options

1 **Click the [Detection conditions] button to open the "Conditions for auto arrangement" dialog.**

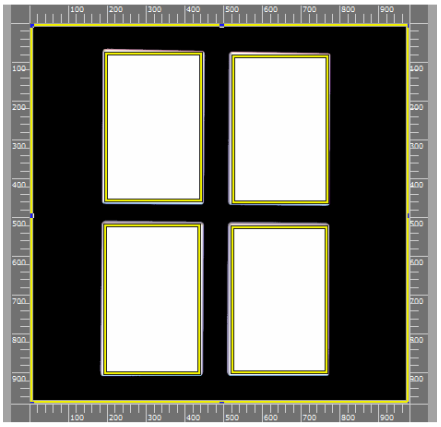
Count

Row * Column Up to 12 areas can be located per each orientation.

Threshold (Y) Enter a value ranging from 0.0 to 100.0 in increments of 0.1 (%).



Rectangular evaluation areas will be automatically drawn on the finder (according to the frame positions and arrangement conditions).



6.1.3 Limitation in number of spots depending on the number of evaluation areas

The number of spots is limited depending on the number of evaluation areas as follows:

Number of evaluation areas	Number of spots per evaluation area
4 or less	2500 or less (50 x 50)
25 or less	400 or less (20 x 20)
100 or less	100 or less (10 x 10)
144 or less	25 or less (5 x 5)

6.1.4 Manual arrangement of evaluation areas

1 **Turn off [AUTO] button in the toolbar.**

2 **Click [Create new] button in the toolbar.**

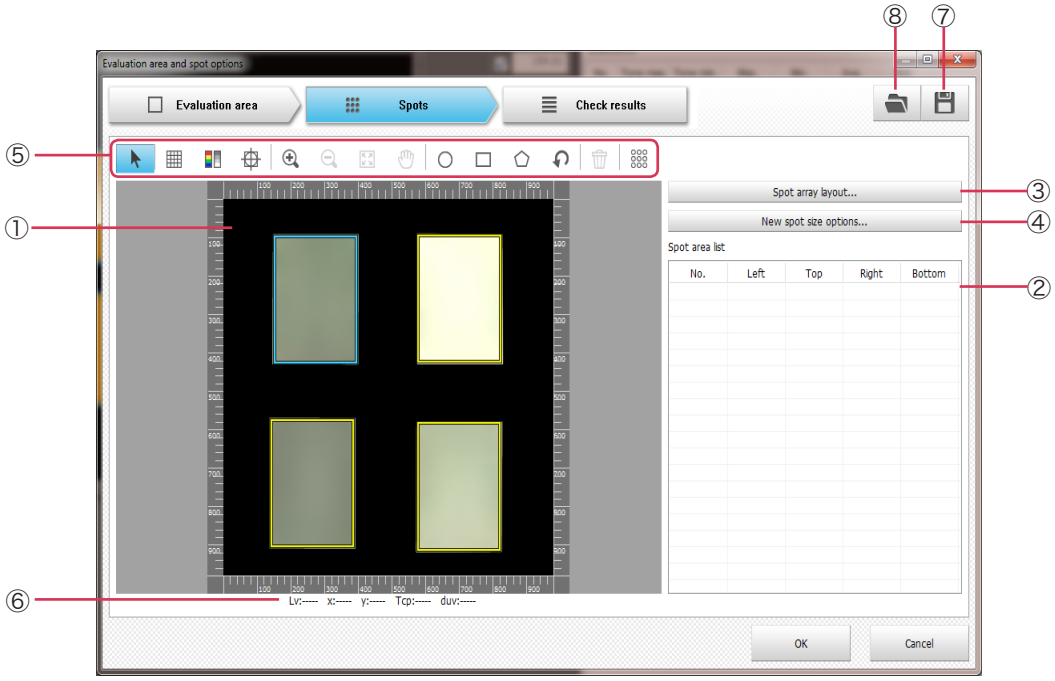
3 **Drag the mouse pointer on the RGB image in the data view to set an evaluation area.**

6.2 Spot setting

6.2.1 General

Click the [Spots] button on the "Evaluation area and spot options" screen.

Note Evaluation areas cannot be edited on this screen.



① Data view

Shows evaluation areas in RGB mode. Monochrome mode can also be selected.

② Spot area list

Lists the spots located in the evaluation area.

The leftmost column of the list shows the data Nos. and others show coordinate values.

Note Spots can be located in the first evaluation area only. Other areas (the second areas and subsequent ones) are on the same spot location conditions as the first one area.

Data No.	
Coordinate values (relative coordinate to the evaluation areas)	Left, top, right and bottom in this order The selected data row reflects to the data view. Multiple data rows can be selected in the list.

③ "Spot array layout"

Click to open the "Spot array layout" screen (see 6.2.2).

④ "New spot size options..."

Click to open the "New spot size options" dialog (see 6.2.3).

⑤ Toolbar

The toolbar contains the following tool icons.

Putting the mouse pointer on a tool icon will open a tooltip for that icon.

Select	Use to select and edit the evaluation areas.
Grid	Use to turn on or off the grid in the data area.
Use to switch between color and monochrome.	Use to switch between color and monochrome.

Cross, outer frame	Cross. Use to turn on or off the outer frame.
Zoom in	When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom in" mark. You can specify the range to enlarge by dragging the mouse pointer. The enlarged image of the range will be displayed. Left-clicking the mouse allows you to enlarge the image up to 32 times. (Left-clicking the mouse while holding down the Shift and Ctrl keys also allows you to enlarge the image size.)
Zoom out	When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom out" mark. Left-clicking the mouse several times allows you to go back to the "All area" display mode. (Right-clicking the mouse while holding down the Shift and Ctrl keys also allows you to reduce the image size.)
All area	Use to go back to the "All area" mode.
Move	When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Move" mark. You can grasp the image where you click the mouse and move it by the distance the mouse has dragged. (Dragging while holding down the space key also allows you to move an image.)
Create new (circle)	Use to locate newly created spots(circle). To locate the spots, click any point on the finder while this icon is on. Spots can also be located by dragging."New spot size options" dialog (see 6.2.3)
Create new (rectangle)	Use to locate newly created spots(rectangle). To locate the spots, click any point on the finder while this icon is on. Spots can also be located by dragging. "New spot size options" dialog (see 6.2.3)
Create new (polygon)	Use to locate polygons. To locate the polygons, click any point on the finder while this icon is on. Clicking once on the finder will form an apex of the polygon. The point at which double-clicking is made is the position of the last apex. **Tip** If spots are polygonal, the size of the evaluation area cannot be changed.
Undo	Use to undo the last action. You can undo up to the last 20 actions.
Delete	Use to undo the last action. You can undo up to the last 20 actions.
Align spots	layout" screen. Even though the spots are somewhat different in size, they will be aligned in each of the evaluation areas.

⑥ Spot information

Shows information on the spot selected in the spot list.

Lv, x, y, Tcp, ⊿uv	If multiple spots are selected in the list, "--" will appear in this field.

⑦ Save evaluation area and spot setting file

Use to save an evaluation area and spot setting file, which can later be loaded and used for measurement.

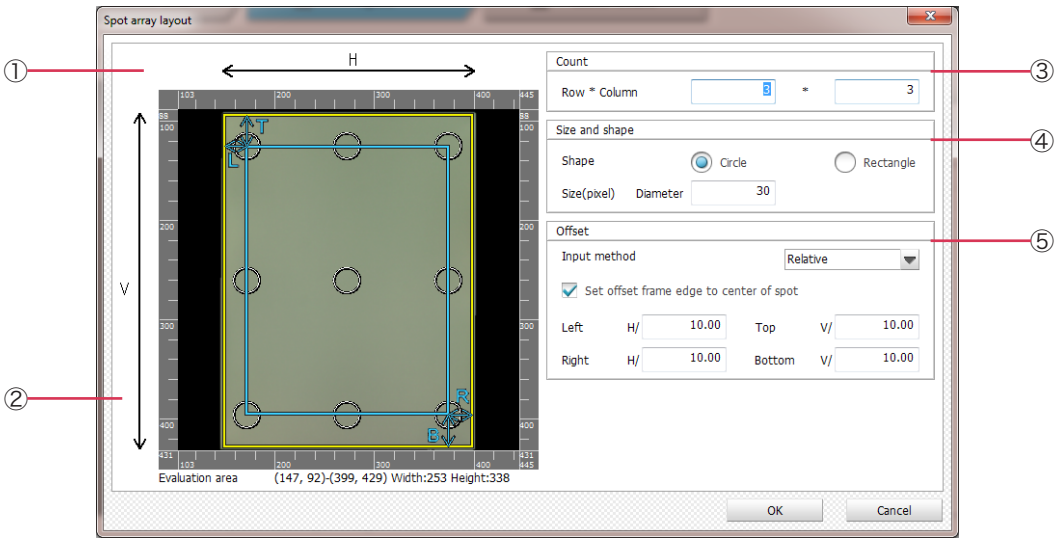
⑧ Load an evaluation area and spot setting file

Use to open and load an existing evaluation area and spot setting file.

6.2.2 Spot array layout

Circular or rectangular spots can be aligned automatically.

[Spot array layout...] Click to open the "Spot array layout" screen.



① Data view

Shows the image corresponding to the selected data.

② Evaluation area

Shows the coordinates of the evaluation area.

③ Count

Enter values that are not more than 50.

④ Size and shape

Shape Select the shape of spots between circle and rectangle.

Size (pixel) Enter the diameter if you select Circle.
Enter the height and width if you select Rectangle.

⑤ Offset

This area allows you to specify the offset (margin) from the edge of the evaluation area.

Input method
Absolute: The entered value is used as an offset.
Relative: The offset is determined relative to the size of the evaluation area.

Values to be entered
Absolute values: Enter integers not exceeding the value of resolution.
Relative values: Enter values ranging from 2 to 100 to the second decimal place.

☐Set offset frame edge to center of spot

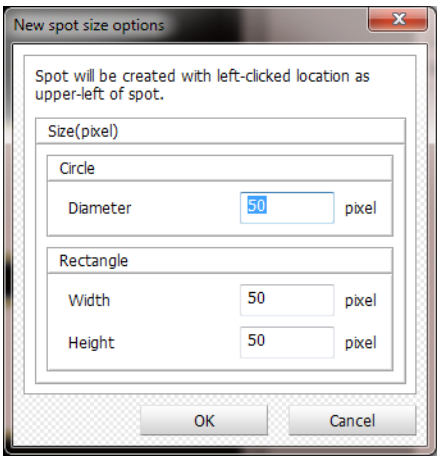
Check the checkbox if you wish to define the offset relative to the center of the spots located at the two corners of the evaluation area.
Do not check the checkbox if you wish to define the offset relative to the circumference of the spots located at the two corners of the evaluation area.

[OK] Click to close the screen with saving the setting.
The [Arrange spots] icon will turn on.

6.2.3 "New spot size options" dialog

This screen allows you to create new the spots.

Click to the [New spot size options...] button, open the "New spot size options" dialog.



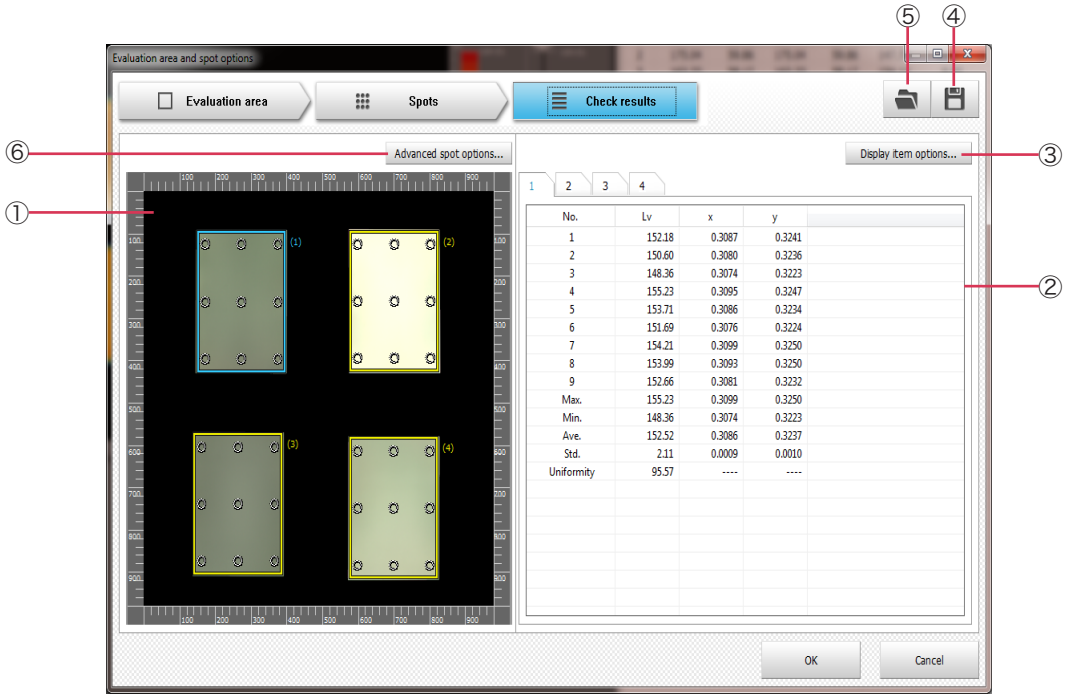
Diameter of circle	Enter an integer ranging from 10 to 200.
Width/height of rectangle	Enter integers ranging from 10 to 200.
[**OK**]	Click to save the setting. Use this window in the process of "Create new (circle)" or "Create new (rectangle)".

6.3 Checking the spot measurement results

6.3.1 General

This screen allows you to check the spot measurement results.

To access this screen, click the [Check results] button on the "Evaluation area and spot options" screen.



① Finder view

Shows evaluation areas and spots in RGB mode.

② Result list

Shows the measurement results by evaluation area.

The figures listed are averages in each spot.

The [Display item options...] button ③ allows you to select the items to be displayed (See 6.3.2 Display item options).

Tip If multiple evaluation areas are defined, spots may protrude from evaluation areas. In such a case, pixels in the protruded portions of spots are not used for calculation.This also applies to pixels overexposed, underexposed, or suffered a calculation error. Note that the processing time varies depending on the size and number of spots.

③ "Display item options..."

Click to open the “Display item options” dialog (see 6.3.2) .

④ Save evaluation area and spot setting file

Use to save an evaluation area and spot setting file, which can later be loaded and used for measurement.

⑤ Load an evaluation area and spot setting file

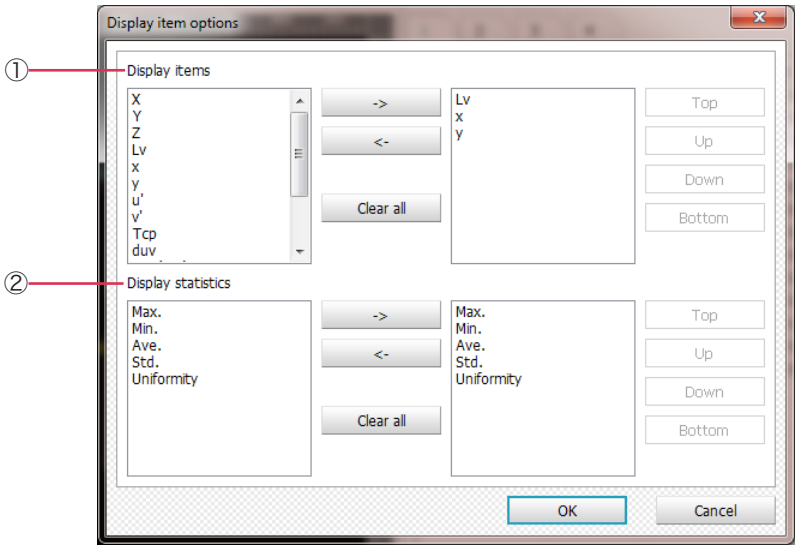
Use to open and load an existing evaluation area and spot setting file.

⑥ "Advanced spot options..."

Clicking any item in the result list and clicking this button will open the "Advanced spot options" dialog box. (see 6.3.3)

6.3.2 Display item options

The "Display item options" screen allows you to select the items you wish to view in the results list.



① Display items

You can select any among the following 15 items.

X	y	Tcp (JIS)
Y	u'	⊿ uv (JIS)
Z	v'	Dominant Wavelength (*)
Lv	Tcp	Excitation Pulity
x	⊿ uv	Ev

Tip *A minus sign denotes the complementary wavelength. See 1.4 of Annex for the complementary wavelength.

② Display statistics

[Max.] [Min.] [Ave.] [Std.] [Uniformity]

Button description (common to buttons for "Items tobe displayed" and "Statistical values to be displayed."

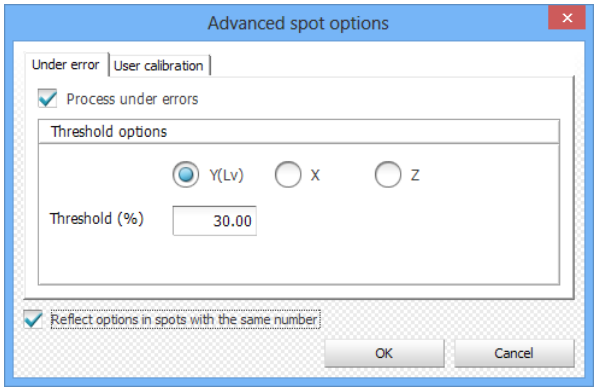
[->]	Click to move the selected item in the item list (left) to the selection list (right).
[<-]	Click to remove the selected item from the selection list (right).
[Clear all]	Click to remove all items from the selection list.
[Top]	Click to move the selected item to the top of the selection list. This button does not work if the item at the top of the selection list is selected.
[Up]	Click to move the selected item up one position in the selection list.
[Down]	Click to move the selected item down one position in the selection list.
[Bottom]	Click to move the selected item to the bottom of the selection list. This button does not work if the item at the bottom of the selection list is selected.
[OK]	Click to save the setting and exit the screen.

6.3.3 Advanced spot options

This section describes two features that allows you to perform setting for each spot.

6.3.3.1 Under error

Use this feature to measure only the luminous parts of the measuring object in the spot.

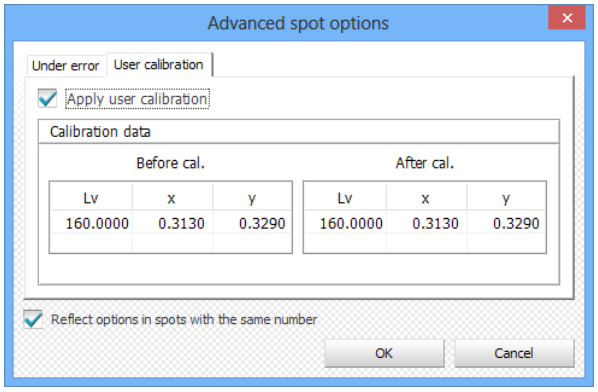


☐Process under error. Check the checkbox if you wish to enable the image correction feature.

