Optical Measuring Instrument

Operation Manual

USPM-RU-W series
USPM-W-B

Before use

Thank you for your purchasing our NIR Micro Spectrophotometer.
To use this product safely and satisfactorily benefit from doing so, please take the time to carefully read this Operation Manual before using the product.
Keep this manual handy when using the product, and store it close to the unit for future reference. Page 9 of this manual contains the warranty. Fill in the necessary items, and store it in a safe place.

Precautions when measuring

If the product body vibrates or the ambient light changes during measurement, accurate measurement may not be possible. When using the product, pay close attention to the installation environment.

Contents

・Principles of measurement
・Precautions for safe use of the lighting device (lamp house)
  (Check list for inspection of the lighting device (lamp house))
・Precautions for proper use of the power cord

Preface

■ Usage environment
Use the unit in an environment that conforms to the specification on the usage environment.
Refer to <u>2.3 Product specification</u> for the usage environment conditions.

■ How to carry
For how to carry the unit, refer to <u>3.1 To transfer and install the main unit</u>.

■ How to clean
For how to clean the unit, refer to <u>5.2 (2) Cleaning</u>.

■ About the lamp house
Though heavily dependent on the usage conditions (ambient temperature and humidity, supply voltage, period of lighting, etc.), the useful life of the lighting device (lamp house) * assumes either short one of for approximately eight years（In the case of the use of approximately eight hours a day） or approximately 20,000 hours .
*The above statement does not guarantee freedom from failures or repair at no charge during the service life.
* Depending on the usage conditions, there is a possibility of aging degradation in a shorter period.
Inspect the lamp house according to **Appendix: Checklist for inspection of the lighting device (lamp house)** until the lamp house reaches the end of its useful life.
Should any unexpected incident occur (e.g., smoke) during use, turn off the power immediately and contact the sales representative where you purchased the unit or our sales department. Regular inspection is recommended, in order to achieve safe use and reduce downtime.

■ About the reference sample
The reference data once a year is recommended to be updated because 45reference sample and the high reflection reference sample give the mirror court. Please contact the shop or our business window of store purchased when you update it.

■ About the personal computer (hereinafter "computer")
We (EVIDENT) will take no responsibility for any and all damage arising out of the use or malfunction of the unit, including, but not limited to, any damage to the data stored in your personal computer(s). Please make a backup copy of your computer system and keep it in a safe place. (EVIDENT does not provide any backup support.)

We assure the quality of the unit when it is shipped from our factory. No malfunction or disability due to any change in the environment settings of the computer (e.g., any change in the BIOS) or the installation of other applications, are covered by the quality assurance of EVIDENT.

When there is only a small amount of free space in the computer's hard disk drive this may make the data processing take longer or even cause errors. Delete unneeded data files regularly. For how to delete data files, refer to the operating system manual.

NEVER delete or rename any folders already included on the hard disk drive of the computer in the configuration at shipment. Otherwise, the software may become no longer usable.
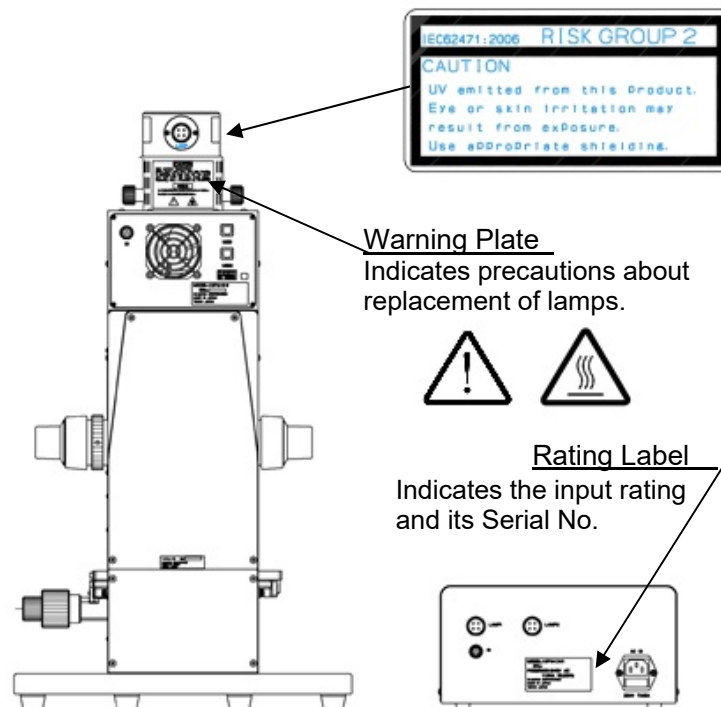
Cautions, Ratings and Graphic Symbols

[Safety symbols]
An NIR micro spectrophotometer has labels with the following marks.
Handle it carefully, keeping the meanings of the marks in mind.

Symbols	Description
⚠ (hot surface symbol)	Don not touch with your hand. There is a risk of burns.
⚠ (exclamation symbol)	Indicates any unspecified danger. Follow the precaution described next to this mark.
|	The main switch is turned ON.
○	The main switch is turned OFF.

[Locations of the warning labels and rating labels]
Warning labels and rating labels are indicated in the places shown in the figure. If any one of them is missing or any warning label becomes dirty or starts to peel, contact your supplier or our sales department for a replacement.

IEC62471:2006 RISK GROUP 2
CAUTION
UV emitted from this product.
Eye or skin irritation may
result from exposure.
Use appropriate shielding.

Warning Plate
Indicates precautions about replacement of lamps.

Rating Label
Indicates the input rating and its Serial No.

This product corresponds to RISK GROUP2 in the UV range (200-400nm) based on IEC62471-2.

In addition, this product corresponds to RISK GROUP1 in the blue light range (300-700nm).

[Symbols on the box]

The box has the following symbols:

↑↑	Indicates this side up.
☂	Indicates the box should be protected from rain.
⚱	Indicates the items inside are fragile and the box should be handled with care.
♲	Indicates the compatibility with China RoHS.

For Safe Use

The purpose of the unit

This unit is designed to measure the spectroscopic characteristics, such as reflectance and transmittance. Do not use it for any other purpose.

About this Operation Manual

This Operation Manual contains essential information for the safe and effective use of the unit. Before use, please read this Operation Manual and the manuals of the devices used in combination with the unit. Take care to understand the contents and always follow their instructions.
Safety cannot be ensured when the unit is used in any manner not covered in this Operation Manual.
Keep this Operation Manual and the manuals of the associated devices in a place where you can access them easily. If you have any questions on the content of this Operation Manual, please contact the sales representative where you purchased the unit or the sales department at EVIDENT.

NEVER repair or modify the unit

NEVER disassemble or modify the unit except to replace consumables. Otherwise, there is a risk of injury, damage to equipment, and inability to secure the proper functioning of the unit. Take measures according to section "6. Troubleshooting" if a repair is considered necessary. When you cannot fix a problem, send the unit for repair to the supplier where you purchased it or to the EVIDENT sales department.

Warnings in this document

This document uses the following symbols and terms in the manner as described below. These symbols and terms are classified into several safety levels. To use the unit safely and properly, make sure that you thoroughly understand the contents of the symbols and terms.

⚠ WARNING	Failure to follow these precautions may result in serious injury or death.
⚠ CAUTION	Failure to follow these precautions may result in injury or material damage to this Product or peripheral devices.

■ Symbols denoting prohibition (prohibited actions)

Prohibited

Disassembly prohibited

■ Symbols denoting obligation (mandatory actions)

Mandatory

Unplugged

Grounded

■ Symbols denoting caution

Caution

Caution against ignition

Caution against electric shock

General precautions on handling

Strictly adhere to the following precautions when handling this unit. Please observe the precautions provided in the subsequent chapters.

⚠ WARNING	Failure to follow these precautions may result in serious injury or death.

Prohibited

■ **Do not place the unit in a location subject to lamp smoke, vapor, moisture, or excessive dust!**
Doing so may cause a fire or electrical shock. Do not place the unit in a location that is exposed to direct sunlight, or in a location that is subject to extreme variations in temperature, such as near heating equipment or thermal equipment. Do not place the unit in a location subject to moisture or excessive dust.

Prohibited

■ **Do not put water or foreign objects inside the unit!**
Doing so may cause a fire or electrical shock hazard. When water or any foreign object gets inside the unit, turn off the power and unplug the power cord immediately, and then contact to supplier where you purchased it or the EVIDENT sales department.

■ Do not disassemble or modify the unit!
Disassembly or modifying the unit for a reason other than replacement of consumables may cause fire, electric shock hazard or injury. If an abnormality occurs, such as unusual odor or noise, immediately turn off the power, remove the power plug from the wall outlet, and contact our sales representatives or our sales department for repair. For your own safety, never attempt to perform repairs on your own.

Disassembly prohibited

■ Do not cover the vents!
There are vents for heat dissipation on the front and the side of the photometric head.
Be careful not to cover the vents.

Prohibited

■ Install the unit at least 10 cm away from a wall!
Since the lamp house gets hot when the lamp is illuminated, place the unit at a point at least 10 cm away from any walls. Operating the unit near a wall may cause fire.

Mandatory

■ Do not touch the lamp house or put anything on it!
Do not touch the top of the lamp house that becomes hot when the lamp is illuminated. Do not put anything on the lamp house. There is the danger of burns or fire.

Prohibited

■ Do not place the plastic cover on the lamp house until it has cooled!
Since the lamp house gets hot when lamp is illuminated, do not place the plastic cover on it until the lamp house has cooled. Otherwise, there is a risk of fire.

Caution against ignition

■ Do not watch the light of the halogen lamp directly!
Do not watch the light of the halogen lamp directly.
Eyes might be damaged

Prohibited

■ Use the prescribed power supply

Use the prescribed power supply in this operation manual. If any power supply other than that prescribed in this manual is used, the safety performance of the product cannot be guaranteed, and fire may result.

Mandatory

■ Use the supplied power cord and cable.

Be sure to use the supplied power cord and cable.
Use of any power cord or cable other than that supplied may cause a failure such as the generation of noise or a malfunction due to external noise. The supplied power cord and cable cannot be used with other equipment. For products for which the power cord is not supplied, review Precautions for proper use of the power cord before selecting an appropriate power cord.

Mandatory

■ Do not operate the unit with wet hands!

Operating the unit or removing/inserting the power plug with wet hands may cause electrical shock.

Caution against electric shock

■ Ground the unit securely!

Connect the earth terminal of a three-terminal outlet to the ground for safety. Imperfect grounding may cause electric shocks.

Grounded

■ About the warning labels

On the lamp house, which gets very hot, warning labels are affixed (See page 2). Follow the instructions on the labels. If a warning label gets dirty or starts to peel, contact the supplier where you purchased the unit or our sales department for replacements.

Caution

■ Replacement of fuses

Before replacing a fuse, turn off the power and unplug the power cord, to prevent an electrical shock.

Unplugged

■ Do not use the unit for any purpose other than the intended!

This device is intended to measure spectroscopic characteristics, such as reflectance and transmittance. Do not use any other purpose than the intended.

Prohibited

⚠CAUTION	Failure to follow these precautions may result in injury or material damage to this Product or peripheral devices.

Prohibited

■ <u>Do not place the unit in an unstable location!</u>
If the unit is placed on an unstable stand, on an incline, or on a rigid floor, it may be knocked over or fall down, resulting in injury.
Fully check the strength and incline of the installation location.

Prohibited

■ <u>Do not attempt to replace a lamp just after turning it off!</u>
The lamp is hot just after the light is turned off. Wait until the lamp cools before replacing it. Otherwise there is a risk of burns.

Mandatory

■ <u>Pay attention when adjusting focus!</u>
In adjusting focus, pay close attention to the location of the objective lens so that it does not touch a sample.

Mandatory

■ <u>Measure a room-temperature sample!</u>
Measure a room-temperature sample. A high-temperature sample may cause heat deformation of or damage to the stage.

Warranty

(1) Warranty Card

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***** Warranty Card *****
(Product Name) NIR Micro Spectrophotometer     (Model Name) USPM-W-B
                                        Serial No. _____
                                          *The user must enter the serial No.


                          Customer Information

Name _____

Address _____

Phone Number _____

(Warranty Period)    One year from the date of purchase or after 2000 hours of use,
                     whichever comes first.

(Date of Purchase)      _____

(Vendor)                _____
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(2) Warranty Conditions

This warranty guarantees free repair for the following conditions.

[Free Repair]

1) EVIDENT Corporation will repair, free of charge, any problem caused by a manufacturing defect, provided that the problem occurred while correctly using the product in compliance with the provisions of the manual during the warranty period.

2) We do not warrant any failure due to other causes (ex. peripheral devices or the environment of the installation site).

3) Regardless of the warranty period, there will be a charge to repair the following:

   ■ Defect or damage due to the incorrect use of the device.

   ■ Defect or damage due to acts of God (lightening or flood, etc.) or other unforeseeable accidents.

   ■ Defect or damage due to apparatuses other than this device.

   ■ Defect or damage to a part or component that is repaired or modified by an individual other than EVIDENT service personnel, or defect or damage due to such repair or modification.

   ■ Defect or damage to a product whose serial number has been deliberately changed or removed.

   ■ Defect or damage to an expandable items.

4) For details on how to have defects repaired in Japan or overseas, contact the service department at EVIDENT Corporation. Contact the support division given in the attachment.

* The warranty card guarantees any free-of-charge repair under the terms and conditions specified in this document. The warranty is not intended to restrict the right of the customer. Even after the warranty period, the service department at EVIDENT will gladly welcome any questions. Contact the support division given in the attachment.

■ Although we went to great effort to confirm the accuracy of the contents of this document, if you feel that certain points are unclear, or find any mistakes or omissions, please contact the service department at EVIDENT Corporation. Contact the support division given in the attachment.

■ Regardless of the preceding provision, we will take no responsibility for the impact of the approved outcome.

Product Features

The Product has the following features:

⚠ WARNING	This device is intended to measure spectroscopic characteristics, such as reflectance and transmittance. Do not use it for anything other than the intended purpose.

■ Wideband measurement

The unit is able to measure the spectroscopic characteristics within the wide wavelength range of 380 nm to 1,050 nm.

■ Measurement in a minute area

The unit is able to measure the surface reflectance of a minute area (ø70 μm (ø17 μm with an optional x40 objective lens)) in a sphere or a micro-optical part.

■ Measurement of thin plates

The product is able to measure plates of thickness of 1 mm (0.15 mm with an optional x40 objective lens).

■ Reflectivity measurement of Part around lens

The reflectivity measurement in the part around the lens becomes easy in using optional rotation stage.

*The measurement that is optional and provides for permeability, 45-degree reflectivity measurement of the incidence, and the polarizing direction can be done.

1. Confirming the Package Contents

Check the package to confirm the main unit and all accessories are included in accord with the table shown below. Also, check that no part has been damaged in transit. If you find anything missing or discover a component has been damaged, or have any questions, please contact your sales representative or our sales department before attempting to use anything in the package.
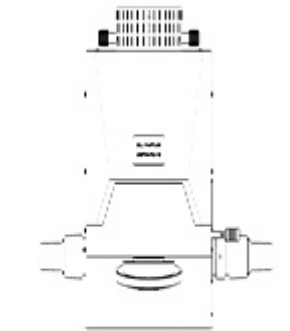
1. NIR Micro Spectrophotometer: USPM-W-B Operation Manual

2. Spectral Analysis Software: USPM-SA Operation Manual

3. Spectral Analysis Software: USPM-SA Installation Instructions

4. Main unit

5. controller supply unit

6. Lamp house

7. x10 objective lens

8. x20 objective lens

9. x40 object ive lens

※11. Wavelength calibration sample
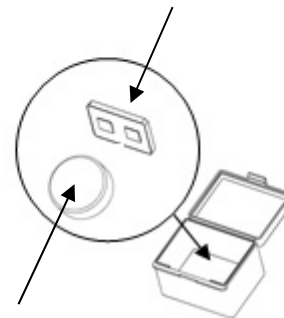
※10. BK7 reference sample

12. USB cables

13. Lamp cable

※We can provide you with our document (for a fee) describing the calibration of BK7 reference sample and Wavelength calibration sample, if necessary. Please contact the supplier where you purchased the unit or our sales department.
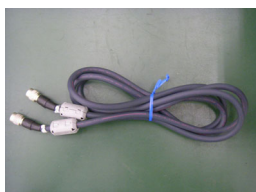
14. IO cable

15. Application software Included Media

16. Protection key

17. Halogen lamps 18. Fuses 19. Caps for the revolver

20. Hexagon wrench 21. Rotation stage ※22. High-reflectivity reference sample

※It is a reference sample for the high reflectivity sample. Reference data CD is attached. The reference data once a year is recommended to be updated because the high reflectivity reference sample give the mirror court. Please contact the shop or our business window of store purchased when you update it.

	Item		Num.	Description
1	NIR Micro Spectrophotometer USPM-W-B Operation Manual		1	This document
2	Spectral Analysis Software USPM-SA Operation Manual		1	
3	Spectral Analysis Software USPM-SA Installation Instructions		1	
4	Main unit		1	
5	Controller supply unit		1	
6	Lamp house		1	
7	x10 objective lens	Model: USPM-OBL10	1	
8	x20 objective lens	Model: USPM-OBL20	1	
9	x40 objective lens	Model: USPM-OBL40	1	Optional
10	BK7 reference sample		1	Reference
11	Wavelength calibration sample		1	Reference of wavelength calibration
12	USB cables		2	1.5 m
13	Lamp cable		1	1.5 m
14	IO cable		1	1.5 m
15	Application software Included Media		1	Including drivers
16	Protection key		1	
17	Halogen lamps (for the unit only)		5	4 spares
18	Fuses: Rated voltage/current: 250 V AC, 3.15 A Size: ø5.2 mm × 20 mm Time delay fuse ,high breaking capacity type		3	2 spares
19	Caps for the revolver		5	
20	Hexagon wrench		1	For Work installation board detaching
21	Rotation stage (with two M3 × 18 screws)		1	Optional
22	High-reflectivity reference sample (with data CD)		1	Optional

⚠ CAUTION | A computer and its power cord are prepared separately.
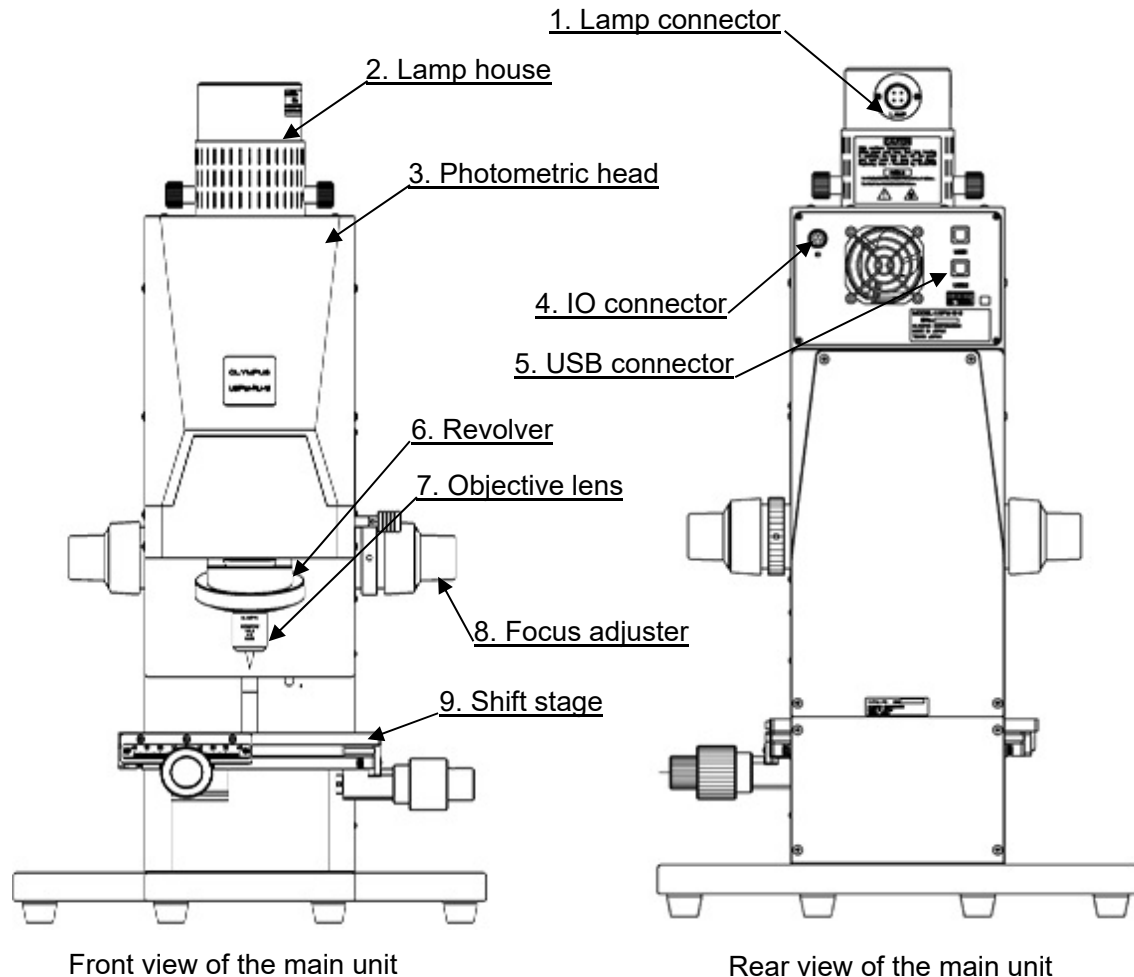
⚠ CAUTION | Use the computer properly in accordance with its manuals.

⚠ CAUTION | Do not install any other applications than those specified. Such unauthorized applications may cause a system failure.

2. Names and Functions of Parts and their Specifications

2.1. The names and functions of each part in the unit

1. Lamp connector

2. Lamp house

3. Photometric head

4. IO connector

5. USB connector

6. Revolver

7. Objective lens

8. Focus adjuster

9. Shift stage

Front view of the main unit

Rear view of the main unit

The functions and the operations of each part in the unit are presented below:

1. Lamp connector
   Supplies power to the lamp house. It is connected to the controller supply unit via the lamp cable.

2. Lamp house
   Accommodates a halogen lamp. For details, refer to "3. Installation and Connection".

3. Photometric head
   Contains the optical system for spectrophotometry.

4. IO connector
   Supplies control power. It is connected to the controller supply unit via the IO cable.

5. (Two) USB connectors
   Transmit video signals and control signals. Each of them is connected to the computer via a USB cable.

6. Revolver
   An objective lens is placed on it. For detail, refer to "3. Installation and Connection".

   ⓘ **Mandatory**

   All the object lenses are for use in the unit only. Do not use any of them in other devices.

7. Objective lenses
   Choose and place one of them on the revolver according to the application.

8. Focus adjuster
   Moves the photometric head and an objective lens in the vertical direction. The load adjuster is available for adjusting the load on the motion of focus.

Coarse tuning knob
Fine tuning knob
Load adjuster
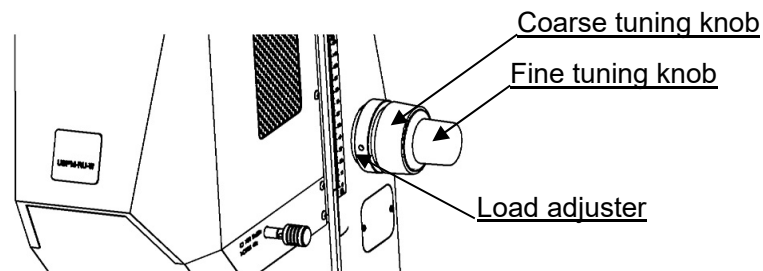
9. Shift stage
   The coarse tuning knob and the fine tuning knob are used to adjust the position of the sample on the stage in the horizontal direction (forward or backward, or right or left).

Coarse tuning knob
Fine tuning knob
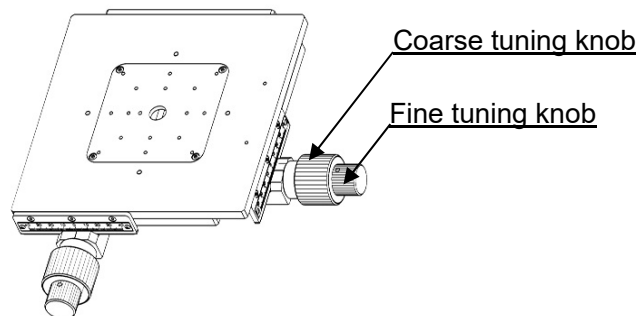
2.2. The names and functions of the items on the controller supply unit

Rear view of the controller supply unit
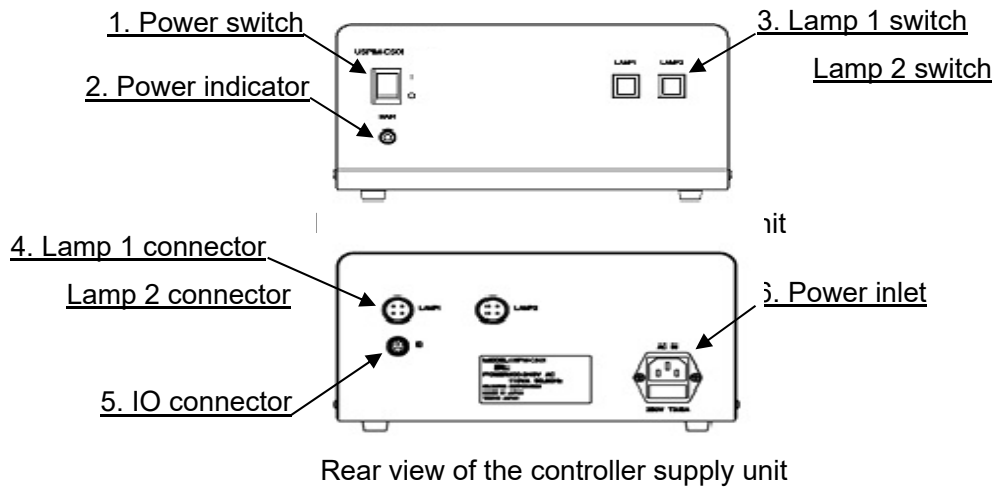
The functions and operating methods are shown below:

1. Power switch
   Turn on or off the power of the controller supply unit.

2. Power indicator
   Light on when power is on and off when power is off.

⚠ CAUTION	Lamp 2 switch and connector are used with an optional unit (Transmittance measurement set, 45-degree measurement set).

3. Lamp 1 switch / Lamp 2 switch
   Supplies power to the lamp house or switches the power destination. Turning on a switch supplies power through the corresponding connector (Lamp 1 or Lamp 2 connector) to illuminate the halogen lamp.

4. Lamp 1 connector / Lamp 2 connector
   Each connector supplies power to the corresponding lamp house.
   Connect a LAMP cable to each connector. (DC 12.3V ⎓)

5. IO connector
   Supplies control voltage to the unit. Connect an IO cable. (DC 12V ⎓)

❗ Mandatory	Always use the supplied cable. With any other cables, there is a risk of malfunction due to internal or external noise. The supplied cables may not be used for any other devices.

6. Power inlet
   Connect the power cord here to supply power to the controller supply unit. The component is equipped with a fuse. For details on replacing the fuse, refer to **3.4 Installation and replacement of fuses**.

2.3. Product specification

Item	Specification		
Name	NIR Micro Spectrophotometer		
Model	USPM-W-B		
Wavelength range	380 nm - 1,050 nm		
Display resolution of wavelength	About 1 nm (Wavelength resolution About 5 nm)		
Repeatability	With 10x/20x objective lens	±0.02[%] or less (430 nm - 1,010 nm), ±0.2[%] or less (in other ranges)	
	With 40x objective lens	±0.05[%] or less (430 nm - 950 nm), ±0.5[%] or less (in other ranges)	
	Analysis of film thickness	±1[%] or less	
Halogen lamps	Custom halogen lamps supplied by Life Elex: JC12V 55W (*Average life: 700 h) * Average life is the time when half of test samples are burned out. In short, the time at which the survival rate reaches 50%.		
Objective lenses	Model	USPM-OBL10	USPM-OBL20	USPM-OBL40
	Magnification	10x	20x	40x
	NA	0.12	0.24	0.24
	Range (Spot dia.)	70 µm	35 µm	17.5 µm
	Distance	14.3 mm	4.2 mm	2.2 mm
	curvature radius of sample	±5mm〜	±1mm〜	±1mm〜
	Thickness of sample	1.0mm〜	0.5mm〜	0.2mm〜
Shift stage	Size of mounting: 200(W) × 200(D) mm; Load: 3 kg Operating range: (XY) ±40 mm, (Z) 125 mm		
Rotation stage （OPTIONAL）	Sample that can be loaded： Diameter ø5~60mm, surface of flange 1~10mm, Height MAX10mm Load : 150g Operating range : ±90°		
Weight	Main unit: Approx. 26 kg (excluding computer) Controller supply unit: Approx. 6.7 kg		
Dimension	The body: 360(W) × 446(D) × 606(H) Controller supply unit: 250(W) × 270(D) × 125(H)		

Power specification	Input: 100–240 V AC 110 VA 50/60 Hz
	Fuse: Rated voltage/current: 250 V AC, 3.15 A
	              Size: ø5.2 mm × 20 mm
	              Time lag ,high breaking capacity type Number: 2		

Computer and monitor	Computer - CPU: Intel CPU 2.6 GHz or better, PC/AT–compatible machine - Chipset: Made by Intel Corporation (recommendation) - Memory: 4 GB or greater is recommended - HDD: more than 40 GB - Supported OS: Windows® 10 Professional (64-bit version) Windows® 11 Professional (64-bit version) - An optical drive that can read a DVD-ROM (external types can also be used) - USB 2.0 × 3 ports or greater - EMC: Class B Monitor - Resolution: 1024 × 768 or greater - EMC: Class B		

| Usage environment	Indoor use Altitude: up to 2,000 m Temperature: 15ºC - 30ºC Humidity: 15% - 60% RH (non-condensing) Voltage fluctuation: ±10% Contamination: 2 (IEC60664-1) Installation Category (Overvoltage Category): II (IEC60664-1)

3. Installation and Connection

3.1. To transfer and install the main unit

When installing or transferring the main unit, take care of the following points:

⚠ CAUTION	Hold the base when installing or transferring the main unit. Otherwise some failure may be caused.

Base
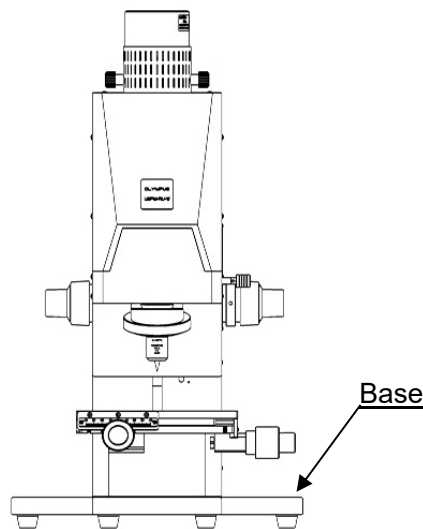
⚠ CAUTION	Always have two or more persons install or transfer the main unit, which weighs approx. 26 kg. Handling the unit alone may cause injury.

