



PT5E-0503

Riken Photoelectron Spectrometer AC-5 Operating Manual

RIKEN KEIKI Co., Ltd.

2-7-6 Azusawa, Itabashi-ku, Tokyo, 174-8744, Japan

Phone : +81-3-3966-1113

Fax : +81-3-3558-9110

E-mail : intdept@rikenkeiki.co.jp

Web site : <http://www.rikenkeiki.co.jp/>

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1

Before Using

This chapter describes the information to be known before using this unit.

1-1. Overview

Thank you very much for choosing our AC-5. Please check that the model number of the product you purchased is included in this manual.

This manual is described on the assumption of the following:

- Use this unit conforming to the purpose of use described in the next section.
- The safety and quality of this product cannot be guaranteed if this manual and related manuals below are ignored when operating or maintaining this product or it is altered in any way or repaired using unspecified parts. We will not be liable for any accidents caused by these conditions.
- Any copying or reproduction of this manual, in whole or in part, without permission is prohibited.
- Due to the improvement of this product, the contents of this manual are subject to be changed without prior notice.

This manual contains information required for using this product properly. Not only the first-time users but also the users who have used this product in past times must read and understand this manual before using this product.




Also keep this manual in the place where this product is used to be checked immediately as necessary. To use this product, the manuals below are available in addition to this manual. Please read them as necessary.

Number in the figure	Function
AC-5 Measurement Application Operating Manual	The AC-5 measurement application handling is described.
AC-5 Analysis Application Operating Manual	The AC-5 analysis application handling is described.

1-2. Purpose of use

- Metal material work function measurement
- Ionization potential measurement for semiconductor materials and organic materials
- Density of states measurement

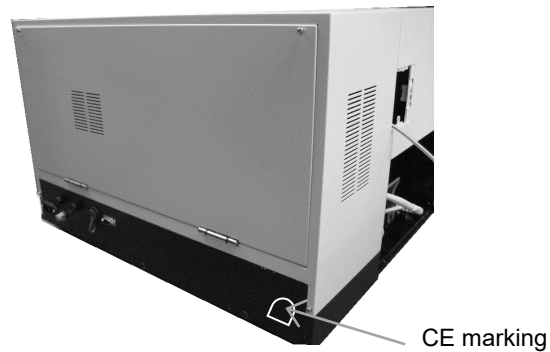
1-3. Definition of DANGER, WARNING, CAUTION, and NOTE

 DANGER	This message indicates that improper handling may cause serious damage on life, health or assets.
 WARNING	This message indicates that improper handling may cause serious damage on health or assets.
 CAUTION	This message indicates that improper handling may cause minor damage on health or assets.
NOTE	This message indicates advice on handling.

1-4. Method of confirmation for CE marking type

The CE marking is labeled on the detector in case of comply with CE marking. Please confirm the instrument specification before using. Please refer Declaration of Conformity that is at the end of this manual if you have CE marking type.

You can confirm instrument specification to see the CE marking as follows.



CE marking label (DC unit)

2

Important Notices on Safety

2-1. Warning cases



WARNING

Do not open the main unit cover while the unit is energized.

- High-voltage parts exist within the main unit; an electric shock may be generated.
- Never look at the ultraviolet lamp while it is lighting up with naked eyes because ultraviolet is being emitted from the lamp. Pain in the eyes and vision disorder will be caused.
- Never apply ultraviolet directly on your skin. Skin inflammations will be caused.
- Never touch the ultraviolet lamp while it is lighting up or immediately after the lamp is turned off because it is hot. Burn injuries will be caused.

Abnormal heat, smoke, sound or odor

In case any abnormality occurs during use, stop using the unit immediately, turn the power off, and disconnect the cable from the wall outlet. Continuing to use the unit in such situation may cause an electric shock or fire.

Shocks by dropping, etc.

Do not give a shock to the unit by dropping, crash, etc.

It may disturb the proper operation and measurement as this product consists of precision parts such as optical systems and automatic stages.

Use in locations with high temperature/humidity or dusty places

- Do not store or use the unit in locations with high temperature/humidity or dusty places. The unit's abnormal behaviors, electric shocks, fires, etc. may be caused. Use the unit within the use temperature/humidity range (15 - 35°C, 60%RH or less, and -30°C dew point or more).
- When the unit is exposed to large temperature differences, such as when it is moved from a low temperature place to a high temperature place, condensation may be formed on the surface or inside the unit. Using the unit in this situation causes failures. When the unit is relocated, leave it in a new installation site for a few hours to have it adjusted to the ambient temperature.