Threshold options Select Y (Lv), X, or Z.
Enter a threshold (%) ranging from 0.01 to 100.00 to the second decimal place.
If the threshold is set to 100%, the pixels in the evaluation area will all be ignored. If it is set to 0%, the pixels having a pixel value of 0 will only be ignored.

☐Reflect options in spots with the same number Checking the checkbox causes the setting to apply to spots with the same number in all evaluation areas.

6.3.3.2 User calibration



☐Apply user calibration Check the checkbox if you wish to enable the image correction feature.

Calibration dada

Before cal. Enter values within the following ranges.

Lv	0.05<= <=100000 (when brightness unit is cd/m^2)
x	0.0000< <1.0000
y	0.0000< <1.0000

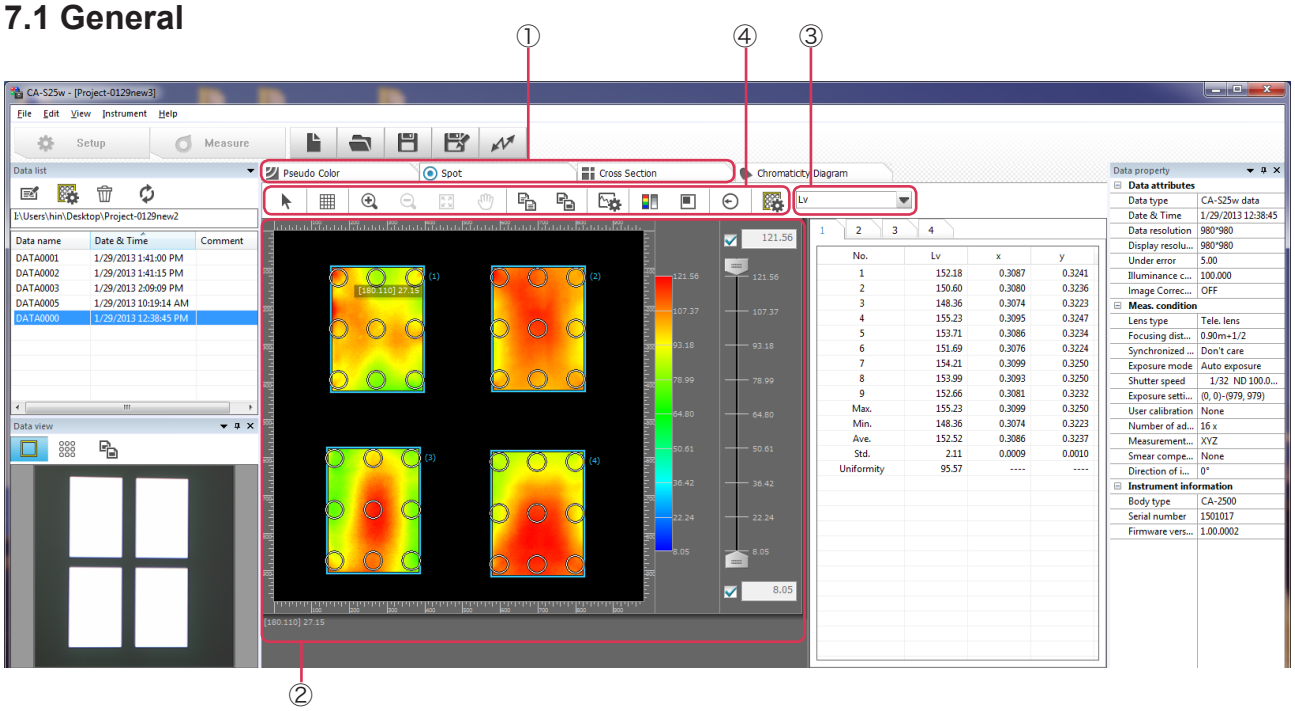
After cal. Enter values within the following ranges.

Lv	0.05<= <=100000(when brightness unit is cd/m^2)
x	0.0000< <1.0000
y	0.0000< <1.0000

7. "Observation" screen

The "Observation" screen allows you to visually check the measurement results from various perspectives.

7.1 General



① Page selection tabs

Four tabs are available: "Pseudo color", "Spot", "Section view", and "Chromaticity diagram".

② Tab description

Pseudo Color	Click to open the pseudo color page.
Spot	Click to open the spot page.
Cross section	Click to open the section view page.
Chromaticity diagram	Click to open the chromaticity diagram page.

③ Selection of colorimetric values

You can select any among the following 13 items.

X	Lv	u'	⊿ uv	Ev
Y	x	v'	Dominant Wavelength	
Z	y	Tcp	Excitation Pulity	

④ Toolbar

The toolbar contains the following tool icons.

Select	Use to select and edit the evaluation areas.
Grid	Use to turn on or off the grid.
Zoom in	When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom in" mark. You can specify the range to enlarge by dragging the mouse pointer. The enlarged image of the range will be displayed. Left-clicking the mouse allows you to enlarge the image up to 32 times. (Left-clicking the mouse while holding down the Shift and Ctrl keys also allows you to enlarge the image size.)

Zoom out

When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom out" mark.
Left-clicking the mouse several times allows you to go back to the "All area" display mode.
(Right-clicking the mouse while holding down the Shift and Ctrl keys also allows you to reduce the image size.)

All area

Use to go back to the "All area" mode.

Move

When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Move" mark. You can grasp the image where you click the mouse and move it by the distance the mouse has dragged.
(Dragging while holding down the space key also allows you to move an image.)

Copy numeric value

Use to copy measurement data on the clipboard. Clicking this icon will show you options for the range to be copied.
The options are as follows:

All area	All area data
Evaluation area	All data in evaluation area
Display area	All data in display area
Statistics	Statistical values per evaluation area

Copy image

Use to copy the currently displayed image on the clipboard.

Graphic setting

Click to go to the "Setup graph" page "Setup graph" screen (see 7.2.2).

Use to switch between color and monochrome.

Use to switch between color and monochrome.

Tone control range

Use to select the tone control range. Clicking this icon will show you options for the range. A check mark in the checkbox denotes that option is currently selected.
To change the tone control scheme, click the "Pseudo color" tab on the “Setup graph” screen "Pseudo Color" (7.2.2.1).

☐ All area	All area data
☐ Evaluation area	All data in evaluation area
☐ Display area	All data in display area

Contour ON/OFF

Use to turn on or off the contour in the evaluation area.
The "Contour lines" screen allows you to change the display contents "Contour lines" screen (see 7.2.2.2).

Color shift

Use to display the color shift line according to the setting.
See 7.3.2.3 Color shift for the setting.

Evaluation criteria

Click to go to the "Evaluation area and spot options" screen (see 6.1.1).

Mark

Use to mark a point in the evaluation area with "+". The shape of the mouse pointer changes to the same shape of the icon. Left-click the point you wish to specify as the center of lines (marked "+"), along which longitudinal and cross section views should be displayed. Clicking while holding down the Shift key also allows you to do the same work.
Up to 20 marks can be placed.

Arbitrary section view

Use to mark a point in the evaluation area with "+". The shape of the mouse pointer changes to the same shape of the icon. Left-click the point you wish to specify as the starting point of a dragged line (marked "+"), along which a cross section view should be displayed.

Spot result

Use to indicate spot measuring results on the chromaticity diagram.

Switch between pseudo color and chromaticity

Use to switch between pseudo color and chromaticity.
This tool icon reflects to a selected graph.
An area selected on the chromaticity diagram will also be displayed on the pseudo color image (See 7.5.3).

Matrix of toolbar in Observation screen

No.	Button icons	Pseudo Color	Spot	Section view	Chromaticity diagram
1	Select	○	○	○	○
2	Grid	○	○	○	○
3	Zoom in	○	○	○	○
4	Zoom out	○	○	○	○
5	All area	○	○	○	○
6	Move	○	○	○	○
7	Copy numeric value	○	○	○	○
8	Copy image	○	○	○	○
9	Graphic setting	○	○	○	○
10	Use to switch between color and monochrome.	○	○	○	○
11	Tone control range	○	○	○	○
12	Contour lines	○	-	-	-
13	Color shift	-	○	-	-
14	Evaluation conditions	-	○	-	-
15	Mark	-	-	○	-
16	Arbitrary section view	-	-	○	-
17	Spot result	-	-	-	○
18	Switch between pseudo color and chromaticity	-	-	-	○

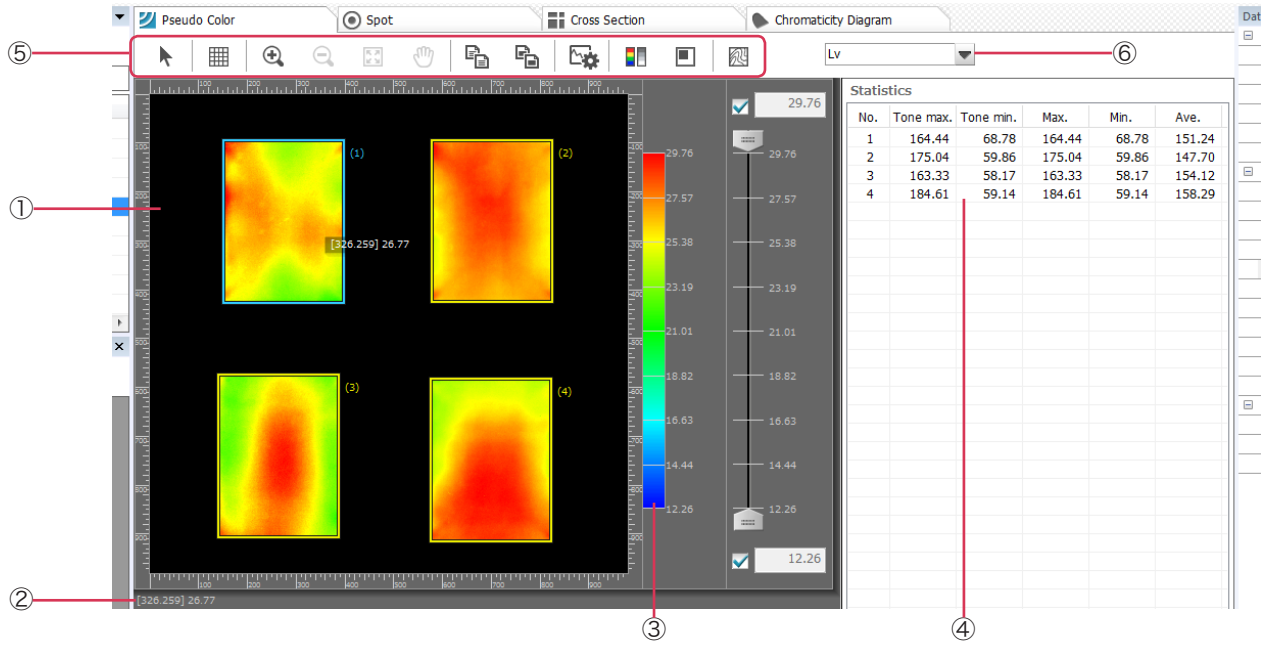
7.2 "Pseudo color" page

The following describse "Pseudo color" page.

The "Pseudo color" page will allow you to check that the measurement is correct or obtained values are properly distributed (mura), and to observe the data image for further analysis.

Tip Also see "2. Observation of pseudo color" of III Supplementary Description of Major functions.

7.2.1 Page layout



① Tab description

Shows the image of the evaluation area in pseudo color.

When there are multiple evaluation areas, each will be given a number.

② Information field

When you put the mouse pointer on an evaluation area, this field will show the pixel position and the colorimetric value of that position.

③ Tone control bars

The upper slide bar is for controlling the max tone and the lower for the min tone.

If a checkbox is checked, the corresponding tone is automatically controlled. Unchecking the checkbox allows you to specify the max or min value. Both the checkboxes default to "checked".

You can use the slide bars, no matter whether or not the checkbox is checked. Moving a slide bar will uncheck the checkbox.

④ Statistics

Lists statistical values.

These values are listed per evaluation area.

⑤ Toolbar

See " ④ Toolbar of 7.1 General".

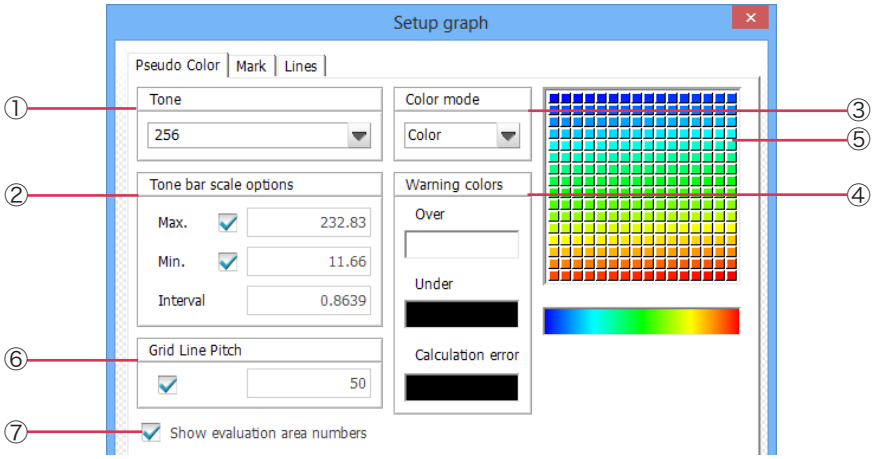
⑥ Items to be displayed

See " ③ Selection of colorimetric values of 7.1 General".

7.2.2 Setup graph

7.2.2.1 Pseudo Color

Click the [Graphic setting] button in the toolbar will open the "Setup graph" screen.
The following describes the "Pseudo color" page.



① Tone

You can choose whether to select one from options or to enter any value.

Available options	256, 128, 64, 32, 16, 8, 4
Any value	Ranging from 2 to 256

② Tone bar scale options

Max. Checking the checkbox results in a selection of auto control mode. Unchecking it allows you to enter any value.

Min. Checking the checkbox results in a selection of auto control mode. Unchecking it allows you to enter any value.

Interval This is calculated automatically depending on the tone, max value, and min value, and cannot be edited.

③ Color mode

Select either of monochrome or color.

④ Warning colors

Over This color indicates that color representation of some regions of an image fails due to overexposure. Select any from the color pattern.

Under This color indicates that color representation of some regions of an image fails due to underexposure. Select any from the color pattern.

Calculation error This color indicates that color calculation of an image fails due any reason. Select any from the color pattern.

Clicking a blank field will open the "Color setting" screen where you can select the desired color.

⑤ Color bar

Provides display depending on the warning color selection. The color bar cannot be edited.

Tip If multiple evaluation areas are defined, perform tone control per area.

⑥ Grid Line Pitch

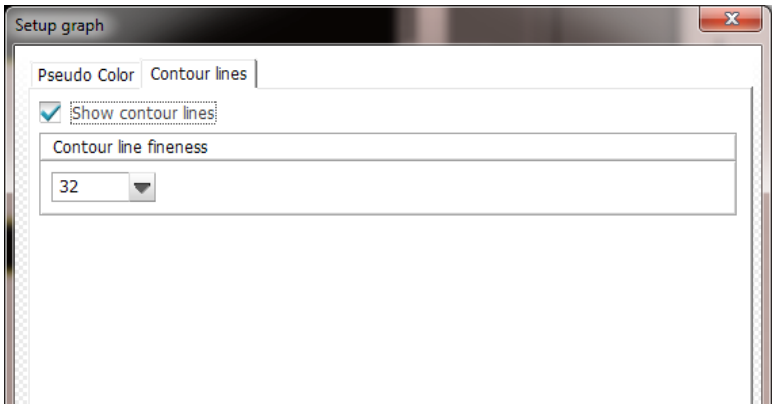
Checking the checkbox results in a selection of auto setting mode. Unchecking it allows you to enter any value ranging from 5 to 100.

⑦ Show evaluation area numbers

Checking the checkbox will show the number of an evaluation area if there are multiple evaluation areas.

7.2.2.2 Contour lines

Click the [Graphic setting] button in the toolbar will open the "Setup graph" screen.
The following describes the "Contour" page.



☐ **Show contour lines** Check the checkbox to display contour lines.

Note If the magnification exceeds 4x, contour lines will not be displayed.

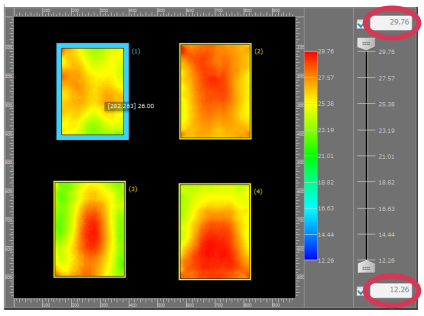
Contour line fineness You can choose whether to select one from options or to enter any value.

Available options	32, 16, 8, 4
Any value	Ranging from 2 to 32

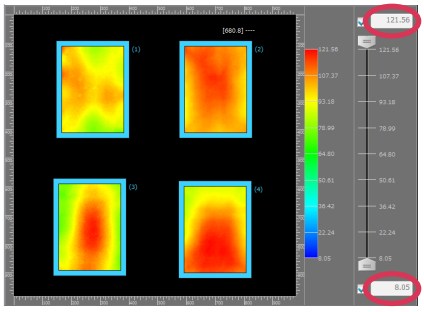
Tip If there are multiple evaluation areas, perform scaling the tone control bar per evaluation area. In such a case, the tone control area needs to be identical to the evaluation area.

As is shown in the figure below, the selected evaluation area is subject to control with the slide bar.
Selecting a point outside of evaluation areas will cause all the evaluation areas to be subject to control.