⚠ CAUTION	Do not cause any impact to occur to the main unit when installing or transferring it. Damages to optical parts or effects on adjustment may result, causing failure or incorrectness.

⚠ CAUTION	Avoid installing it in an unstable place or any place with strong vibrations. There is a risk of the unit overturning or falling, or personal injury. Take the usage conditions into consideration in installing it.

⚠ CAUTION	Keep the photometric head at the lowest position during installation or transfer. Otherwise the unit may become unbalanced.

⚠ CAUTION	Disconnect all cables before moving the unit. Otherwise, there is the risk of a cable breaking or causing damage to the connectors. Cabling must be done only after the unit is set in a stable place.

⚠ CAUTION	If the temperature of the unit is greatly different from the room temperature, dew is likely to form on the inside of the unit after installation or transport. Wait until the dew evaporates before using the unit, instead of trying to wipe it off.
⚠ CAUTION	The unit is equipped with fans. Keep a space of at least 10 cm between any object and the left, right and back of the unit.
⚠ CAUTION	Do not place equipment so that it is difficult to pull out power cord from rear side receptacle of Power Supply Box

If you need to repack the unit to ship it, contact your sales representative or our sales department.

[How to install the unit]

(1) Remove the main unit, the controller supply unit and all accessories from the shipping carton.

(2) Check whether all the items listed in "1. Confirming the Package Contents" are included.

(3) Remove the packing materials, and check whether there is any visible damage to the contents.

(4) Put the main unit, the controller supply unit and the computer in a place that meets the specified usage conditions.

3.2. Fitting an objective lens

🔴 Mandatory	Use both hands and proper care in installing and detaching an objective lens. Dropping an objective lens may cause damage to the optics or adjustment failure, leading to incorrectness of measurement.

Detach the same number of caps in the revolver as the number of objective lenses you want to attach.
Then insert the objective lenses into the revolver. Be sure to insert them fully.

Revolver
Object lens

3.3. Installation and replacement of halogen lamp

⚠CAUTION	For your safety, you should always remove and install a halogen lamp by first turning off the power switch, unplugging the cord, and when the halogen lamp and the socket are cool to the touch, remove and install the lamp.
⚠CAUTION	Do not touch the glass part of the halogen lamp with your bare fingers. Wipe off any residue on the bulb from your fingers and any dirt because they can cause blackening on the bulb, which will damage it.
⚠CAUTION	The lamp house needs to be inspected. Conduct regular inspections according to **Appendix: Checklist for inspection the lighting device (lamp house).**
⚠CAUTION	Do not watch the light of the halogen lamp directly. Eyes might be damaged

Light source: JC12V55W (made by Life Elex Inc.)

(1) Loosen and remove the two fixing knobs of the lamp house, and pull it out vertically.

(2) The pulled-out lamp house has a lamp socket to install a halogen lamp. Push the two levers down and insert the two pins on the lamp base into the holes in the socket. If the lamp does not lean or it is not inserted correctly, the unevenness of a ring image like the right photograph will occur. When unevenness is checked, please check whether insertion of a lamp is corrected.
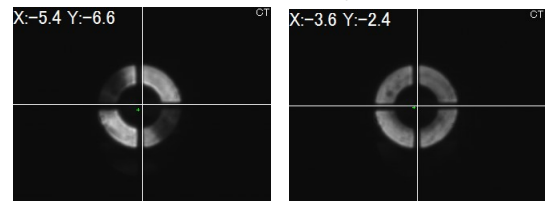
Unevenness of a ring image | Correct ring image

(3) Release your finger on the levers slowly.

(4) Insert the lamp house back into the original position. Make sure that the lamp connector is toward the back surface of the main unit. Confirm the threaded holes and the lamp house are properly aligned. Tighten the two fixing knobs to secure the lamp house.

Halogen lamp

Lamp house

Two fixing knobs

Levers

Lamp socket

IEC62471:2006 RISK GROUP 2
CAUTION
UV emitted from this product.
Eye or skin irritation may
result from exposure.
Use appropriate shielding.

Fixing hole for the lamp house

Lamp connector
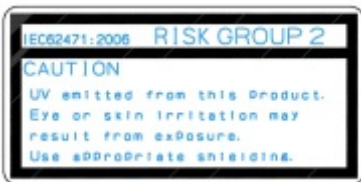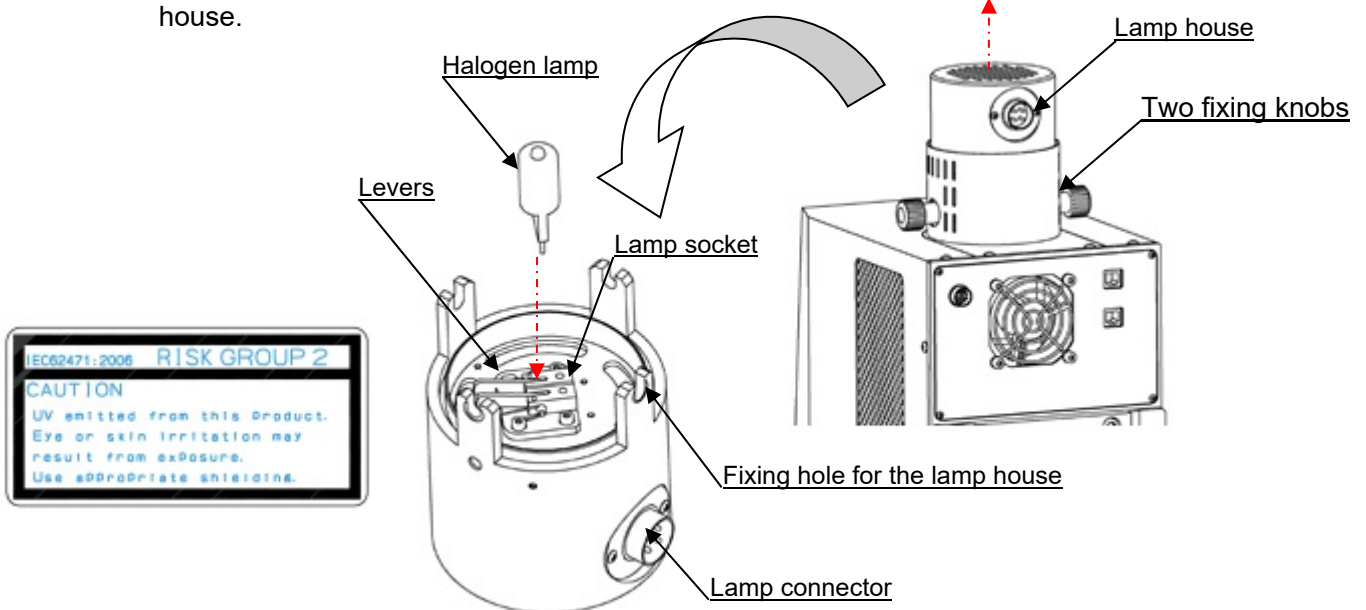
3.4. Installation and replacement of fuses

Unplugged

Always turn off the power and unplug the power cord before installing or removing any fuses.

Fuse: Rated voltage/current: 250V AC, 3.15 A; Size: ø5.2 mm × 20 mm
time delay fuses、high breaking capacity type
Compatible parts permitted

(1) Pull out the fuse holder stored in the slot below the power cord inlet.

(2) Remove the blown-out fuse and replace it with a new one.

Fuse

Fuse holder
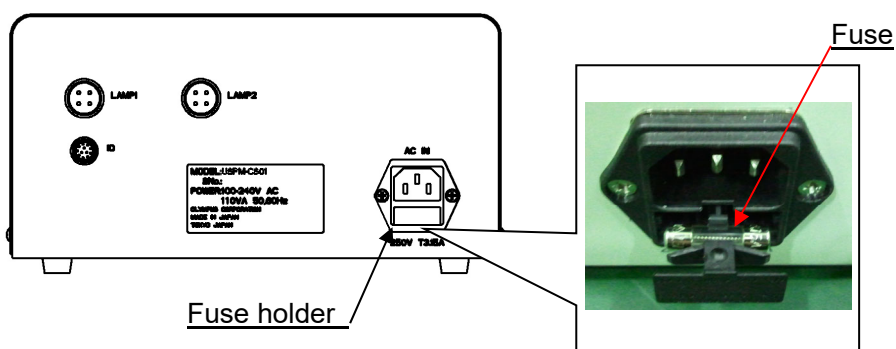
3.5. Replacement of the gas spring

＊Please refer to **6.troubleshooting** for the exchange time.

⚠ CAUTION

Tighten the load adjuster properly. If the load adjuster is loose, the photometric head is likely to drop during the replacement of the gas spring.

Tools: Cross-shaped tip screwdriver and flat-blade screwdriver

(1)   Raise the photometric head to the upper limit, and then turn the load adjuster clockwise to fix it tightly.

(2)   Remove the four screws on the back with the cross-shaped tip screwdriver, and remove the upper cover.

(3)   Remove two screws on the top side of the rack with the cross-shaped tip screwdriver, and remove the cover.

(4)   Loosen and remove the jig for replacing the gas spring inside of the base.

(5)   Screw the jig into the replacement hole of the gas spring on the top surface of the rack.

(6)   Loosen and remove hinge pin 1 at the upper edge of the gas spring with a slotted screwdriver.

(7)   Loosen and remove the replacement jig.

(8)   Pull out the gas spring from the hole.

(9)   Insert a new gas spring into the hole.

(10)   Push the replacement jig into the gas spring access hole to compress the gas spring.

(11)   Insert and fix hinge pin 1 into the upper edge of the new gas spring with a slotted screwdriver.

(12)   Remove the replacement jig of the gas spring.

(13)   Fix the covers with the screws.

(14)   Turn the load adjuster counterclockwise to loosen it.

(1), (2)

Photometric head

Four screws on the back

Load adjuster

Upper cover

(3), (4)

Two screws on the top side of the rack

Jig for replacing the gas spring

(5), (6), (7)

Jig for replacing the gas spring

Gas spring access hole

Hinge pin 1

(8)

Gas spring
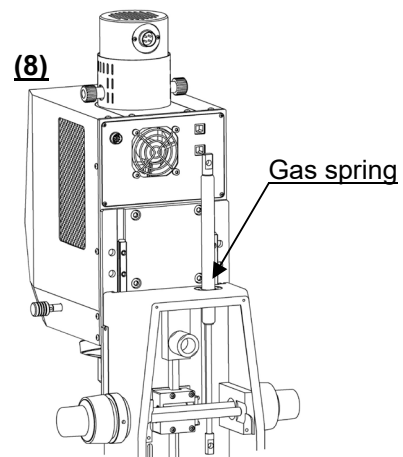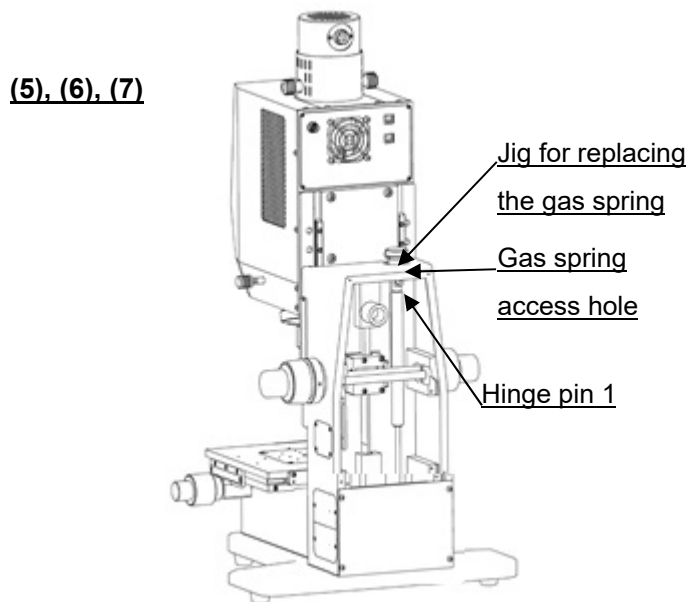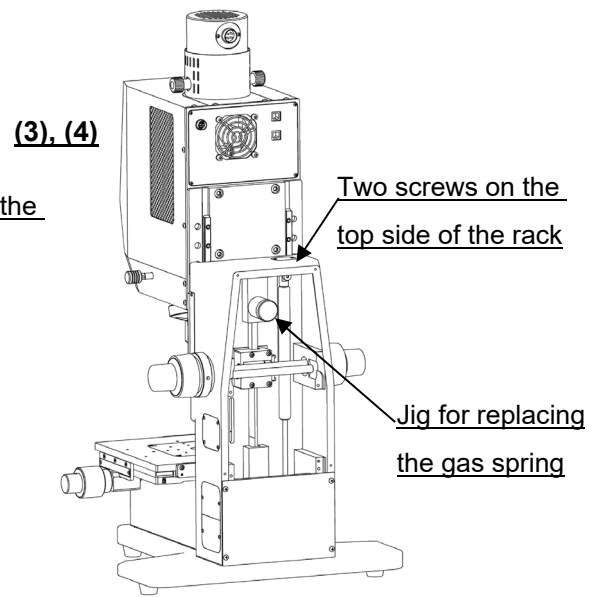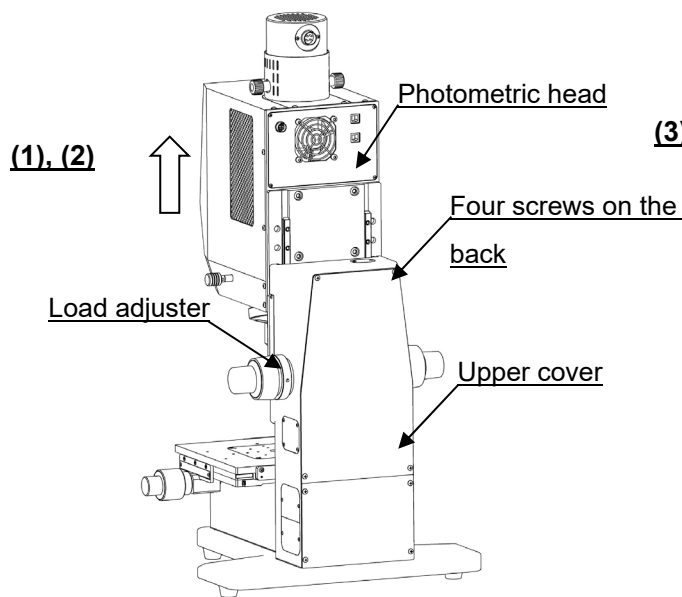
(9) - (14) is the reverse procedure of (1) - (8).

3.6. Installation of the optional rotation stage

⚠ CAUTION	If the optional tilt stage is attached, remove the work plate on the upper surface of the tilt stage.

Tool: hexagon wrench

(1) Install the rotation stage on the topside of the shift stage, and fix it by screwing two bolts into the fixing hole.
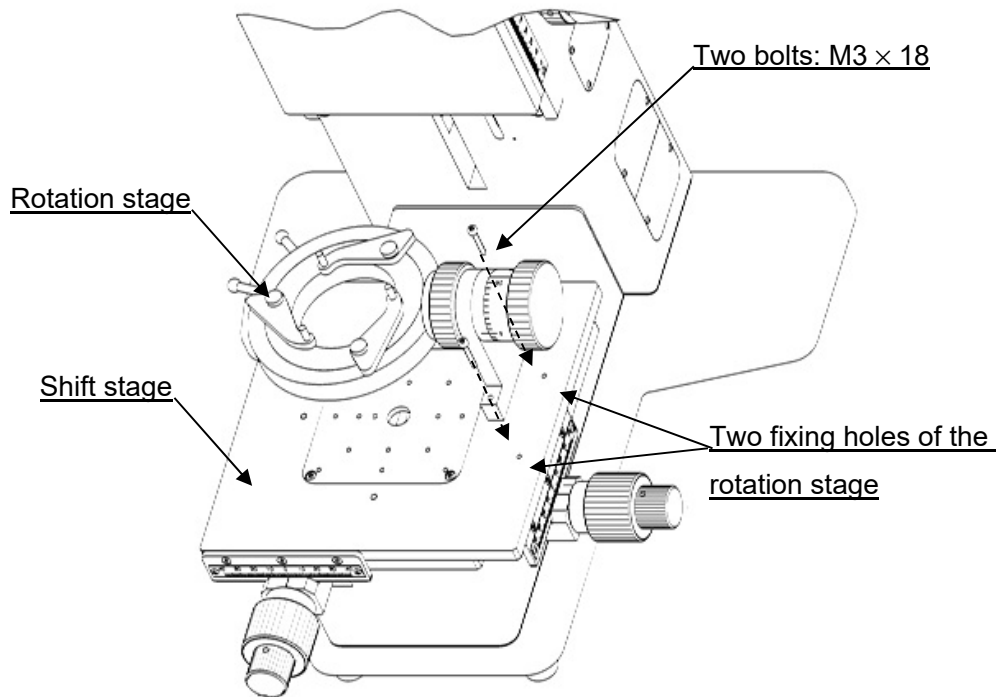
[How to remove the work plate]

(1) Remove the four bolts (M3 × 5).

(2) Remove the work plate installed on the upper surface of the stage.
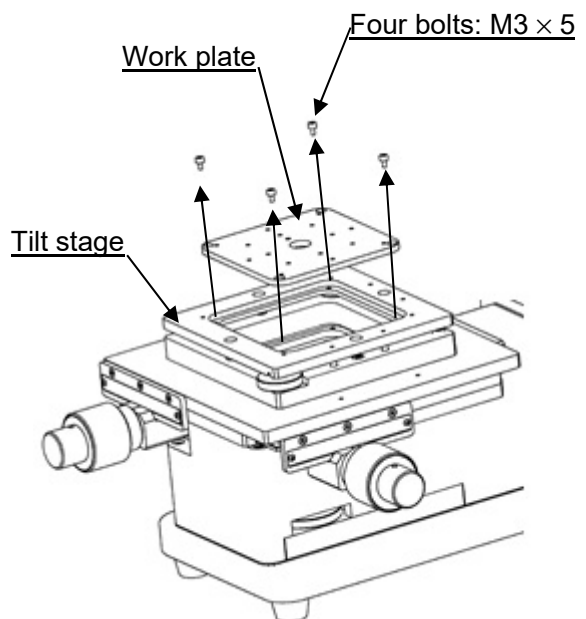
3.7. Connection

⚠ CAUTION	Take care not to apply excessive force in handling the cables, since they can be damaged by bending or twisting.
⚠ CAUTION	For cable setting, keep cables away from something sharp.
⚠ CAUTION	Connect the cables only when all power switches are turned off and the power cord is unplugged.
⚠ CAUTION	There is the possibility of melting the power cord and creating a short-circuit if the power cord comes into contact with the lamp house. Leave enough space between the power cord and the lamp house.
⚠ CAUTION	Always use the supplied cables. Using any other cables than the supplied may cause failures due to internal and/or external noises. The supplied cables are not suitable for use with any other device.

Connect the cables according to the figure below:
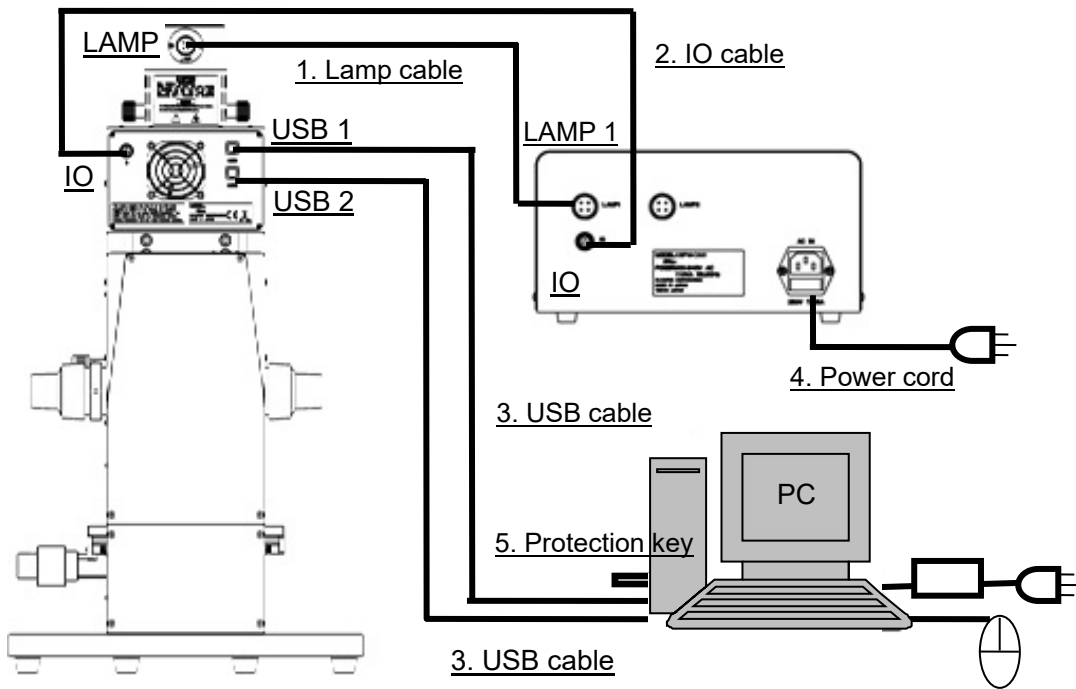
	Item	Connection
1	Lamp cable	Between "LAMP" connector on the unit and "LAMP 1" connector on the controller supply unit
2	IO cable	Between "IO" connector on the unit and "IO" on the controller supply unit
3	USB cables (two)	Between "USB 1" / "USB 2" on the unit and any two USB ports on the computer (no distinction between cables and ports)
4	Power cord	Plug into a 100–240 V power supply. Use the supplied power cord; insert it into a standard two-blade electric outlet with ground terminal. Without grounding, the intended electrical safety is not achieved.
5	Protection key	Any USB port on the computer

4. How to Use

This chapter describes the general operations of the unit. For details on the usage, all personnel operating the unit should be sufficiently trained from the viewpoint of each specialized area.

⚠ CAUTION	When the computer is misbehaving or any failure is found in the measurement data, plug off and reinsert USB cable and then reboot the software.
	If you still have such troubles after rebooting the software, please turn off the Control Power Supply Box and then reboot the computer.
	Even if you still have such trouble after rebooting the computer, please contact to us.

4.1. A flow of measurement

[In micro-spectrophotometry]
(1)   Turn on the controller supply unit, and then start the computer and open the software application.
→ Refer to **4.2 Launch**.
(2)   Choose an objective lens.
→ Refer to **4.3 Choosing an objective lens**.
(3)   Choose the ring slit
→ Refer to **4.4 Choosing the ring slit**.
(4)   Set up the work configuration file.
→ Refer to **4.5 Setup of the work configuration file**.
(5)   Put the BK7 reference sample.
→ Refer to **4.6 Setting the BK7 reference sample /Setting the sample to be measured**
(6)   Adjust the position of the BK7 reference sample.
→ Refer to**4.6 Setting the BK7 reference sample /Setting the sample to be measured**
(7)   Adjust the sampling interval.
→ Refer to **4.8 Adjusting the sampling interval**.
(8)   Obtain the background value.
→ Refer to **4.9 Obtaining the background value**.
(9)   Obtain the reference value.
→ Refer to **4.10 Obtaining the reference value**.
(10)   Set the sample to be measured.
→ Refer to **4.6 Setting the BK7 reference sample /Setting the sample to be measured**
(11)   Adjust the position of the sample.
→ Refer to **4.6 Setting the BK7 reference sample /Setting the sample to be measured**
(12)   Conduct a measurement.

→ When conducting a spectrometry:
   Refer to **4.11 Spectroscopy**.

→ When measuring a film thickness (after conducting **4.11 Spectroscopy**):
   Refer to **4.12 Analysis of film thickness**.

→ When measuring color difference (after conducting **4.11 Spectroscopy**):
   Refer to **4.13 Calculation of color difference**.

(13) Check the result.
   → Refer to **4.18 Checking for the results**.

(14) Quit the application; then turn off the controller supply unit and shut down the computer.
   → Refer to **4.19 Quit**.

[In a measurement with a rotation stage]

(1)   Turn on the controller supply unit, the computer, and then launch the software.
        → Refer to **4.2 Launch**.

(2)   Set up the work configuration file.
        → Refer to **4.5 Setup of the work configuration file**.

(3)   Put the BK7 reference sample.
        → Refer to **4.14 Setting the BK7 reference sample when using the rotation stage**.

(4)   Adjust the position of the BK7 reference sample.
        → Refer to **4.15 Adjusting the position of the BK7 reference sample when using the rotation stage**.

(5)   Adjust the sampling interval.
        → Refer to **4.8 Adjusting the sampling interval**.

(6)   Obtain the background value.
        → Refer to **4.9 Obtaining the background value**.

(7)   Obtain the reference value.
        → Refer to **4.10 Obtaining the reference value**.

(8)   Put the sample to be measured.
        → Refer to **4.16 Setting the sample to be measured when using the rotation stage**.

(9)   Choose an objective lens.
        → Refer to **4.3 Choosing an objective lens**.

(10)   Choose the ring slit
        → Refer to **4.4 Choosing the ring slit**.

(11)   Adjust the position of the sample.
        → Refer to **4.17 Adjusting the position of the sample to be measured when using the rotation stage**.

(12)   Conduct a spectrometry.
        → Refer to **4.11 Spectroscopy**.

(13)   Check the result.
        → Refer to **4.18 Checking for the results**.

(14)   Quit the application; then turn off the controller supply unit and shut down the computer.
        → Refer to **4.19 Quit**.

4.2. Launch

<table>
<tr><td>⚠CAUTION</td><td>Use the computer properly in accordance with its manuals.</td></tr>
<tr><td>⚠CAUTION</td><td>It takes about 30 minutes from turning on the lamp switch for the lamp to reach the stable state. Allow the lamp to warm up, if necessary.</td></tr>
</table>

(1)   Turn on the power switch of the controller supply unit.

(2)   Turn on the Lamp 1 switch (for the transmittance measurement option: Lamp 2 switch) on the controller supply unit.

(3)   Start the computer, and double-click the icon on the desktop ⬛ to launch the program.

4.3. Choosing an objective lens

(1)   Choose an objective lens that fits with the purpose of measurement. Turn the revolver to the objective lens to be used.

Model	USPM-OBL10	USPM-OBL20	USPM-OBL40
Magnification	10x	20x	40x
NA	0.12	0.24	0.24
Range (Spot dia.)	70 µm	35 µm	17.5 µm
Distance	14.3 mm	4.2 mm	2.2 mm
curvature radius of sample	±5mm〜	±1mm〜	±1mm〜
Thickness of sample	1.0mm〜	0.5mm〜	0.2mm〜

4.4. Choosing the ring slit

(1)   Choose the ring slit.
Use the ring slit switching knob to set the ring slit.
For any objective lens of x10 or x20, push the knob.
For any objective lens of x40, pull the knob.

Ring slit switching knob
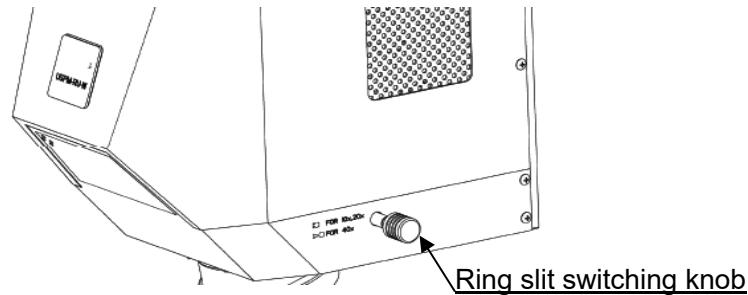
4.5. Setup of the work configuration file

For detail, refer to **6.2 Work configuration** in the **USPM-SA Software Operation Manual**.

(1)   Choose [Setup]-[Work] on the File menu. The work setup window opens.
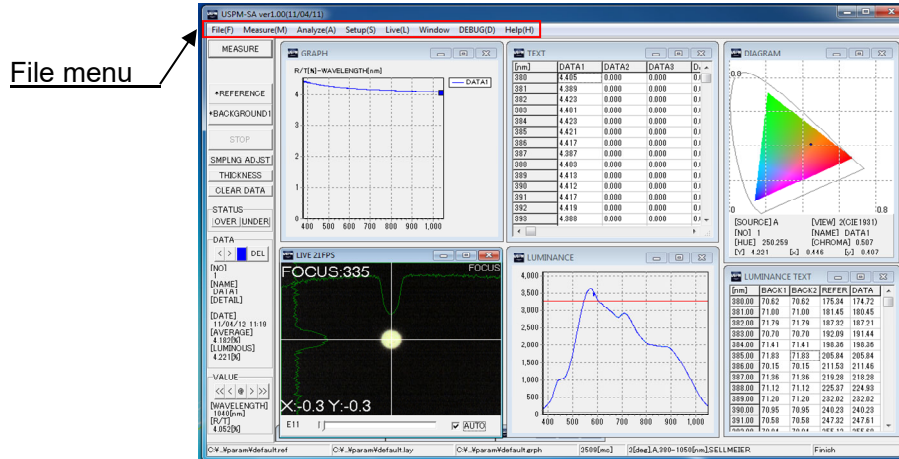
File menu

(2)   Configure the reference.

[When using BK7 reference sample]
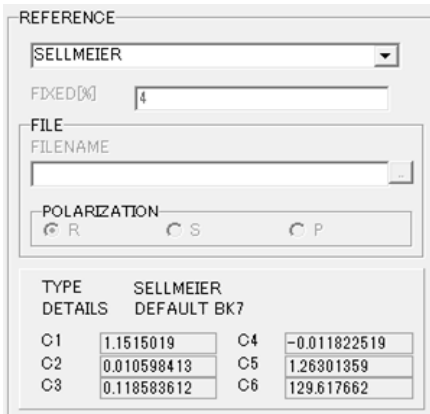
(1)   Click ▽, and select SELLMEIER.

[When using the optional high-reflectivity reference sample]
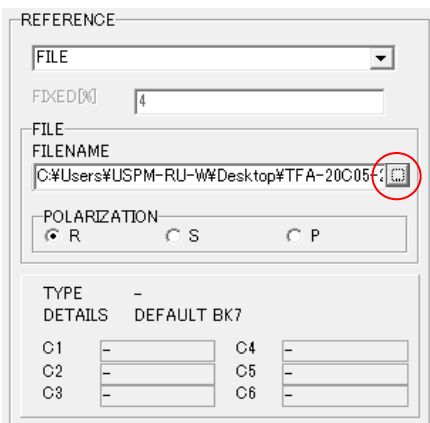
(1)   Click ▽ and select FILE.

(2)   Click the element indicated by the circle part and open "hrr.rf " file.
"hrr.rf" file is in the cd.