Power supply to be used

Use the unit only with the indicated power voltage. If not, damage of the unit, electric shocks, and fires will be caused.



WARNING

Connection of grounding terminal

For safety, connect the power cable to a grounded outlet (3P).
If the supplied conversion plug is used by necessity, ground an earth terminal.
Ignoring this may cause electric shock.

Power cable handling

Do not place anything on the power cable and do not pull, press, bend, or process the power cable.
Ignoring this may cause damage of the power cable, electric shocks, and fires.

Inserting/removing the power plug

- When the power cable is inserted to/removed from the outlet, the power plug must be held. If the cable is pulled, a part of the cable will be broken and cause fires.
- Check for dust attached to the power plug and insert the plug all the way. Do not use an outlet that may cause connection failures. It may result in fire.
- Do not insert the power cable to an outlet with a wet hand. An electric shock may be caused.

Avoid overloading electrical outlet.

Avoid connecting many power plugs to the same electrical outlet which can cause overloading. Not only does it pose a risk of fire, but it also affects other devices when the circuit breaker trips due to overloading. Also, it makes the product vulnerable to noise from the power source, thus causing malfunctions.

Intrusion of foreign substances

Do not put anything other than measurement targets in the unit from the sample door.
Also prevent metallic or flammable materials from entering the unit from a ventilator window or others.
If the unit is used while they are in the unit, malfunctions, electric shocks, and fires will be caused.



Caution, electricity

This label is attached on or inside of the unit to indicate that hazardous voltages may exist.



Caution, high temperature

This label is attached on or inside of the unit to indicate that the surface may be with hazardous high temperature.



Caution, ultraviolet

This label is attached on or inside of the unit to indicate that looking straight may cause vision disorder.



General warning

This label indicates that improper handling may cause serious damage on health or assets.

**WARNING****Placing anything on the unit**

Do not place a container filled with water, such as a vase and flower pot, or small metallic object like a pin and clip on the unit. Using the unit while such objects are inside the unit may cause failures, electric shocks, or fires.

Stage interlock

The interlock function does not allow the stage operation while the sample door is open.

Transfer/transportation

- Because the unit is heavy, be careful not to drop it and ensure the safety of operators when it is transferred or transported.
- Make sure that two or more persons carry the unit holding the bottom of it.

Installation

Install this product on a stable table with adequate strength.

2-2. Precautions



CAUTION

Use this product in a room such as a laboratory with stable temperature/humidity. Especially avoid installing the unit in places below. Ignoring this may result in failure or accident.

- Outdoors or places exposed to water
- Dusty or dump places
- Places with frequent vibrations
- Places with frequent temperature/humidity changes. Places with direct sun lights and wind from an air conditioner.
- Places with many chemical materials such as solvent/acid/alkali vapors and gasses in the air. Avoid noises from a high-capacity transformer, power sources for motors, driving power, etc. and others and noise sources of high voltage generators.

Contact with edges of metal, etc.

Be very careful when you need to touch the edges of steel sheets and others for relocation or other reasons.

Use of a transceiver near this product.

Note that emission of radio waves from a transceiver or others near this product or cables may disturb correct measurement. If a transceiver or others are used, they must be used in a place where they disturb nothing.

Order of power-on

Power on the main unit according to the PC application software.

Repower-on

When the power is turned on again, wait five minutes or more after the power off. If the power is turned on within five minutes, normal operations may be disabled.

Order of operation end

Exit the PC application software first, and then turn off the power of the main unit.

Cautions for compressed air

- Use compressed air for compressed air. Synthetic air made by mixing nitrogen and oxygen cannot be used.
- If the following substances are included in the compressed dry air, the unit may be degraded and damaged.

Type	Substances that must not be included
Solvent	Acetone, benzene, phenol, toluene, trichloroethylene, xylene, cresol, thinner, aniline, chloroform, alcohol, dioxane, tetrahydrofuran, methylene chloride, cyclohexanone, carbon tetrachloride, etc.
Acid	Sulfuric acid, nitric acid, hydrochloric acid, acetic acid, lactic acid, chromium acid, etc.
Gas	Chlorine gas, sulfurous acid gas, hydrogen sulfide, bromine, semiconductor manufacturing gas, etc.
Oil	Phosphoric ester hydraulic oil, fuel oil, soluble cutting oil (alkaline), kerosene, etc.