□ When an evaluation area is selected



□ When all evaluation areas are selected



7.2.3 Right-click menu

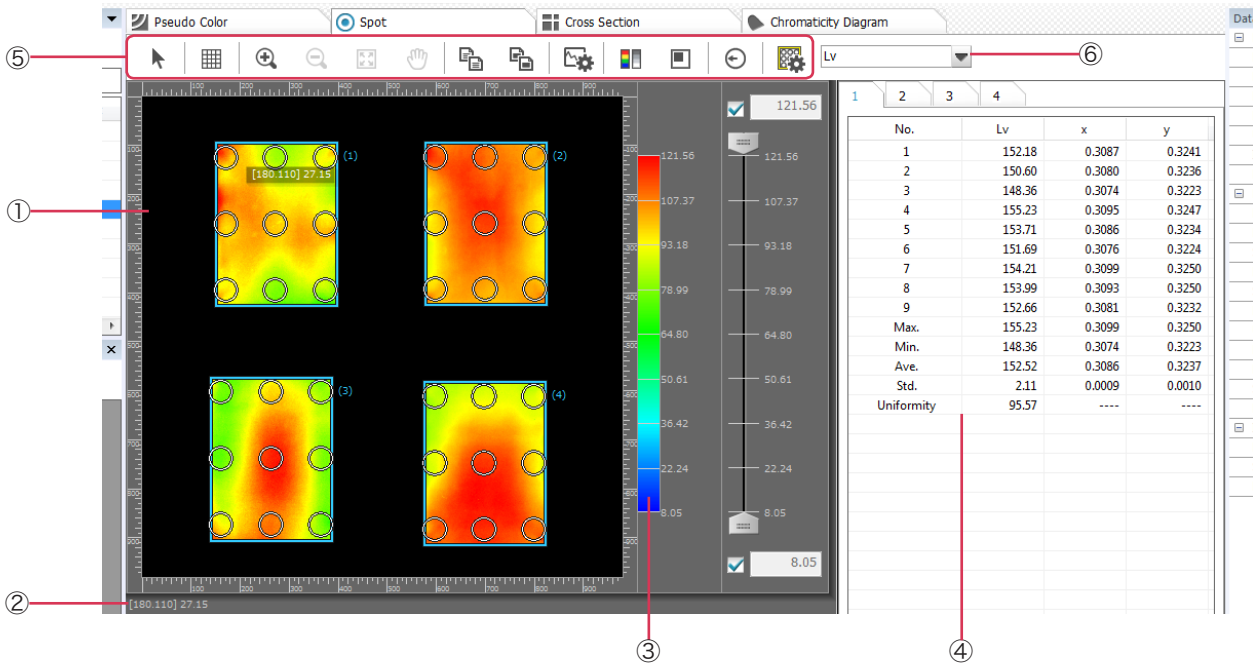
Right-clicking any point on the observation screen will open the following menu.

Evaluation area and spot options		Select to go to the "Evaluation criteria setting" screen. (6.1.1)(6.2.1)
Advanced data options...		Select to go to the "Importing files" screen (see 8.3).
Copy numeric value		Use to copy numeric values on the clipboard. For the format applied to the copied data, See 8.4.1 Numeric value copy format.
	All area	
	Evaluation area	
	Display area	
	Statistics	Statistical values per evaluation area.
Save text...		Use to open the "File save" screen and save numeric values as text. SSee 8.4.2 Saving values as text.
	All area	
	Evaluation area	
	Display area	
	Statistics	Statistical values per evaluation area.
Copy image		
Graphic setting		Select to go to the "Setup graph" screen (see 7.3.2).

7.3 Spot

The following describes the spot page.

7.3.1 Page layout



① Tab description

Shows the image of the evaluation area in pseudo color.
When there are multiple evaluation areas, each will be given a number.

② Information field

When you put the mouse pointer on an evaluation area, this field will show the pixel position and the colorimetric value of that position.

③ Tone control bars

The upper slide bar is for controlling the max tone and the lower for the min tone.
If a checkbox is checked, the corresponding tone is automatically controlled. Unchecking the checkbox allows you to specify the max or min value. Both the checkboxes default to "checked".
You can use the slide bars, no matter whether or not the checkbox is checked. Moving a slide bar will uncheck the checkbox.

④ Spot list (See 6.2.1)

See " ② Spot area list of 6.2.1 General ".

⑤ Toolbar

See " ④ Toolbar of 7.1 General ".

⑥ Selection of colorimetric values

See " ③ Selection of colorimetric values of 7.1 General ".

7.3.2 Setup graph

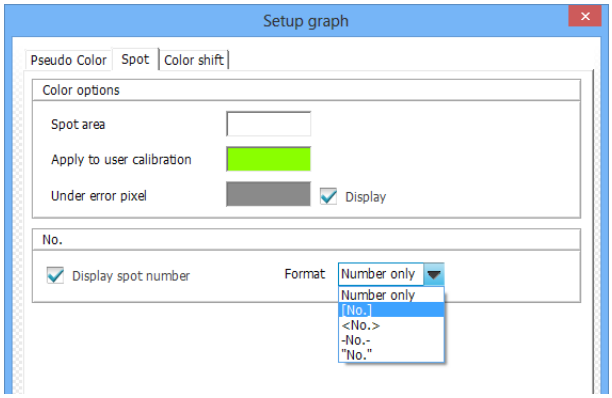
The following describes how to set graphs on the spot page.
Click the [Graphic setting] button in the toolbar will open the "Setup graph" screen.

7.3.2.1 Pseudo Color

See " 7.2.2.1 Pseudo Color ".

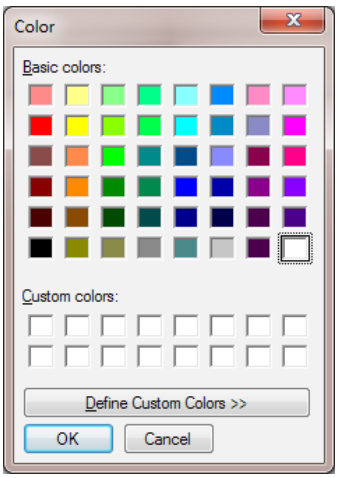
7.3.2.2 Spot

Click the "Spot" tab in the "Setup graph" screen.
Clicking a box of spot area will open the "Color" screen.



Color options

Spot area Clicking the box will allow you to set the color on the "Color" screen.



Apply to user calibration Clicking the box will cause the "Color" screen to appear, where you can set the color of the spots subject to user calibration.

Under error pixel Check the checkbox of "☐ Display" if you wish to enable this feature.
Clicking the box will cause the "Color" screen to appear, where you can set the color of under error pixels in the spot.

No.

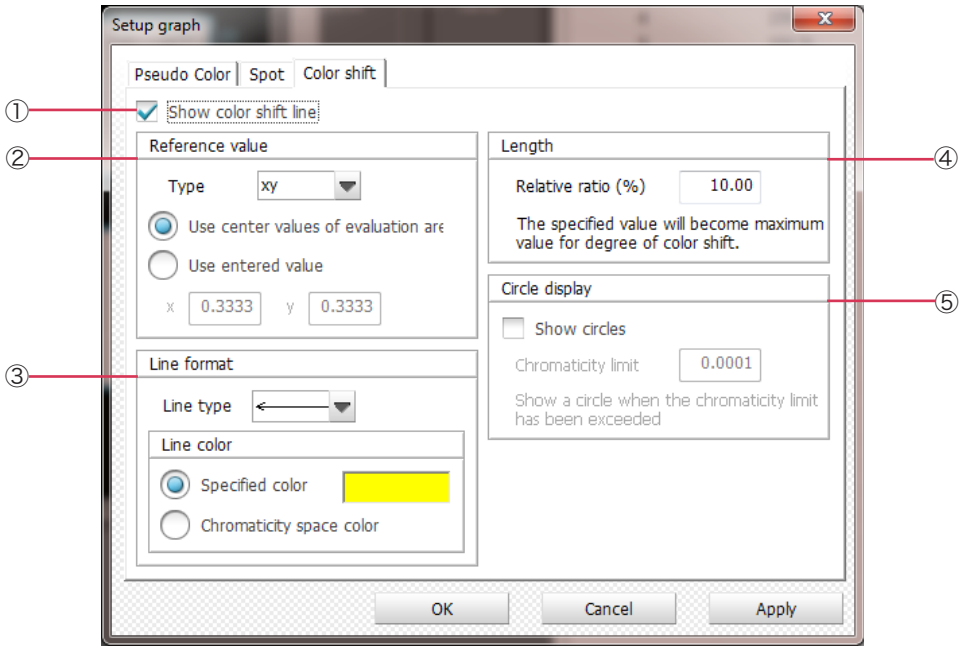
Display spot number Check the checkbox if you wish to enable this feature.
Enabling this feature causes the spot number to be displayed near the spot.

Format Select one from the following five options:
Number only , **[No.]** , **< No. >** , **- No. -** , **" No. "**

7.3.2.3 Color shift

The degree of color shift from the reference value in each spot will be shown.

Click the "Color shift" tab in the "Setup graph" screen.



① Color shift line ON/OFF

☐Show color shift line — Checking the checkbox will cause the color shift line to be displayed on the pseudo color. The arrow direction represents the direction of color shift on the chromaticity diagram. The following items will also become active.

* The color shift line is not displayed when measurement is made in single-filter (X, Y or Z) mode.

② Reference value

Type — This area allows you to set a colorimetric system that is the reference for color shift. Lvxy Select either Lvxy or Lvu'v'.

○Use center values of evaluation area — The value corresponding to the center of each evaluation area is used as the reference.

○Use entered value — Values entered in the fields are used as the reference.

③ Line format

Line type — Select the type of line.

Line color — Select the color of line.

○Specified color — Selecting this option will open the "Color setting" screen where you can set the color.

○Chromaticity space color — Selecting this option will cause the line to be drawn in the same color as that on the chromaticity diagram.

④ Length of color shift line (as percentage of length of evaluation area)

Relative ratio (%) — You can specify the length of the color shift line as a percentage of the length of the long side of evaluation areas. Enter any value ranging from 1 to 100, as appropriate.

⑤ Circle display

☐Show circles — Checking the checkbox will cause a circle to be used for highlighting the position where the color difference exceeds the evaluation criteria.

Enter any value ranging from 0.0001 to 1.0000. (Chromaticity limit)

7.3.3 Right-click menu

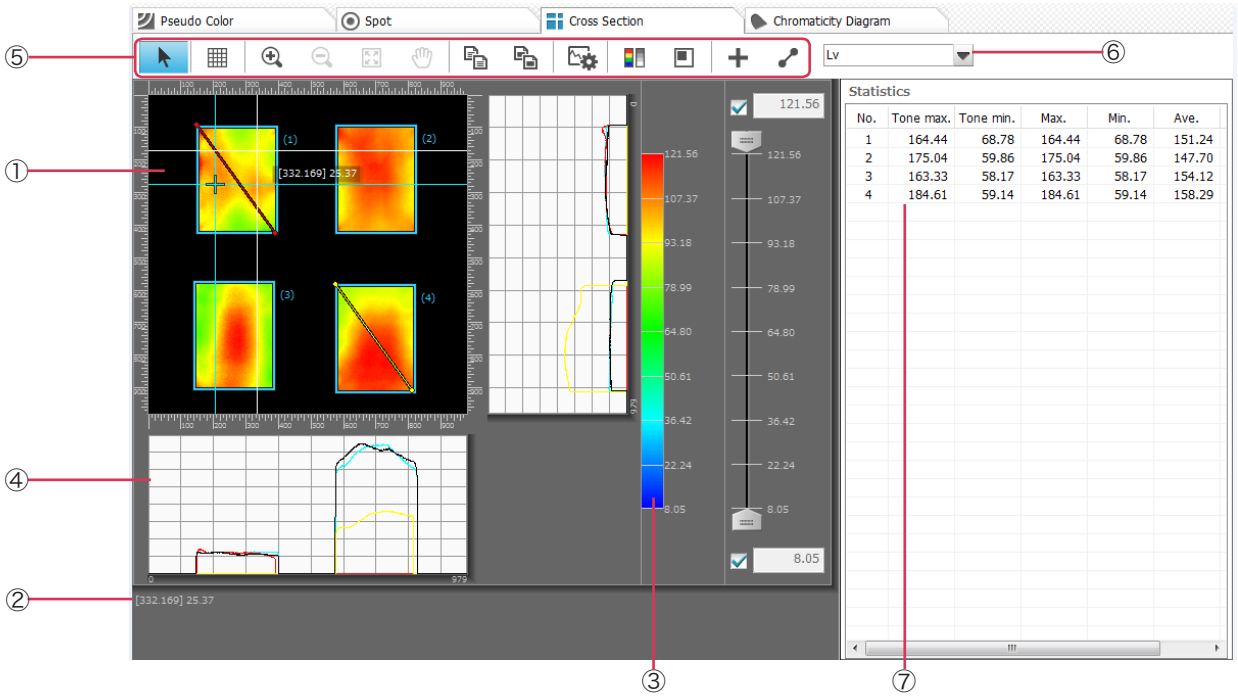
Right-clicking any point on the observation screen will open the following menu.

Evaluation area and spot options	Select to go to the "Evaluation criteria setting" screen. (6.1.1) (6.2.1)
Data setting	Select to go to the "Importing files" screen (see 8.3).
Copy numeric value	Use to copy numeric values on the clipboard. For the format applied to the copied data, See 8.4.1 Numeric value copy format.
All area	
Evaluation area	
Display area	
Statistics	Statistical values per evaluation area
Spot result	
Save text...	Use to open the "File save" screen and save numeric values as text. SSee 8.4.2 Saving values as text.
All area	
Evaluation area	
Display area	
Statistics	Statistical values per evaluation area
Spot result	
Copy image	
Graphic setting	Select to go to the "Setup graph" screen (see 7.3.2).

7.4 Section view

The following describes the section view page.

7.4.1 Page layout



① Tab description

Shows the image of the evaluation area in pseudo color.
When there are multiple evaluation areas, each will be given a number.

② Information field

When you put the mouse pointer on an evaluation area, this field will show the pixel position and the colorimetric value of that position.

③ Tone control bars

The upper slide bar is for controlling the max tone and the lower for the min tone.
If a checkbox is checked, the corresponding tone is automatically controlled. Unchecking the checkbox allows you to specify the max or min value. Both the checkboxes default to "checked".
You can use the slide bars, no matter whether or not the checkbox is checked. Moving a slide bar will uncheck the checkbox.

④ Section view

Shows the longitudinal and cross section views of the image at the mouse pointer position.
Clicking the image while the "Mark" or "Arbitrary section view" icon in the toolbar is on also allows the section views to be displayed.
Clicking the image while the "Zoom in" icon in the toolbar is on also allows the section views to be displayed.

⑤ Toolbar

See " ④ Toolbar of 7.1 General ".

⑥ Selection of colorimetric values

See " ③ Selection of colorimetric values of 7.1 General ".

⑦ Statistics

Lists statistical values. These values are listed per evaluation area.

7.4.2 Setup graph

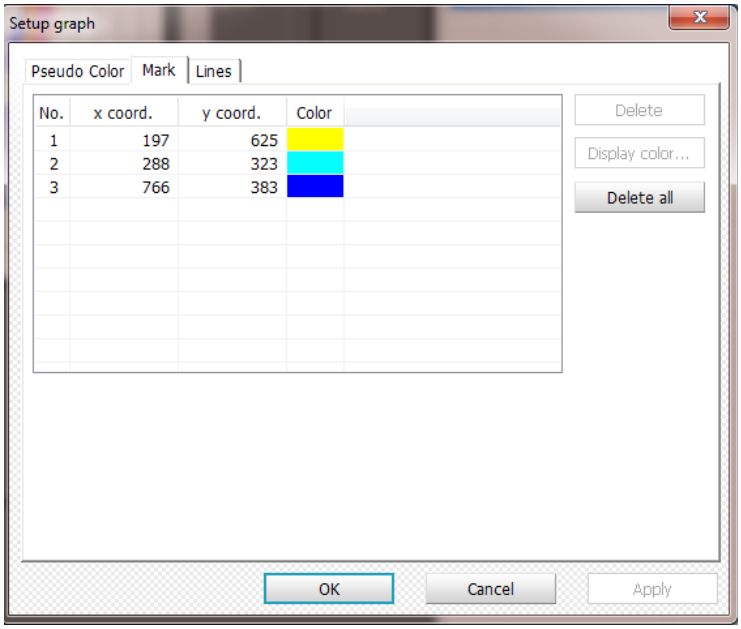
The following describes how to set graphs on the section view page.
Click the [Graphic setting] button in the toolbar will open the "Setup graph" screen.

7.4.2.1 Pseudo Color

See " 7.2.2.1 Pseudo Color ".

7.4.2.2 Mark

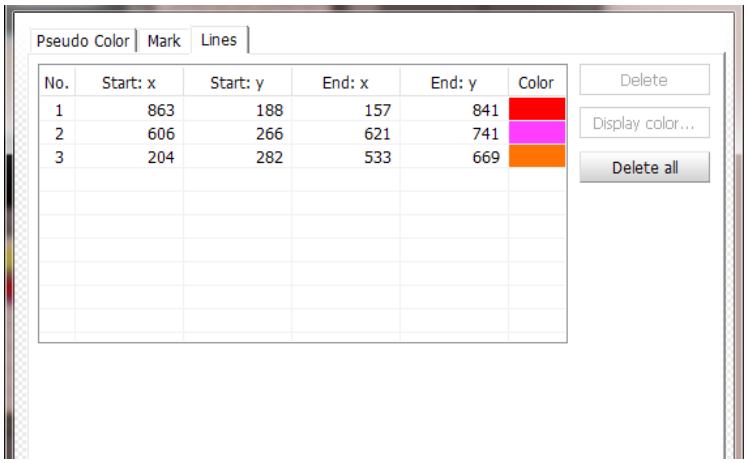
Click the [Mark] tab in the "Setup grapf" screen.



List	The top row consists of the following items.
No.	Data number beginning with 1.
x coord.	Position information
y coord.	Position information You can directly enter the coordinates in these cells.
Color	Actual color of the mark
[Delete]	Use to delete the selected data.
[Display Color...]	Use to select the color of the selected data. Double-clicking a color cell will open the "Color setting" screen.
[Delete all]	Use to delete all the data in the list.

7.4.2.3 Arbitrary straight line

Click the [Lines] tab in the "Setup graph" screen.



List	The top row consists of the following items.
No.	Data number beginning with 1.
x coordinate of starting point	Position information of the starting point of the section line
y coordinate of starting point	Position information of the starting point of the section line
x coordinate of endpoint	Position information of the endpoint of the section line
y coordinate of endpoint	Position information of the endpoint of the section line You can directly enter the coordinates in the cells.
Color	Actual color of the section line
[Delete]	Use to delete the selected data.
[Display Color...]	Use to select the color of the selected data. Double-clicking a color cell will open the "Color setting" screen.
[Delete all]	Use to delete all the data in the list.