4.6. Setting the BK7 reference sample /Setting the sample to be measured

(1) Place the BK7 reference sample（the sample to be measured）on the top surface of the shift stage. To avoid unnecessary reflected light, it is recommended to put the BK7 reference sample（the sample to be measured）on the center of the stage, where there is a hole for letting light pass.

4.7. Adjusting the position of the BK7 reference sample /Adjusting the position of the sample to be measured

[How to switch the window]
Double-click anywhere on the black area to switch between FOCUS and CT in the LIVE window. You may obtain the same effect through choosing [Live] on the menu.
(A FOCUS window appears when the time the software opens.)
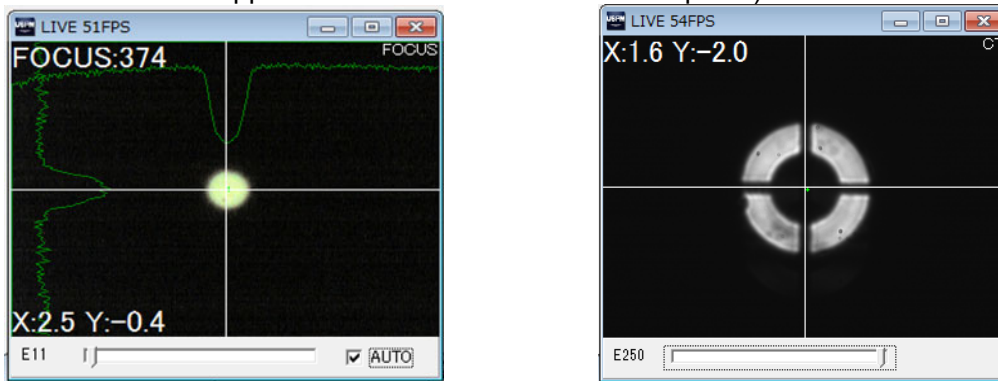
(1) Adjust focus on the BK7 reference sample（the sample to be measured）.
First, select the check box marked "AUTO" at the lower right of the FOCUS window.
Looking at the FOCUS window, use the focus adjuster to get an optimum focus position of the BK7 reference sample（the sample to be measured）.
The focus adjuster contains a coarse tuning knob and a fine tuning knob.
The optimum focus position is the one that returns the smallest value of FOCUS:xxxx (at the upper left of the window).

Being out of focus   Focus is found   Optimum position
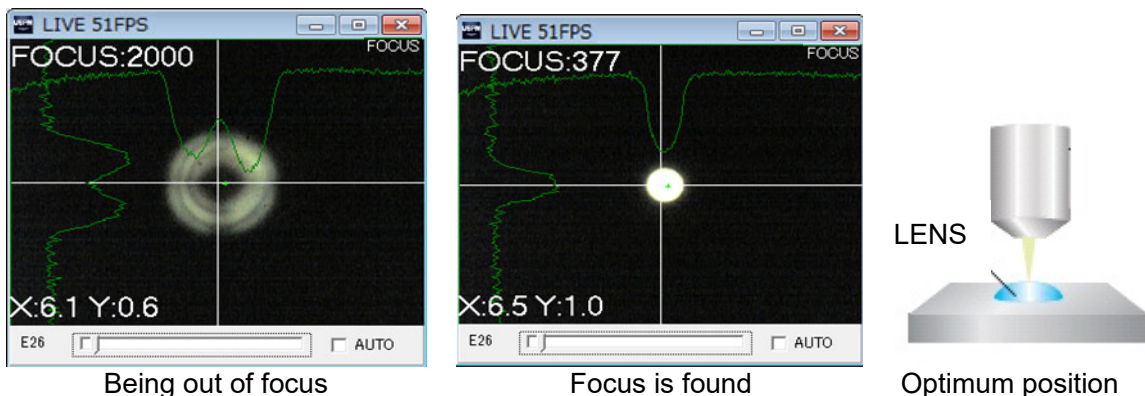
(2)   Adjust the shift of the BK7 reference sample（the sample to be measured）.

[For a flat sample]
Looking at a circle of light injected from the objective lens that is visible on the top surface of the BK7 reference sample（the sample to be measured）, use the shift adjuster of the shift stage to set the shift of the sample. The shift adjuster contains a coarse tuning knob and a fine tuning knob.

[For a sample with a gear radius]

Hint: Because the focus of any sample with gear radius changes with the shift adjustment, adjust the focus again according to the focus adjustment described on the previous page.

First, click the bar indicated in the following figure to adjust the gain so that a circle is displayed.

Looking at CT window, use the shift adjuster to move the sample toward the vertical direction against the optical axis. Align the center of the circular light with the intersection of the two lines in the CT window.
Adjust the position until the figures at the upper left (X:*** Y:***) turn white.
For any work of a small gear radius, (X:0±1 Y:0±1) is recommended.

Gain adjustment
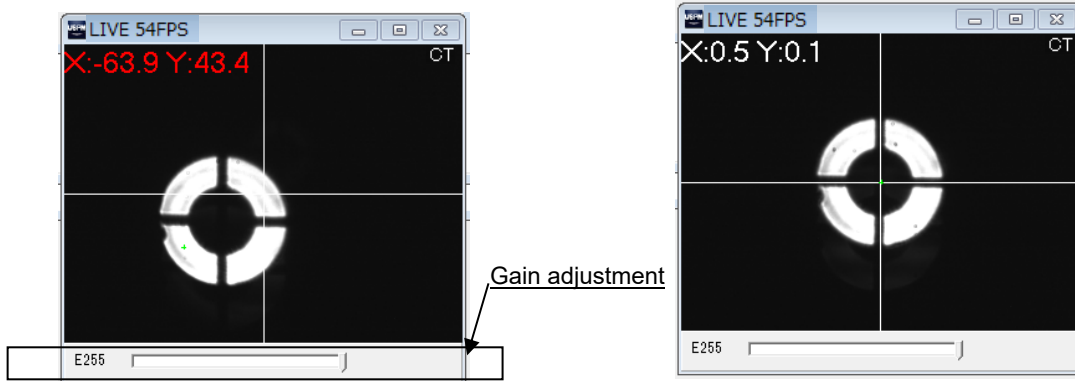
Shift is out of alignment   Shift is well aligned

4.8. Adjusting the sampling interval

Adjust the sampling interval so that the quantity of spectroscopic light received by the BK7 reference sample does not exceed the maximum quantity of light of the photodetector. Go through the following steps to adjust the sampling interval.

> Hint: If the quantity of the sample to be measure is considered to be larger than that of the reference sample, use the former sample to adjust the sampling interval.

(1) Press SMPLNG ADJST in the operation panel.

(2) As the START INTERVAL window opens, enter a value and click OK.
The shutter opens and a measurement begins.
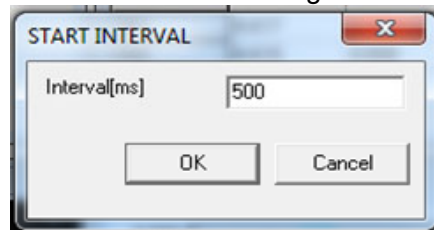
> Hint: An error may occur due to the input value. If you encounter an error, check the message to modify the input value.
> [If the input value is too small]   [If the input value is too large]
>
>
>
> [If the reference quantity of light is too small]
>
>
>
> If you encounter one of these messages, input a sampling interval manually.
> [Procedure for manually adjusting the sampling interval]
> (1) Choose [Setup]-[Work] on the File menu to open the work setup window.
> (2) Input a proper sampling interval and then click OK.
>
> SAMPLING INTERVAL
> 1000   [ms:10-19999]
>
> (3) Click REFERENCE. Looking at LUMINANCE window, modify the value until the graph exceeds the red line to an unsaturated position.
>
>
>
> (4) Then, conduct a task of 4.9 Obtaining the background value.
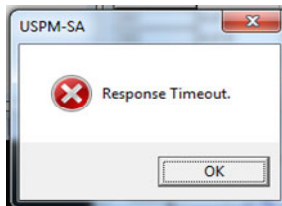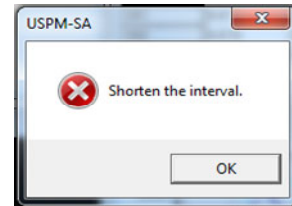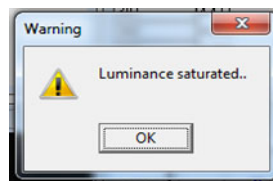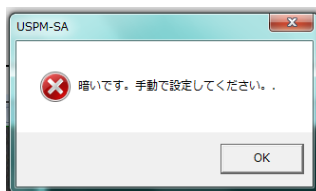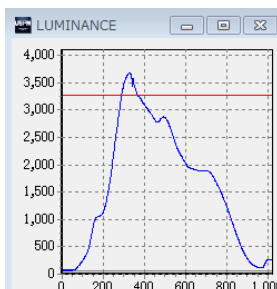
(3) The Information window opens that displays the sampling interval. After that, Click OK to end the operation.Then, the shutter operates again.

4.9. Obtaining the background value

(1) Click BACKGROUND1 on the operation panel.
A clicky sound is generated, and then a warning alarm sounds as the process finishes.
As the data is saved, an asterisk (*) appears at the left of BACKGROUND1 in the operation panel.

4.10. Obtaining the reference value

(1) Click REFERENCE on the operation panel.
The shutter sounds, the reference value is captured. After that, the shutter operates again, and a warning alarm sounds as the process finishes.
As the data is saved, an asterisk (*) appears at the left of REFERENCE in the operation panel.

4.11. Spectroscopy

(1) Click MEASURE on the operation panel.
The shutter sounds, indicating the start of spectroscopy. When alarm sounds and spectroscopy is ended, a shutter sounds again.
The result is displayed in the sub-windows. Up to 20 results can be stored.
If you measure film thickness, refer to **4.12 Analysis of film thickness**. If you measure color differences, refer to **4.13 Calculation of color difference**.

4.12. Analysis of film thickness

(1) Open the LAYER settings window.
Choose [Setup]-[Layer] on the File menu. The LAYER window opens.

File menu

PV8344F4E016
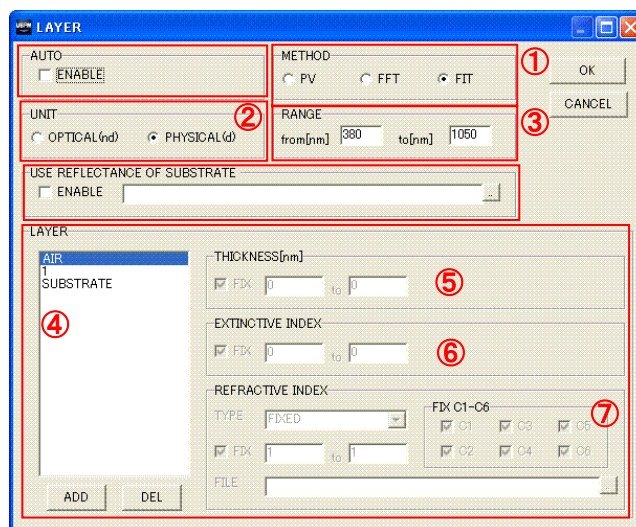
(2) Configure the layer.
The film thickness measurement can be selected from "Peak valley method (PV)", "Fourier transform method (FFT)", and "Curve fitting method (FIT)" according to the usage. The unit of the film thickness can select the optical film thickness and the physical film thickness. A set item is different according to each mode of analysis and the unit of the film thickness. The following table is confirmed, and the condition that ○ has adhered according to the mode of analysis is set. Please refer to **6.3 Layer setting** in the **UPSM-SA Software Operation Manual** for details of a set item.

■Feature of each mode of analysis

	Peak-valley method: [PV]	Fourier transform method: [FFT]	Curve fit method: [FIT]
Feature of each mode of analysis	A complex setting is unnecessary. Two peak/ valley more is necessary for the spectral reflectivity.	When the detection of peak/valley of the spectral reflectivity is difficult, it is effective.	It is possible to measure it even if there is no peak/ valley in the spectral reflectivity.
Layer that can be measured	Only the single-layer	Single layer /multilayer	Single layer /multilayer

■Set item of each mode of analysis

①METHOD	PV		FFT		FIT	
②UNIT	**Optical thickness**	**Physical thickness**	**Optical thickness**	**Physical thickness**	**Optical thickness**	**Physical thickness**
③RANGE	○	○	○	○	○	○
④ THE NUMBER OF LAYERS TO THAT IN THE SAMPLE	—	—	○	○	○	○
⑤THICKNESS	—	—	—	—	○	○
⑥EXTINCTIVE INDEX	—	—	—	—	○	○
⑦REFRACTIVE INDEX	—	○	—	○	○	○

| Item	Description
AUTO	If enabled, analysis of film thickness is automatically done after the easurement.
UNIT	Unit of the film thickness displayed in the analysis.
USE REFLECTANCE OF SUBSTANCE	Any spectroscopy data file (*.csv/*.dat) is available as reflectance of substance. The first data in the data file will be used as the reflectance of substance. Details on reflectance of substance will be provided later.
RANGE	Wavelength range to be analyzed in the analysis of film thickness. High accuracy can be achieved by restricting the range to the wavelength range of high reliance of spectral analysis.
METHOD	The method of analysis of film thickness. [PV] denotes peak-valley method, [FFT] frequency analysis method, and [FIT] curve fit method. For detail on each method, refer to **6.3 Layer setting** in the **UPSM-SA Software Operation Manual**.
LAYER	Design parameter of the layer to be analyzed. There is no need to set up if METHOD is [PV] and UNIT is [OPTICAL]. Otherwise, it must be properly configured. For details on the setting, refer to **6.3.1 Layer setting** in the **UPSM-SA Software Operation Manual**.

(3)   Click the THICKNESS button to conduct an analysis of film thickness.


4.13. Calculation of color difference

Calculation of color difference is extracted from the values of spectroscopy.
For detail, refer to **5.3.1 Calculation of color difference** in the **USPM-SA Software Operation Manual**.

(1)   Open the COLOR DIFFERENCE window.
   Choose [Analyze]-[Color Difference] on the File menu. The COLOR DIFFERENCE window opens.

File menu
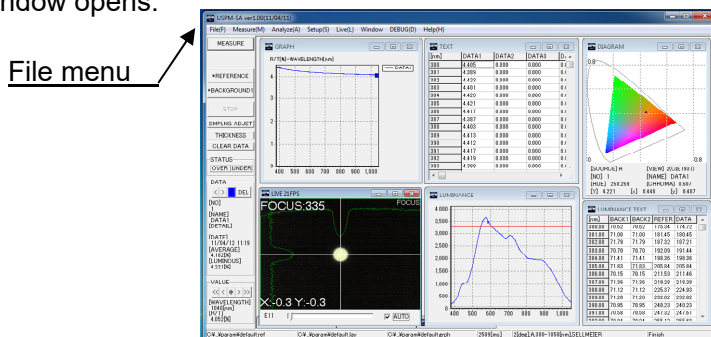
(2)   Use the <​ ​> buttons to select a DATA NO for the calculation of color difference in each pane of DATA1 and DATA2. Color difference is automatically calculated as the numbers are defined.
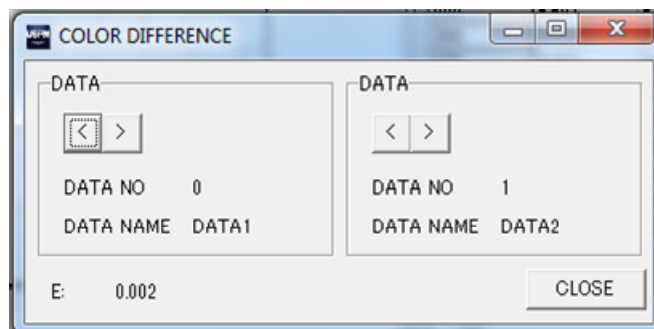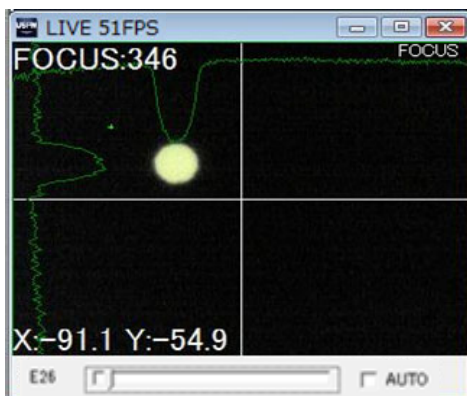
4.14. Setting the BK7 reference sample when using the rotation stage

(1)   Set the BK7 reference sample on the rotation stage.
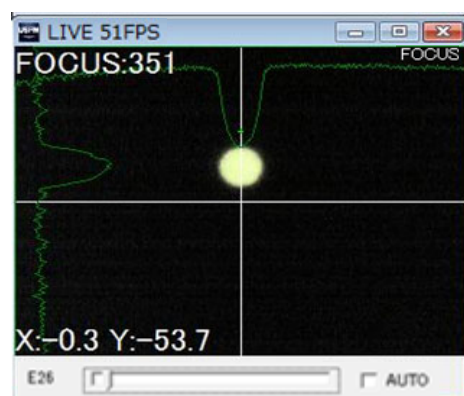   Adjust the holding chuck with the chuck knob to set the sample.
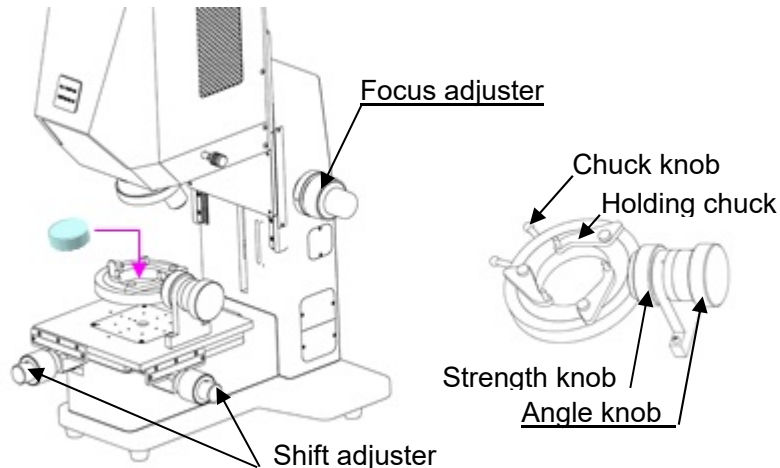
4.15. Adjusting the position of the BK7 reference sample when using the rotation stage

(1)   Set the revolver to Through (no objective lens is attached).

(2)   Looking at the beam from the objective lens, use the shift adjuster to place it into the desired position.

(3)   Adjust tilt of the BK7 reference sample.
       Use the strength knob to adjust the strength properly. Then, looking at the FOCUS window, use the angle knob to turn the BK7 reference sample to adjust its tilt in an axis. At this adjustment, the position may be moved only in the horizontal direction of the FOCUS window. The vertical angle has no mechanical effect on the measurement.
   Adjust the tilt so that the figure (X:***) at the upper left of the FOCUS window is within (X:0±1).

Tilt is out of alignment   Tilt is properly aligned

4.16. Setting the sample to be measured when using the rotation stage

(1) Set the sample to be measured on the rotation stage.
Follow the same procedure as described in 4.14 Setting the BK7 reference sample when using the rotation stage.

(2) Adjust the angle of the sample to the desired for the measurement. Use the scale.

Chuck knob

Holding chuck

Strength knob

Angle knob

Scale
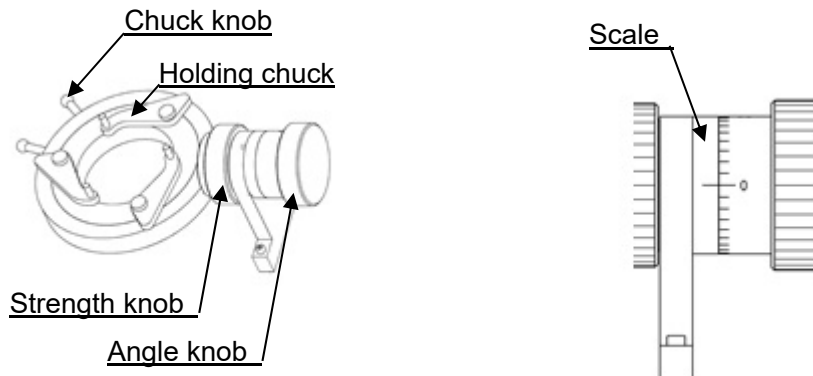
4.17. Adjusting the position of the sample to be measured when using the rotation stage

(1) Looking at the beam from the objective lens, use the shift adjuster to place it in the desired position.

(2) Adjust the focus on the sample to be measured.
Follow the same procedure as described in 4.7 Adjusting the position of the BK7 /Adjusting the position of the sample to be measured

4.18. Checking the results

For details on the main window of the software, refer to **Chapter 4 Main Window** in the **USPM-SA Software Operation Manual**.

File menu

(1) GRAPH window

(2) TEXT window

(3) DIAGRAM window

(4) Operation panel (detailed values)

(5) LUMINANCE window

(6) LUMINANCE TEXT window

(7) THICKNESS INFO window

(8) THICKNESS window

(1) GRAPH window
The GRAPH window displays the result of spectroscopic reflectance measurement.
The vertical axis indicates the reflectance, and the horizontal axis the wavelength.

(2) TEXT window
The TEXT window shows the values of the measurement result.

(3) <u>DIAGRAM window</u>
A chromaticity diagram of the result is displayed.
An XY chromaticity diagram and a Lab chromaticity diagram are available.
Double-clicking the window switches the display between XY and Lab diagrams.
Graph setting also allows you to change between the two chromaticity diagrams.
For the diagram settings, refer to **6.4 Graph setting** in the **USPM-SA Software Operation Manual**.

(4) <u>Operation panel (detailed values)</u>
Detailed values of the measurement results are displayed in the DATA pane of the operation panel in the left part of the main window. Use the $\boxed{<}$ $\boxed{<<}$ $\boxed{>}$ $\boxed{>>}$ buttons to change the wavelength.
Click the $\boxed{DEL}$ button to delete the measurement result.

(5) <u>LUMINANCE window</u>
The spectroscopic quantity of the lights of background, reference and measurement is indicated in a graph in black (grey), cyan and blue, respectively. The red line indicates the upper limit of the spectroscopic quantity defined in the system configuration window.（The pink line indicates the lower limit of the spectroscopic quantity defined in the system configuration window.）

(6) <u>LUMINANCE TEXT window</u>
The spectroscopic quantity values of the lights of background, reference and measurement are displayed. The interval of display is configurable in the graph setting window.

(7) <u>THICKNESS INFO window</u>
Displayed by choosing [Window]-[THICKNESS INFO] on the File menu.
It displays the status of analysis of film thickness. With incorrect status of analysis, the thickness is not normally measured. For the status of analysis, refer to **7.9 THICKNESS INFO window** in the **USPM-SA Software Operation Manual**.

(8) <u>THICKNESS window</u>
Displayed by choosing [Window]-[THICKNESS] on the File menu.
It displays the method and result of analysis of film thickness. For details on the display items, refer to **7.8 THICKNESS window** in the **USPM-SA Software Operation Manual**.

[Saving the data]
Choose [File]-[SaveAs.. datafile] on the File menu.
The save file dialog box appears. Specify the name of the file. You can specify its file format by selecting an extension in this dialog box.

[Print]
Choose [File]-[Main print] on the File menu.
The print setting dialog box appears. Set the print properties properly, and then click the $\boxed{OK}$ button.

4.19. <u>Quit</u>

(1) Choose [File]-[Quit] on the File menu to quit the program.

(2) Turn off the power switch of the controller supply unit.

(3) Shut down the computer.

5. Precautions for Storage

5.1. Storage

When the product is not to be used for a long time, turn off power to the unit and the computer, unplug the power cords, and cover the unit to protect it from dust.

[Storage condition]

(1) Temperature : 10ºC - 60ºC, no sudden changes

(2) Humidity : 80% RH or lower, non-condensing

5.2. Maintenance

(1) Components

・ Halogen lamps
(For how to replace, refer to 3.3 Installation and replacement of halogen lamp)

・ Fuses
(For how to replace, refer to 3.4 Installation and replacement of fuses)

・ Gas spring
(For how to replace, refer to 3.5 Replacement of the gas spring)

(2) Cleaning

⚠ CAUTION	Absolute alcohol is highly flammable. When using it, always turn off the power, and pay attention to the ventilation of the room. Follow the instructions on the usage label of this solvent.

(1) Body
Avoid using any organic solvent in the cleaning of any parts other than the lens. Wipe off heavy dirt, if any, with a soft cloth slightly dampened with a diluted neutral detergent.

(2) Lens
Use a commercial air blaster to blow dust off of the lens and then wipe it softly with a sheet of lens cleaning tissue (or washed gauze). Wipe off any fingerprints or oils with a sheet of lens cleaning tissue dampened with a little absolute alcohol. When dust or a stain inside of the lens causes trouble with its measurement performance, it is necessary to disassemble the lens and clean it. Please contact the supplier where you purchased the unit or our sales department.

(3) BK7 reference sample
The unit measures the relative micro-spectrophotonic characteristics compared with the BK7 reference sample. Wipe off any fingerprints or oil with a sheet of lens cleaning tissue stained with a little absolute alcohol. We can provide you with our document (for a fee) describing the calibration of BK7 reference sample, if necessary. Please contact the supplier where you purchased the unit or our sales department.

5.3. Wavelength offset

(1) Outline of wavelength offset
Wavelength offset is performed to modify the measurement by this unit of the display position of spectral reflectance data in the direction of the wave by comparing it with the position of a certain reference sample for which the peak positions of its spectral reflectance is known (measured by another standard device).
In the offset, you may shift the whole measured wavelength to a shorter or longer wavelength in ±10 [nm] increments.

(2) How to calibrate wavelength:
The following section describes how to calibrate using the supplied calibration sample.
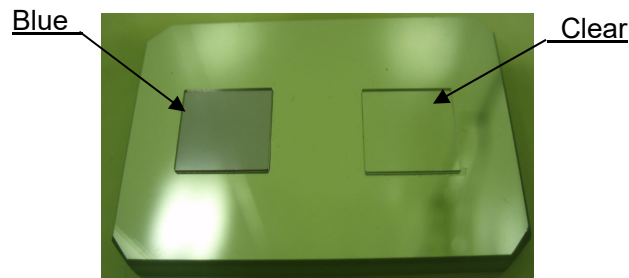
Calibration sample

■ Setup of the work configuration file
   Refer to **4.5 Setup of the work configuration file**.

■ Prepare the calibration sample
Put the calibration sample on the stage. Bring the reflecting mirror under the clear glass (not the clear glass itself) into focus.
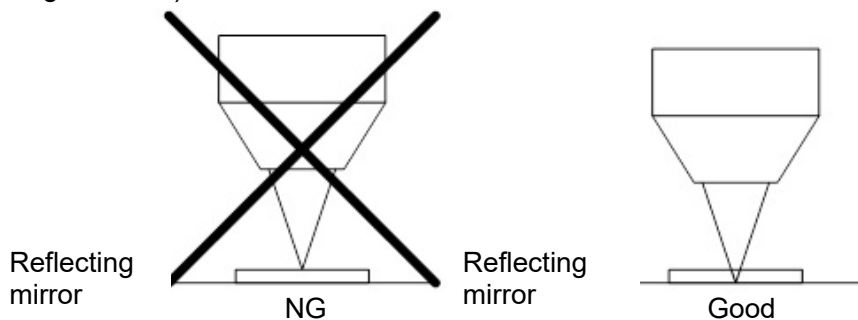
■ Adjusting the sampling interval
   Refer to **4.8 Adjusting the sampling interval**.

■ Measurement of background
   Click the BACKGROUND1 button to conduct a measurement of background.

■ Measurement of reference
Measure the backside plane of clear glass as the reference face.

As the focus is set, click the REFERENCE button to measure the reference. If the data is saturated, adjust the sampling interval and conduct the background measurement again.

■Measurement of the blue sample plate
Bring the reflecting mirror under the blue glass into focus as in the measurement of the reference, and then click the MEASURE button to conduct a measurement.

■ Confirmation of direction of wavelength
The value of nine valley in the following graph is confirmed. Choose **[Setup]-[System]** on the File menu to open the system configuration window. It is necessary to input the password before the system setting window is opened. Please input initial value "uspm" of the password. Enter a value in the **[CALIBRATION]** field. As the value increases, the measurement data shifts to a shorter wavelength in 1 [nm] increments. Comparing the graph of reflectance generated from the measurement with the reflectance graph of the calibration (CALIB) sample, enter the measurement value that best matches.

■ Save the shifted value
Click **[OK]** to save the value in the system configuration window. Load the file to use the calibrated value when launching the product later.

(3)   Calibration and offset of reflectance
No calibration and no offset means of the device offer the calibration of the reflectivity of this product for the relative value measurement.
But We can provide you with our document (for a fee) describing the calibration of BK7 reference sample, if necessary.
Please contact the supplier where you purchased the unit or our sales department.
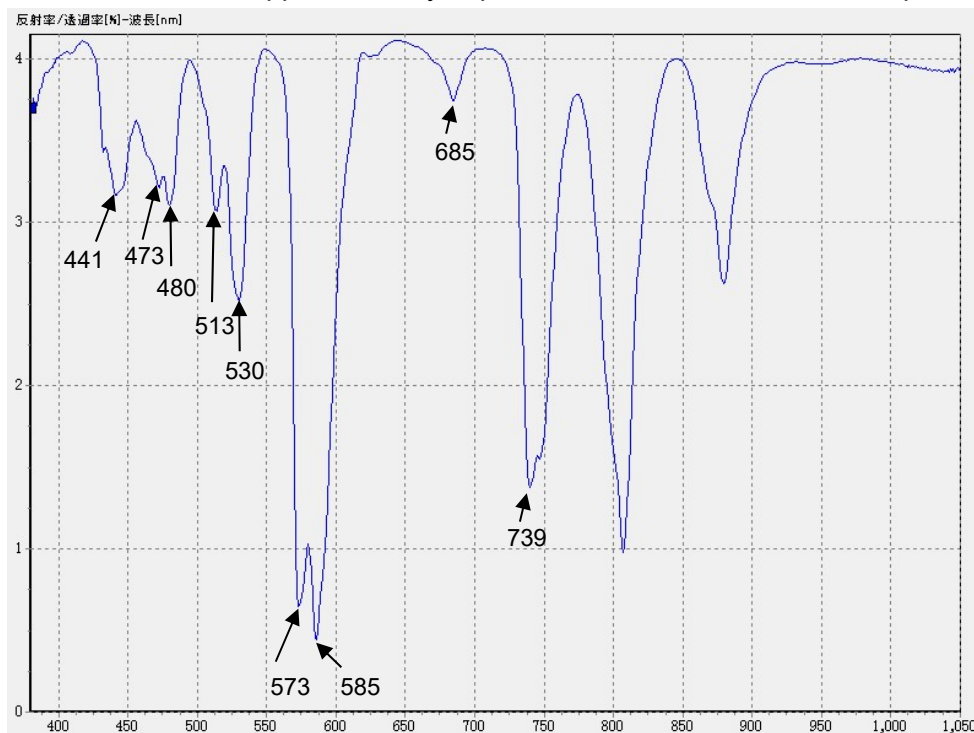
Graph of reflectance of the CALIB sample
(*The values in the boxes are references)

6. Troubleshooting

Incidents	Causes and countermeasures
CT window displays no image	(1) Check for deterioration of the lamp. (2) Check the connection of the lamp. (3) Check the lamp switch. (4) Check the adjustment of ring slits. (5) Check the gain adjustment. (6) Restart the software if the camera is not recognized.
FOCUS window displays no image	(1) Check for deterioration of the lamp. (2) Check the connection of the lamp. (3) Check the lamp switch. (4) Check the adjustment of ring slits. (5) Check whether the AUTO check box at the lower right of the FOCUS window is selected. (6) Restart the software if the camera is not recognized.
The focus adjuster is too tight	(1) Check the strength of the load adjuster. (2) Check for deterioration of the gas spring. If the photometric head suddenly drops from its own weight when the focus lock is released, there is the possibility of deterioration of the gas spring inside of the unit.
Failure in the measurement of reflectance/ transmittance direction	(1) Check for deterioration of the lamp. (2) Check the connection of the lamp. (3) Check whether warm-up is complete. (4) If you changed the setting, check whether the background and reference values were obtained again before the measurement. (5) Check whether reflection from the reverse side of the sample affects the measurement. (6) Check the alignment of the sample. (7) Check for the proper setting of the revolver. (8) Check the connection of the objective lens. (9) Check the adjustment of the ring slits. (10) Check the correctness of the reference.

	(11) Check the correctness of reference setting.
	(12) Check whether sampling interval is appropriate.
	(13) Check for injection of ambient light from fluorescent lamps or the sun.
Failure in the measurement of wavelength direction	(1) Refer to <u>5.3 Wavelength offset</u> to conduct a offset.
Display of wavelength in LUMINANCE window is incorrect	(1) Turn off the controller supply unit and reboot the computer.
Display of wavelength in GRAPH window is incorrect	(1) Turn off the controller supply unit and reboot the computer.
Computer's misbehaving operation. Failure in measurement data.	(1) Plug off and reinsert USB cable, then reboot the software. (2) Turn off the Control Power Suppy Box, then reboot the computer.

7. Compliance with Regulations

⚠ CAUTION	IEC61326-1 defines two categories according to the location for use. Class A: Equipment suitable for use in establishments other than domestic, and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes. Class B: Equipment for use in domestic establishments, and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes. This system is applied Class A. Some interference may occur if this system is used in domestic location.

7.1. Disposal

Follow the state and local regulations and ordinances when disposing of the product.

7.2. Energy consumption

To reduce energy consumption, turn off the power to the unit when not in use. The computer consumes standby electricity even in the power-off state. Energy consumption is reduced when the power cord is unplugged when the unit is not in use.
Standby electricity and power consumption of computers is different between models. Confirm the ratings in your computer's documents. (FYI: A typical computer consumes about 1 W of standby electricity and about 25 W of active power, while active power often increases to 50 W depending on the peripherals and applications in use)

7.3. About KC (For Korean Customers)

A급 기기 (업무용 방송통신기자재)

이 기기는 업무용(A급) 전자파적합기기로서 판 매자 또는 사용자는 이 점을 주의하시기 바라 며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Appendix

○ Principles of measurement

How to calculate spectral reflectance (spectral transmittance) with the product is described below.
The product measures the strength of spectral reflectance of the reference, whose reflectance (transmittance) is known (Ireference (λ)) and that of the sample to be measured, whose reflectance is unknown (Isample (λ)). Based on the two spectral reflectance values, use the following formula to calculate the reflectance of the sample under measurement. Therefore, the measurement value output from the product is not an absolute value but a relative value against the reference sample.

$$R_{(\lambda)} = \frac{I_{sample_{(\lambda)}} - I_{background_{(\lambda)}}}{I_{reference_{(\lambda)}} - I_{background_{(\lambda)}}} \cdot R_{theory_{(\lambda)}}$$

$R_{(\lambda)}$: Measured value of the spectral reflectance of the sample

$I_{sample_{(\lambda)}}$: Strength of spectral reflectance of the measured sample

$I_{reference_{(\lambda)}}$: Strength of spectral reflectance of the reference

$I_{background_{(\lambda)}}$: Strength of background

$R_{theory_{(\lambda)}}$: Theoretical value of the spectral reflectance of the reference

The reference samples provided as an accessory with the product are composed of S-BSL7 glass made by OHARA, GmbH.

○ Precautions for safe use of the lighting device (lamp house)

Though heavily dependent on the usage conditions (ambient temperature and humidity, supply voltage, period of lighting, etc.), the useful life of the lighting device (lamp house) * assumes either short one of for approximately eight years（In the case of the use of approximately eight hours a day） or approximately 20,000 hours .
*The above statement does not guarantee freedom from failures or repair at no   charge during the service life.
*Depending on the usage conditions, there is a possibility of aging degradation in a shorter period.
Inspect the lamp house according to **Appendix: Checklist for inspection of the lighting device (lamp house)** until the lamp house reaches the end of its useful life. Should any unexpected incident occur (e.g., smoke) during use, turn off the power immediately and contact the sales representative where you purchased the unit or our sales department. Regular inspection is recommended, in order to achieve safe use and reduce downtime.

Checklist for inspection of the lighting device (lamp house)

- Read the manuals carefully before conducting an inspection.

- Inspections on a regular basis (at least once every half year and when replacing a lamp) is recommended in order to ensure safe use.

- Inspect the items in the list, and put a checkmark next to each passed item and a circle next to each item having some problem.

- If there is a circle next to any item examined in the latest inspection, **stop using** the unit and ask your supplier to inspect the unit or to replace it with a new lighting device.

- If you find any failure in any other items than those on the list or some kind of failure in other components of our products aside from the lighting device, **stop using** the product and ask your supplier to inspect the unit.

- Repairs, replacement and inspections out of warranty are available for a fee.
  Contact your supplier with any questions you may have.

Inspection checklist	Result (date of inspection)			
	/	/	/	/
1. Eight years have elapsed since purchase, or the total time of lamp use has exceeded 20,000 hours.				
2. Sometimes lamp does not illuminate even when you turn on the main switch				
3. The light blinks if you move the lamp cable or the body itself.				
4. The lamp cable or another part is abnormally hot.				
5. There is an odor like something is burning when in use.				
6. Light flickers even after the lamp is replaced.				
7. A deformation, unsteadiness or loose part is discovered when installing the lighting device (e.g., a lamp house is too tight to insert).				
8. The color of any terminal or the lamp socket is drastically changed. Or, the color is different between the left one and the right one.				
9. There is change of color, deformation or cracks in the lamp house.				
10. There is melting, cracks, deformation or solidification in the lamp cable or wiring.				
11. Frequency of repair is higher than before for the same type of other units brought into service around the same time.				

*   Make photocopies of the list if needed.

Lamp socket

Terminal (levers)
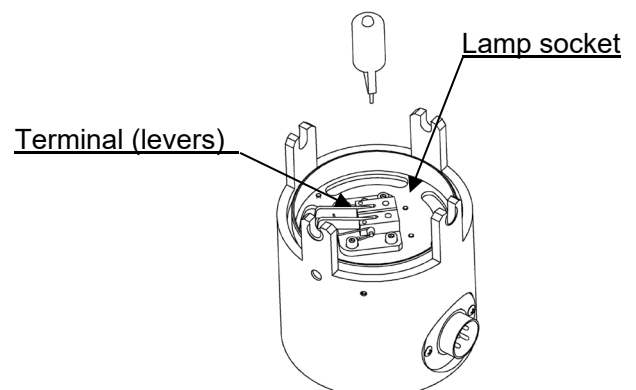
○ Precautions for proper use of the power cord

When no power cord is attached to the product, refer to the "Specification" and "Certification cord" below to choose a proper power cord for the unit.

⚠ CAUTION	We do not guarantee the electrical safety of the product, if an incorrect power cord is connected to the product.

Specification

Rated Voltage	125 V AC (100–120 V AC), 250 V AC (220–240 V AC)
Rated Current	6A minimum
Rated Temperature	60ºC minimum
Length	3.05 m maximum
Components	Grounded inlet plug, with the opposite end formed in compliance with IEC

Table 1. Certification cord

The power cord must be certified by any one of the certification organizations in Table 1, or be associated with any one of the certification marks shown in Table 1 and/or 2. The connector must be associated with any one of the certification marks in Table 1. If no cords certified by any of the certification organizations in Table 1 are available in the country where you use the product, use a substitute certified by the certification body of the country or any similar organization.

Country	Certification organization	Certification mark	Country	Certification organization	Certification mark
Argentina	IRAM		Italy	IMQ	
Australia	SAA		Japan	JET	
Austria	ÖVE		Netherlands	KEMA	
Belgium	CEBEC		Norway	NEMKO	
Canada	CSA		Spain	AEE	
Denmark	DEMKO		Sweden	SEMKO	
Finland	FEI		Switzerland	SEV	
France	UTE		UK	ASTA,BSI	
Germany	VDE		USA	UL	
Ireland	NSAI				

Table 2. HAR flexible cord
Certification organizations and cord labels

Certification organization	Labels (Probably marked on the cover or insulating part in the internal wiring)		Replacement symbol with black-red-yellow line Length (mm)		
			Black	Red	Yellow
Comite Electrotechnique Belge (CEBEC)	CEVEC	<HAR>	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V.Prüfstelle	<VDE>	<HAR>	30	10	10
Union Technique de d'Electricite' (UTE)	USE	<HAR>	30	30	10
Instituto Italiano del Marcio di Qualita' (IMQ)	IEMMEQU	<HAR>	10	30	50
British Approvals Service for Electric Cables (BASEC)	BASEC	<HAR>	10	10	30
N.V. KEMA	KEMA-KUER	<HAR>	10	30	30
SEMKO AB Svenska Elektriska Materielkontrollanstalter	SEMKO	<HAR>	10	10	50
Österreichischer Verband für Elektrotechnik (ÖVK)	<ÖVK>	<HAR>	30	10	50
Danmarks Elektriske Materielkontrol (DEMKO)	<DEMKO>	<HAR>	30	10	30
National Standards Authority of Ireland (NSAI)	<NSAI>	<HAR>	30	30	50
Norges Elektriske Materiellkontroll (NEMKO)	NEMKO	<HAR>	10	10	70
Asociacion Electrotecnica Y Electronica Espanola (AEE)	<UNDE>	<HAR>	30	10	70
Hellenic Organization for Standardization (ELOT)	ELOT	<HAR>	30	30	70
Instituto Portugues da Qualidade (IPQ)	| np |	<HAR>	10	10	90
Schweizerischer Elektro Technischer Verein (SEV)	SEV	<HAR>	10	30	90
Elektriska Inspektoratet	SETI	<HAR>	10	30	90

Underwriters Laboratories Inc. (UL)   SV, SVT, SJ or SJT, 3 X 18AWG
Canadian Standards Association (CSA)   SV, SVT, SJ or SJT, 3 X 18AWG

Instruction Manual

Spectral Analysis Software

USPM-SA v1.01

Before use

Thank you for purchasing our spectral analysis software. In order to use this software safely and to maximize the benefit from doing so, be sure to read this instruction manual completely before use.
Please also keep this manual close at hand when using the product and store it carefully for future reference.

Contents

Introduction

This spectral analysis software (USPM-SA) is the dedicated software of the near-infrared (NIR) micro-spectrophotometer (USPM-RU-W). Since it is always possible that computer data may become damaged due to unexpected trouble, please backup data periodically.

■   About the computer

We assume no responsibility for all incidental damages, including compensation for computer data, resulting from the use or unserviceability of this product. For the computer system used, users must create backup data and store such carefully. (We do not support backup operations.)

This product provides quality assurance when factory settings are used. Any abnormal operation and functional failure due to a configuration change (BIOS change) of a computer made by a user or due to the installation of other software falls outside the target of our company's quality assurance parameters.

Any decrease in the capacity of the hard disk causes data processing to become extremely delayed or may cause an error to occur. Actively erase unnecessary data files. Regarding how to erase data files, see the OS manual. Never delete and rename any folder prepared in the hard disk of the computer during delivery. Doing so may render software unusable.

In computers other than those specified for the use of this product, this software may not be able to exhibit full performance.

Safety Precautions

Intended purpose of this product

The purpose of this product is to control near-infrared micro-spectrophotometers. Do not use this product for any use other than this intended purpose.

About the instruction manual

This instruction manual contains information essentially required when using this product safely and effectively. Prior to use, be sure to thoroughly read this manual and the instruction manual for the related equipment used simultaneously with this product, fully understand their content, and follow the instructions during use. Store this manual and the instruction manual for the related equipment simultaneously used in a location where you can refer to them immediately. Contact the retailer or our branch office if you have any questions regarding the contents of this instruction manual.

Warning indications in this manual

In this manual, the symbol marks and terms below are used in accordance with the descriptive contents. The symbol marks and terms are described for each safety level. To use this product safely and properly, thoroughly understand the contents of symbol marks and terms.

⚠ **WARNING**	Indicates that failure to observe this warning may result in serious personal injury or death due to a fire or electrical shock.

⚠ **CAUTION**	Indicates that failure to observe this caution may result in injury or material damage due to an electrical shock or other accident.

■ Symbol denoting prohibition (prohibited actions)

Prohibited

■ Symbol denoting obligation (mandatory actions)

Mandatory

■ Symbol denoting caution

Caution

⚠ CAUTION	Failure to follow the precaution below may result in injury or material damage to peripheral products.

🚫

Prohibited

- ■ <u>Do not turn off hardware power during software start.</u>
Doing so may result in improper operation.

1. Confirmation of Packaged Products

Make sure that all software and supplied accessories are completely received and check whether products are missing or damaged. Contact the retailer or our branch office immediately if products are missing or if you have any questions regarding products.

- Attached Media

- Protection key

- Software Instruction Manual (this document)

Protection key
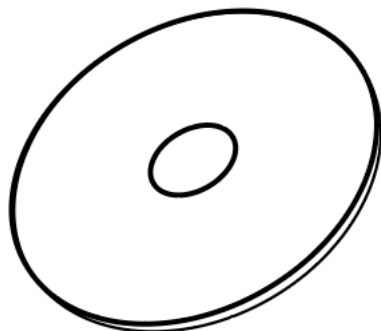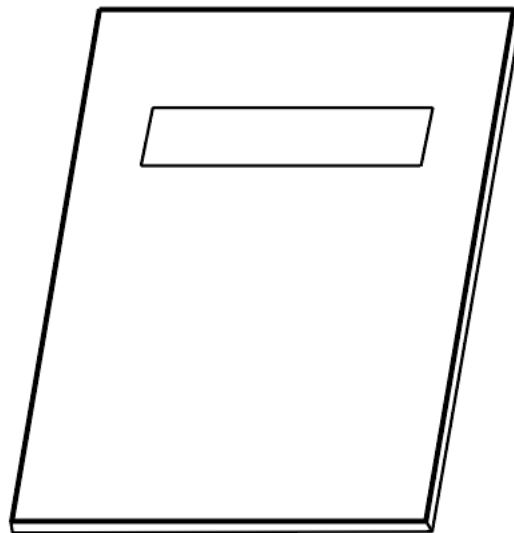
Attached Media   Software Instruction Manual (this document)

2. Installation and Wiring

2.1.Installation

Perform installation according to the "Installation procedure" in the attached sheet. Contact our business personnel if you have any questions.

2.2.Wiring

- Insert a protection key into any USB port of your computer.

- Wire the hardware according to the instruction manual of the hardware in question.

3. Usage

This chapter describes the outline of software according to the general procedure. For details on use, conduct full training from the standpoint of a specialist.

3.1. Program start and termination

■　Start

Double-click the USPM-SA shortcut icon on the desktop and start the software. Turn on the power to all the hardware used and then start the software.


■　Termination

Select [File] - [Quit] from the file menu and terminate the software. Then, turn off the power to all hardware.

3.2. Measurement of spectral measured values (spectral reflection factors and spectral transmission factors)

Various operation buttons are arranged on the main window. These operation buttons enable the spectral measured values to be measured. Measure these using the procedure below to obtain the spectral measured values of the sample to be measured.

■　Setting the work setting file

Select [Setup] - [Work] from the file menu and open a WORK setting window. Set each item according to the sample to be measured. For details on the settings, see the [6.2 Work setting].
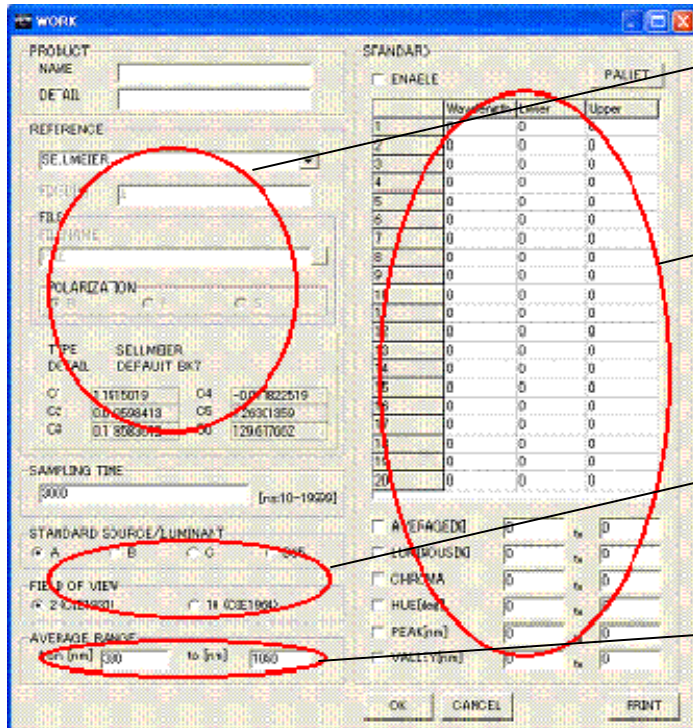
Sets the theoretical spectral reflection factor (transmission factor) of the reference used; for more details, see the [6.2.1 [Reference] setting] .

Sets the specification value for deciding the acceptability of the measured spectral measured values; for this setting, see the [6.2.2 [Standard] setting].

Set when displaying a chromaticity diagram from the spectral measured values.

Sets the average wavelength range when calculating the average reflection/transmission factor.

■ Adjusting the sampling time

The sampling time must be adjusted so that it is not saturated in excess of the maximum value of the spectral light intensity that can be acquired. The procedure for automatically adjusting the sampling time is described below. Arrange the reference first to enter the measurement state. Then, select [Measure] - [Sampling adjust] from the file menu and display a START INTERVAL window. Enter the expected sampling time, for example, "1000," and press the OK button. The sampling time is automatically adjusted to the range in which the spectral light intensity is sufficient and not saturated. After adjustment is completed, a display screen appears. Press the OK button to complete the adjustment of the sampling time.

■ Executing background measurement

Press the BACKGROUND1 button to execute background measurement for acquiring the spectral light intensity of a dark current caused by scattered light or electrical noises.

■ Executing reference measurement

Press the REFERENCE button to execute reference measurement for acquiring the spectral light intensity of the reference.

■ Executing measurement

Arrange the sample to be measured to enter the measurement state. Press the MEASURE
button to execute measurement for acquiring the spectral light intensity of the sample.

■ Confirming the spectral measured values (reflection and transmission factors)

Confirm the spectral measured values on each window. Each data and wavelength piece of
information can be acquired by performing an operation on the operation panel.

A chromaticity diagram and its related numeric value are displayed on the DIAGRAM window. The type of the chromaticity diagram can be changed on the GRAPH setting window.

The graph of the spectral measured values is displayed on the GRAPH window. The range of a vertical axis can be changed on the GRAPH setting window.

The numeric values of the spectral measured values are displayed on the TEXT window. The display interval can be changed on the GRAPH setting window.

In [Data] and [Value], you can confirm the currently selected data number and its detail information. To change the data number and wavelength to be displayed, press the "<" and ">" buttons.

In [Status], the [OVER] field displayed in red indicates that the spectral light intensity was saturated. In this case, the spectral measured values cannot be obtained accurately. Adjust the sampling time again.

■ Saving spectral measured value data

Select [SaveAs.. datafile] from the file menu. A save dialog box appears, thus assign a name
to the data and save it. You can change the saving format by changing the extension in the
"Save" dialog box. For details of the saveing format, see the [5.1 [File] menu].
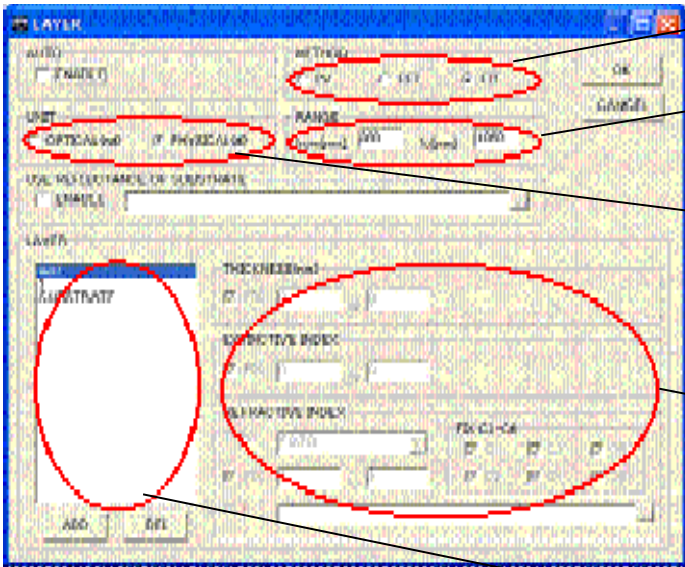
■ Printing spectral measured value data

Select [Custom print] from the file menu. A print setting dialog box appears. Set each item and press the OK button for printing.

3.3. Analysis of film thickness

After the measurement of the spectral measured values (reflection and transmission factors) is completed, film thickness can be analyzed by setting a layer setting file and then executing the analysis of film thickness. The film thickness is analyzed using the procedure below.

■ Setting the layer setting file

Select [Setup] - [Layer] from the file menu and open a LAYER setting window. Set each item according to the sample to be analyzed for film thickness. For details of the setting, see the [6.3 Layer setting].
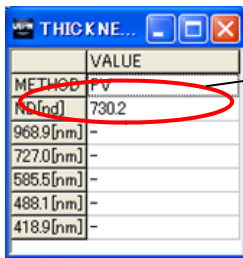
Sets the range of the wavelength to be analyzed for film thickness

Selects the analysis method of film thickness; for the analysis method, see the [6.3 Layer setting].

Sets the unit required when displaying the result of film thickness analysis

Sets the thickness, extinctive index, and refractive index of the selected layer; set each item to all layers not including an AIR layer. However, setting is not required when [UNIT] is [OPTICAL] and when [METHOD] is [FFT]. For more details, see the [6.3 Layer setting].

Sets the layer count of the sample to be analyzed for film thickness; change the number of layers using the ADD and DEL buttons.
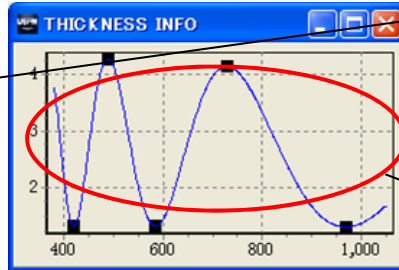
■ Analyzing the film thickness

Press the THICKNESS button and execute film thickness analysis.

■ Confirming the result of film thickness analysis

Confirm the result on the THICKNESS and THICKNESS INFO windows. For details of the windows, see the [7.8 [THICKNESS] window] and [7.9 [THICKNESS INFO] window].


A film thickness analysis method and its result are displayed. For the contents of the display, see the [7.8 [THICKNESS] window].

The state of film thickness analysis is displayed; film thickness is not normally analyzed when the analysis state is improper. For the analysis state, see the [7.9 [THICKNESS INFO] window].

4. Main Window

As shown below, the main window consists of a file menu, status display, an operation panel, and several windows.
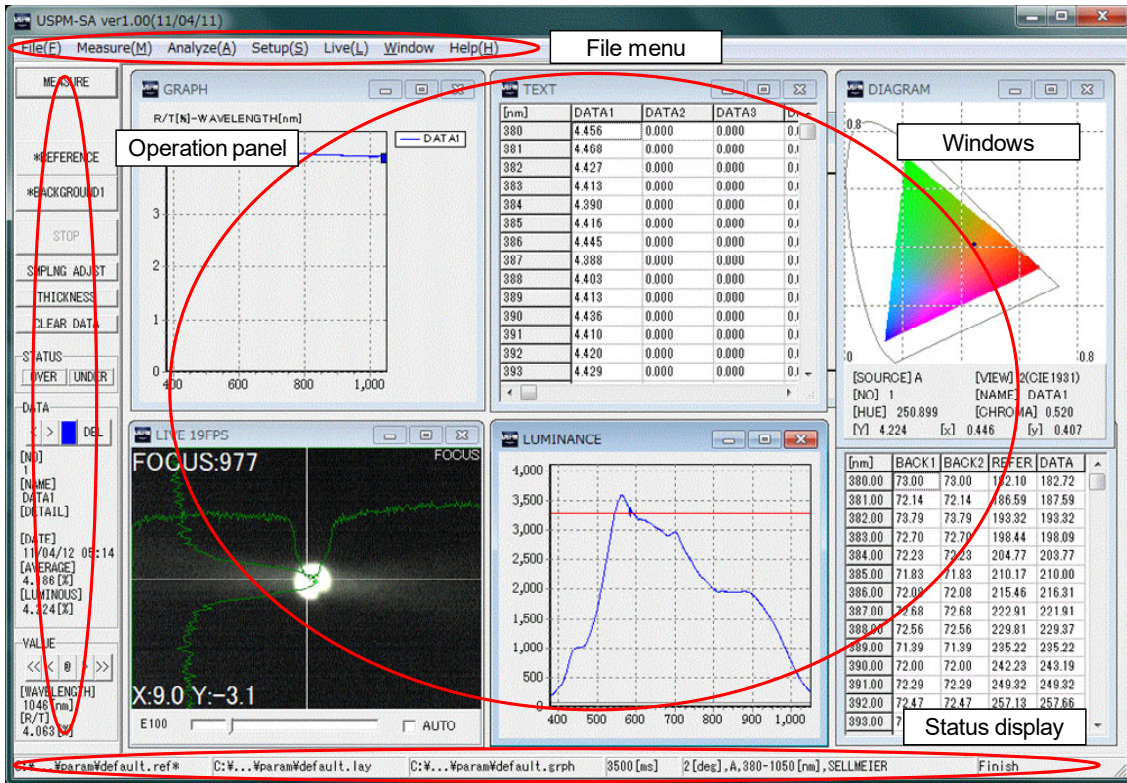
4.1. File menu

Each file menu has submenus, respectively. For the details of each submenu, please read each file menu item.

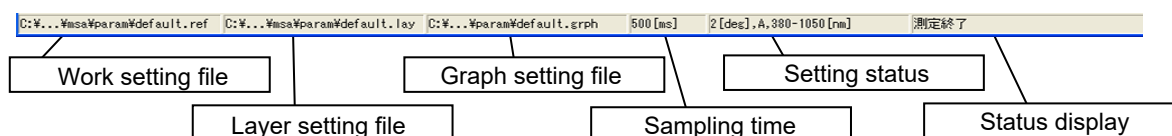| Menu	Description
File	Several file operations
Measure	Several measurements and sampling adjustments
Analyze	Film thickness analysis and color-difference analysis
Setup	Various settings
Live	Image switching
Window	Various windows
Help	Help, version information (and the instruction manual)

4.2.Operation panel

The operation panel displays various operation buttons and spectral measured value data.

Menu	Description
MEASURE	Measures a sample; this operation is the same as that when pressing the [F1] key of the computer used.
BACKGROUND2	Measures the background for measurement; this operation is the same as that when pressing the [F2] key of the computer used. Display and non-display can be switched using the system setting. Set this to non-display during factory settings.
REFERENCE	Performs reference measurement; this operation is the same as that when pressing the [F3] key of the computer used.
BACKGROUND1	Performs a background measurement for reference; this operation is the same as that when pressing the [F4] key of the computer used.
Stop	Stops various measurements and film thickness analysis validated when measurements and film thickness analysis can be stopped.
SMPLNG ADJST	Adjusts the sampling time automatically; this operation is the same as that when pressing the [F5] key of the computer used.
Thickness	Analyzes the film thickness
Clear data	Deletes all spectral measured value data
Status	Displays the measurement status [OVER]: This indicates that the spectral light intensity is saturated in excess of the maximum value of the spectral light intensity that can be acquired when this field is displayed in red. In this case, spectral measured values cannot be obtained accurately. Therefore, adjust the sampling time so that spectral light intensity is not saturated for all the background, reference, and sample measurements. [UNDER]: This indicates that the spectral light intensity is not sufficient when this field is displayed in red. The prescribed performance may not be obtained in this case.
Data	Displays the spectral measured values [<][>]: Selects the data number of the spectral measured values.

	[Del]: Deletes the spectral measured value data of a data number. [No.]: Displays the data number. [Name]: Displays the data name. [Detail]: Displays the contents of data. [Date]: Displays the measurement date and time. [Average (reflection/transmission)]: Displays the average reflection and transmission factors. [Luminous (reflection/transmission)]: Displays the luminous reflection and transmission factors.
Value	Displays the details of the spectral measured values [<<][<][@][>][>>]: Selects the wavelength value of the spectral measured values to be displayed in detail. The cursor on the GRAPH window moves according to the selected wavelength value. Press the [@] button when moving the cursor to any wavelength value. The wavelength value can be specified on another window. [Wavelength] ([1/wavelength]): Displays the selected wavelength value. [R/T] ([Refractive index]): Displays the spectral measured values of the selected wavelength value.

4.3. Status display

The status display block displays the setting filename and setting status.