7.4.3 Right-click menu

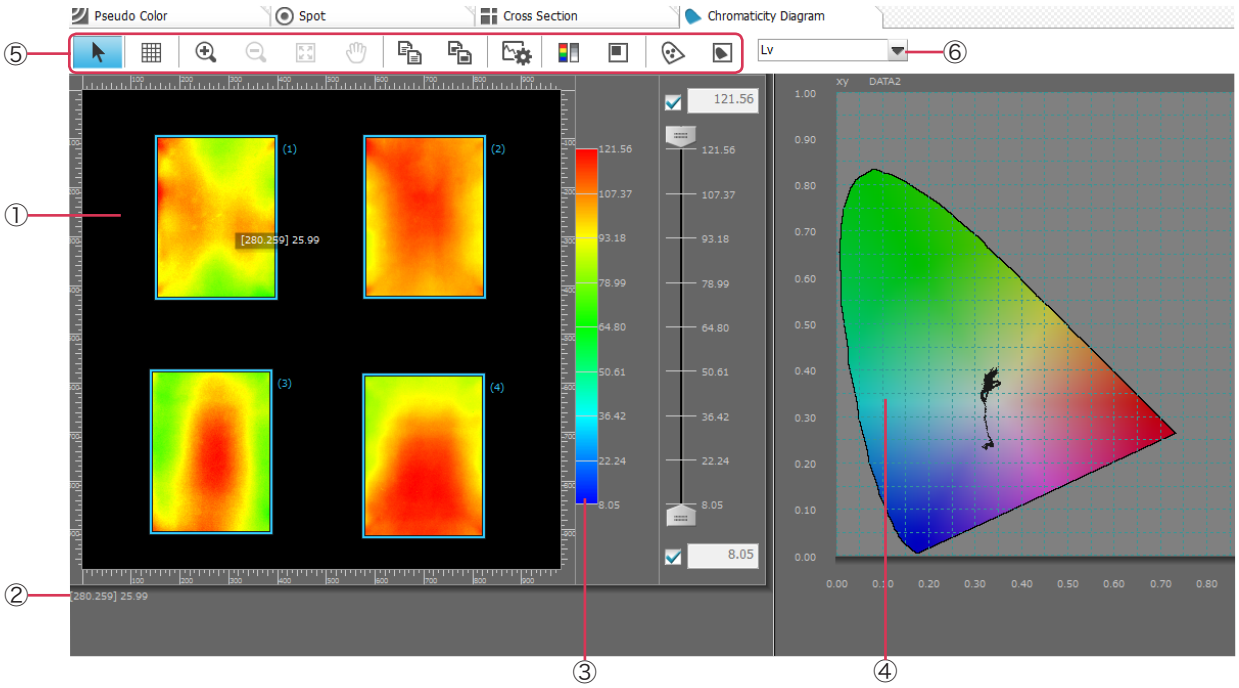
Right-clicking any point on the observation screen will open the following menu.

Evaluation area and spot options	Select to go to the "Evaluation criteria setting" screen. (6.1.1) (6.2.1)
Data setting	Select to go to the "Importing files" screen (see 8.3).
Copy numeric value	Use to copy numeric values on the clipboard. For the format applied to the copied data, See 8.4.1 Numeric value copy format.
All area	
Evaluation area	
Display area	
Statistics	Statistical values per evaluation area
Cross section	
Save text...	Use to open the "File save" screen and save numeric values as text. SSee 8.4.2 Saving values as text.
All area	
Evaluation area	
Display area	
Statistics	Statistical values per evaluation area
Cross section	
Copy image	
Graphic setting	Select to go to the "Setup graph" screen (see 7.4.2).

7.5 Chromaticity diagram

The following describes the chromaticity diagram page.

7.5.1 Page layout



① Display area

Shows the image of the evaluation area in pseudo color.
When there are multiple evaluation areas, each will be given a number.

② Information field

When you put the mouse pointer on an evaluation area, this field will show the pixel position and the colorimetric value of that position.

③ Tone control bars

The upper slide bar is for controlling the max tone and the lower for the min tone.
If a checkbox is checked, the corresponding tone is automatically controlled. Unchecking the checkbox allows you to specify the max or min value. Both the checkboxes default to "checked".
You can use the slide bars, no matter whether or not the checkbox is checked. Moving a slide bar will uncheck the checkbox.

④ Chromaticity diagram

Shows the chromaticity diagram selected using "Graphic setting" in the toolbar.
Selection of either xy or u'v' graph is allowed.

⑤ Toolbar

See " ④ Toolbar of 7.1 General".

⑥ Selection of colorimetric values

See " ③ Selection of colorimetric values of 7.1 General".

7.5.2 Setup graph

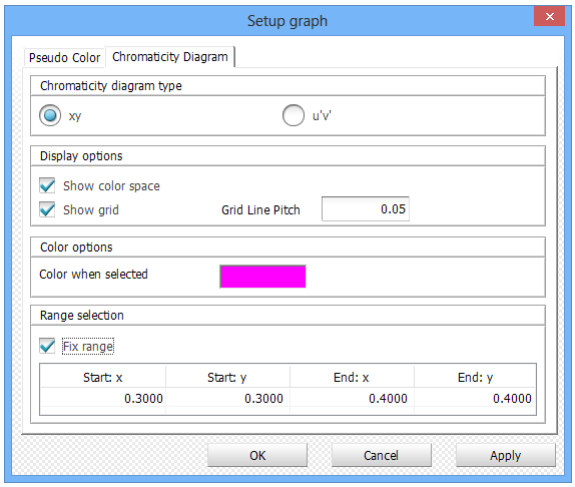
The following describes how to set graphs on the chromaticity diagram page.
Click the [Graphic setting] button in the toolbar will open the "Setup graph" screen.

7.5.2.1 Pseudo Color

See "7.2.2.1 Pseudo Color"

7.5.2.2 Chromaticity diagram

Click the "Chromaticity Diagram" tab in the "Setup graph" screen.



Chromaticity diagram type

Chromaticity diagram type Select either xy or u'v' graph. The selected chromaticity diagram will appear on the observation screen.

Display options

☐ **Show color space** Checking the checkbox will cause the color space in the chromaticity diagram to be displayed in color.

☐ **Show grid** Checking the checkbox will cause the grid to be displayed on the chromaticity diagram.

Grid Line Pitch You can enter a value ranging from 0.001 to 0.999. This is set to 0.05 by default.

Color options

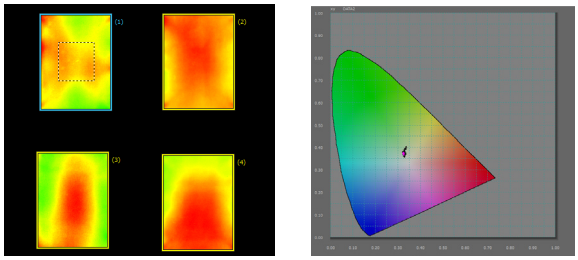
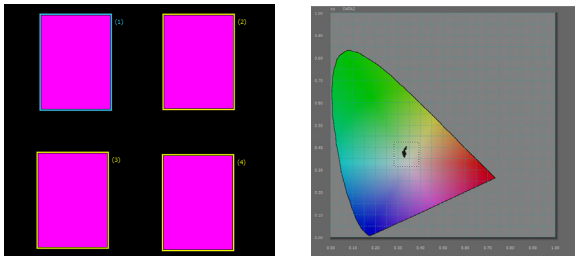
Color when selected Clicking the box will cause the "Color" screen to appear, where you can set the selection color.

Range selection

☐ **Fix range** You can enter coordinate values ranging from 0.0001 to 0.9999 into the start point and end point fields.
Fixing the range makes it impossible to set or change the range on the chromaticity diagram.

7.5.3 Graph subject to operation

As already mentioned, an area selected on the chromaticity diagram while the "Switch between pseudo color and chromaticity" icon in the toolbar is on will also be displayed in different color on the pseudo color image.
An area selected on the pseudo color while the "Switch between pseudo color and chromaticity" icon in the toolbar is off will also be displayed in different color on the chromaticity diagram.

<Pseudo color Main>
An area selected on pseudo color should be displayed in different color.

<Chromaticity diagram Main>
An area selected on chromaticity diagram should be displayed in different color.


Tip The "different color" mentioned above refers to the color selected from the Color options in "7.5.2.2 Chromaticity diagram".

7.5.4 Right-click menu

Right-clicking any point on the observation screen will open the following menu.

Evaluation area and spot options		Select to go to the "Evaluation criteria setting" screen. (6.1.1)(6.2.1)
Data setting		Select to go to the "Importing files" screen (see 8.3).
Copy numeric value		Use to copy numeric values on the clipboard. For the format applied to the copied data, See 8.4.1 Numeric value copy format.
	All area	
	Evaluation area	
	Display area	
	Statistics	Statistical values per evaluation area
Save text...		Use to open the "File save" screen and save numeric values as text. See 8.4.2 Saving values as text.
	All area	
	Evaluation area	
	Display area	
	Statistics	Statistical values per evaluation area
Copy image		
Graphic setting		Select to go to the "Setup graph" screen (see 7.5.2).

8. Other functions

8.1 Version information

Procedure

1 **Click "Help" in the menu bar and select "About CA-S25w(A)...".**

The following screen will appear indicating the version information of color management software CA-S25w.

8.2 Accessing the operation manual

Procedure

1 **Click "Help" in the menu bar and select "Software manual".**

The operation manual will be displayed in PDF format.

Tip If you fail to open the manual, launch Adobe Reader, click "Edit" in the menu bar, select "References" from the pull down menu, select "Internet" from Categories, and make sure the checkbox for "Display PDF in browser" is checked.

8.3 Importing files

CA-S25w allows you to import .mcl files created this software and CA-S20w version 1.3 and version 2.3 and later)
The "Evaluation area and spot options" of data files is transferred.
CSV files can also be imported. This necessitates that the following two conditions:

1) Numeric value copy format is "Full area" (8.4.1.1).
2) The files are located in the same folder and are named as shown below:
(File name)_X.csv = X-coordinate data, (File name)_Y.csv = Y-coordinate data, (File name)_Z.csv = Z-coordinate data

Selecting and importing a .csv file will also cause other two .csv files to be imported.

Tip When the resolution of the data contained in. csv or other files (created using CA-S20w Version 2.3 or later or CA-S25w Version 1.0) to be imported is 196 x 196 or 490 x 490, importing these files using CA-S25w Version 1.1 will change the resolution of the data to 980 x 980.

Procedure

1 **Click "File" in the menu bar and select "Import".**

The "Open file" dialog will appear.

2 **Select .*mcl or .*csv from types of files.**

3 **Select the file you wish to open and click [Open] button.**

8.4 Data output options

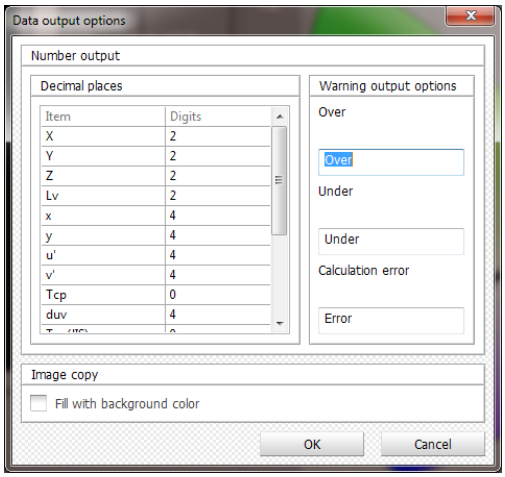
Decimal places of numeric values, among others that are to be outputted, can be specified per value.

Procedure

1 **Click "Edit" in the menu bar and select "Data output options".**

The "Data output options" screen will appear.

2 **Set decimal places.**



Description of "Data output options" screen

Number of decimal places

Decimal places Enter a value ranging from 0 to 6 for each item.
* This setting applies when numeric values are displayed or copied.

Warning output options

Over Enter 10 or less alphanumeric characters.

Under Enter 10 or less alphanumeric characters.

Calculation error Enter 10 or less alphanumeric characters.
* This setting applies when numeric values are copied.

Image copy

☐Fill with background color If the checkbox is checked, the image is copied with the background filled in. If it is not checked, the image is copied with the transparent background.

8.4.1 Numeric value copy format

To copy numeric values to the clipboard, right-click any point in the observation screen and select "Copy numeric values". Available formats are follows:

See the following sections for details on the "Right-click menu" in the observation screen.
Pseudo color screen (7.2.3) , Cross Section (7.3.3) , Spots (7.4.3) , Chromaticity Diagram (7.5.4)

8.4.1.1 Full area

		Description
		Section data will be copied starting with the upper left corner.

	0	1	2	3	～	150
0	36.04	36.04	36.04	36.04	～	36.12
1	36.04	36.04	36.04	36.05	～	36.34
:	:	:	:	:	～	:
150	36.04	36.04	36.04	36.04	～	36.06

8.4.1.2 Evaluation area or Display area

		Description
		Section data will be copied starting with the upper left corner of the area. 392 393 394 395 ～ 500 50 36.04 36.04 36.04 36.04 ～ 36.12 51 36.04 36.04 36.04 36.05 ～ 36.34 : : : : : ～ : 156 36.04 36.04 36.04 36.04 ～ 36.06

8.4.1.3 When there are multiple evaluation areas

Data of the areas selected will be copied. If all areas have been selected, copy will be made in ascending order of the number of areas.

		Description
		Section data will be copied starting with the upper left corner of the area. [1] Output block of evaluation area 1 [2] Output block of evaluation area 2

8.4.1.4 Statistics

		Description
		Section data will be copied starting with the upper left corner of the area. Coordinates of area / X coordinate of upper left / Y coordinate of upper left / X coordinate of lower right / Y coordinate of lower right Gradation max. Gradation min. Max. 45.37 Min. 3.19 Ave. 23.36 Std. 10.61

8.4.1.5 When there are multiple evaluation areas

Data of the areas selected will be copied. If all areas have been selected, copy will be made in ascending order of the number of areas.

		Description
		Statistical values of the area will be copied. [1] Output block of evaluation area 1 [2] Output block of evaluation area 2

8.4.1.6 Cross section

		Description
		Numerical values taken from the section view specified by the mark or selected two points are copied. Values in the second and third columns apply to the section specified by the mark and values in the fourth and fifth columns apply to the section specified by the line defined by selected 2 points. (Only the values corresponding to the line segment are output. The output value corresponding to outside the line segment is "0".) (In the order of Y axis direction, X axis direction) x1 250 0 250 250 y1 0 150 100 100 x2 250 979 400 400 y2 979 150 300 300 0 30.44 20.32 0 0 1 30.43 20.35 0 0 : M 30.45 20.12 0 0

8.4.1.7 Spot result

		Description
		Colorimetric values will be provided depending on the setting in "Select displayed item".

	X	Y	Z
1	33.35	29.94	31.83
2	22.78	20.02	14.22
3	22.66	18.95	12.03
:			
25	39.38	37.07	36.46
Max.	43.62	40.55	43.82
Min.	12.87	10.95	10.95
Ave.	28.81	25.65	22.59
Std.	9.73	10.21	13.78

8.4.1.8 When there are multiple evaluation areas

Data of the areas selected will be copied. If all areas have been selected, copy will be made in ascending order of the number of areas.

		Description
		Statistical values of the area will be copied. [1] Output block of evaluation area 1 [2] Output block of evaluation area 2

Tip Areas subject to copy and items to be copied

	Pseudocolor	Spots	Cross Section	Chromaticity Diagram
Full area	○	○	○	○
Evaluation area	○	○	○	○
Display area	○	○	○	○
Statistics	○	○	○	○
Cross section	—	—	○	—
Spot result	—	○	—	—

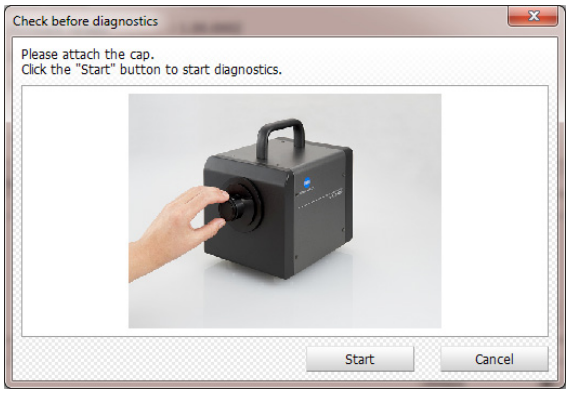
8.4.2 Saving values as text

To save numeric values as text, right-click any point in the observation screen and select "Save as text". Available formats are the same as those for coping numeric values to the clipboard. Names of resulting files should have an extension of .txt or .csv.

See the following sections for details on the "Right-click menu" in the observation screen.
Pseudo color screen (7.2.3) , Cross Section (7.3.3) , Spots (7.4.3) , Chromaticity Diagram (7.5.4)

8.5 Self diagnostics

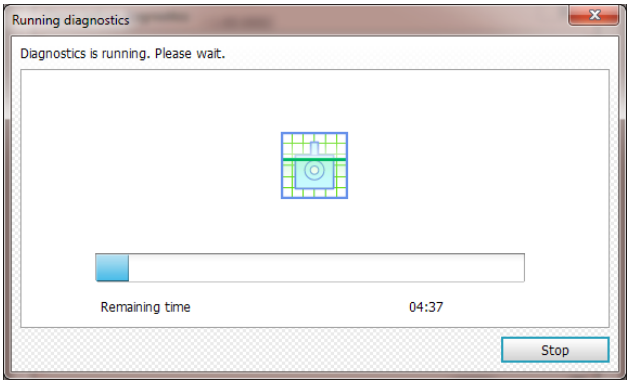
Click the [Start diagnostics] button on the "Instrument information" screen. The "Check before diagnostics" dialog will open.



[Start] Click to exit to the "Diagnostics in progress" screen and start self-diagnostics.
[Cancel] Click to quit self-diagnostics and exit to the "Instrument information".

8.5.1 Running diagnostics

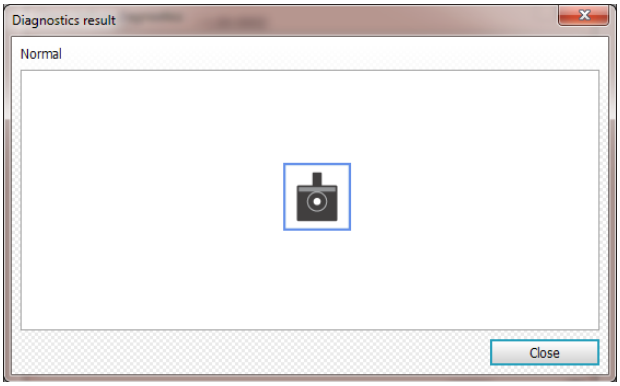
Self-diagnostics will take about five minutes. This screen shows the remaining time for completing self-diagnostics.



[Stop] Click to quit diagnostics.

8.5.2 Result of self-diagnostics (Normal)

If the result of self-diagnostics is normal, the following screen will appear.



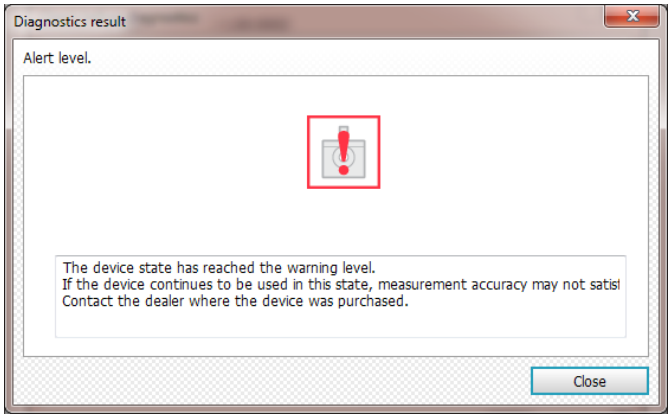
[Close] Click to exit to the "Instrument information" screen.