Menu	Description
Work setting file	Displays the work setting filename
Layer setting file	Displays the layer setting filename
Graph setting file	Displays the graph setting filename
Sampling time	Displays the sampling time; the sampling time is set using the work setting file described later.
Setting status	Displays the field of view, the standard light source, the average wavelength range, and the reference setting; these are set using the work setting file described later.
Status display	Displays the situation display message

4.4. Various windows

Various windows display the measurement result or the status of the spectral measured values. They can be arranged in the proper position on a main window, respectively. Each window can also be changed in size. For details on the windows, see the [7. Windows].
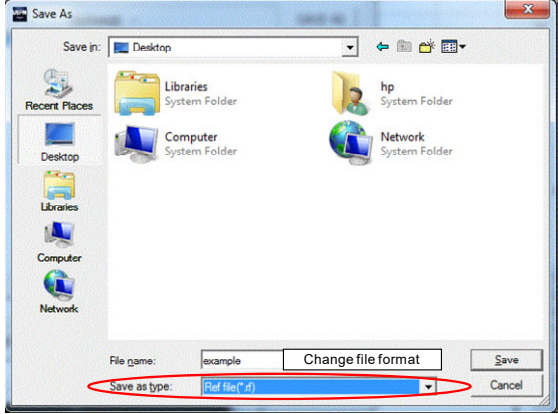
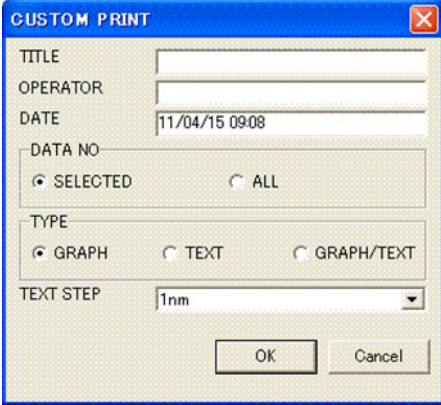| Menu	Description
CAMERA CONTROL	Displays the settings for FOCUS and CT images.
DIAGRAM	Displays the chromaticity diagram
GRAPH	Displays the spectral measured values using a graph
LIVE	Displays the FOCUS and CT images
LUMINANCE	Displays the spectral light intensity using a graph
LUMINANCE TEXT	Displays the spectral light intensity using a numeric value
OK/NG	Displays the result of the acceptability decision
TEXT	Displays the spectral measured values using a numeric value

THICKNESS	Displays the result of film thickness analysis
THICKNESS INFO	Displays the status of film thickness analysis

5. File Menu

5.1. [File] menu

The [File] menu is constituted by the submenus below.

Menu	Description
Open datafile	Opens spectral measured value data; this submenu can be used in CSV and DAT formats.
SaveAs.. datafile	Saves spectral measured value data; the spectral measured value data can be saved in CSV and DAT formats. For details on the saving format, see the [9. File Configuration and Format]. The saving format can be changed by selecting [File type] from the [Save As] dialog box. The saving format and its corresponding [File type] are as follows. For CSV and DAT formats; however, [Detail] of data is not saved. [CSV files (*.csv)]: CSV format [DAT files (*.dat)]: DAT format [CSV add files (*.csv)] CSV format and add data
New work	Creates a new work setting file
Open work	Opens the existing work setting file
Save work	Overwrites/saves a work setting file
SaveAs.. work	Assigns a name to a work setting file and saves it
New layer	Creates a new layer setting file
Open layer	Opens the existing layer setting file
Save layer	Overwrites/saves a layer setting file
SaveAs.. layer	Assigns a name to a layer setting file and saves it

Open graph	Opens the existing graph setting file
SaveAs.. graph	Assigns a name to a graph setting file and saves it
Open layout	Opens the existing layout setting file
SaveAs.. layout	Assigns a name to a layout setting file and saves it
Custom print	Prints spectral measured value data; the print format is specified on the setting window. The print size is optimized to A4 size.

Enter data in [Title], [Operator], and [Date] as required. These are printed in the header of the printed file. In [Data No], select the spectral measured value data to be printed. In [Selected], the currently selected spectral measured value data is printed. In [All], all spectral measured value data items are printed. In [Type], select from three types of print formats (graph, text, and graph/text). In [Graph], a graph is printed, and in [Text], a numeric character string is printed. In [Graph/Text], a graph and numeric character string are printed. When printing a numeric character string, the wavelength interval can be set in [Text step].

 |
| Main print | Prints the whole main window |
| Quit | Exits software |

5.2. [Measure] Menu

The [Measure] menu is constituted by the submenus below.

Menu	Description
MEASURE	Performs measurement; this function is the same as that for [MEASURE] on the operation panel.
BACKGROUND2	Performs the background measurement for measurement; this function is the same as that for [BACKGROUND2] on the operation panel. Display and non-display can be switched by using system settings. Set this to non-display during factory settings.
REFERENCE	Performs reference measurement; this function is the same as that for [REFERENCE] on the operation panel.
BACKGROUND1	Performs a background measurement for reference; this function is the same as that for [BACKGROUND1] on the operation panel.
Sampling adjust	Adjusts the sampling time automatically; this function is the same as that for [SMPLNG ADJST] on the operation panel. Usage of this function is described in the section below.

### 5.2.1. Sampling adjustment

[Sampling adjust] is a function for automatically adjusting the sampling time. The sampling time is a value set on the WORK setting window described later. The exposure time of the photosensor is set so that the acquired spectral light intensity is not saturated in excess of the maximum value of the spectral light intensity during background measurement, reference measurement, and sample measurement. The automatic adjustment procedure using this sampling adjustment function is described below. Spectral measured values cannot be accurately obtained when spectral light intensity is saturated during each measurement.

(1) Compare the sample and reference to be measured, select the sample or reference in which the maximum value of the acquired spectral light intensity is higher, and arrange it in a stage.

(2) Put the system into the ordinary measurement state.

(3) Select [Measure] - [Sampling adjust] from the file menu.

(4) A START INTERVAL window appears. Enter the expected sampling time and press the OK button.
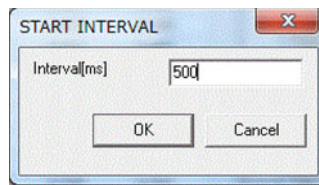
(5) It takes about several tens of seconds to perform adjustment.

(6) Adjustment is completed when the window below appears. The sampling time of the work setting file is changed to the displayed numeric value when you press the OK button.
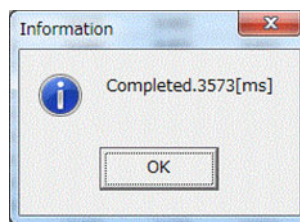

5.3. [Analyze] menu

The [Analysze] menu is constituted by the submenus below.

Menu	Description
Thickness	Analyzes the film thickness
Color difference	Displays a color-difference measurement window; usage of this function is described in the section below.

5.3.1. Color-difference calculation

[Color difference] is a function that calculates color difference from the spectral measured value data. The COLOR DIFFERENCE window below appears when you execute [Color difference].
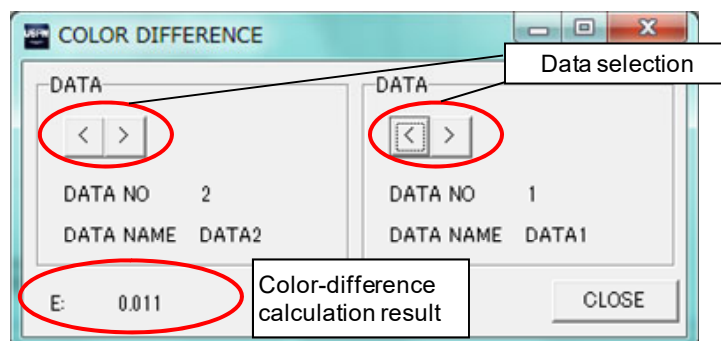
Select the data numbers, used as the color-difference calculation, for data 1 and data 2 using the $\boxed{<}$ and $\boxed{>}$ buttons. Color difference is automatically displayed during selection. An expression for obtaining color difference ΔE is given below.

$$\Delta E = \sqrt{\Delta L*^2 + \Delta a*^2 + \Delta b*^2} \quad \text{.........................} \quad \text{(Expression 5-1)}$$

$\Delta L*$: Difference of $L*$ in the $L*a*b*$ chromaticity diagram

$\Delta a*$: Difference of $a*$ in the $L*a*b*$ chromaticity diagram

$\Delta b*$: Difference of $b*$ in the $L*a*b*$ chromaticity diagram

5.4. [Setup] menu

The [Setup] menu is constituted by the submenus below. For details on each setting window, see the [6. Settings].

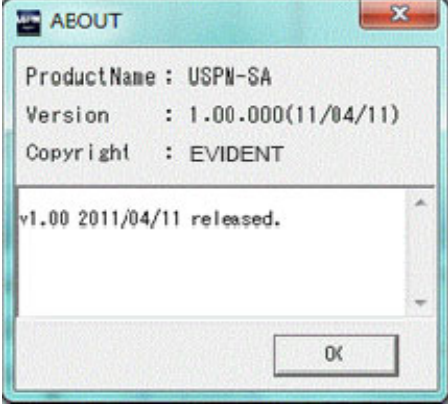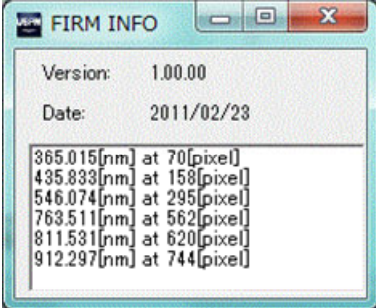| Menu	Description
Work	Displays a WORK setting window
Layer	Displays a LAYER setting window
Graph	Displays a GRAPH setting window
System	Displays a SYSTEM setting window
Dispersion editor	Displays a DISPERSION setting window

5.5. [LIVE] menu

The [LIVE] menu is substituted by the submenus below.

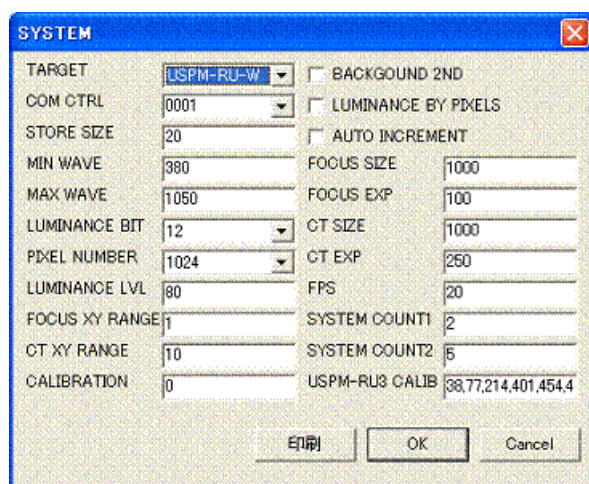| Menu	Description
FOCUS	Displays a FOCUS camera image on a [LIVE] window; this operation is the same as that when pressing the [F11] key of the computer used.
CT	Displays a CT camera image on a [LIVE] window; this operation is the same as that when pressing the [F12] key of the computer used.

5.6. [Help] menu

The [Help] menu is constituted by the submenus below.

Menu	Description
(Instruction manual name)	Opens the instruction manual
About	Displays an information window ABOUT ProductName : USPN-SA Version : 1.00.000(11/04/11) Copyright : EVIDENT v1.00 2011/04/11 released. OK
About Firm	Displays a firm information window FIRM INFO Version: 1.00.00 Date: 2011/02/23 365.015[nm] at 70[pixel] 435.833[nm] at 158[pixel] 546.074[nm] at 295[pixel] 763.511[nm] at 562[pixel] 811.531[nm] at 620[pixel] 912.297[nm] at 744[pixel]

6. Settings

6.1. System settings

A SYSTEM setting window appears when you select [Setup] - [System] from the file menu. A system setting file can be changed on the SYSTEM setting window. All spectral measured value data items are deleted when you open the SYSTEM setting window. Therefore, open the SYSTEM setting window after saving the required spectral measured value data. Enter a password before opening the SYSTEM setting window. Enter the initial value "uspm" as the password in this case.

Menu	Description
TARGET	Select the equipment to be connected. For a near-infrared micro-spectrophotometer (USPM-RU-W), set this to USPM-RU-W.
COM CTLR	Select the connection ID number of an internal arithmetic unit. Usually, set this to [0001]. This item does not require change.
STORE SIZE	Sets the total number of spectral measured value data items saved in storage; a maximum of 20 data items can be secured in storage. Usually, set this to 20. The setting range is an integer value of 1 to 20.
MIN WAVE	Sets the lower-limit value of the wavelength to be displayed and analyzed; data files may not be readable when you

	change this value. The setting value varies depending on the equipment to be connected. For a near-infrared micro-spectrophotometer (USPM-RU-W), set this to 380.
MAX WAVE	Sets the upper-limit value of the wavelength to be displayed and analyzed; data files may not be readable when you change this value. The setting value varies depending on the equipment to be connected. For a near-infrared micro-spectrophotometer (USPM-RU-W), set this to 1050.
LUMINANCE BIT	Sets the number of data bits for the spectral light intensity; usually, set this to 12. This item does not require change. The maximum value of spectral light intensity changes when this item is changed.
PIXEL NUMBER	Sets the number of pixels in a photosensor; the setting value varies depending on the equipment to be connected. For a near-infrared micro-spectrophotometer (USPM-RU-W), set this to 1024.
LUMINANCE LVL	Sets the lower-limit value for the spectral light intensity; enter a ratio for the maximum spectral light intensity value as a percentage. For less than the lower-limit value set here, [UNDER] changes to red in the status display of the operation panel. The sampling time adjusted by [Adjust sampling] varies depending on this item. Usually, set this to 80. The setting range is an integer value of 0 to 100.
FOCUS XY RANGE	Sets the gravity tolerance of a FOCUS window; the gravity position display color of the FOCUS window turns red when this item lapses out of the set range. Usually, set this to 1. The setting range is an integer value of 0 to 100.
CT XY RANGE	Sets the gravity tolerance of a CT window; the gravity position display color of the CT window turns red when this item lapses out of the set range. Usually, set this to 10. The setting range is an integer value of 0 to 100.
CALIBRATION	Sets the movement amount in the direction of the wavelength; enter negative numbers when moving this in the long wavelength direction. Enter positive numbers when moving this in the short wavelength direction. Usually, set this to 0. Set this also according to the wavelength calibration procedure.
BACKGROUND 2ND	Sets a double background function; a BACKGROUND2 button is displayed on the operation panel of the main window when this item is set to "Enable." This enables background measurement. Usually, set this to "Disable."

LUMINANCE BY PIXELS	Sets how to display a [LUMINANCE] window; the window is displayed for each pixel of a photosensor when this item is set to "Enable." It is displayed for each wavelength when this item is set to "Disable." Usually, set this to "Disable."
AUTO INCREMENT	Sets the storage data number of the spectral measured value data during measurement; the empty data numbers of the spectral measured values are automatically searched every time measurement is executed when this item is set to "Enable." The priority level of the search is as follows: (1) the current data number, (2) a data number higher than the current data number, and (3) the lowest data number. Data is stored in the current data number when there is no empty data number. When this item is set to "Disable," data is stored in the specified data number by the execution of measurement. Usually, set this to "Disable."
FOCUS SIZE	Sets the index during the automatic adjustment of a FOCUS window; usually, set this to 1000. The setting range is an integer value of 100 to 5000.
FOCUS EXP	Sets the exposure time of a FOCUS camera; usually, set this to 100. The setting range is an integer value of 1 to 525.
CT SIZE	Sets the index during the automatic adjustment of a FT window; usually, set this to 1000. The setting range is an integer value of 100 to 10000.
CT EXP	Sets the exposure time of a CT camera; usually, set this to 250. The setting range is an integer value of 0 to 255.
FPS	Limits the loading speed of a camera; usually, set this to 20. The setting range is an integer value of 0 to 30. Limitation is released when this item is set to 0.
SYSTEM COUNT1	This item is a parameter related to a FOCUS camera. Usually, set this to 2. It is set according to the performance of the computer.
SYSTEM COUNT2	This item is a parameter related to a FOCUS camera. Usually, set this to 5. It is set according to the performance of the computer.
USPM-RU3 CALIB	This item does not require change.

6.2.Work setting

Select [Setup] - [Work] from the file menu. A WORK setting window appears.

Menu	Description
Name	Enters the name of a work setting file
Detail	Enters the details of a work setting file
Reference	Sets the theoretical value of a reference; for details of the setting, see the [6.2.1 [Reference] setting].

Sampling time	Sets the sampling time (exposure time); the sampling time must be set so that the acquired spectral light intensity does not exceed the maximum value of the spectral light intensity. Spectral measured values cannot be accurately acquired when the spectral light intensity is saturated in excess of the maximum value of the spectral light intensity. The acquired spectral light intensity can be confirmed on the LUMINANCE and LUMINANCE TEXT windows.
Standard source/illuminant	Sets the standard light and light source that are of the illuminant prescribed in the CIE; this item influences the result related to a chromaticity diagram.
Field of view	Sets the XYZ display color system based on a two-degree field of view and the $X_{10}Y_{10}Z_{10}$ display color system based on a 10-degree field of view; this item influences the result related to a chromaticity diagram.
Average range	Sets the average wavelength range of an average reflection factor; this item influences the numeric value of [average (reflection/transmission)].
Standard	Sets the standard used for the acceptability decision; for details of the setting, see the [6.2.2 [Standard] setting].

6.2.1. [Reference] setting

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Menu	Description
Dispersion setting tab	Select the type of a dispersion setting value to set the theoretical spectral reflection factor (transmission factor) of a reference. [Sellmeier], [Schott], [FIXED], or [FILE] can be selected as standard. The type is increased by creating a user dispersion setting file on the DISPERSION editing window described later. The standard type is as follows: [Sellmeier] is a Sellmeier dispersion formula, [Schott] is a Schott dispersion formula, [FIXED] is a fixed value, and [FILE] is used to read a file. For standard types excluding [FIXED] and [FILE], values cannot be changed on this window. Create a dispersion setting file by dispersion editing when changing values.
FIXED [%]	Enter the theoretical reflection factor (transmission factor) of a reference. You must set this item when selecting [FIXED] in a dispersion setting tab.
FILE	Enter the reference wavelength dispersion data filename used for the theoretical spectral reflection factor (transmission factor) of a reference. You must set this item when selecting [FILE] in a dispersion setting tab. A file can be read in a .ref format.
POLARIZATION	Sets the direction of polarization; you must set this item when selecting [FILE] in a dispersion setting tab.
Dispersion setting detail	Displays the detail information of the dispersion setting type selected in a dispersion setting tab; however, this does not apply when [FIXED] or [FILE] is selected.

■ Calculating the spectral measured value data

For this software, a spectral reflection factor and transmission factor that are spectral measured values are calculated using the expression below. Spectral measured values are calculated from the spectral light intensity of the sample to be measured and the spectral light intensity of a background with the spectral light intensity of a reference, in which the spectral measured values are already known, as standard.

$$R_{(\lambda)} = \frac{I_{sample(\lambda)} - I_{background(\lambda)}}{I_{reference(\lambda)} - I_{background(\lambda)}} \cdot R_{theory(\lambda)} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (6\text{-}1)$$

$R_{(\lambda)}$: Spectral measured value data

$I_{sample(\lambda)}$: Spectral light intensity of sample

$I_{reference(\lambda)}$: Spectral light intensity of reference

$I_{background(\lambda)}$: Spectral light intensity of background

$R_{theory(\lambda)}$: Theoretical spectral reflection (transmission) factor of reference

A refractive index is calculated from spectral measured value data using the expression below when it is displayed according to the setting state on a GRAPH setting window.

$$n_{(\lambda)} = \sqrt{\frac{1 + \sqrt{R_{(\lambda)}}}{1 - \sqrt{R_{(\lambda)}}}} \quad \ldots\ldots\ldots\ldots \quad (6\text{-}2)$$

$R_{(\lambda)}$: Spectral measured value data

$n_{(\lambda)}$: Spectral refractive index data

■   Setting the theoretical reflection factor of a reference

As known by the calculation expression (6-1) of the spectral measured value data described above, the theoretical reflection factor (transmission factor) of a reference must be set in advance to calculate the spectral measured value data. The way to set a refractive index and the way to set a reflection factor (transmission factor) are used to set the theoretical reflection factor (transmission factor) of a reference. Four methods are provided in all.

(1)   Setting the refractive index using the dispersion formula

The refractive index of a reference is set using Sellmeier, Schott, and Cauchy dispersion formulas. The theoretical spectral reflection factor (transmission factor) calculated from the set refractive index using the expression below is treated as the theoretical spectral reflection factor (transmission factor) of a reference. These dispersion formulas are also

given below. The coefficients of each dispersion formula can be edited by creating dispersion setting files on a DISPERSION editing window.

$$R_{theory(\lambda)} = \left(\frac{1 + n_{(\lambda)}}{1 - n_{(\lambda)}} \right)^2 \quad \dotsb \quad (6\text{-}3)$$

$R_{theory_{(\lambda)}}$: Theoretical spectral reflection (transmission) factor of reference

$n_{(\lambda)}$: Spectral refractive index data

Dispersion formula	Expression
Sellmeier dispersion formula	$n_{(\lambda)}{}^2 - 1 = \dfrac{C_1 \cdot \lambda^2}{\lambda^2 - C_2} + \dfrac{C_3 \cdot \lambda^2}{\lambda^2 - C_4} + \dfrac{C_5 \cdot \lambda^2}{\lambda^2 - C_6}$
Schott dispersion formula	$n_{(\lambda)} = \sqrt{C_1 + C_2 \cdot \lambda^2 + \dfrac{C_3}{\lambda^2} + \dfrac{C_4}{\lambda^4} + \dfrac{C_5}{\lambda^6} + \dfrac{C_6}{\lambda^8}}$
Cauchy dispersion formula	$n_{(\lambda)} = C_1 + \dfrac{C_2}{\lambda^2} + \dfrac{C_3}{\lambda^4}$

$n_{(\lambda)}$: Wavelength dispersion of the refractive index

$C_1 \cdots C_6$: Coefficient of the dispersion formula

(2) Setting the refractive index using a user calculation expression

The refractive index of a reference is set using the set user calculation expression. The theoretical spectral reflection factor (transmission factor) calculated from the set refractive index is treated as the theoretical spectral reflection factor (transmission factor) of a reference. The user calculation expression can be set by creating a dispersion setting file on a DISPERSION editing window. For details of dispersion settings, see the [6.5 Dispersion setting].

(3) Setting the reflection factor by inputting a fixed value

A fixed value in which wavelength dispersion is not considered is set as the theoretical reflection factor (transmission factor) of a reference. The reflection factor (transmission factor) set here is treated within the whole measurement wavelength as a fixed theoretical reflection (transmission) factor value.

(4) Setting the reflection factor by loading a file

The reference wavelength dispersion data file (*.rf) is specified as the theoretical spectral
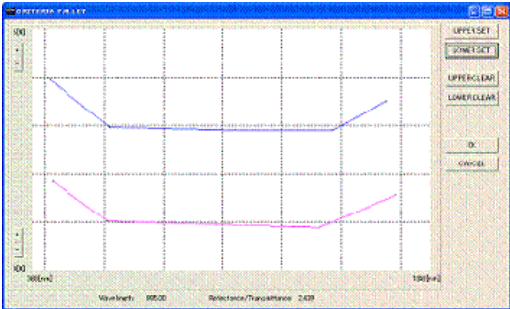
reflection factor (transmission factor) of a reference. The spectral reflection factor (transmission factor) measured using other spectrophotometers can be used as the theoretical spectral reflection (transmission) factor data of a reference.
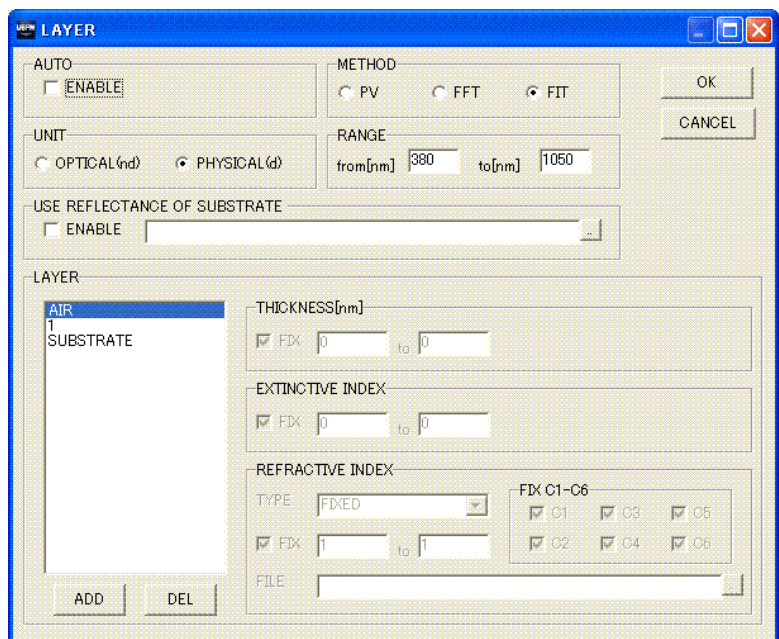
6.2.2. [Standard] setting

Reflection factor standard
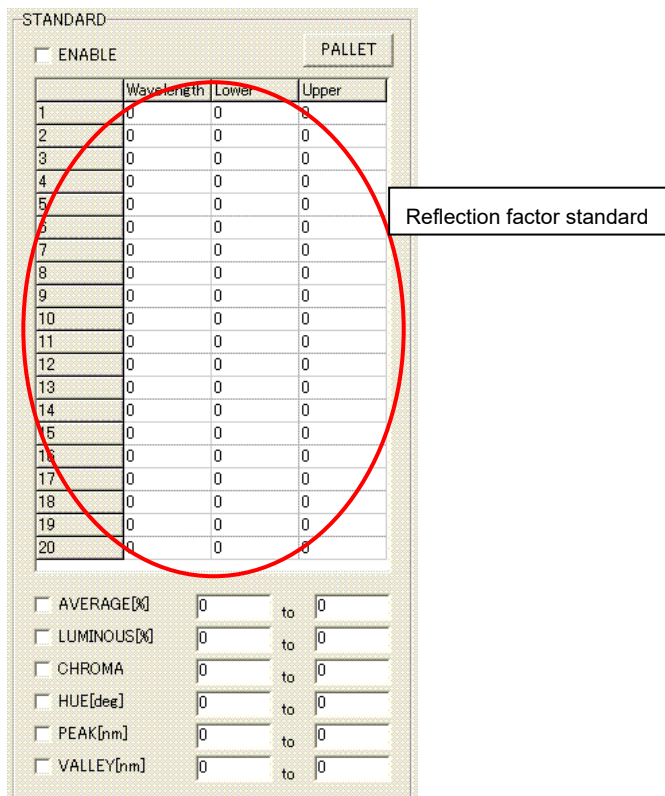
Menu	Description
Reflection factor standard	Sets the upper- and lower-limit reflection(/transmission) factor standards of a reflection factor to each wavelength; click the check box when enabling the set standard value. Enter the

	wavelength in [Wavelength], a lower-limit reflection factor value in [Lower], and an upper-limit reflection factor value in [Upper]. Upper- and lower-limit reflection factor values can be set to a maximum of 20 wavelengths. Values of more than 0 must be entered to [Lower] and [Upper]. Therefore, when you want to set only [Lower], for example, only [Lower] is enabled if you enter [0] in the corresponding [Upper]. This item can also be set in the pallet described later.
Average (reflection/transmission) [%]	Sets the upper- and lower-limit reflection/transmission factor standards of the average reflection and transmission factors; click the check box when enabling the set standard value.
Luminous (reflection/transmission) [%]	Sets the upper- and lower-limit reflection/transmission factor standards of the luminous reflection and transmission factors; click the check box when enabling the set standard value.
Chroma	Sets the upper- and lower-limit standards of the chroma; click the check box when enabling the set standard value.
Hue [Degree]	Sets the upper- and lower-limit standards of a hue angle; click the check box when enabling the set standard value.
Peak [nm]	Sets the upper- and lower-limit wavelength values of a maximum value in a reflection factor; click the check box when enabling the set standard value.
Valley [nm]	Sets the upper- and lower-limit wavelength values of a minimum value in a reflection factor; click the check box when enabling the set standard value.

Pallet	Displays the input pallet of a reflection factor standard; the reflection factor standard value can also be entered using this pallet. Press the upper- or lower-limit value setting button and click the value to be set as a standard value in a graph using the mouse. The clicked point is used as a standard value. To modify the point, press the upper- or lower-limit value deletion button. During completion, press the OK button.

6.3. Layer setting

Select [Setup] - [Layer] from the file menu. A LAYER setting window appears.

Menu	Description
Auto	When this item is enabled, film thickness is automatically analyzed after measurement.
Unit	Sets the display unit of the film thickness analysis; you can select the physical film thickness and the optical film thickness obtained when the physical film thickness is multiplied by a refractive index.
Use reflectance of substrate	Sets the refractive index of a substrate; when using this item, set it to Enable and then set the data filename used as the refractive index of a substrate. A spectral measured value data file (*.csv/*.dat) can be set as the refractive index of a substrate. The first data of a data file is used as the refractive index of a substrate. The refractive index of a substrate is described below in detail.
range	Sets the range of the wavelength to be analyzed for film thickness; analysis can be done with high precision by restricting the analysis range to the wavelength range in which spectral measured values are high in reliability.
method	Sets the analysis method of the film thickness; [PV] is a peak-valley method, and [FFT] is a frequency analysis method. [FIT] is a curve fit method. For details of each method, see the section below.
Layer	Enter the design parameters of a layer to be analyzed. Setting is not required when the analysis method is [PV] and when the unit is [Optical]. Excluding that described above, set the following items: ・When the unit is [Physical] 　PV:　Refractive index of the first layer 　FFT:　Refractive index of each layer not including the AIR and SUBSTRATE layers 　FIT:　All items ・When the unit is [Optical] 　PV:　Not required 　FFT:　Number of layers 　FIT:　All items

■　Film thickness analysis

The three ways below used to analyze a spectral reflection factor are provided as film

thickness analysis. Select an analysis method according to the application. The refractive index of the coat materials may have to be set when calculating the physical and optical film thickness. Set the refractive index on a LAYER setting window according to the table below.

As the result of film thickness analysis, the calculated value varies depending on each setting state. Use this function to obtain a relative value.

(1) Peak-valley method: [PV]

This method is used to calculate film thickness from the peak and valley periodicities of the measured spectral reflection factor value data. Film thickness can be easily obtained because a complicated setting is not required. This method is effective only for the analysis of a single-layer film. However, this method cannot be used when two or more peaks and valleys do not exist in the analysis range.Set the first layer's refractive index of layer setting when obtaining the physical film thickness.

In the peak-valley method, the refractive index of the coat materials can be set using [Use reflectance of substrate]. A data file for which the spectral reflection factor value of a substrate was measured is specified for [Use reflectance of substrate]. Using the expression below, the refractive index n_c of the coat materials in the peak or valley wavelength is obtained from the substrate's refractive index n_b, converted from the loaded spectral reflection factor value data and the spectral reflection factor value data R measured with the materials coated.

$$n_c = \sqrt{\frac{1+\sqrt{R}}{1-\sqrt{R}} \cdot n_b} \quad \text{.........} \quad (6\text{-}4)$$

n_c : Refractive index of coat materials
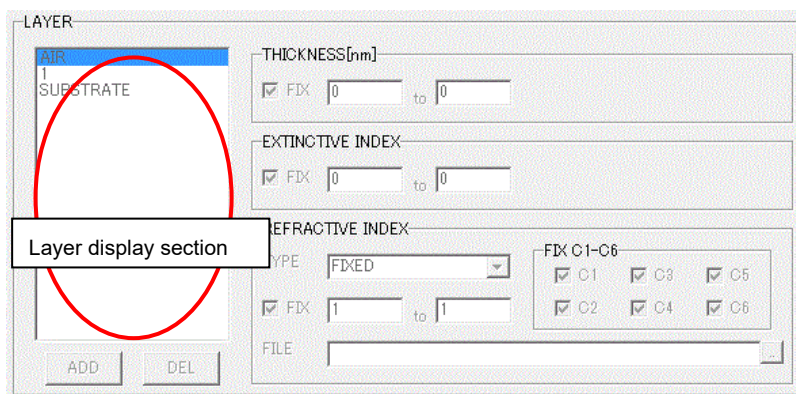
n_b : Refractive index of substrate

(2) Fourier transform method: [FFT]

This method is used to calculate film thickness from the periodicity of the measured spectral reflection factor value data. Film thickness can be obtained with noise minutely influenced when it is difficult to detect peaks and valleys in a peak-valley method. This method is effective for the analysis of single- and multi-layer films. The number of layers for layer setting must be set to the number of layers for the sample to be treated. Set the refractive index of each layer for layer setting when obtaining physical film thickness. As in a peak-valley method, however, this method cannot be used when two or more peaks and valleys do not exist in the analysis range.

(3) Curve fit method: [FIT]

This method is used to calculate film thickness by presuming the film configuration so that the difference between the measured spectral reflection factor value data and the reflection factor value data calculated based on a certain film configuration is the minimum. Film thickness can be obtained even when two or more peaks and valleys do not exist in [Range]. This method is effective for the analysis of single- and multi-layer films. The number of layers, the thickness of layers, an extinctive index, and a refractive index must be set for layer setting. Since they are used as the initial values of analysis, the analysis result may vary depending on the setting. This method does not guaranteed absolute values because it has local solutions.

6.3.1. Layer setting

Menu	Description
Layer display section	Displays, selects, and sets the layer count and layer structure of the sample to be analyzed for film thickness; press the [Add] or [Del] button when increasing or decreasing the number of layers. The detail of the layer selected here can be changed by confirming [Thickness], [Extinctive index], and [Refractive index]. [AIR] indicates the air on the incidence side, and [SUBSTRATE] indicates a base material.
Add	Can add a layer and change the number of layers
Del	Can delete the selected layer and change the number of layers
Thickness	Sets the thickness of the selected layer; this item must be set when an analysis method is [FIT]. When you enable [FIX], enter the thickness of the layer because the thickness of the

	selected layer is not treated for film thickness analysis. When you disable [FIX], enter the thickness of the layer in the relevant range because the thickness of the selected layer is treated for analysis. During analysis, analysis is made in the entered range.
Extinctive index	Sets the extinctive index of the selected layer; this item must be set when an analysis method is [FIT]. When you enable [FIX], enter the extinctive index of the layer because the extinctive index of the selected layer is not treated for film thickness analysis. When you disable [FIX], enter the extinctive index of the layer in the relevant range because the extinctive index of the selected layer is treated for analysis. During analysis, analysis is made in the entered range.
Refractive index	Sets the refractive index of the selected layer; this item must be set irrespective of an analysis method.
	First, select the type of dispersion setting value [TYPE]. The four types of ([Sellmeier], [Schott], [Fixed], and [File]) can be selected as standard. The type can be increased by creating a user dispersion setting file on a DISPERSION editing window. The standard type is as follows: [Sellmeier] is a Sellmeier dispersion formula, [Schott] is a Schott dispersion formula, [FIXED] is a fixed value, and [FILE] is used to load a file. For standard types except [FIXED] and [FILE], values cannot be changed on this window. Create a dispersion setting file using dispersion editing when changing values.
	Specify the filename of the refractive index data in the [File] field when you select [FILE].
	Enter a refractive index using numeric values when you select [FIXED]. When you enable [FIX], enter the refractive index of the layer because the refractive index of the selected layer is not treated for film thickness analysis. When you disable [FIX], enter the refractive index of the layer in the relevant range because the refractive index of the selected layer is treated for analysis. During analysis, analysis is made in the entered range.
	A refractive index is set using a dispersion setting file when you select types other than [FIXED] and [FILE]. The items enabled in a [FIX C1-C6] field at that time are not treated for analysis. The disable items are treated for analysis.

6.4.<u>Graph setting</u>

Select [Setup] - [Graph] from the file menu. A GRAPH setting window appears. A graph setting file can be changed on the GRAPH setting window.
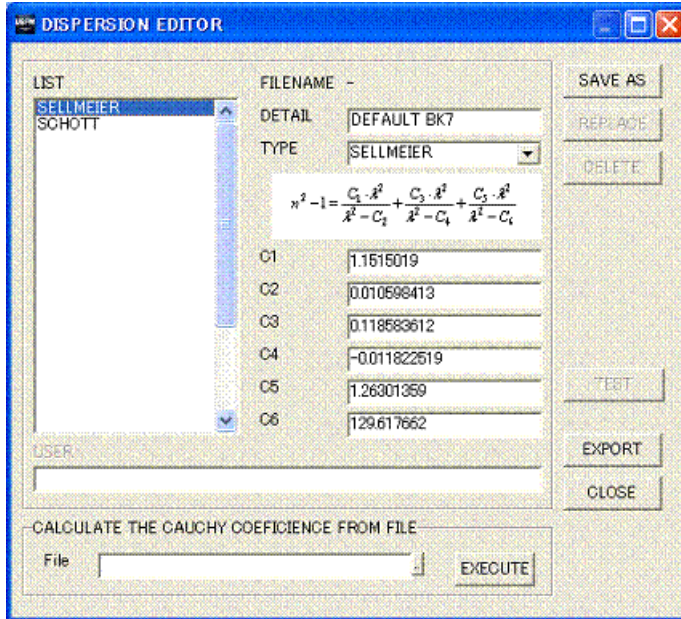

Menu	Description
Graph type	Select the type of a graph on a [GRAPH] window. The type of the graph set here is displayed just after a value is measured.
Chromaticity diagram	Select the type of chromaticity diagram on a [DIAGRAM] window. The type of chromaticity diagram set here is displayed just after a value is measured.
L*a*b scale	Select a display scale when the chromaticity diagram displayed on a [DIAGRAM] window is an L*a*b chromaticity diagram.
Graph additional line	Displays auxiliary data on a [GRAPH] window; enable [Show theory] when displaying the theoretical value of a reference. When displaying the saved data, enable [Show userfile] and set a filename. Only the first data can be displayed in this case. [Show theory] and [Show userfile] can be set simultaneously.

format	Sets the display format on each window; [Wavelength] refers to the display format of the wavelength, [Value] represents the other data formats, and [Date] represents the date display format.
Graph Y-axis	Sets the vertical axis values on a [GRAPH] window; the vertical axis is automatically adjusted when enabling [AUTO] and the vertical gridline is automatically adjusted when enabling [AUTO] of gridline. But according to the size of [GRAPH] window, the gridline may not be displayed.
Graph X-axis	Sets the horizontal axis and gridline values on a [GRAPH] window; the horizontal axis is automatically adjusted when enabling [AUTO] and the horizontal gridline is automatically adjusted when enabling [AUTO] of gridline. But according to the size of [GRAPH] window, the gridline may not be displayed.
Text	Enter a display interval in [Interval] to set the interval of numeric display on a [TEXT] window. Only the data set using the standard value on a REFERENCE setting window is displayed when enabling [Only standard].
Cursor	Sets the cursor display position on a [GRAPH] window; a cursor is displayed in the position set here just after a value is measured.
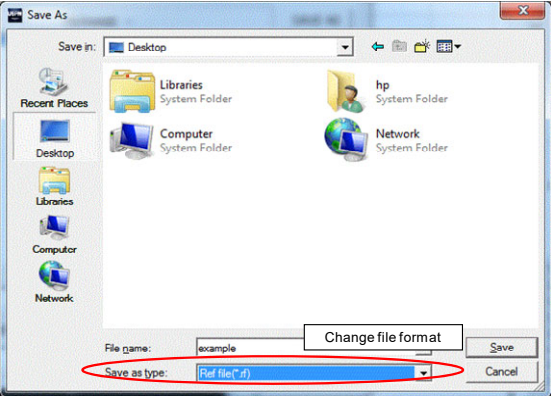
6.5. Dispersion setting

Select [Setup] - [Dispersion editor] from the file menu. A DISPERSION setting window appears. A dispersion setting file (*.cf) can be created and changed on the DISPERSION setting window.

Menu	Description
List	Displays the list of dispersion setting files to select from; two types ([Sellmeier] and [Schott]) can be selected as standard. The list is increased by creating a dispersion setting file. The standard dispersion setting files are as follows: [Sellmeier] is a Sellmeier dispersion formula and [Schott] is a Schott dispersion formula. They cannot be changed. Create a new dispersion setting file when changing a value.
File	Displays the name of the selected dispersion setting file. In a standard dispersion setting file, the filename is not displayed.
Detail	Displays the detail information of the selected dispersion setting file.
Type	Selects the dispersion formula of a dispersion setting file; [Sellmeier] is a Sellmeier dispersion formula, [Schott] is a Schott dispersion formula, and [Cauchy] is a Cauchy dispersion formula. A dispersion formula is calculated using a calculation expression set in [USER] when you select [USER].
C1-C6	Sets the coefficient of a dispersion setting file
USER	Sets the user calculation expression of a dispersion setting file; this item can be used when [TYPE] is set to [USER]. In this case, a calculation expression can be set freely. Enterable characters as follows. The setting can be confirmed in [Test] described later. Coefficients C1 to C6: C1, C2, C3, C4, C5, and C6 Wavelength [um]: W Operator: +, -, *, /, ^ (power), and (,) Function: SUM(...), AVERAGE(...), STDEV($\cdots$), ABS(), SIN(), COS(), TAN(), ASIN(), ACOS(), ATAN(), ATAN2(...), EXP(), MAX(...), MIN(...), SQRT(), LOG(), LOG10(), SINH(), COSH(), and TANH() The item in (...) is entered as SUM(C0, C1, and C2). Example: Enter as described below when setting the Cauchy dispersion formula below by using this item. Cauchy dispersion formula: $C_1 + \dfrac{C_2}{\lambda^2} + \dfrac{C_3}{\lambda^4}$ $\Rightarrow$ Setting for entry: C1+C2/W^2+C3/W^4

Calculate the Cauchy coefficient from file	The coefficient of a Cauchy dispersion formula is calculated from the refractive index when the refractive index for several wavelengths of coat materials is known. Each coefficient that approximates to the Cauchy dispersion formula is calculated when you set a filename in which the wavelength and refractive index are described and when you press the Run button. A file that can be loaded is used as the CSV file created in the format below. (Wavelength 1 [um]), (Refractive index 1) (Wavelength 2 [um]), (Refractive index 2) (Wavelength 3 [um]), (Refractive index 3) . .
Save	Saves the created dispersion setting file
Replace	This saves the created dispersion setting file. However, a standard dispersion setting file cannot be overwrite-saved.
Delete	Deletes the selected dispersion setting file; however, a standard dispersion setting file cannot be deleted.
Test	Checks the user calculation expression set in [USER]. The calculation result of a user dispersion formula in a specific wavelength is displayed.

Export	Outputs the numeric value of the current dispersion setting file. A refractive index (*.ind format) or reflection factor (*.rf format) can be selected as an output format. Assign the name to be displayed and select it from the file type on a SAVE window.
Close	Closes the setting window

7. Windows

The main screen of this software is constituted by multiple windows. Various windows can be freely arranged on the main window. The arranged state can be kept with the layout setting file saved and loaded. On each window, the operation below can be performed by clicking the right button of the mouse.

Menu	Description
COPY	You can select [COPY] by clicking the right button. The current data value and image are copied to the clipboard. A data value or image is prescribed on each window.
SAVE	You can select [SAVE] by clicking the right button. The current data value and image are saved. The format in which a data value is saved in is CSV format. A format for saving an image can be selected by changing the file type.

7.1.CAMERA CONTROL] Window

You can set the brightness of FOCUS and CT images.
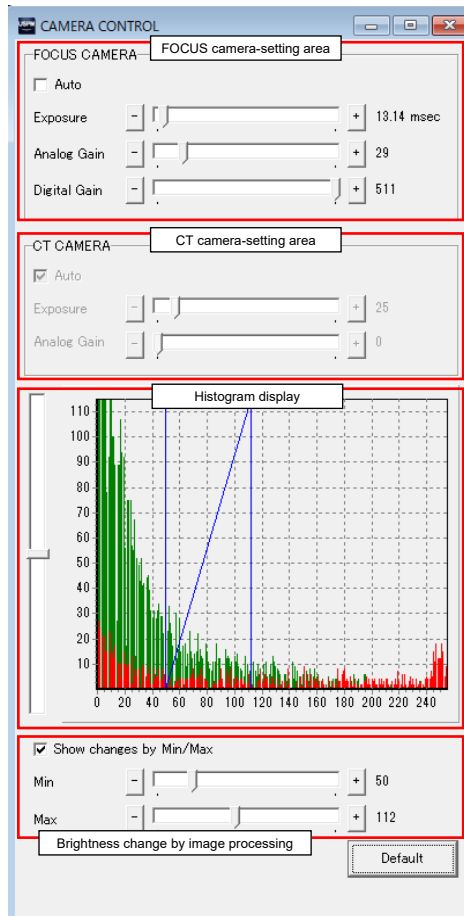
Item	Details
FOCUS camera-setting area	This function is available when a FOCUS picture is displayed in LIVE window.
Auto	When enabled, the exposure time is set automatically. It is changed synchronously with the Auto checkbox in LIVE window.
Exposure	Changes the exposure time. This function is not available when [Auto] in LIVE window is enabled. When the exposure time is changed, the update interval of the image may change.
Digital Gain	Changes the brightness.
Analog Gain	Changes the brightness. Analog Gain cannot be operated when [Auto] is enabled in the live image display. It is changed in synchronization with the Exposure Time Adjust slider in LIVE window.

Item	Details
CT camera-setting area	This function is available when a CT picture is displayed in LIVE window.
Auto	When enabled, the exposure time is set automatically. It is changed synchronously with the Auto checkbox in LIVE window.
Exposure	Changes the exposure time. This function is not available when [Auto] in LIVE window is enabled. When the exposure time is changed, the update interval of the image may change.
Analog Gain	Changes the brightness. Analog Gain cannot be operated when [Auto] is enabled in the live image display. It is changed in synchronization with the Exposure Time Adjust slider in LIVE window.

Item	Details
Histogram display	Displays the brightness of the picture displayed in LIVE window graphically. The brightness prior to Min/Max setting change is displayed in green and the brightness after the change is displayed in red. The left slider allows you to change the display scale of the vertical axis of the graph.
Brightness change by image processing	You can change the brightness of the image by setting the maximum and minimum brightness of the camera image to be displayed. When Show changes by Min/Max is enabled, the brightness after changing Min/Max setting can be displayed in red.
Default	Restores CAMERA CONTROL window settings to the default settings. If the [Auto] check in LIVE window is ON, Analog Gain settings and check boxes for Exposure and FOCUS cameras will not be initialized.

7.2.[DIAGRAM] window

A chromaticity diagram is displayed on the [DIAGRAM] window. XY and L*a*b chromaticity diagram displays can be switched when you double-click the window. (However, the setting value of a graph setting file is not changed.) The current image can be saved when you click the right button to select [SAVE]. JPEG or BMP can be selected as the saving format. The current image can be copied to the clipboard when you select [COPY].
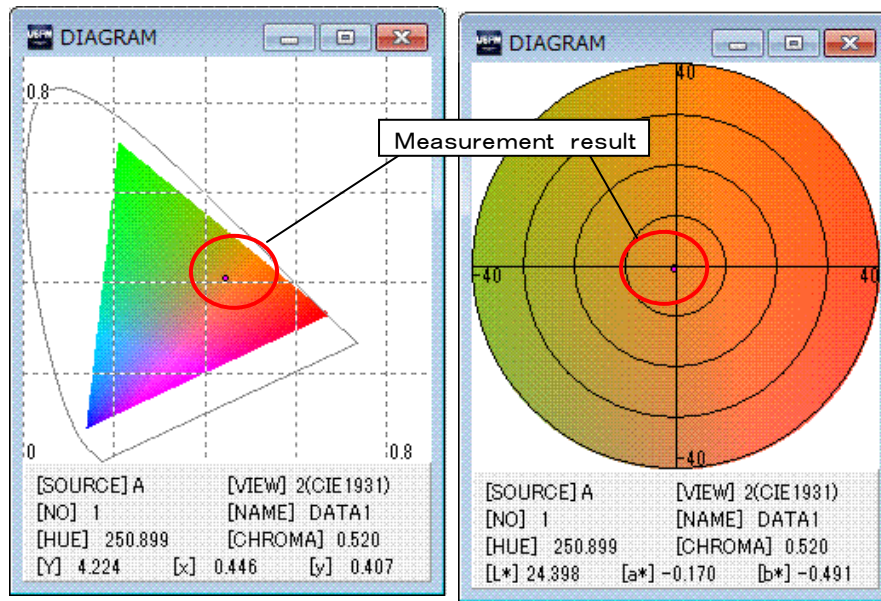

Menu	Description
Measurement result	Displays the measurement result
SOURCE	Displays the state of the standard light source set using a work setting file
VIEW	Displays the field-of-view state set using a work setting file
NO.	Displays the selected data number
NAME	Displays the data name of the selected data number
HUE	Displays the measurement result of the selected data number's hue angle
CHROMA	Displays the measurement result of the selected data number's chroma
Y	Displays the measurement result of the selected data number's tri-stimulus value Y
x	Displays the chromaticity coordinate x position of the selected data number's XY chromaticity diagram

y	Displays the chromaticity coordinate y position of the selected data number's XY chromaticity diagram
L*	Displays the chromaticity coordinate L position of the selected data number's L*a*b chromaticity diagram

a*	Displays the chromaticity coordinate a* position of the selected data number's L*a*b chromaticity diagram
b*	Displays the chromaticity coordinate b* position of the selected data number's L*a*b chromaticity diagram

7.3.[GRAPH] window

Spectral measured value data is displayed using a graph.
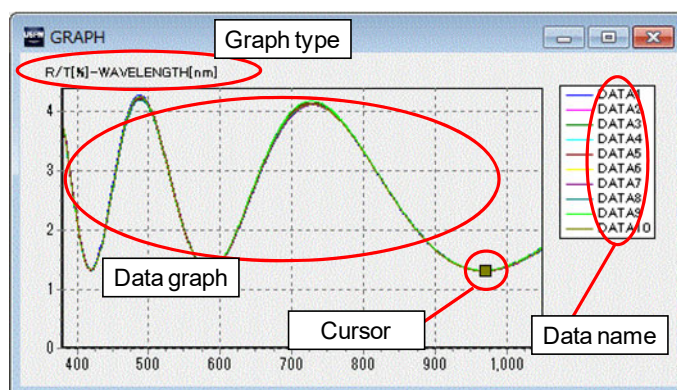
Menu	Description
Graph type	Displays the type of a graph; the type displayed during the completion of measurement is determined by setting the graph type (GRAPH) of a graph setting file. The graph type is changed by double-clicking the mouse. (However, a graph setting file is not changed by double-click operation.)
Data name	Displays the name of each color in a data graph; a NAME input window appears when you click the mouse. [Data

	name] and [Data contents] can be changed on the window.
Data graph	This is the result data of spectral measured values.
Cursor	Displays the position of a cursor operated on an [INFO] window; just after measurement, the cursor is located in the minimum value of the spectral reflection and transmission factor values.
SAVE	[SAVE] can be selected when you click the right button of the mouse. The current image is saved. JPEG or BMP can be selected as the saving format.
COPY	[COPY] can be selected when you click the right button of the mouse. The current image is copied to the clipboard.

7.4.[LIVE] window

FOCUS and CT images are displayed on the [LIVE] window. They can be switched by selecting [FOCUS] or [CT] from [Image] from the file menu or double-clicking on the screen. The current image can be saved when you click the right button of the mouse to select [SAVE]. JPEG or BMP can be selected as the saving format. The current image can be copied to the clipboard when you select [COPY].
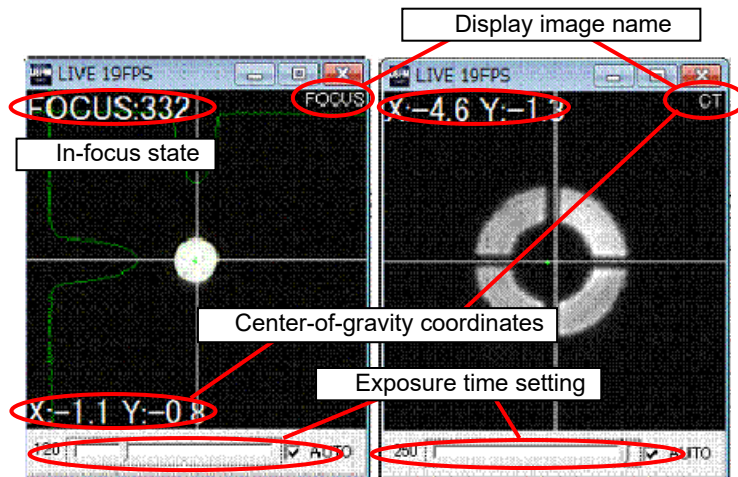
Menu	Description
Display image name	Indicates the displayed image; [FOCUS] is displayed when the current display is a FOCUS camera image. [CT] is displayed when it is a CT camera image.
Center-of-gravity coordinates	Displays the center-of-gravity coordinate position; this item is displayed in red when the center-of-gravity coordinate position is out of the range set using a system setting file.

Menu	Description
Exposure time setting	Sets the exposure time; the current exposure time is displayed in the numeric value on the left. Automatic adjustment is properly performed when you click the AUTO check box. "Wait...." is displayed while automatic adjustment is in progress.
In-focus state	Displays the in-focus state; the position in which a value is lowest near the in-focus state is an in-focus position.
Luminance graph	Displays the luminance state
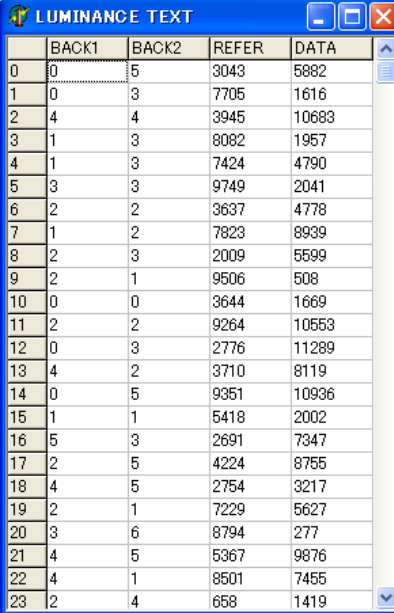
7.5.[LUMINANCE] window

Each spectral light intensity of a background, reference, and measurement is displayed in black (gray), light blue, and blue, respectively. The pink graph indicates the lower-limit value of the spectral light intensity set on a SYSTEM setting window. The red graph indicates the maximum value of the spectral light intensity.
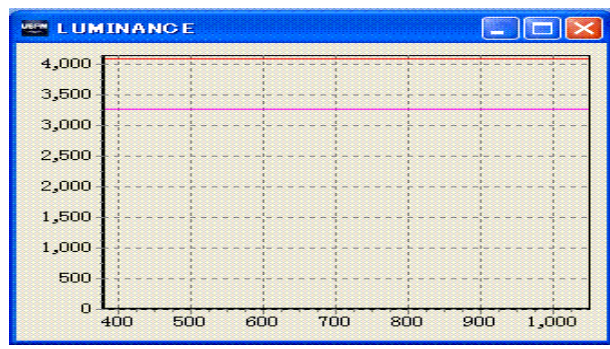
7.6.[LUMINANCE TEXT] window

Each spectral light intensity level of a background, reference, or measurement is displayed on the [LUMINANCE TEXT] window.

	BACK1	BACK2	REFER	DATA
0	0	5	3043	5882
1	0	3	7705	1616
2	4	4	3945	10683
3	1	3	8082	1957
4	1	3	7424	4790
5	3	3	9749	2041
6	2	2	3637	4778
7	1	2	7823	8939
8	2	3	2009	5599
9	2	1	9506	508
10	0	0	3644	1669
11	2	2	9264	10553
12	0	3	2776	11289
13	4	2	3710	8119
14	0	5	9351	10936
15	1	1	5418	2002
16	5	3	2691	7347
17	2	5	4224	8755
18	4	5	2754	3217
19	2	1	7229	5627
20	3	6	8794	277
21	4	5	5367	9876
22	4	1	8501	7455
23	2	4	658	1419

7.7.[OK/NG] window

Result are displayed on the [OK/NG] window.

7.8.[TEXT] window

The reflection and transmission factor values of the spectral measured values are displayed using numeric values.
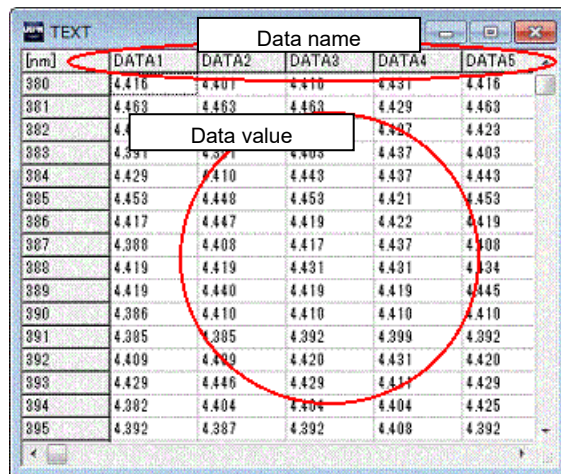
Menu	Description
Data name	Displays the name of each color in a data graph; a NAME input window appears when you click the mouse. The data name can be changed on the window.
Data value	This is the result data of the spectral measured values.
SAVE	[SAVE] can be selected when you click the right button of the mouse. The current data value is saved. The format in which data is saved is CSV.
COPY	[COPY] can be selected when you click the right button of the mouse. The current data value is copied to the clipboard.

7.9. [THICKNESS] Window

The result of film thickness analysis is displayed on the [THICKNESS] window.

The progress information of film thickness analysis displayed on this window varies depending on the setting state of [Analysis method] on a LAYER setting window. It is separately described below.

7.9.1. Peak-valley method: PV

Each wavelength of the analysis [Analysis method] used, analysis results, and the detected peak and valley is displayed on this window when [PV] (peak-valley method) is selected for [Analysis method] on a LAYER setting window. The [Method] field displays an analysis method, and the [ND[nd] (D[nm])] field displays the analyzed optical film thickness (physical film thickness). The items below display the detected peak and valley wavelengths. At that time, the refractive index corresponding to the peak and valley wavelengths is also displayed when the refractive index of a substrate is used.
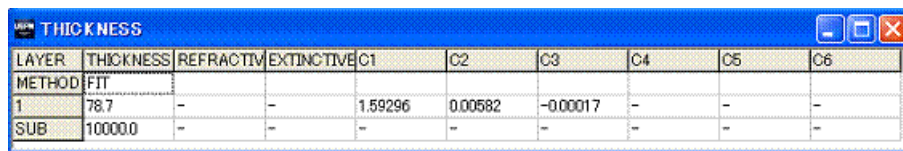
7.9.2. Fourier transform method: FFT

The film thickness analysis method and analysis result for each layer are displayed on this window when [FFT] (Fourier transform method) is selected for [Analysis method] on a LAYER setting window. The [Method] field displays a film thickness analysis method, and [ND(n)[nd] (D(n)[nm])] field displays the analyzed optical film thickness (physical film thickness). A subscript (n) ([1] in the figure) indicates the layer number of a film.

7.9.3. Curve fit method: FIT

The film thickness analysis method and analysis result for each layer are displayed on this window when [FIT] (curve fit method) is selected for [Analysis method] on a LAYER setting window. The [Method] field displays a film thickness analysis method and the optical film thickness (physical film thickness) analyzed for each layer.

7.10.[THICKNESS INFO] window

The progress information of film thickness analysis is displayed on the [THICKNESS INFO] window. See the [THICKNESS] window for the result of actual film thickness analysis.

The progress information of the film thickness analysis displayed on this window varies depending on the setting state of [method] on a LAYER setting window. It is separately described below.

7.10.1. Peak-valley method: PV
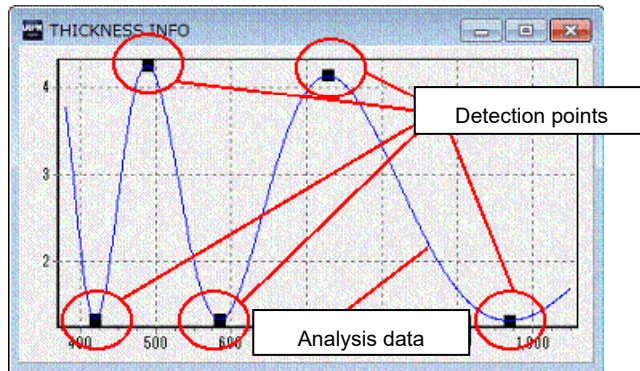
Analysis data and detection points are displayed on this window when [PV] (peak-valley method) is selected for an analysis method on a LAYER setting window. The analysis data is the spectral measured value data to be analyzed for film thickness. It is the same as the spectral measured value data displayed on a [GRAPH] window. The detection points display the peak and valley positions of the analysis data used for film thickness analysis. Film thickness is not also properly analyzed if the detection points are not properly displayed in the peak and valley positions.

7.10.2. Fourier transform method: FFT
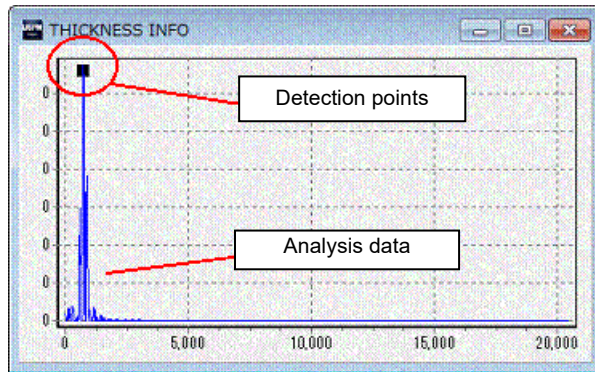
Analysis data and a detection point are displayed on this window when [FFT] (Fourier transform method) is selected for [method] on a LAYER setting window. The analysis data is the data obtained when the spectral measured value data to be analyzed for film thickness is frequency-analyzed. In this case, the vertical axis is a power spectrum, and the horizontal axis is optical film thickness. The detection point displays the peak of analysis data used for film thickness analysis. It can be checked. Film thickness is not also properly analyzed if the detection point is not properly displayed in the peak position.