8.5.3 Diagnostics result (Alert level)

If the result of self-diagnostics is abnormal, the following screen will appear.

If you see this screen, contact your local dealer.

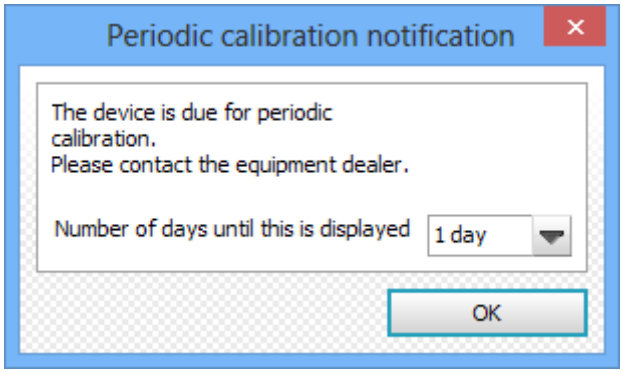
If an error occurs during diagnostics, a corresponding error message will appear.



[Close] Click to exit to the "Instrument information" screen.

8.5.4 Periodic calibration notification

This dialog appears when calibration is due. (*Setting is needed. See " 2.3 Instrument information ".)



Number of days until this is displayed again The message display interval can be selected from the following options:
1 day, **7 days**, **30 days**, **6 months**, **1 year**

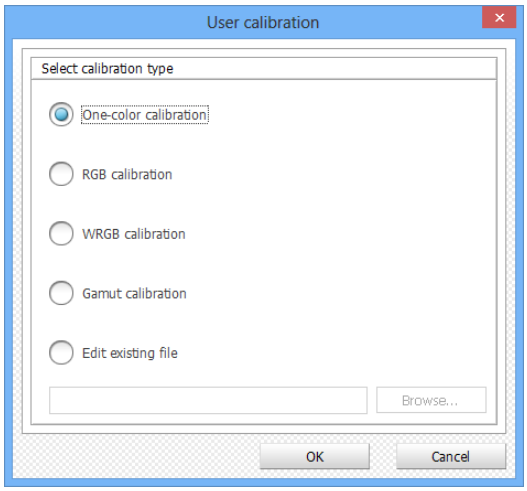
8.6 User calibration

The following describes how to use the user calibration feature for measurement.

Procedure

1 **Click "Instrument" in the menu bar and select "User calibration".**

The "User calibration" dialog will appear.
The following five modes are available.
Select one among "One-color calibration", "RGB calibration", "WRGB calibration", "Gamut calibration", and "Edit existing file" .

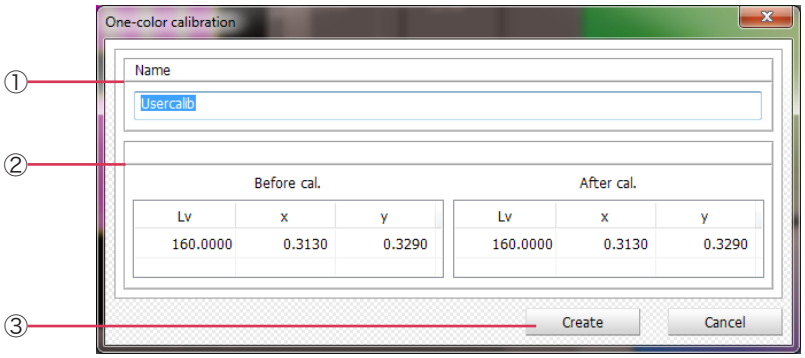


You can invoke any of created and saved user calibration files from the "measurement conditions" screen (See " ⑤ Use user calibration file of 5.1.2.1 General").

8.6.1 Edit existing file

○**Edit existing file** If you wish to edit an existing file, select this option and click the [Browse...] button.
Files you can edit are those with an extension of ".mcl", ".ccl".

8.6.2 One-color calibration



① Name

Enter the name that is 50 or less characters long.

② Calibration information

Before cal. Enter values within the following ranges. You can also paste the clipboard contents.

Lv	0.05<= <=100000 (when brightness unit is cd/m²)
x	0.0000< <1.0000
y	0.0000< <1.0000

After cal. Enter values within the following ranges. You can also paste the clipboard contents.

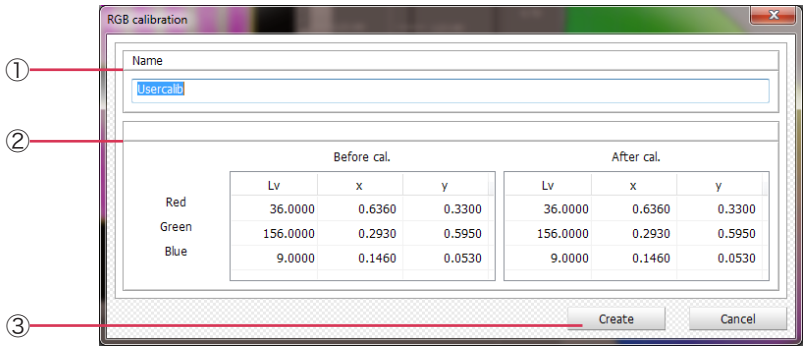
Lv	0.05<= <=100000 (when brightness unit is cd/m²)
x	0.0000< <1.0000
y	0.0000< <1.0000

③ [Create] button

The [Create] button will turn enabled when the name, "Before cal." values, and "After cal." values are all entered.

When the button is clicked: A user calibration file will be created with the specified name.
If an entry is invalid, a message will appear. You should follow the message.

8.6.3 RGB calibration



① Name

Enter the name that is 50 or less characters long.

② Calibration information

Before cal. Enter values within the following ranges. You can also paste the clipboard contents.

Lv	0.05<= <=100000 (when brightness unit is cd/m²)
x	0.0000< <1.0000
y	0.0000< <1.0000

After cal. Enter values within the following ranges. You can also paste the clipboard contents.

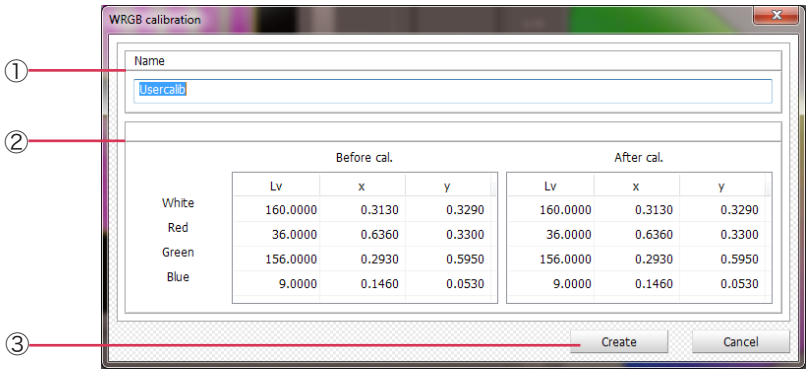
Lv	0.05<= <=100000 (when brightness unit is cd/m²)
x	0.0000< <1.0000
y	0.0000< <1.0000

③ [Create] button

The [Create] button will turn enabled when the name, "Before cal." values, and "After cal." values are all entered.

When the button is clicked: A user calibration file will be created with the specified name.
If an entry is inappropriate, a message will appear indicating the inappropriate entry.

8.6.4 WRGB calibration



① Name

Enter the name that is 50 or less characters long.

② Calibration information

Before cal. Enter values within the following ranges. You can also paste the clipboard contents.

Lv	0.05<= <=100000 (when brightness unit is cd/m²)
x	0.0000< <1.0000
y	0.0000< <1.0000

After cal. Enter values within the following ranges. You can also paste the clipboard contents.

Lv	0.05<= <=100000 (when brightness unit is cd/m²)
x	0.0000< <1.0000
y	0.0000< <1.0000

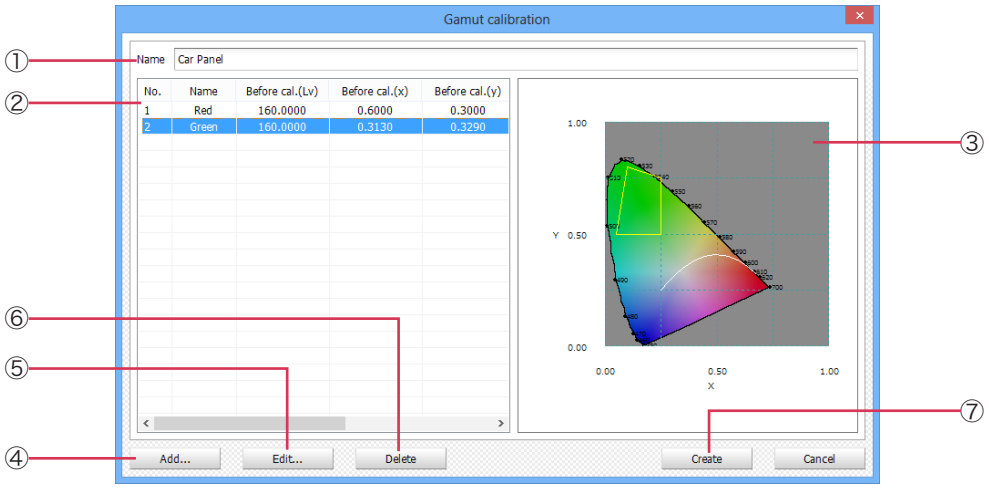
③ [Create] button

The [Create] button will turn enabled when the name, "Before cal." values, and "After cal." values are all entered.

When the button is clicked: A user calibration file will be created with the specified name.
If an entry is inappropriate, a message will appear indicating the inappropriate entry.

8.6.5 Gamut calibration

This feature allows user calibration per color gamut.
Using this feature to measure a object consisting of multi-color LEDs such as a combination meter of car will increase the chromaticity measurement accuracy.



① Name

Enter the name that is 50 or less characters long.

② Calibration data list

Shows the list of registered data. Up to 20 files can be listed.
Items indicated in the list are follows:
If evaluation areas of two data files are overlapped, a data file with a smaller number is used.

No. Name Before cal. (Lv) Before cal. (x) Before cal. (y) After cal. (Lv) After cal. (x) After cal. (y)

③ Chromaticity diagram

Shows the selected data area in the chromaticity coordinates.

④ [Add...]

Click to go to the "Gamut data creation" (8.6.5.1).

⑤ [Edit]

Click to go to the "Gamut data creation" (8.6.5.1).

⑥ [Delete]

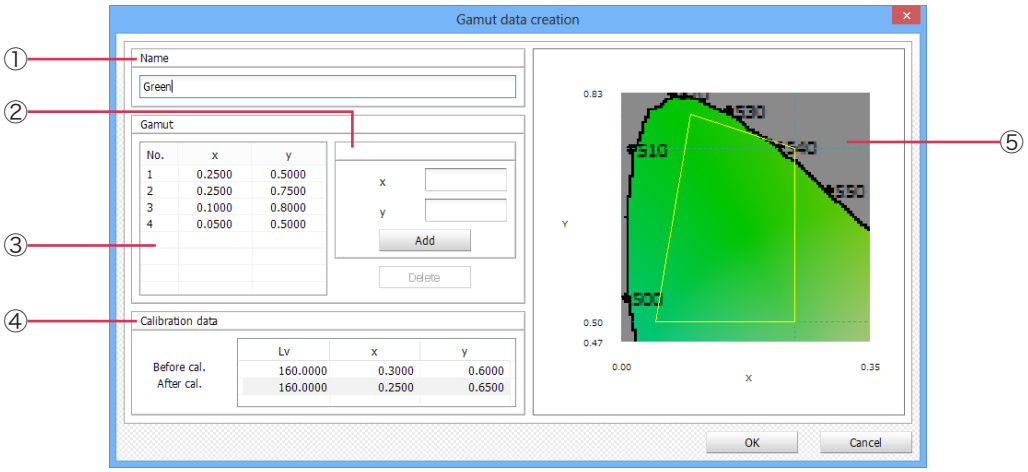
Click to delete the selected file from the data list.

⑦ [Create]

The [Create] button will turn enabled when the name, "Before cal." values, and "After cal." values are all entered.

When the button is clicked: A user calibration file will be created with the specified name.
If an entry is inappropriate, a message will appear indicating the inappropriate entry.

8.6.5.1 Gamut data creation



① Name

Enter the name that is 50 or less characters long.

② Area specification

Specify the area subject to calibration as follows:

[Add]

Enter x and y-coordinate values in the following ranges:

x	0.0000< <1.0000
y	0.0000< <1.0000

Click to update the list (3) according to the values entered.

If an entry is invalid, a message will appear indicating the invalid entry, and the list is not updated.

If an entry is inappropriate for creating a gamut, a message will appear indicating the inappropriate entry, and the list is not updated.

③ List

Shows the list of data registered in ② . Up to 10 data files can be listed..

Items indicated in the list are follows:

No. x y

[Delete]

Click to delete the highlighted file(s) from the data list.

If deleting the highlighted file(s) makes it impossible to create a gamut, a message will appear indicating so, and the deletion is cancelled.

④ Calibration data

Before cal.

Enter values within the following ranges.

Lv	0.05<= <=100000 (when brightness unit is cd/m^2)
x	0.0000< <1.0000
y	0.0000< <1.0000

After cal.

Enter values within the following ranges.

Lv	0.05<= <=100000 (when brightness unit is cd/m^2)
x	0.0000< <1.0000
y	0.0000< <1.0000

⑤ Chromaticity diagram

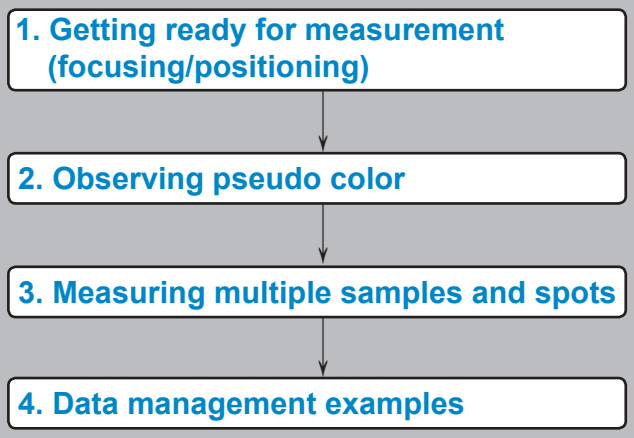
Shows a gamut created from the highlighted data file in the list.

□Supplementary Description

III Supplementary Description of Major Functions

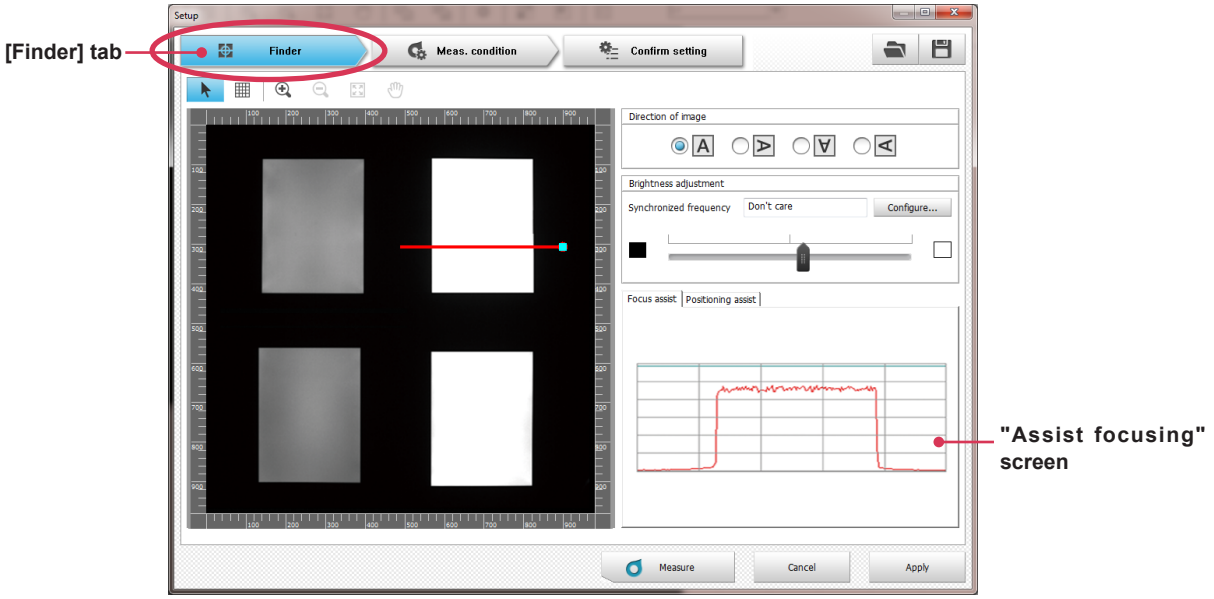
The following provides supplementary description of the major functions in order to ensure correct and efficient use of this software.

[Operation flow]



1. Getting ready for measurement (focusing/positioning)

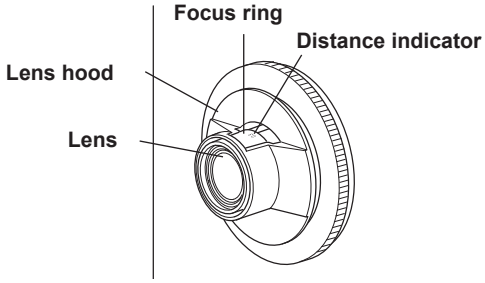
This section provides main points for focusing and positioning on the assumption that the measuring object is a LCD screen of a tablet PC or the like.
First of all, click the [Finder] tab on the "Measurement setup" screen.



① Focusing

The "Assist focusing" feature helps you bring the object into focus.

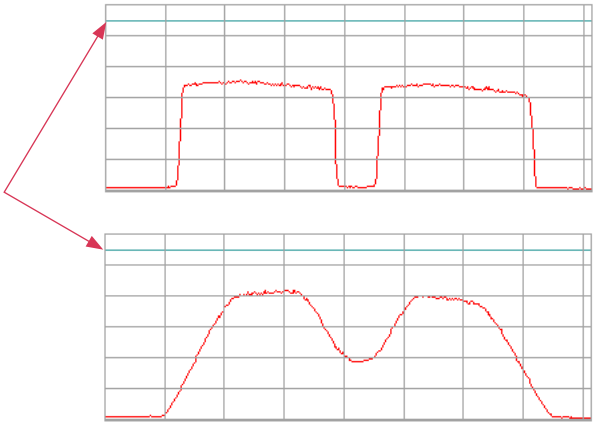
1 **While viewing the image on the monitor, turn the focus ring of the objective lens to your desired position (usually until the object just comes into focus).**



2 **At this time, clicking the "Assist focusing" screen will allow you to check the contrast of the image.**

If the object does not come into focus, the section view has dull edges even at positions with different brightness.