7.10.3. Curve fit method: FIT
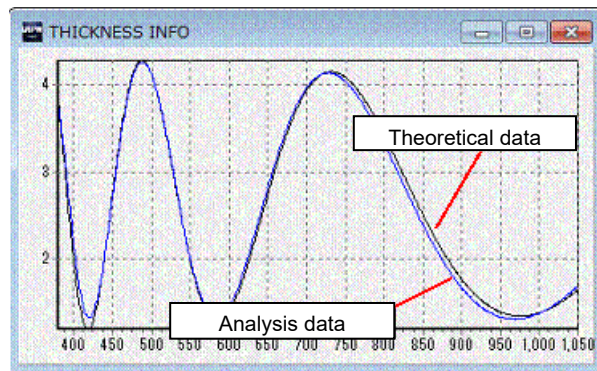
Analysis data and theoretical data are displayed on this window when [FIT] (curve fit method) is selected for [method] on a LAYER setting window. The analysis data is the result data of the spectral measured values to be analyzed for film thickness. It is the same as the data displayed on a [GRAPH] window. The theoretical data is the theoretical value data created as

the result of film thickness analysis. The comparison of the analysis data with the theoretical data can be confirmed.

8. Others

8.1.Loading the setting files using a shortcut

By setting the property of a shortcut, the specified setting file can be loaded when software is started using a shortcut. The way in which you can specify a setting file is described below.

(1) Create a shortcut for this software on the desktop and open the property of the created shortcut. The executable file of this software exists in [C: ¥USPM-SA¥uspm.exe].

(2) Select the [Shortcut] tab from Properties. Enter the parameter arguments and their corresponding setting values in the [Link destination] field. Put one half-size space between the parameter arguments and setting values during entry. The parameter arguments and their corresponding setting values are shown in the table below. The extensions of the setting values can be omitted. Various setting files loaded as the setting values must be stored in the specified file arrangement destination.

Parameter argument	Setting value	File arrangement destination
-R	Work setting filename (*.ref)	[C:¥USPM-SA¥Param] folder
-G	Graph setting filename (*.grph)	[C:¥USPM-SA¥Param] folder
-L	Layout filename (*.layout)	[C:¥USPM-SA¥Conf] folder
-Y	Layer setting filename (*.lay)	[C:¥USPM-SA¥Param] folder
-T	Subtitle	-
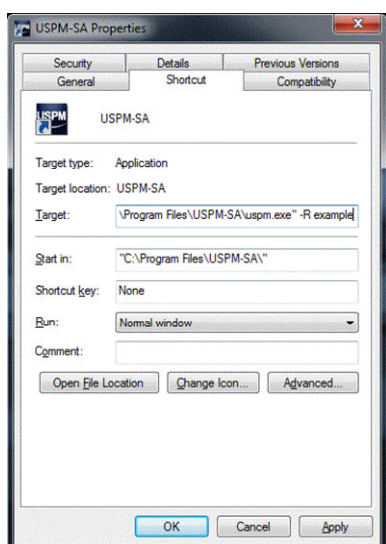
Example: The case is given where a work setting file "example.ref" is loaded during startup.
Add "-R example" after "C:¥USPM-SA¥uspm.exe" in the "Link destination" field.
"C:¥USPM-SA¥uspm.exe□-R□example" is obtained as a whole. ("□" indicates a half-size space.)

9. File Configuration and Format

The configuration of file formats used in this software is shown below.

Format name	Extension	Description
Data file	*.dat/*.csv	Data file in which spectral measured value data is saved
System setting file	*.conf	System-related setting file
Work setting file	*.ref	Setting file for work setting
Graph setting file	*.graph	Display-related setting file
Layer setting file	*.lay	Setting file for layer setting
Layout setting file	*.layout	Setting file for window arrangement
Reference wavelength dispersion data file	*.rf	File for loading reflection factor
Wavelength dispersion data file	*.ind	File for loading refractive index
Dispersion setting file	*.cf	Setting file for dispersion setting

9.1. Spectral measured value data file (*.csv/*.dat)

This is spectral measured value data in which a measurement result is saved. In this software, a maximum of 20 spectral measured value data items can be displayed and saved in the same file. The data file of the spectral measured value data can be saved in CSV and DAT formats. The DAT format is compatible with software of Ver.3.00 or earlier.

■ CSV format

USPM-SA v1.00 DATAFILE 380-1050: Data file identification tag

wavelength, DATA1, Data2, ・・・, Data10   : Data name

380, measurement value of Data1 wavelength 380, measurement value of Data2 wavelength 380, ···, measurement value of Data10 wavelength 380

  381, measurement value of Data1 wavelength 381, measurement value of Data2 wavelength 381, ···, measurement value of Data10 wavelength 381

382, measurement value of Data1 wavelength 382, measurement value of Data2 wavelength 382, ···, measurement value of Data10 wavelength 382

···

1048, measurement value of Data1 wavelength 1048, measurement value of Data2 wavelength 1048, ···, measurement value of Data10 wavelength 1048

1049, measurement value of Data1 wavelength 1049, measurement value of Data2 wavelength 1049 , ···, measurement value of Data10 wavelength 1049

1050, measurement value of Data1 wavelength 1050, measurement value of Data2 wavelength 1050, ···, measurement value of Data10 wavelength 1050

[end]

■ DAT format

USPM-SA v1.00 DATAFILE 380-1050   : Data file identification tag

                                         : Comment

                    : Number of data items

Data1   : Data name

Measurement value of Data1 wavelength 380

Measurement value of Data1 wavelength 381

・・・

Measurement value of Data1 wavelength 780

Data2   : Data name

Measurement value of Data2 wavelength 780

・・・

Measurement value of Data2 wavelength 780

・・・

Data10   : Data name

Measurement value of Data10 wavelength 780

・・・

Measurement value of Data10 wavelength 780

[end]

9.2. Additional data files (*.csv)

An additional file is created when the measured spectral measured values are saved in CSV format.

```
USPM-SA v1.01 ADDFILE                    : Data file identification tag

Source"Number of   standard light source",(0:A,1:B,2:C,3:D65),View"state of field-of-view",(True:2(CIE1931),False:10(CIE1964)

L*, Data1 L*, Data2 L*, Data3 L*, …

a*, Data1 a*, Data2 a*, Data3 a*, …

b*, Data1 b*, Data2 b*, Data3 b*, …

x, Data1 x, Data2 x, Data3 x, …

y, Data1 y, Data2 y, Data3 y, …

HUE, Data1 hue angle, Data2 hue angle, Data3 hue angle, …

CHROMA, Data1 chroma, Data2 chroma, Data3 chroma, …

AVERAGE, Data1 average reflection factor, Data2 average reflection factor, Data3 average reflection factor, …

LUMINOUS, Data1 luminous reflection factor, Data2 luminous reflection factor, Data3 luminous reflection factor,···

NO, Data1 sample No, Data2 sample No, Data3 sample No,···

DETAIL1, Data1 remarks 1, Data2 remarks 1, Data3 remarks 1,···

DETAIL2, Data1 remarks 2, Data2 remarks 2, Data3 remarks 2,···

DATE, Data1 measurement date, Data2 measurement date, Data3 measurement date,···

[end]
```

9.3. Wavelength dispersion data file of coat materials(*.ind)

This is the wavelength dispersion data file of a coat material's refractive index used for film thickness calculation. The data file is based on a file format used when EXPORT is

executed on a DISPERSION editing window. The extension is "*.ind". Data is based on a text format. The refractive index between the shortest and longest wavelengths is arranged after an identification tag in steps of 1 [nm].

```
USPM-SA v1.00 INDEXFILE          :Identification tag of reference file
1.00000000000000                 :Refractive index data [%] (380[nm])
1.00000000000000                 :Refractive index data [%] (381[nm])
...
1.00000000000000                 :Refractive data [%] (1050[nm]))
[end]
```

9.4. Reference wavelength dispersion data file (*.rf)

This is a file format in which the reflection and transmission factor data items of a reference are used when a file is specified. The file format is also used when EXPORT is executed on a DISPERSION editing window. The extension is "*.rf". Data is based on a text format. The spectral reflection and transmission factors between the shortest and longest wavelengths are arranged after an identification tag in steps of 1 [nm].

```
USPM-SA v1.00 REFERENCEFILE       :Identification tag of reference file
4.43729459935712                  :Reflection factor data [%] (380[nm])
4.43524682827653                  :Reflection factor data [%] (381[nm])
…
4.14387764412366                  :Reflection factor data [%] (780[nm])
[end]
```

The format below is used when using polarization.

```
USPM-SA v1.00 REFERENCEFILE        : Identification tag of reference file
(Random polarized reflection factor data of 380 nm [%]), (P polarization of 380 nm [%]), (S polarization of 380 nm [%]),
(Random polarized reflection factor data of 381 nm [%]), (P polarization of 381 nm [%]), (S polarization of 381 nm [%]),
…
(Random polarized reflection factor data of 1050 nm [%]), (P polarization of 1050 nm [%]), (S polarization of 1050 nm [%]),
[end]
```

10. Error Display

Item	Description
License error: USPM-SA	A hardware key cannot be confirmed. Restart after confirming that a hardware key is connected to a computer.
Focus not open device	Cannot communicate with a FOCUS camera; restart after confirming that hardware cables are connected and that the power is turned on.
CT CAMERA ERROR	Cannot communicate with a CT camera; restart after confirming that hardware cables are connected and that the power is turned on.
Failed to open port	Cannot communicate with the control block; restart after confirming that hardware cables are connected and that the power is turned on.
Response timeout	No response is sent from the control block after instructions are sent from software. Restart hardware if this error occurs during the startup of the software.
Failed to load substrate file	The file set to a substrate's refractive index is not proper or may be damaged. Set a normal file.
Failed to load reference file	The file set to the theoretical spectral reflection (transmission) factor of a reference is not proper or may be damaged. Set a normal file.
Calculation error	Any measurement result cannot be calculated. Measure again after reference and background measurements are completed.
Luminance saturated	Spectral light intensity exceeds the saturation limit of a photosensor. Shorten the sampling time so that the spectral light intensity is not saturated and then perform each measurement.
This file cannot be opened.	A data file is not proper or damaged. Set a normal data file.
Failed to test	A user input expression is not entered correctly. Confirm the contents of entry land and execute again.
Little Peaks/Valley	The number of peaks and valleys is too few to perform the peak-valley method (PV) of film thickness analysis. Try other analysis methods.

Data range is less than variables	The number of variables is too many to perform the curve fit method (FIT) of film thickness analysis. Increase the quantity for enabling [FIX].
Too dark. Set manually	Sampling adjustment cannot be used because the sampling time is long. Set the time manually.
Sensor IO error	A sensor for shutter operation cannot be detected. Please contact us for consultation.

11. Index

Item	Description
Changing the theoretical reflection (transmission) factor of a reference	Open the WORK setting window and set the [Reference] field. For details, see the [Reference] setting item.
Setting the standard value	Open the WORK setting window and set the [Standard] field. For details, see the [Reference] setting item.
Analyzing the film thickness	Open the LAYER setting window, set a measurement method, and press the Film thickness analysis button for analysis. For details of the LAYER setting window, see the LAYER setting window item.
Analyzing the color difference	Select [Analysis] - [Color-difference calculation] from the file menu and calculate the color difference. For details, see the color-difference calculation item.
Setting the sampling time	Press the Sampling adjustment button for automatic setting. For details, see the sampling adjustment item. Or open the WORK setting window and set the [Sampling time] field manually. When setting the field manually, perform reference measurement after changing the [Sampling time] item. Confirm the light blue graph on the LUMINANCE window and adjust the sampling time repeatedly so that spectral light intensity is not saturated.
Displaying the theoretical reflection (transmission) factor of a reference	Open the GRAPH setting window and enable [Display theoretical value] in an [Add graph] field. For details, see the graph setting item.
Displaying the existing data file at all times	Open the GRAPH setting window, enable [Display from data file] in an [Add graph] field, and set the file to be displayed. For details, see the graph setting item.
Setting the display range of a graph	Open the GRAPH setting window and set the [Graph axis] field.

Changing the password of a SYSTEM setting window	The password is a string written in the Password.txt in the conf folder in the folder where the software is installed. Open Password.txt and change the character string in the first line.
Recovering lost measured data	For each measurement, a data file is stored in the conf folder, which is located in the folder where the software is installed. Add extension ".dat" and open the file as a data file.

12. Contact Information

- Although we took substantial measures to confirm the accuracy of the contents of this document, if you discover any unclear point or any mistakes/omissions, please contact the Service Department of EVIDENT Corporation as shown in the attached sheet.

- For the sake of improvement, the contents of this document may be subject to change without prior notice.

13. Software License Agreement

⚠ CAUTION	Be sure to thoroughly read the software license agreement below before using this software.

Product name: USPM-SA

Version: 1.01

This software license agreement (hereinafter referred to as "this agreement") is a contract document made between you (irrespective of an individual or corporation) and EVIDENT Corporation (hereinafter referred to as "EVIDENT") concerning EVIDENT's software and printed manual matter (hereinafter referred to together as "this software"), described above and as contained in this package. By downloading, reproducing, and using this software, you shall agree that you are restrained by the terms of the software license agreement. EVIDENT permits the non-exclusive right of using this software on a computer by you on the condition that you observe the regulations below.

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3. You cannot reverse-engineer, inverse-compile, inverse-assemble, or print out this software or any part of it.

4. You cannot combine this software or any part of it with other software or incorporate it into other software.

5. You shall agree that you observe the law and rules, to be applied, regarding export control in Japan, the U.S., and other countries when bringing this software abroad or exporting it.

6. You cannot delete the copyright notice and warning displayed on this software.

Article 5: Limitation of liability

For 90 days after you have purchased this software or products including this software, EVIDENT guarantees that substantial and physical defects that significantly disturb the operation or functions of this software do not exist in the media in which this software is recorded. EVIDENT does not guarantee that all defects are corrected. The only warranty of EVIDENT is to replace the media when media that do not satisfy the guarantee above are sent back to EVIDENT together with the copied receipt.

Article 6: Disclamation of warranty

1. This software, not including the warranty prescribed in this agreement, is provided as is. All warranties including the warranty of non-infringement, product characteristics, and/or conformity to a specific purpose shall not be given irrespective of an explicit or implicit warranty.

2. EVIDENT assumes no liability for damages to you or a third party (that usually include special, direct, or indirect damage, but is not restricted to such) regarding the transfer, use, or performance of this software or resulting from this software.

Article 7: Third-party software

EVIDENT may provide third-party software products (hereinafter referred to as "third-party software") together with this software. You must observe the license terms when you use third-party software irrespective of the regulations of this agreement. EVIDENT provides third-party software for you as is without any explicit or implicit warranty, including the warranty of product characteristics and conformity to a specific purpose. In any case, EVIDENT assumes no liability for direct or indirect damages (that include the loss of lost profits, business interruption, the loss of business information, or other pecuniary losses, but not restricted to such) resulting from use or the lack of serviceability of third-party software.

Article 8: Expiration date

1. This agreement shall be valid from the date at which you accepted this software or products including this software.

2. EVIDENT can cancel this agreement if you violate these terms. In this case, you must discard this software and all reproductions of its components.

Article 9: Applicable laws

1. This agreement shall conform to laws in Japan and shall be interpreted according to laws in Japan.

2. For any trouble regarding this agreement, Tokyo District Court is prescribed as the exclusive competent court of first instance.

Installation Instructions

Spectroscopic Analysis Software
USPM-SA

Before use

We thank you for purchasing our spectroscopic analysis software. In order to use this software safely and to maximize the benefit from doing so, be sure to read this instruction manual completely before use.

Please also keep this manual close at hand when using this product and store it carefully for future reference.

Table of Contents

1. Introduction

1.1. Cautions

If a necessary file is deleted by mistake during installation or uninstallation operations, the PC may not operate properly. Alternatively, if operations are aborted midway, installation or uninstallation may not be correctly executed.

Installation and uninstallation operations must be performed by personnel who have adequate knowledge and experience regarding the operation of a personal computer and who have carefully read this manual.

1.2. Operating environment

For this software, using the following computer system configuration is recommended. Note that if you use a computer with a configuration that is other than our recommendation, optimum software performance may not be possible—or such may not even operate. For information on computers with configurations that have been checked, please contact our sales department.

[Windows10 / Windows11]

    (1) CPU: Intel CPU 2.6 GHz or better, PC/AT-compatible machine

    (2) Chipset: Made by Intel Corporation (recommendation)

    (3) Memory: 4 GB or greater required

    (4) Supported OS: Windows® 10 Professional (64-bit version)

                    Windows® 11 Professional (64-bit version)

    (5) An optical drive that can read a CD-ROM (external types can also be used)

    (6) USB 2.0 x 3 ports or greater

    (7) Resolution: 1024 x 768 or greater

1.3. About the OS login ID

When installing the device drivers or software, be sure to first login to the OS with administrator privilege rights.

1.4. Installation and uninstallation flow

"6. Verifying the driver installation result" must be performed after the installation of each driver is completed. Thus, follow the procedures below for a new installation. For other installation and uninstallation cases, perform them by referring to the relevant chapter as necessary. When you install the software application, execute a wavelength calibration by following the instruction manual of the relevant product after the installation is completed.

■ Flow of a new installation

```
┌──────────────────────────────────────────┐
│  2. Installing the communication port driver │
└──────────────────────────────────────────┘
                      ▼
┌──────────────────────────────────────────┐
│     3. Installing the FOCUS camera driver    │
└──────────────────────────────────────────┘
                      ▼
┌──────────────────────────────────────────┐
│       4. Installing the CT camera driver     │
└──────────────────────────────────────────┘
                      ▼
┌──────────────────────────────────────────┐
│      5. Installing the protection key driver │
└──────────────────────────────────────────┘
                      ▼
┌──────────────────────────────────────────┐
│    6. Verifying the driver installation result │
└──────────────────────────────────────────┘
                      ▼
┌──────────────────────────────────────────┐
│            7. Installing software            │
└──────────────────────────────────────────┘
```
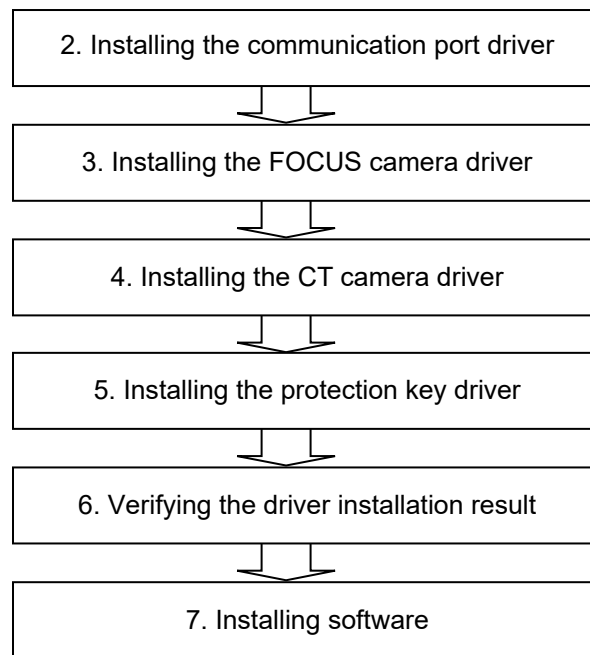
2. Installing the Communication Port Driver

The operations in this chapter do not include any wiring of the computer or the product used.

(1) Place the Included Media into the media drive.

(2) Double-click **CP210x\CP210xVCPInstaller_x64.exe** in the CD-ROM to execute it.

(3) If a warning screen is displayed at this time, click the **Continue** button. A warning related to the user account control may be displayed depending on the settings of the computer used. Click the **Yes** button to proceed with the installation.

(4) In the following screen, click the **Next** button to proceed.
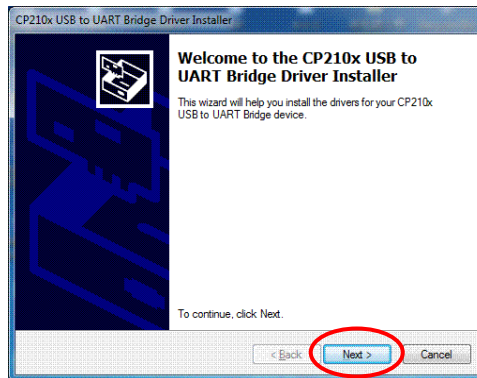
(5) In the following screen, select the **I accept the agreement** check box and click the **Next** button to proceed.
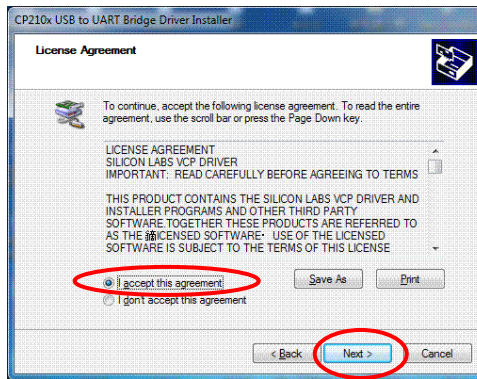
(6) Finally press the **Finish** button to complete the operation.
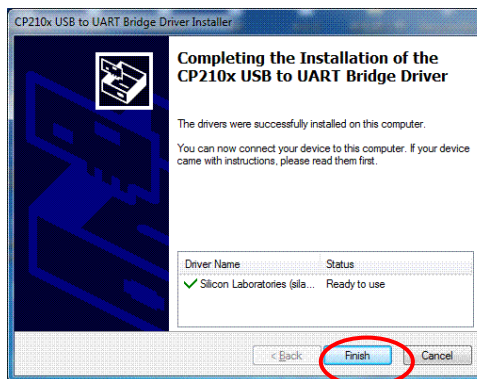
3. Installing the FOCUS Camera Driver

The operations in this chapter do not include any wiring of the computer and or the product used.

[Windows10 / Windows11]

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(1) Place the Included Media into the media drive.

(2) If you are using Windows 10, double-click **MCM320Win10Setup_x64_win10.exe** on the optical drive to execute it. Depending on your computer's settings, you may see a User Account Control warning. Click the **Yes** button to proceed with the installation. (If you are using Windows 11, double-click **MCM320Win11Setup_x64_win11.exe** to execute it.)

(3) In the first screen, click the **Next** button to proceed.

(4) In the following screen, click the **Next** button to proceed. (This step is Windows 10 only.)
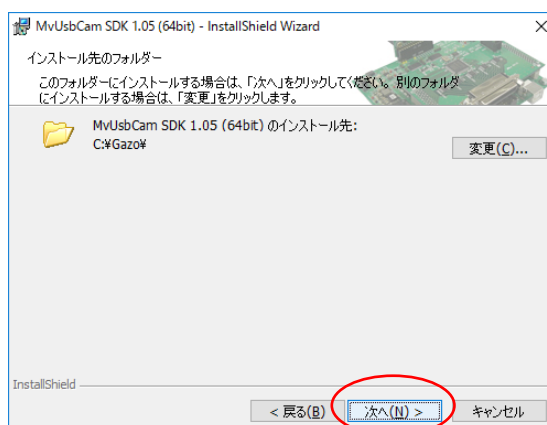
(5) In the following screen, click the **Next** button to start the installation.
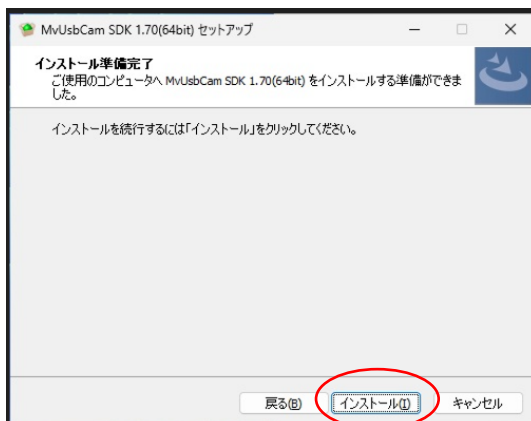
(6) When the following screen is displayed, click the **Finish** button to proceed.

4. Installing the CT Camera Driver

The operations in this chapter do not include any wiring of the computer or the product used.

[Windows10 / Windows11]

< REVISON A4- >

   (1) Place the Included Media into the media drive.

   (2) Double-click uEye\uEye_49610.exe on your optical drive. Depending on the settings of your computer, the extension may not be displayed. Also, user account control warnings may appear depending on the configuration of your computer. To continue the installation, click the Yes button.

   (3) Press OK to proceed to the next page.
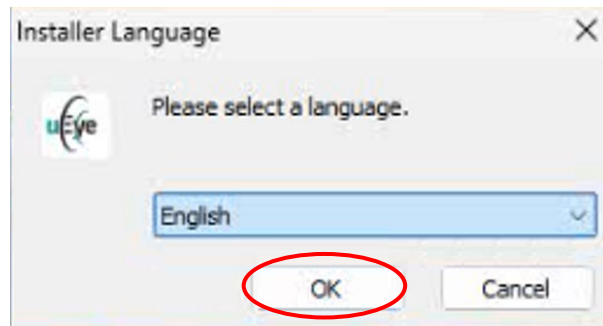
   (4) In the following window, press Next to proceed.

(5) In the following window, press Next to proceed.
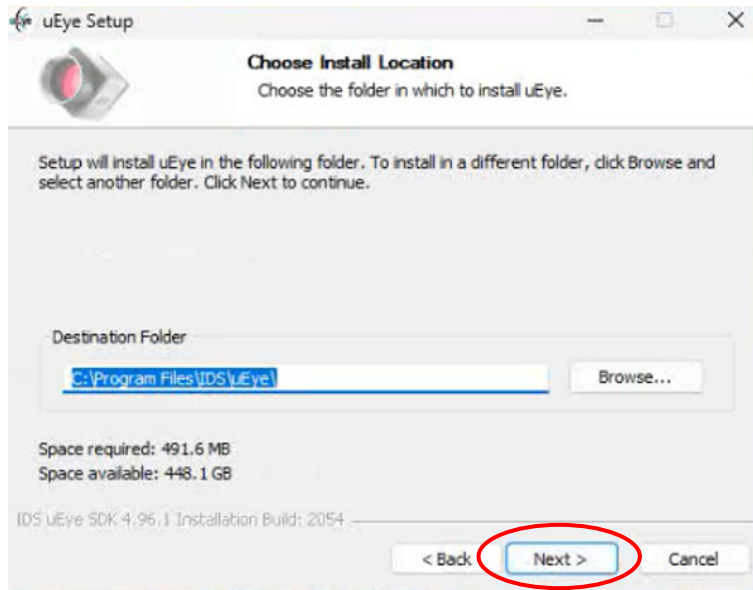
(6) In the following window, press Next to proceed.
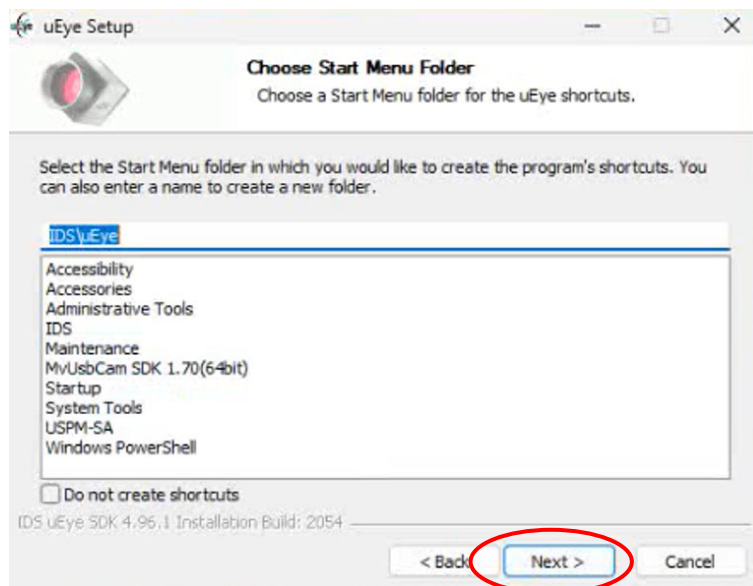
(7) Uncheck "ETH driver" and press Next to proceed.
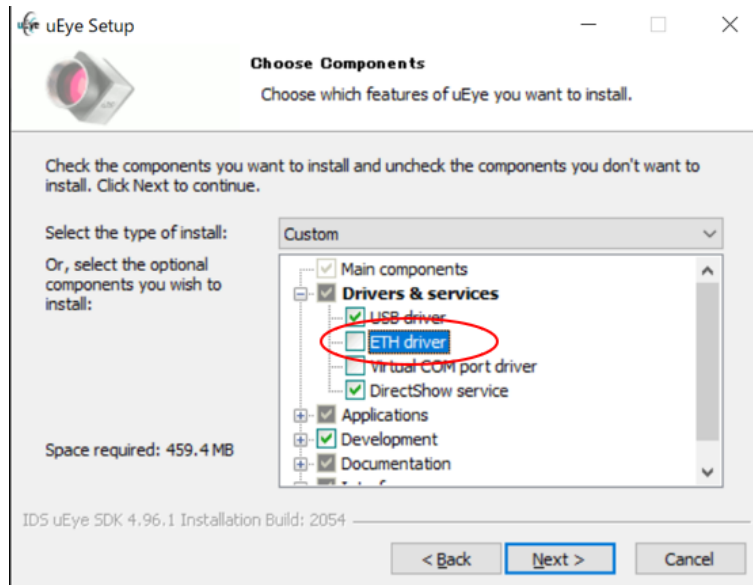
(8) In the following window, press Next to proceed.
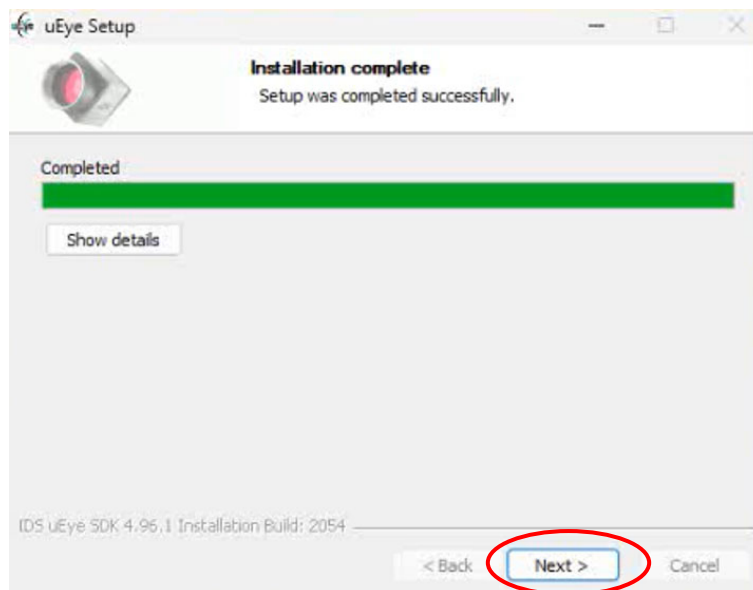
(9) In the following window, uncheck everything and press Next to proceed.
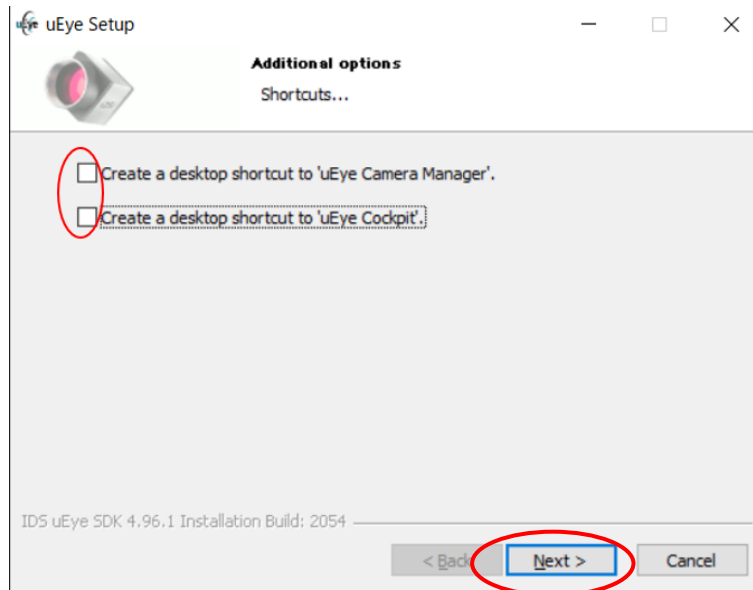
(10) In the final window, press Finish to complete the install.
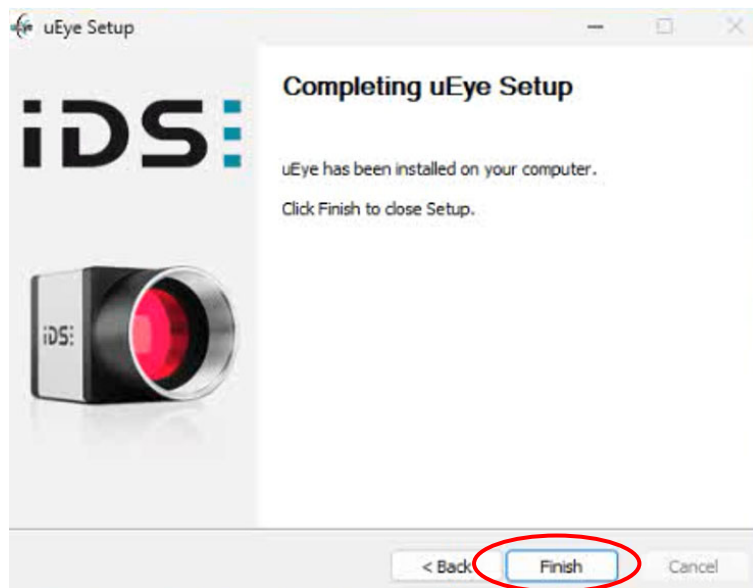
5. Installing the Protection Key Driver

The operations in this chapter do not include any wiring of the computer or the product used.