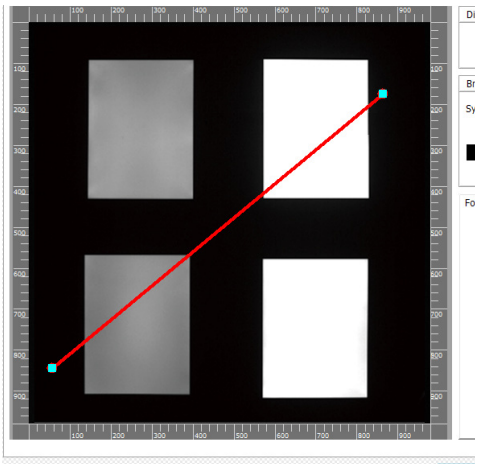
The blue line represents the peak in current brightness setting.



If the object comes into focus, the section view has sharp edges at positions with different brightness.

Tip Using the image on the monitor in conjunction with the section view will make it easier to bring the object into focus.

3 **The section view appearing during focusing represents the brightness of the straight line indicated with red on the monitor. The position, size, and orientation of the straight line can be edited with the mouse (default line: center positioned and horizontally oriented). The straight line is not needed to contain the entire angle of view. A part of the line can be selected and enlarged.**

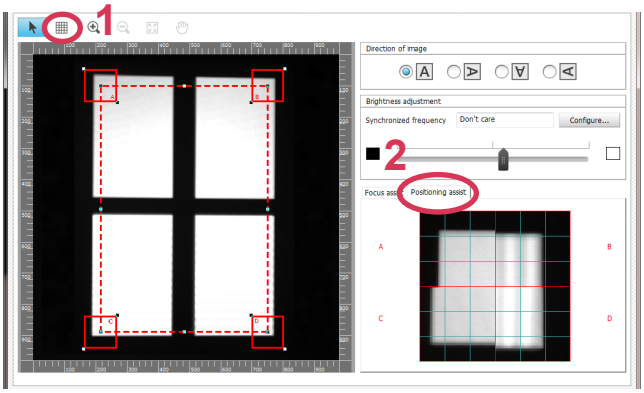


② Positioning

The "Assist positioning" feature helps you adjust the position, tilt, or swing of the instrument.

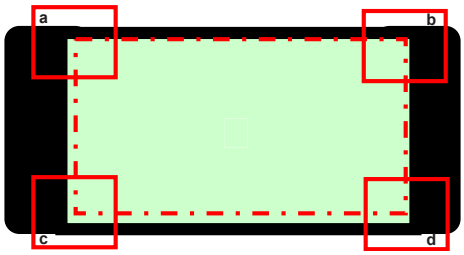
1 **First, turn on the grid and make positional adjustment of the object with reference to the grid.**

2 **Click the "Assist positioning" tab. The four corners of the rectangular object will be enlarged.**

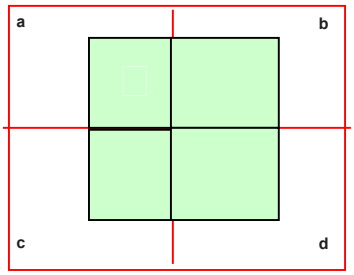


Position the measuring object so that the four corners fall within the red square frame, as shown in the figure right.

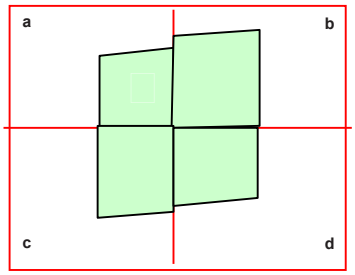
Tip Enlargement of the four corners allows you to easily adjust the position, tile, or swing of the instrument.



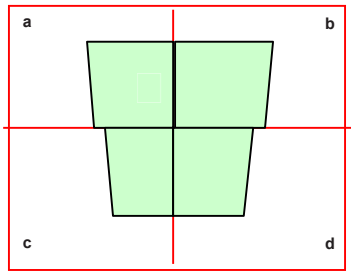
<a>Object positioned correctly



<b>Object positioned with right side up



<c>Object tilted

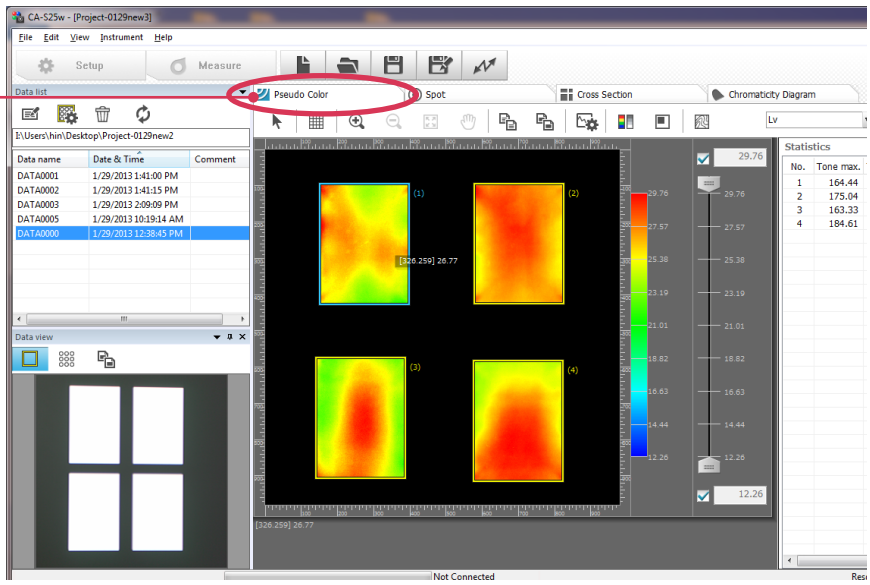


The above figures are slightly exaggerated for the purpose of illustration.

Make adjustment repeatedly until correct focusing/positioning is reached.

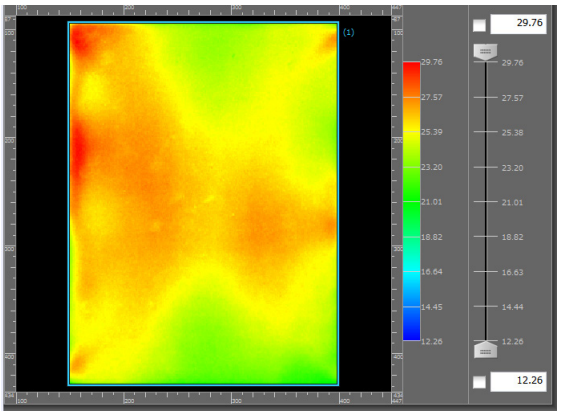
2. Observing pseudo color

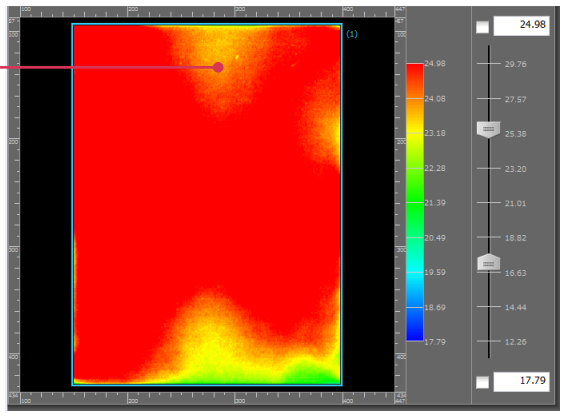
The "Pseudo color" screen is a main feature that will allow you to check that the measurement is correct or obtained values are properly distributed (mura), and to observe the data image for further analysis.
The following describes how to use the pseudo color screen.



① Enhancing mura for easy observation

1 **Slide the tone control bars to the right of the monitor to enhance the monochrome contrast for observation of mura in brightness.**



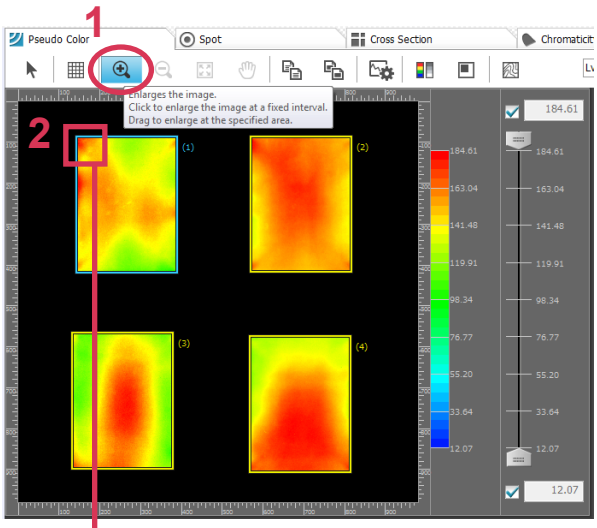


② Partially enlarging an image for easy observation

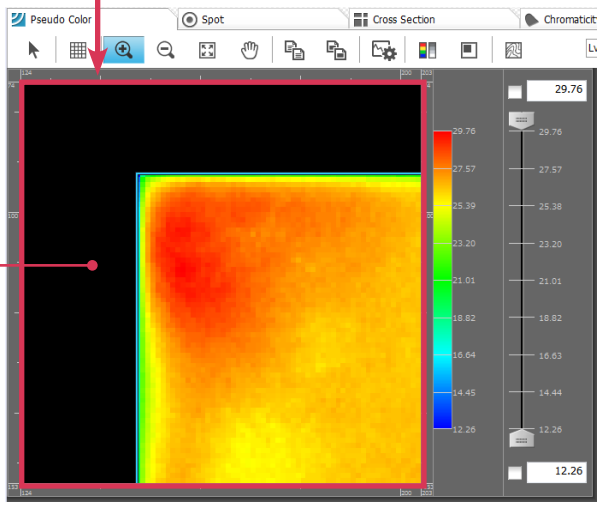
Procedure

1 **Click the [Zoom in] button in the toolbar.**

2 **Click the position you wish to enlarge.**

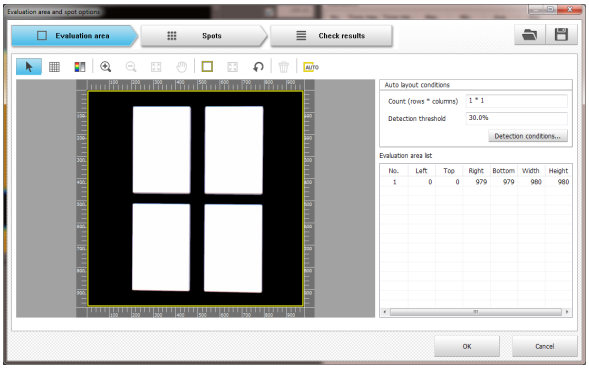


3 **The position will be enlarged and displayed.**



3. Measuring multiple samples and spots

This section provides an example where multiple LCD screens of smartphones or tablet PCs are positioned within the angle of view; then measured and evaluated at a time.
Open the "Evaluation area and spot options" screen.

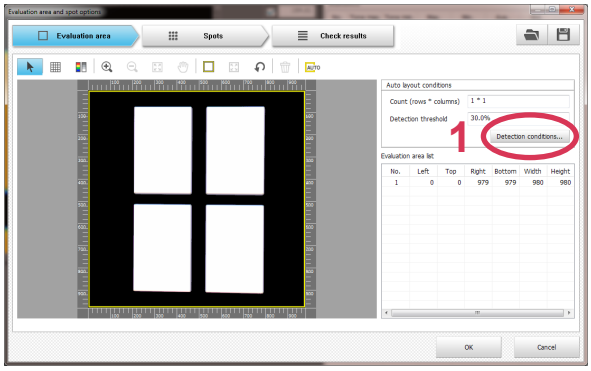


① Setting evaluation areas

Setting an evaluation area for each object (e.g. smartphone) is to identify individual objects.

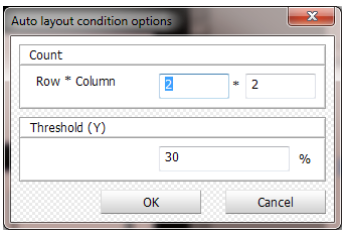
(See "II Detailed Guide 6.1.1")

Tip CA-S25w has an auto arrangement feature that, if given the number of areas and the threshold value, detects luminous parts and arranges evaluation areas automatically.



1 **Click the detection condition button.**

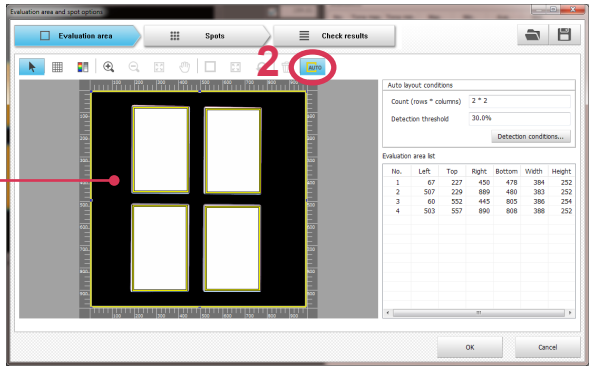
The "Auto layout condition options" screen will appear.



2 **Enter conditions for auto arrangement.**

The figure to the right shows an example screen where the number of areas is "2 x 2" and the threshold is "30"%.

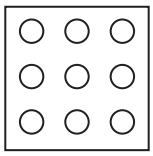
Tip If this feature does not work well, try to modify the evaluation area and/or threshold.



Selecting Auto will immediately activate the auto detection feature, thereby extracted rectangles are drawn.

② Setting spots

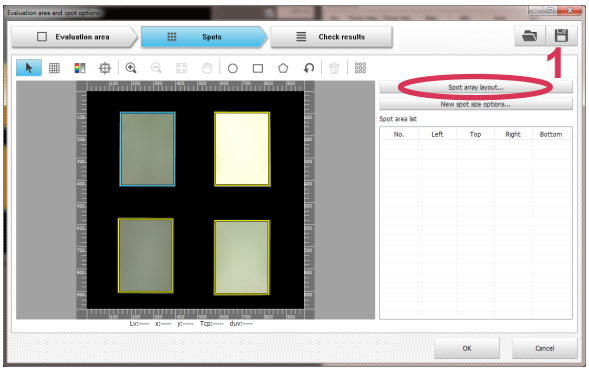
Next, set spots in the evaluation area given a number of 1.
CA-S25w copies the spots set in the evaluation area given a number of 1 to all of other evaluation areas. The following describes how to set nine spots on the basis of VESA standards.



VESA(Video Electronics Standards Association)
An international standardization organization (non-profitable body) for producing international standards on video peripherals for PCs and workstations, that is being operated by a committee consisting of members voted by more than 170 companies worldwide

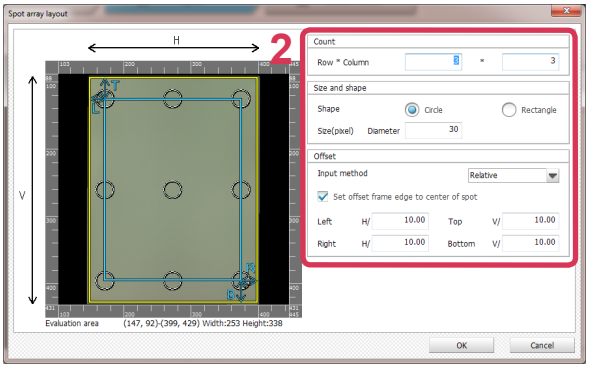
1 **Click the [Spot array layout] button.**

The "Spot array layout" screen will appear.



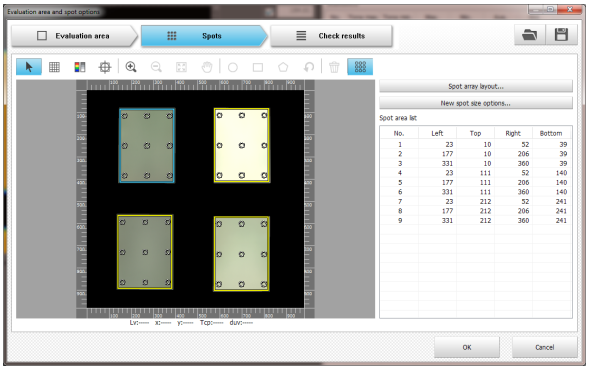
2 **Set spots in the evaluation area given a number of 1.**

Specify a 3 x 3 array layout on the "Spot array layout" screen.
Check the checkbox of "Offset with reference to center of spot".
Set the size, shape, and offset based on VESA standards.
The setting will reflect to the monitor in real time.



3 **When the setting is complete, click the [OK] button.**

The spot setting will be copies to other evaluation areas.

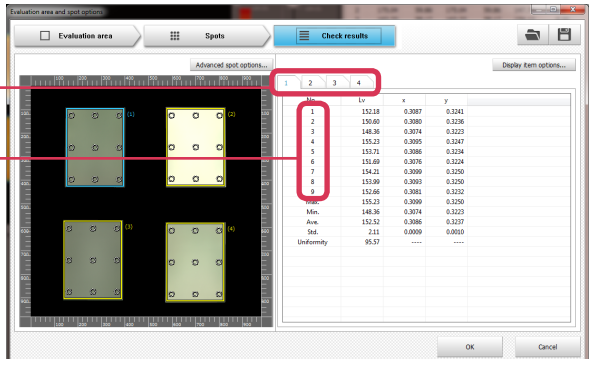


4 **Clicking the [Check result] button will allow you to view colorimetric values of each evaluation area and spot.**

Evaluation area number

Spot number

In this example, L_v, x, and y are listed to the right of each spot number.



Changing the spot size or moving the spot will result in a change of calorimetric values of the spot.

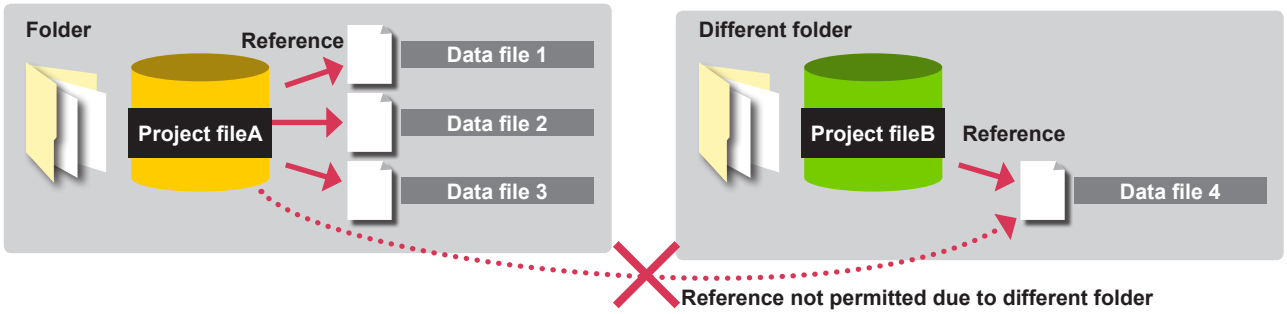
5 **When the checking is complete, click the [OK] button.**

The "Evaluation area and spot options" screen will close.

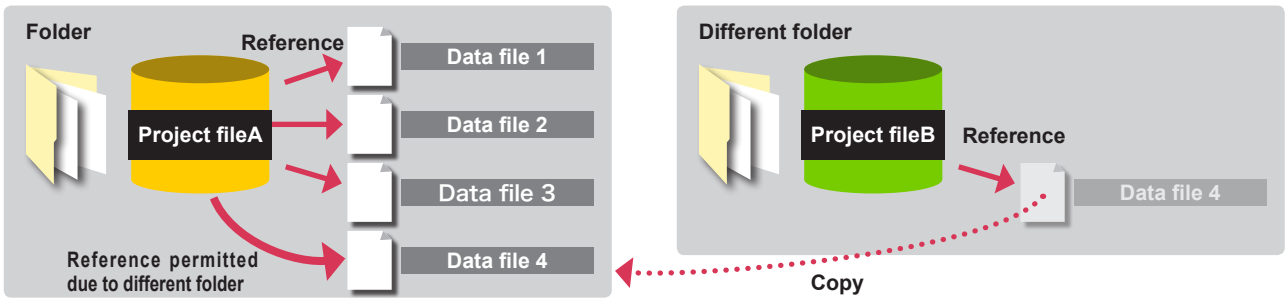
4. Data management examples

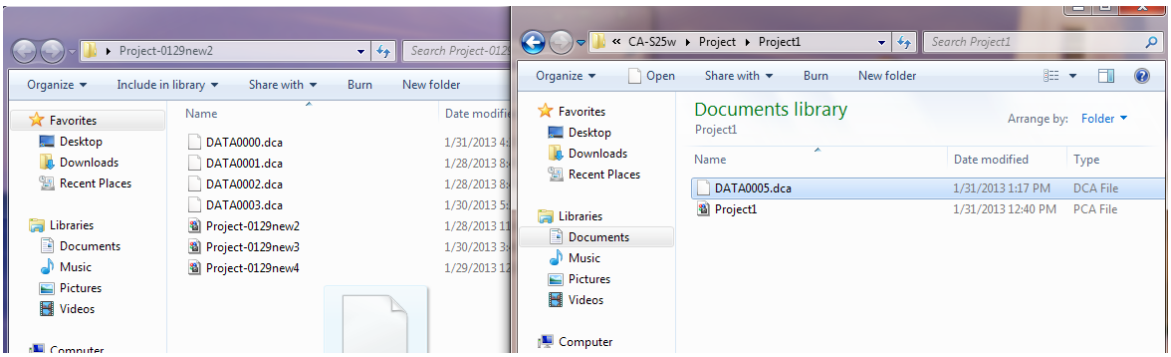
The following provides a data management scheme that will be useful for sorting or arranging the measurement data so far collected and stored.
The concept of "project" is also described.

One measurement session yields one data file. A data file is named "data name.mcl".
A project file references to a data file in the same folder, making images on the "Observation" screen.
A project file itself does not contain measurement data.



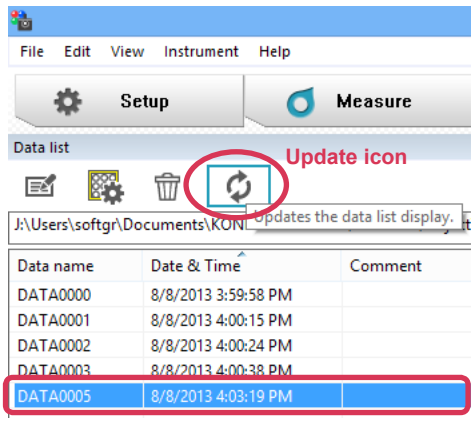
To make it possible for "Project file A" to reference to "Data file 4", move or copy "Data file 4" to the folder containing "Project file A".





A data file can be moved or copied to any folder, no matter what project file is used for measurement.

If you copy a data file to another folder while the project is open, clicking the "Update" icon in the toolbar of the data list window allows you to update the folder.



IV CA-Mura (Optional software)

1. Introduction

Mura measurement software CA-Mura is an option available only for 2D Color Analyzer CA-2500 and uses the "mura quantitative evaluation method" developed by Sony to provide the "mura indexes" and "mura index images" reflecting human sensitivity.
It quantifies mura of the measuring object into values, thus allowing it to be evaluated according to unified criteria instead of human feelings and experiences.
There are three mura indexes: the first one is for luminance mura, the second one for color mura, and the third one for generic mura. The third index among them represents an integration of luminance mura and color mura, and permits an evaluation of mura reflecting human sensitivity.

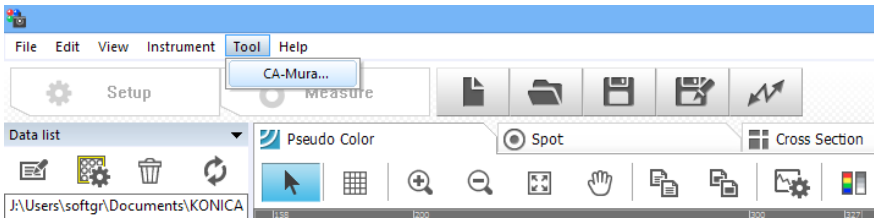
* CA-Mura can also be applied to 2D Color Analyzer CA-2000 provided that data management software CA-S25w has been installed on the PC.

* See the respective installation guides for how to install CA-S25w and CA-Mura.

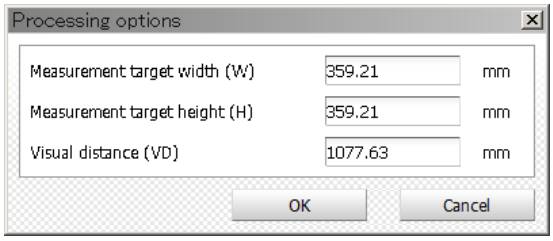
Note CA-Mura is to convert measurement data acquired using CA-S25w into values representing mura. Using CA-Mura alone does not permit acquisition of measurement data.

2. Starting the software

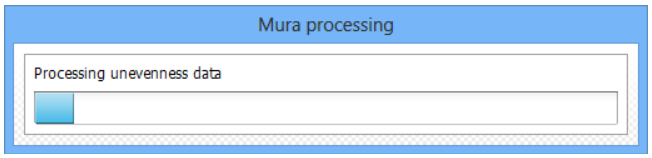
See the CA-Mura installation guide for how to install the software.
If CA-Mura has been installed successfully, you will see "CA-Mura" on the tool menu of the menu bar of data management software CA-S25w.
Select a desired data set from the data list and click "CA-Mura".



When the "Processing options" dialog appears, fill the fields as appropriate and click "OK". (See below)



Doing so will convert the selected data set into mura data and open the main screen. You can select multiple data sets at a time. In such a case, you can choose the data set you wish to display.



CA-Mura uses raw measurement data.
"Raw" means that the data does not reflect detailed data setting (on the resolution, under error, and image correction).

Process setting

Measurement target width (W) Enter the width of the measurement target in mm.

Setting range	0.00 < <= 10,000.00

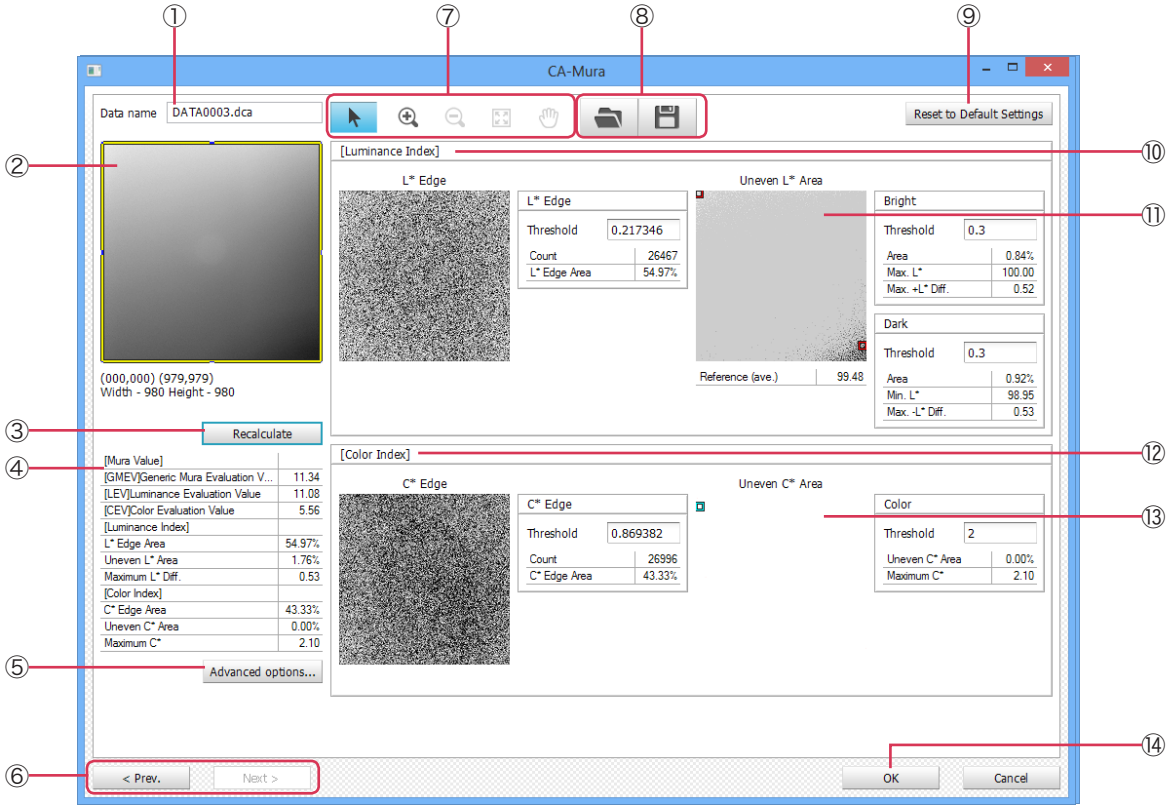
Measurement target height (H) Enter the height of the measurement target in mm.

Setting range	0.00 < <= 10,000.00

Visual Distance (VD) Enter the visual distance in mm. The evaluation is made on the assumption that the object is viewed from the distance defined here.

Setting range	0.00 < <= 50,000.00

3. Main screen



① Data name

Shows the name of the data set currently selected.

② Data

Shows the image from which the selected data set is created.

Yellow frame .....This frame can be edited on the screen. Mura evaluation values are calculated using the data contained in this frame. The frame depends on the evaluation area defined in CA-S25w. You can resize the frame on the CA-Mura main screen. Doing so, however, does not resize the evaluation area. If multiple evaluation areas are defined, the first one is used.

Red frame.....This frame shows the current display range.

③ [Recalculate]

Click to view the mura evaluation values of the data set currently selected.

If you make a change to the frame size, thresholds and/or advanced setting parameters, click this button to update the mura evaluation values.

④ List

[Mura Value]	
Generic Mura Evaluation Value	Integration of luminance mura and color mura
Luminance Evaluation Value	Luminance mura
Color Evaluation Value	Color mura
[Luminannce Index]	
L* Edge Area	Ratio of the number of pixels equal to or exceeding the threshold
Uneven L* Area	Ratio of the number of pixels equal to or exceeding the threshold
Maximum L* Diff.	Maximum L*
[Color Index]	
C* Edge Area	Ratio of the number of pixels equal to or exceeding the threshold
Uneven C* Area	Ratio of the number of pixels equal to or exceeding the threshold
Maximum C*	Maximum color value

* To copy values, right-click to open the right-click menu.

⑤ Advanced options

Click to open the "Advanced options" page. (See 4. Advanced options for details.)

⑥ Data selection

This button is operative when multiple data sets have been selected from the data list created in CA-S25w.

[< Prev.]	Click to go to the previous data set.
[Next >]	Click to go to the next data set.

⑦ Tool bar

The toolbar contains the following tool icons. You can use these icons to manipulate the four images for the luminance and color mura evaluation indexes.

 **Select**	Operative
 **Zoom in**	When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom in" mark. You can specify the range to enlarge by dragging the mouse pointer. The enlarged image of the range will be displayed. Left-clicking the mouse allows you to enlarge the image up to 32 times.
 **Zoom out**	When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Zoom out" mark. Left-clicking the mouse several times allows you to go back to the "All area" display mode.
 **All area**	Use to go back to the "All area" mode.
 **Move**	When you select this icon and place your mouse cursor on the screen, the shape of the mouse pointer will change to "Move" mark. You can grasp the image where you click the mouse and move it by the distance the mouse has dragged.

⑧ Load / Save

 **Load**	Click to open the "Open file" page. After loading a setting file, click the "Recalculate" button to update the mura evaluation values according to settings in the file.
 **Save**	Click to open the "Save file" page. The file containing the current settings will be saved.

⑨ [Reset to Default Setting]

Click to "Reset to Default Setting". After loading a setting file, click the "Recalculate" button to update the mura evaluation values according to settings in the file. Clicking the OK button ⑭ will save the settings and apply them the next time you use CA-Mura.

⑩ < Luminance Indexes L* Edge >

Image

The L* edge image is displayed here. To copy the image, right-click to open the right-click menu. Pixels equal to or exceeding the threshold will be displayed white and other pixels displayed black.

L* Edge Threshold

You can set the threshold within the following range:

Setting range	0.0 < < 5.0 (Larger than 0.0 and smaller than 5.0)

A higher threshold increases the strictness of evaluation (decreases the number of edges) and a lower threshold decreases the strictness of evaluation (increases the number of edges).

⑪ < Luminance Indexes　Uneven L* Area >

Image

The uneven L* area image is displayed here. To copy the image, right-click to open the right-click menu.
Pixels equal to or exceeding the bright threshold will be displayed white, pixels not exceeding the dark threshold displayed black, and other pixels displayed gray.

Bright Threshold

You can set the threshold within the following range:

Setting range	0.0 < < 5.0 (Larger than 0.0 and smaller than 5.0)

Dark Threshold

You can set the threshold within the following range:

Setting range	0.0 < < 5.0 (Larger than 0.0 and smaller than 5.0)

A higher threshold increases the strictness of evaluation and a lower threshold decreases the strictness of evaluation.

⑫ < Color Indexes　C* Edge>

Image

The C* edge image is displayed here. To copy the image, right-click to open the right-click menu.
The L* edge image is displayed here. Pixels equal to or exceeding the threshold will be displayed white and other pixels displayed black.

C* Edge Threshold

You can set the threshold within the following range:

Setting range	0.0 < < 5.0 (Larger than 0.0 and smaller than 5.0)

A higher threshold increases the strictness of evaluation and a lower threshold decreases the strictness of evaluation.

⑬ < Color Indexes　Uneven C* Area>

Image

The uneven C* area image is displayed here. To copy the image, right-click to open the right-click menu.
The image is divided into eight colors according to the deviation from the reference.

Chroma threshold

You can set the threshold within the following range:

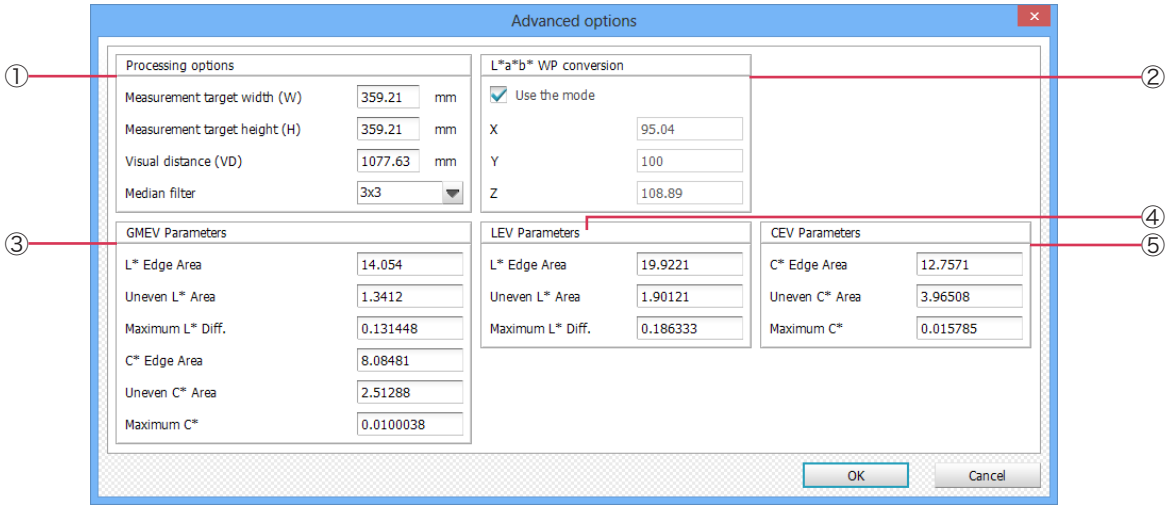
Setting range	0.0 < < 5.0 (Larger than 0.0 and smaller than 5.0)

A higher threshold increases the strictness of evaluation and a lower threshold decreases the strictness of evaluation.

⑭ [OK]

Clicking this button will save the changes to the parameters.

4. Advanced options



① Processing options

Measurement target width (W) Enter the width of the measurement target in mm.

Setting range	0.00 < <= 10,000.00

Measurement target height (H) Enter the height of the measurement target in mm.

Setting range	0.00 < <= 10,000.00

Visual Distance (VD) Enter the visual distance in mm. The evaluation is made on the assumption that the object is viewed from the distance defined here.

Setting range	0.00 < <= 50,000.00

Median filter Select one from the following options:

Setting range	None, 3x3

Select "3x3" usually. Select "None" if you wish to use unfiltered data for evaluation.

② L*a*b* WP conversion

Use the mode Check the checkbox if you wish to use the mode.

XYZ If you wish to enter the reference manually, keep the checkbox unchecked.

Setting range	0.05 <= <= 100,000.00

③ GMEV Parameters

These are parameters for GMEV calculation. Remain them as default usually.

L* Edge Area Enter a value within the following range.

Setting range	0 <= <= 100

Uneven L* Area Enter a value within the following range.

Setting range	0 <= <= 100

Maximum L* Diff. Enter a value within the following range.

Setting range	0 <= <= 100

C* Edge Area Enter a value within the following range.

Setting range	0 <= <= 100

Uneven C* Area Enter a value within the following range.

Setting range	0 <= <= 100

Maximum C* Enter a value within the following range.