Note: Log on to Windows with administrator privileges.

Note: Close all running applications before you begin.

[Windows10 / Windows11]

(1) Double-click **Sentinel\Install.vbs** on the optical drive to run it. Depending on your computer's settings, you may see a User Account Control warning.

(2) If you want to continue with the installation, click the **Yes** button to proceed.

(3) When the confirmation message appears, select **Yes**.
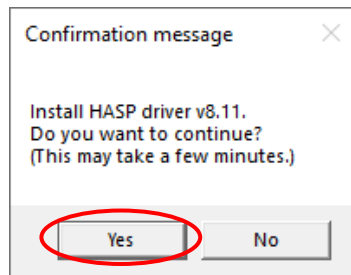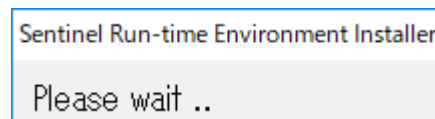
| Confirmation message | Install screen |

(4) When the installation completion screen appears, select **OK**.
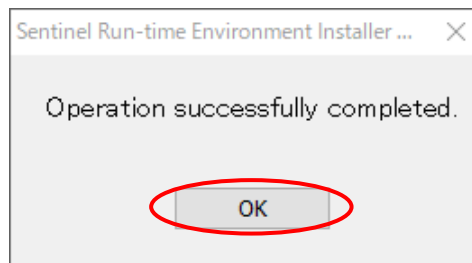
Installation completion screen

6. Verifying the Driver Installation Result

With this chapter, verify the installation results executed in Chapter 2 through to Chapter 5. First, refer to the instruction manual of the product used, then wire the computer and the product, and then turn on the power.

(1) Open the **Control Panel** from the Start menu.
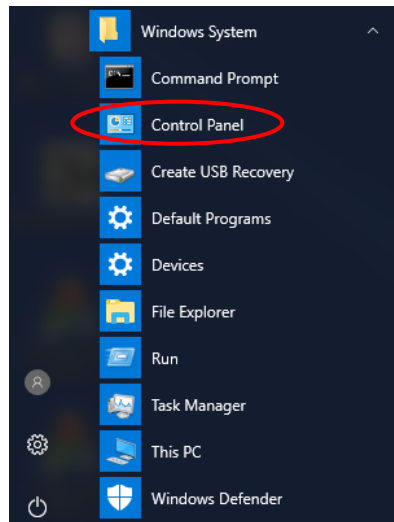
(2) Select **Hardware and Sound** from the **Control Panel**.
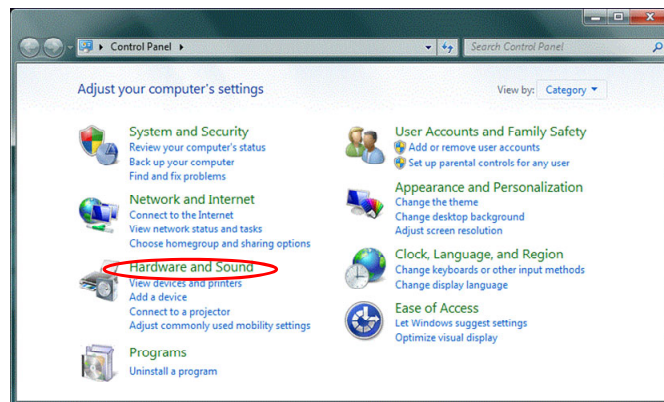
(3) Select **Device Manager** from **Hardware and Sound**.
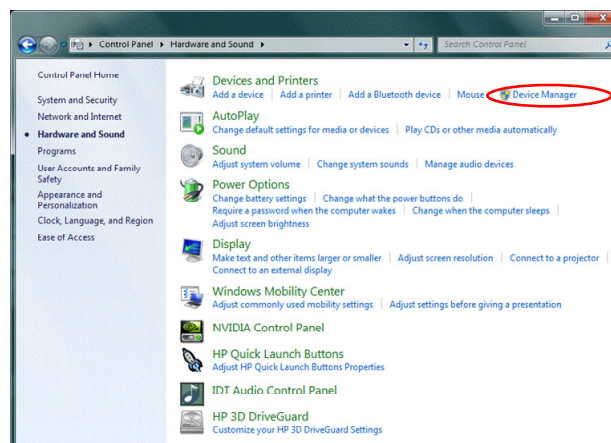
(4) First, verify the communication port installation status. Select **Ports (COM & LPT)** and check that **Silicon Labs CP210x USB to UART Bridge (COM*)** is displayed. Note that the number at the position marked with * differs depending on the configuration of the computer used.
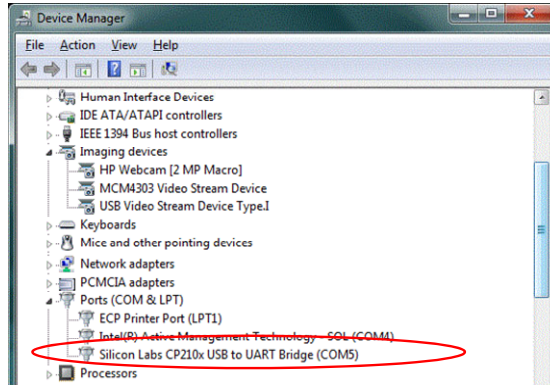
(5) Next, verify the FOCUS camera installation status.

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Select **Imaging devices** and check that **MCM320 Video Stream Device** is displayed. Then, select **Universal Serial Bus controllers** and check that **MCM320 Image Acquisition Controller** is displayed.
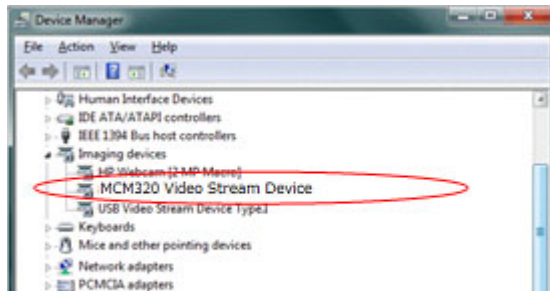
(6) Next, verify the CT camera installation status.

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Select **Universal Serial Bus controllers** and check that **uEye UI-122xLE Series or uEye UI-124xLE Series** is displayed.
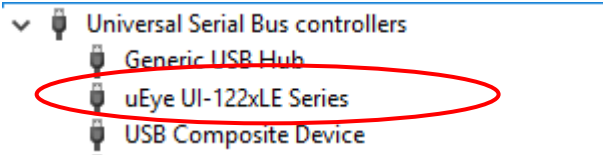
(7) Next, verify the protection key installation status. Select **Universal Serial Bus controllers** and check that **Sentinel HASP Key** is displayed.
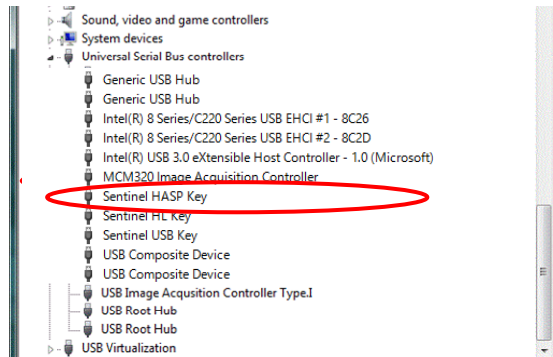
7. Installing Software

Immediately after the installation (or re-installation) of the software application, all settings are set to their respective default values. After you have installed the software application, be sure to execute wavelength calibration by following the instruction manual of the relevant product that you are using.

(1) Place the Included Media into the media drive.

(2) Double-click **setup.exe** in the CD-ROM to execute it. A warning related to the user account control may be displayed depending on the settings of the computer used. Click the **Yes** button to proceed with the installation.

(3) In the first screen, click the **Next** button to proceed.
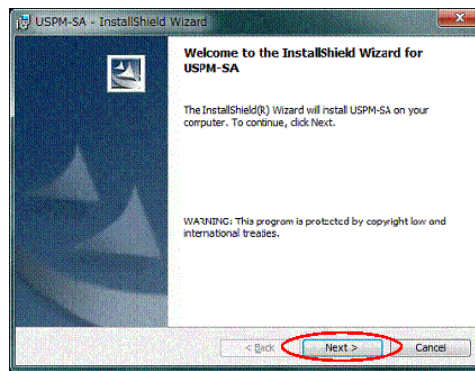
(4) In the following screen, click the **Install** button to proceed.
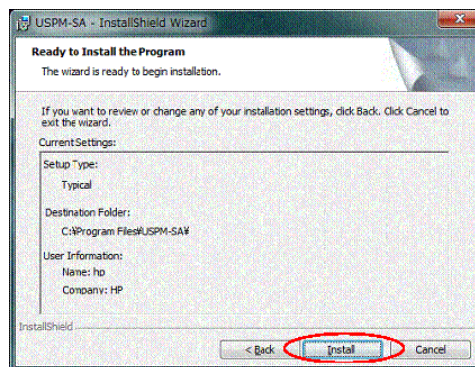
(5) In the last screen, click the **Finish** button to complete the installation.
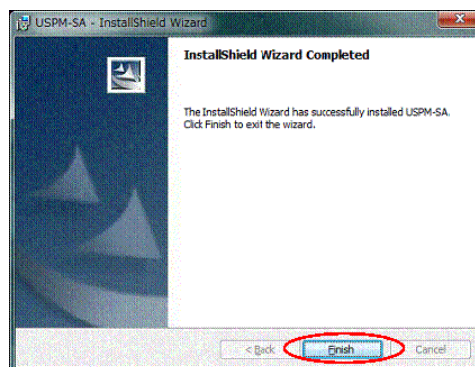
8. Uninstalling the Communication Port Driver

(1) Open the **Control Panel** from the Start menu.
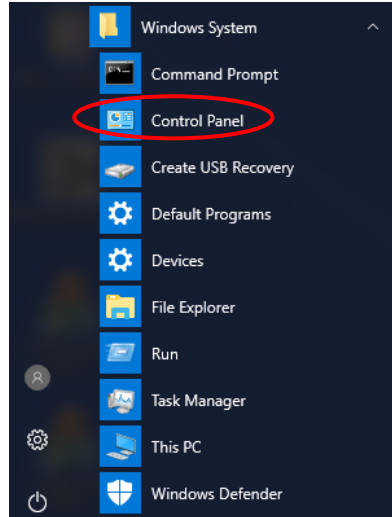
(2) Select **Uninstall a program** from the **Control Panel**.
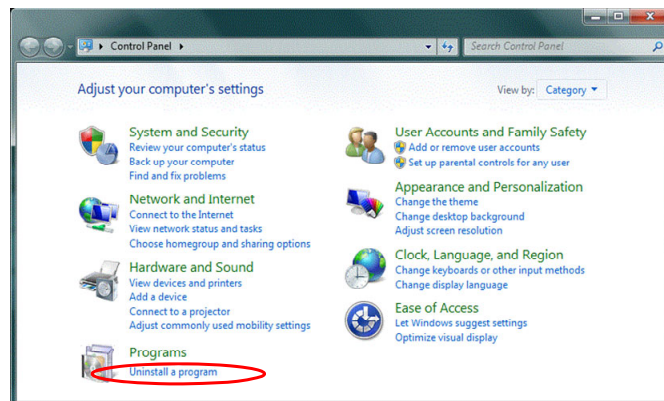
(3) First select **Windows Driver Package – Silicon Laboratories Inc. (silabser) Ports** and then start the uninstallation using the **Uninstall/Change** button.
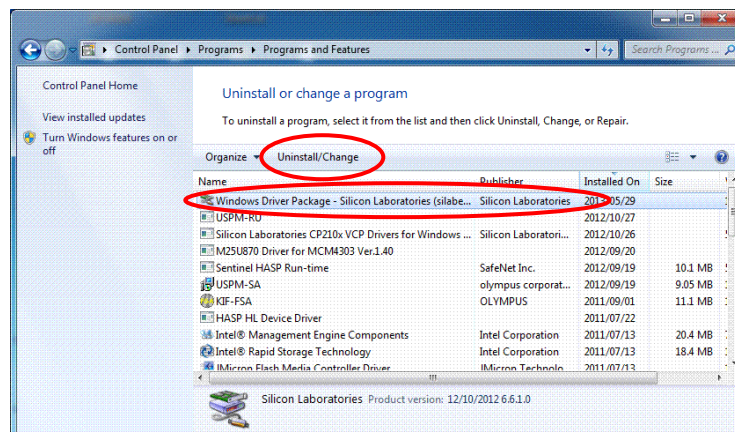
9. Uninstalling the FOCUS Camera Driver

[Windows10 / Windows11]

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(1) Open the **Control Panel** from the Start menu.
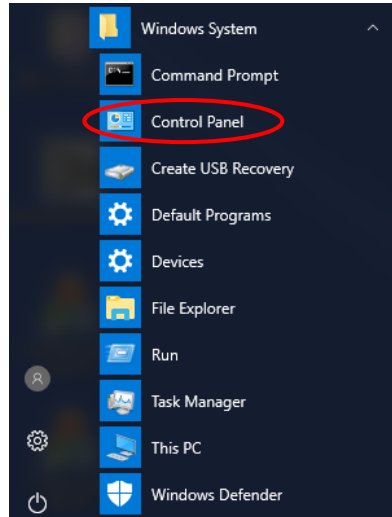
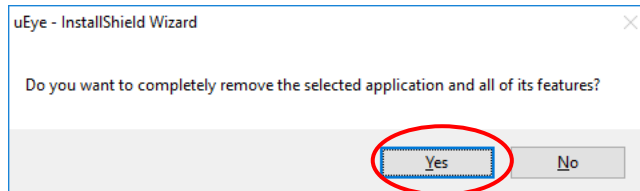(2) Select **Uninstall a program** from the **Control Panel**.
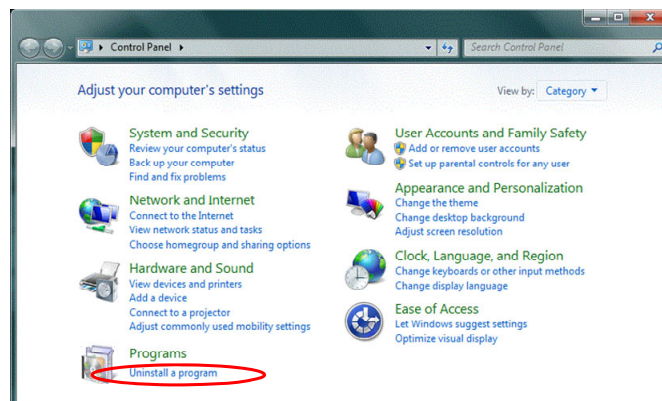
(3) First select **MvUsbCam Sdk x.xx (64bit)** and then start the uninstallation and change using the **Uninstall/Change** button.
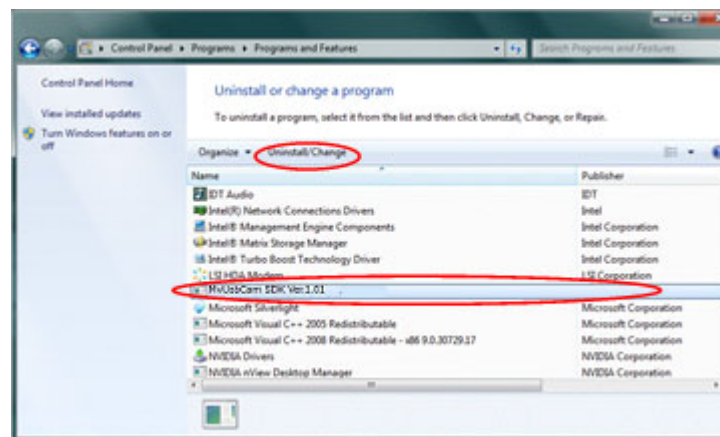
10. Uninstalling the CT Camera Driver

[Windows10 / Windows11]
< REVISON A4- >

    (1)   Open the **Control Panel** from the Start menu.
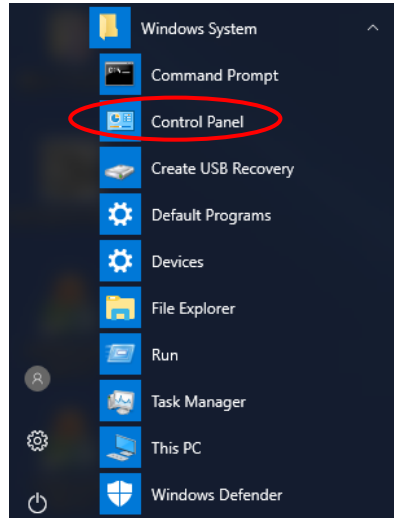
    (2)   Select **Uninstall a program** from the **Control Panel**.
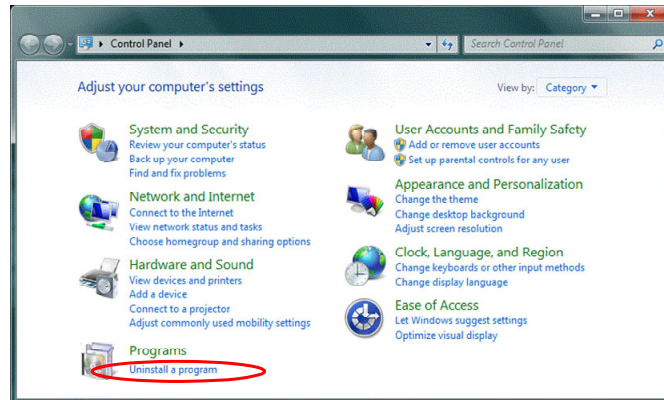
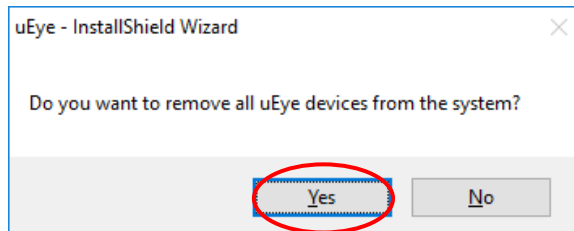   (3)   First select **IDS uEye** and then start the uninstallation using the **Uninstall** button.
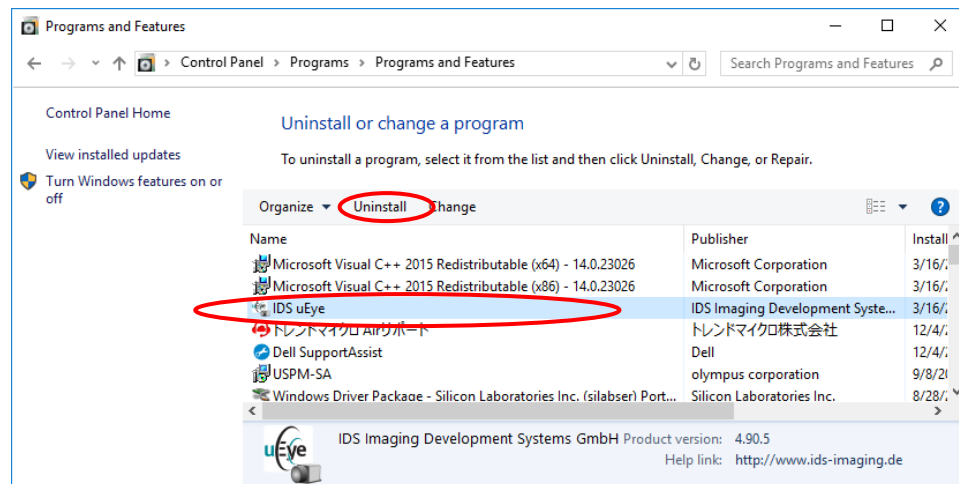
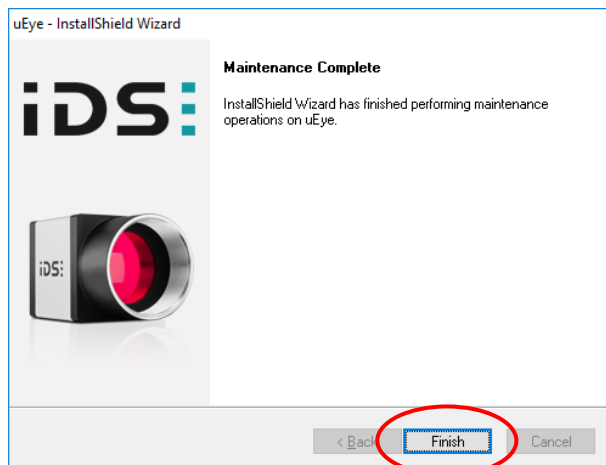(4) In the following screen, select **Remove** and click the **Next** button.
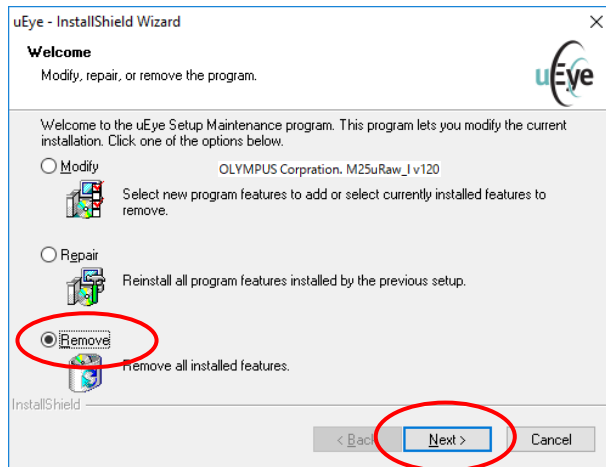
(5) In the following screen, click the **Yes** button.

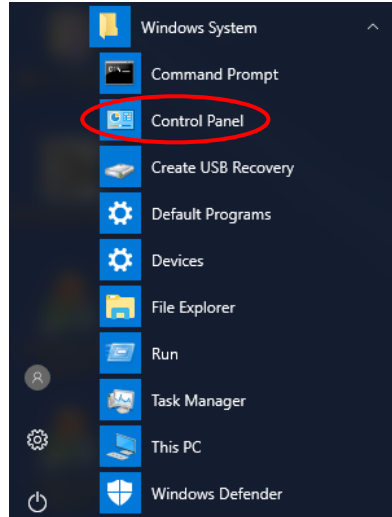(6) In the following screen, click the **Yes** button.

(7) In the last screen, click the **Finish** button to complete the installation. Restart your computer.
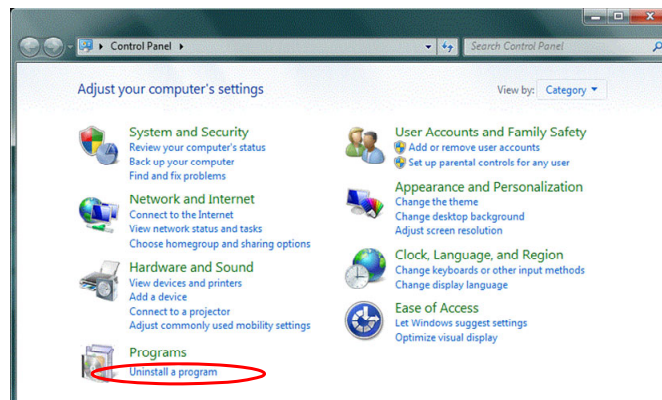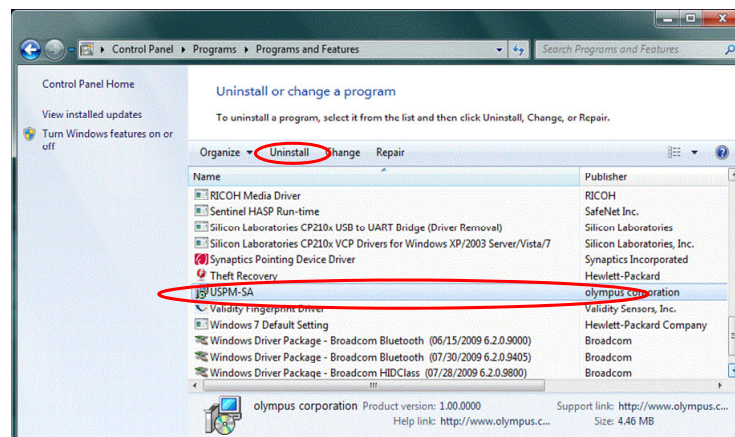
11. Uninstalling Software

(1) Open the **Control Panel** from the Start menu.

(2) Select **Uninstall a program** from the **Control Panel**.

(3) Select **USPM-SA** and then click the **Uninstall** button to start the uninstallation.

(4) When the uninstallation progress status window disappears, the uninstallation is complete.

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The company names and product names referred to in this document may be trademarks or registered trademarks of their respective companies.

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Precautions Regarding the Change of the focus Camera in the USPM-RU-W

As the focus camera in the USPM-RU-W Near-IR Micro Spectrophotometer (hereinafter referred to as the "previous camera") is no longer available, we have replaced it with an alternative camera (hereinafter referred to as the "new camera") since November 2016. This change has no impact on measurement values, although we'd like to inform you of the impacts of use of the device, as follows.

Changes during actual usage

1) Trackability of display and automatic gain

The new camera is slower in its response speed for automatic gain. This results in worse trackability of the image displayed in the FOCUS window for focal control.

The table below lists the response time and display time of the previous and new cameras under the environment at our facilities.

| Items	Previous camera	New camera
Response time of automatic gain[*1]	Approx. 200ms	Approx. 400ms
Display time (frame rate)[*2]	20fps	20fps

[*1] The time necessary to reflect the automatic gain setting in the camera is measured via software.

[*2] The maximum speed is controlled by the software settings.

2) Resolution

The new camera has improved resolution, thanks to increase of its number of pixels. Any dirt or spots on the sample surface will be more clearly displayed in the FOCUS window.

The pictures below show the observation results of BK7 References under the environment at our facilities.

Previous camera	New camera
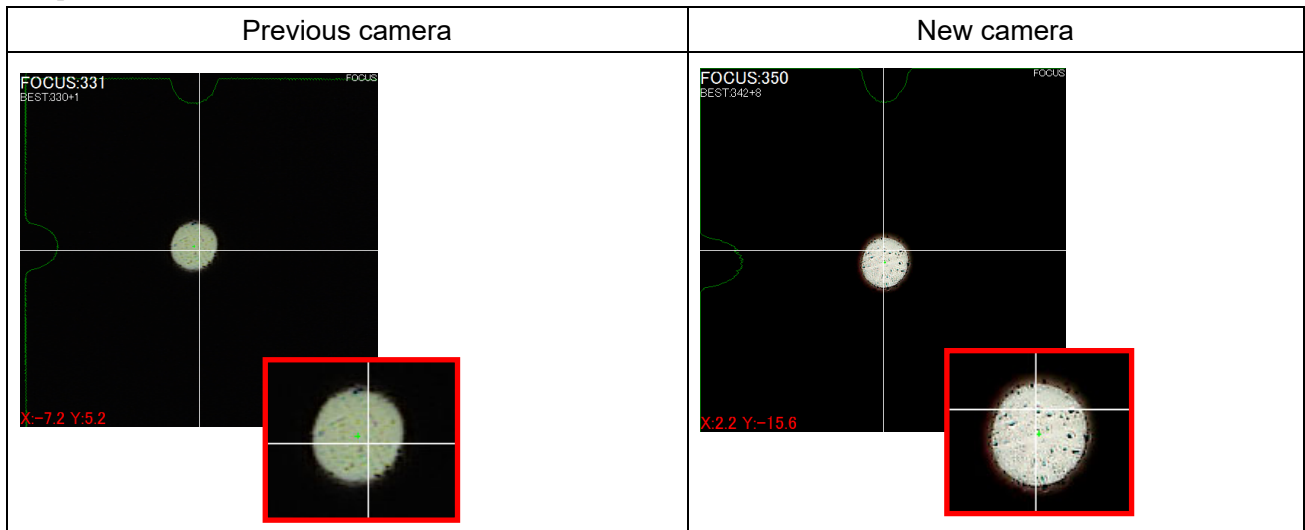
Note: The images were taken with dust adhering to the surfaces of the BK7 References. In actual use, make sure to remove any dust and dirt on the BK7 References.

Life science solutions	Industrial solutions
Service Center	Service Center
https://www.olympus-lifescience.com/support/service/	https://www.olympus-ims.com/service-and-support/service-centers/
Official website	Official website
https://www.olympus-lifescience.com	https://www.olympus-ims.com