Setting range	0 <= <= 100

④ LEV Parameters

These are parameters for LEV calculation. Remain them as default usually.

L* Edge Area Enter a value within the following range.

Setting range	0 <= <= 100

Uneven L* Area Enter a value within the following range.

Setting range	0 <= <= 100

Maximum L* Diff. Enter a value within the following range.

Setting range	0 <= <= 100

④ CEV Parameters

These are parameters for GEV calculation. Remain them as default usually.

C* Edge Area Enter a value within the following range.

Setting range	0 <= <= 100

Uneven C* Area Enter a value within the following range.

Setting range	0 <= <= 100

Maximum C* Enter a value within the following range.

Setting range	0 <= <= 100

C

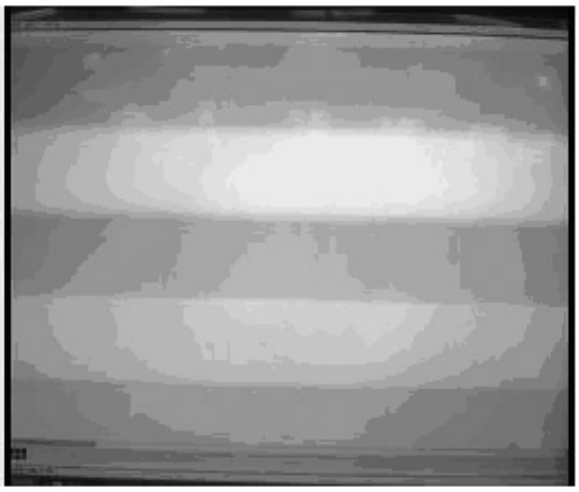
Others

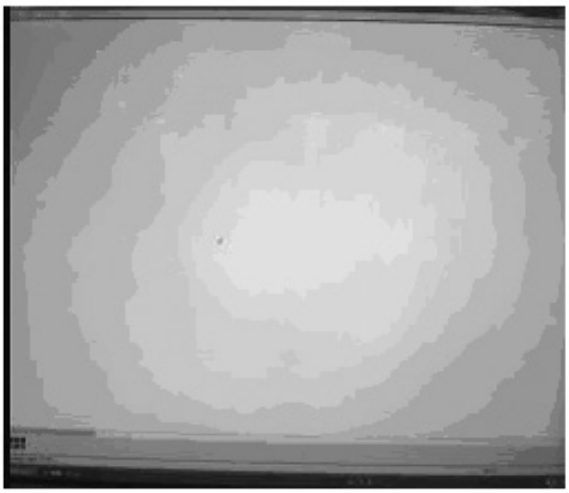
1. Description

1.1 Synchronized measurements

In case of measuring object repeatedly and intermittently emitting light like CRT or PDP, luminance and chroma distributions can be measured steadily by setting light emission period.

Below shows an example of measurement result of CRT. Left is an image obtained light emission period being ignored, and right with the most adequate exposure time matching light emission period. While striped unevenness appears on the left due to the influence by CRT scanning, none of such phenomenon can be seen on the right.



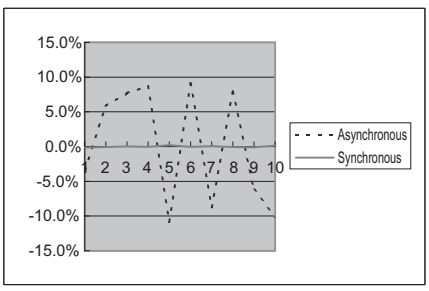


Because light emission timing is different depending on the screen area for CRT, which emits light through electron beam scanning, influence by intermittent light emission is found in the form of above shown unevenness. On the other hand, no unevenness occurs like CRT when entire screen flashes simultaneously like PDP, but measurement value varies with each measurement.

Below shows an example of measurement result of PDP. The graphs show both the synchronous and asynchronous measurement results (the average value in 100 x 100 pixels of the center area) when the same area was measured ten times in succession. While luminance and chromaticity are stable in synchronous measurement, the values obtained by asynchronous measurement change remarkably.

Luminance

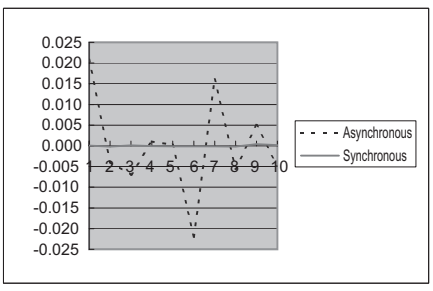
(Difference between the average value of ten times measurement and each measurement value is displayed in percentage)



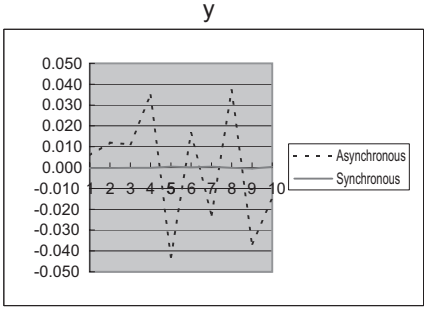
Chromaticity

(Difference between the average value of ten times measurement and each measurement value)

x



y



1.2 User Calibration

Measurement error in luminance and chroma, or difference with the reference value controlled by the client sometimes arise because of the gap between spectral sensitivity of this instrument and CIE1931 color-matching function. In this case, you can use the user calibration function to calibrate measurement values.

CA-2500/CA-2000 applies roughly 2 types of calibration methods to calculate the calibration coefficient. One is monotint calibration and the other RGB matrix one. You can use monotint calibration to perform the user calibration relatively easily, because the calibration coefficient will be generated only by entering values of luminance and chroma for one color (ex. white) before/after calibration. RGB matrix calibration is used to calculate the calibration coefficient by entering values of luminance and chroma for two or more colors (ex. RGB or RGBW) before/after calibration. This method has an advantage to obtain the high calibration result in the wide rage of chroma.

CA-2500/CA-2000 uses the calibration coefficient calculated by either of monotint or RGB matrix calibration method to make a calculation uniformly on entire screen, which enables to calibrate the measurement values for entire screen.

1.3 LvTΔuv

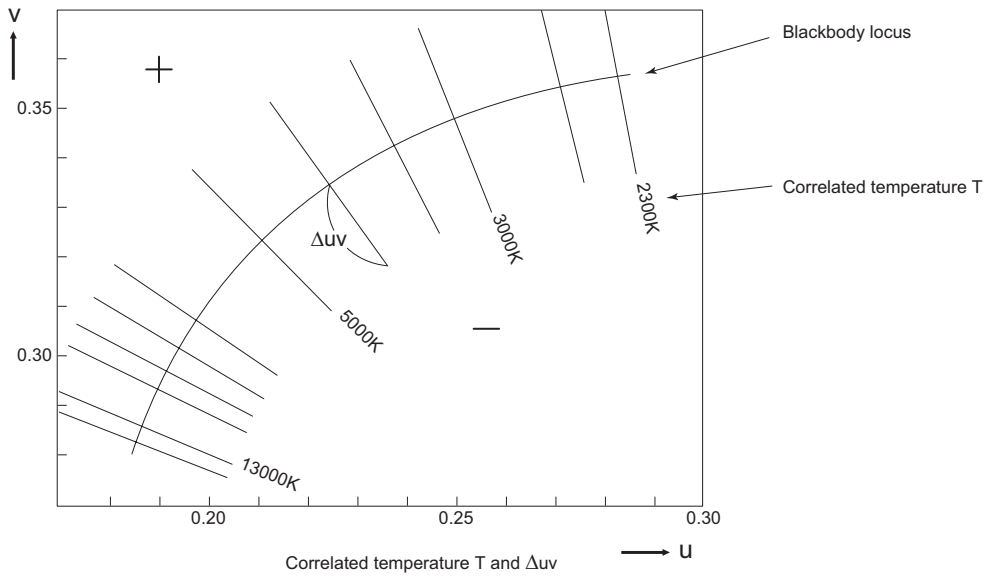
Following factors can be acquired as measurement value with $L_VT\Delta uv$ as color space of this instrument.

L_V : Luminance
T : Correlated color temperature
Δuv : Color difference from blackbody locus

While L_V stands for luminance, T and Δuv for color in $L_VT\Delta uv$.

<Relation between correlated color temperature T and color difference from blackbody locus Δuv>

Color temperature refers to the temperature of blackbody (perfect radiator) which has equal chromaticity coordinates to certain light. However, color temperature only represents colors on blackbody locus.
Correlated color temperature, slightly wider interpretation of color temperature, is very useful to eliminate such problem. Here, correlated color temperature covers those which are slightly outside the range of that of blackbody locus.
If a certain color positions on isotemperature line, the intersection point of isotemperature line and blackbody locus is indicated as correlated color temperature for the color. Isotemperature line means line on chromaticity coordinates which is a set of colors visually close to color temperature on blackbody locus.
However, since all colors on an isotemperature line are represented with equal correlated color temperature, it is not possible to describe color only with correlated color temperature. To solve that, Δuv, deviation of correlated color temperature T from blackbody locus, is to apply for that purpose. If Δuv exists above blackbody locus, it is represented with "+", and below, with "-".



Correlated temperature T and Δuv

1.4 Dominant Wavelength and Excitation Purity

While curve VScSR indicates spectrum locus, point N white point in below chromaticity diagram (x, y). Spectrum color indicates the color of which chromaticity point exists in the area surrounded by spectrum locus, lines VN and NR, and non-spectrum color the color inside triangle NVR comprising purple boundary VR and white point N.

<Dominant wavelength and excitation purity of spectrum color>

Dominant wavelength indicates wavelength corresponding to S, intersection point of extension of NC and spectrum locus (curve VScSR), if chromaticity point C is gained through measurement. Dominant wavelength is represented with a symbol λ_d. The ratio of line NC length to line NS is called excitation purity and represented with a symbol p_e.

<Complementary wavelength and excitation purity of non-spectrum color>

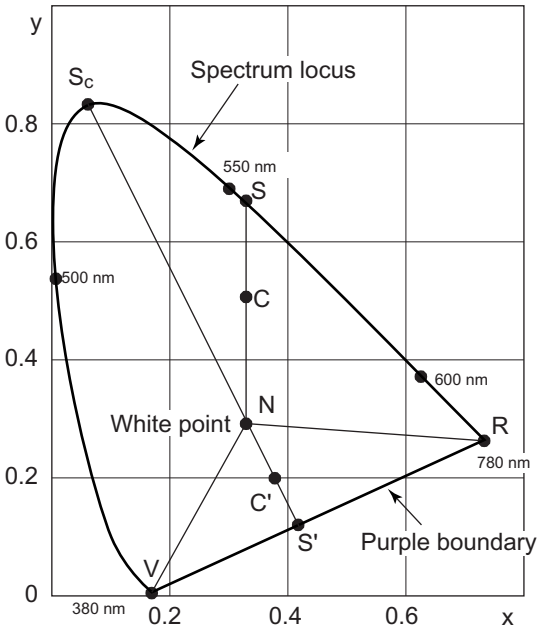
When chormacity point C' is gained through measurement, the extension of NC' to C' direction does not cross with spectrum locus, but with purple boundary.

In this case, wavelength corresponding to Sc, intersection point of extension of NC' to N direction and spectrum locus, is referred to as complementary wavelength which is symbolized with λ_c. The ratio of line NC' length to NS' is called excitation purity and represented with a symbol p_e'.

Excitation purities of spectrum and non-spectrum colors are derived with the following formula when (x_n, y_n) is chromaticity coordinates of point N, (x, y) of point C, (x_λ, y_λ) of point S, (x' , y') of point C', and (x_λ', y_λ') of point S'.

$$p_e = \frac{x - x_n}{x_\lambda - x_n} = \frac{y - y_n}{y_\lambda - y_n}$$

$$p_e' = \frac{x' - x_n}{x_\lambda' - x_n} = \frac{y' - y_n}{y_\lambda' - y_n}$$



Dominant wavelength in chromaticity diagram

2. Error Message

When the software does not work normally during operation, an error message is displayed. The following list shows the type and meaning (content) of error messages and the solutions.

No.	Error Message	Cause (content)	Solution
1	CA-2500/CA-2000 communication error. Try to reconnect after checking the connection.	Error in communication with CA-2500/CA-2000 occurred. Connection to CA-2500/CA-2000 has been cut off automatically.	Click "Instrument" in the menu bar and select "Connection".
2	Failed to connect to the CA-2500/CA-2000. Try to reconnect.	Error in communication with CA-2500/CA-2000 occurred. Connection to CA-2500/CA-2000 has been cut off automatically.	Click "Instrument" in the menu bar and select "Connection".
3	Failed to measure. Try to reconnect.	Error in communication with CA-2500/CA-2000 occurred. Connection to CA-2500/CA-2000 has been cut off automatically.	Click "Instrument" in the menu bar and select "Connection".
4	Temperature error. Restart the device.	Temperature monitor installed in CA-2500/CA-2000 may fail.	Turn off the power, and after waiting for a while, try to restart and connect.
5	Diagnostics could not finish. Run diagnostics again. If this message is displayed again, contact the dealer where the device was purchased.	Connection to CA-2500/CA-2000 may not be established.	Make sure CA-2500/CA2000 is connected securely to PC with USB cable; then retry connection and self diagnostics.
6	Caution is required as the warning level may have been reached. When the warning level is reached, device performance can no longer be maintained.	Measuring accuracy of CA-2500/CA-2000 will soon deteriorate to such a level that the stated specifications are not ensured.	You are recommended to ask your local dealer or the manufacturer for preventive maintenance, though the performance of the instrument would not have deteriorated to an intolerable level.
7	The device state has reached the warning level. If the device continues to be used in this state, measurement accuracy may not satisfy the specifications. Contact the dealer where the device was purchased.	Measuring accuracy of CA-2500/CA-2000 has almost deteriorated to such a level that the stated specifications are not ensured.	Ask your local dealer or the manufacturer for maintenance without delay.
8	The required file(s) are missing. einstall the software.	File used for software recognition may be corrupted.	Reinstall the software.
9	An error occurred while switching the filter. Restart the device.	① Error in CA-2500/CA-2000 was detected. ② The adapter may not be proper.	① Turn off the power, and after waiting for a while, try to restart and connect. ② Make sure the standard supplied or optional AC adapter (AC-A312) is used. If not, turn off the power; then replace the adapter with AC-A312.
10	The fan is not running. Restart the device.	① Failure of CA-2500/CA-2000 (cooling fan) was detected. ② The adapter may not be proper.	① Turn off the power, and after waiting for a while, try to restart and connect. ② Make sure the standard supplied or optional AC adapter (AC-A312) is used. If not, turn off the power; then replace the adapter with AC-A312.
11	The motor is not running correctly. Restart the device.	① Error in CA-2500/CA-2000 was detected. ② The adapter may not be proper.	① Turn off the power, and after waiting for a while, try to restart and connect. ② Make sure the standard supplied or optional AC adapter (AC-A312) is used. If not, turn off the power; then replace the adapter with AC-A312.
12	The information saved inside the device is not valid. Contact the dealer where the device was purchased.	Information stored in CA-2500/CA-2000 is invalid.	Contact your local dealer.
13	Periodic calibration is now required. Contact the dealer where the device was purchased.	It is about time you are recommended to ask your local dealer or the manufacturer for regular inspection and calibration of CA-2500/CA-2000.	Contact your local dealer.
14	The file could not be accessed. The file may be in a location that cannot be accessed or the file may be read-only.	The file may be in a location that cannot be accessed or the file may be read-only.	Check the access privilege for the file or file folder.

3. Error Check

Should error be found in this instrument, try corrective actions shown in the following table. If this does not help, this instrument has possibly been broken. Please contact the nearest KONICA MINOLTA SENSING authorized service facility with indicated error number.

Error No.	Symptom	Item to Check	Corrective Action
1	Takes much time for measurement.	Check multiplication number.	The higher set number is, the better repeatability is, but the longer measurement it takes. To cut measurement time rather than better repeatability, set fewer number for multiplication.
		Is the object of low luminance?	If so, shutter speed becomes slow needing longer measurement time. This should not be regarded as failure, but just accumulates weak light for measurement with appropriate light intensity. If low luminance object is measured with higher multiplication number, it takes consumable time for measurement. Set lower number for shorter measurement.
2	Abnormal data indicated.	Has any foreign object adhered to lens or lens mount filter?	Wipe these objects off with soft and clean cloth.
		Have you shut off outside light?	Shut light off lest measurement area be exposed to outside light.
		Hasn't fluor lump reflected on measurement object?	Shut light off to prevent light reflection on measurement object. Just a little light emission, leakage, or reflection severely affects low luminance surface measurement especially.
		Is there any unexpected light emission?	Look at measurement object closely. Just a little light emission, leakage, or reflection severely affects low luminance surface measurement especially.
		Haven't you used lens other than supplied?	Use those supplied.
		Haven't you used lens with different serial number.	Use the lens of which serial number is identical to instrument.
		Have you selected correct lens type?	Select the type of using lens.
		Has the lens focus position been correct?	Set correct focus position information in software for the usage condition.
		Is the light exposure adequate?	In case of manual exposure mode, select appropriate exposure.
		Check for luminance unit and user calibration.	Set adequately depending on the purpose.

Error No.	Symptom	Item to Check	Corrective Action
3	Pattern-like unevenness appears.	Check whether stripe-like unevenness fluctuates by slightly changing the distance between CA-2500/CA-2000 and measurement object.	If so, Moire fringes could have generated. Adjust the measurement distance of object to reduce such phenomenon.
		Is it round striped pattern? Check whether pattern position does not shift even after slight migration of field angle of CA-2500/CA-2000 and measurement object up to down or right to left.	If not, it should not be regarded as failure, but just unique pattern of this instrument. CA-2500/CA-2000 shows just slight pattern-like unevenness originally. Apply lower display tone.
4	Measurement values vary quite largely. Image looks rough.	Has the light exposure been adequate?	If light exposure is not enough under manual exposure, fluctuation of measurement values tends to be large. Set light intensity as large as possible, but so as not to overexpose.
		Check whether the luminance has been low.	If it is close to the limit, noise from obtained image signal becomes larger which generates uneven values or rough image, but this is not failure.
		Check whether the multiplication has been set low.	The lower multiplication is, the shorter measurement time is, but values tend to be more variant and image rougher. To reduce such variance rather than to pursue shorter measurement, set multiplication as high as possible.
5	User calibration has not been functioned as expected.	Check whether the coefficient has been correct.	Select appropriate method and coefficient depending on purpose.
6	Small pixel number for data. (Fewer than 980 x 980 pixels.)	Check data process range. Pixel number tends to be smaller if set up to process specified range data of all measurement area.	Set measurement range properly according to purpose and condition.
		Check resolution condition. Resolution can be selected among 3 types; 980x980, 490x490 and 196x196 pixels.	Set the resolution properly according to purpose and condition.

4. Index

KONICA MINOLTA

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