- Using the unit with higher pressure than the specified one may damage the dry air generator.
- Install the compressor in the same environment where the AC-5 is installed.
- Inducting liquid such as water from the compressed dry air tube will damage the unit.
- Inducting gases such as nitrogen gas, oxygen gas, and inactive gas other than air from the compressed dry air tube may damage the unit.
- Use a Teflon tube with a specified diameter for the compressed air piping.
- Use the tube supplied by RIKENKEIKI.

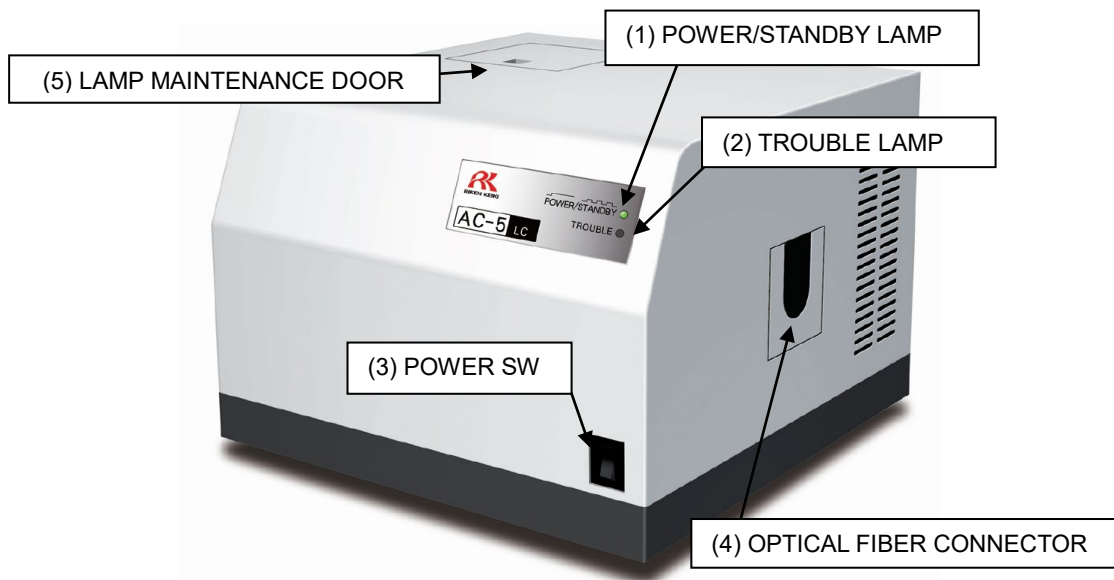
3

Product Functions

3-1. Names and functions for each part

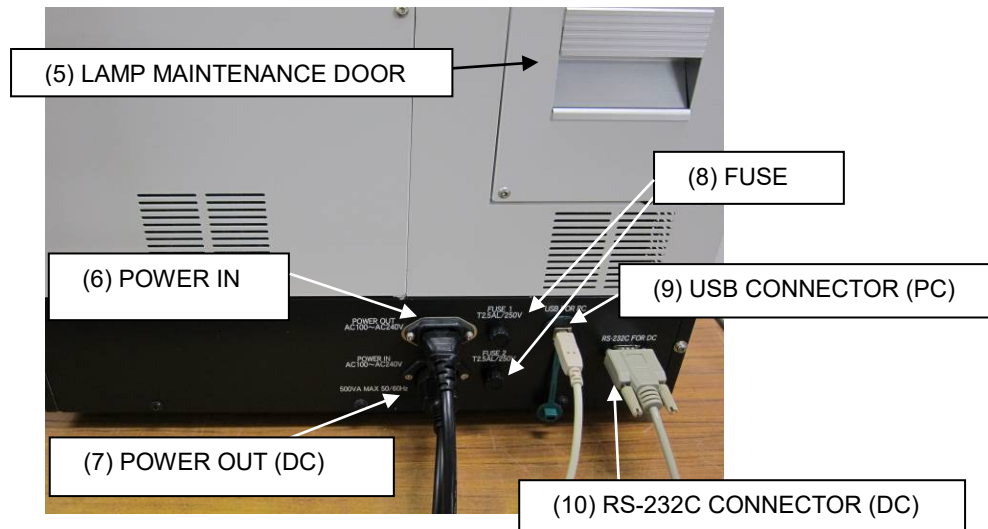
3-1.1. LC (Light source part)

[Front]



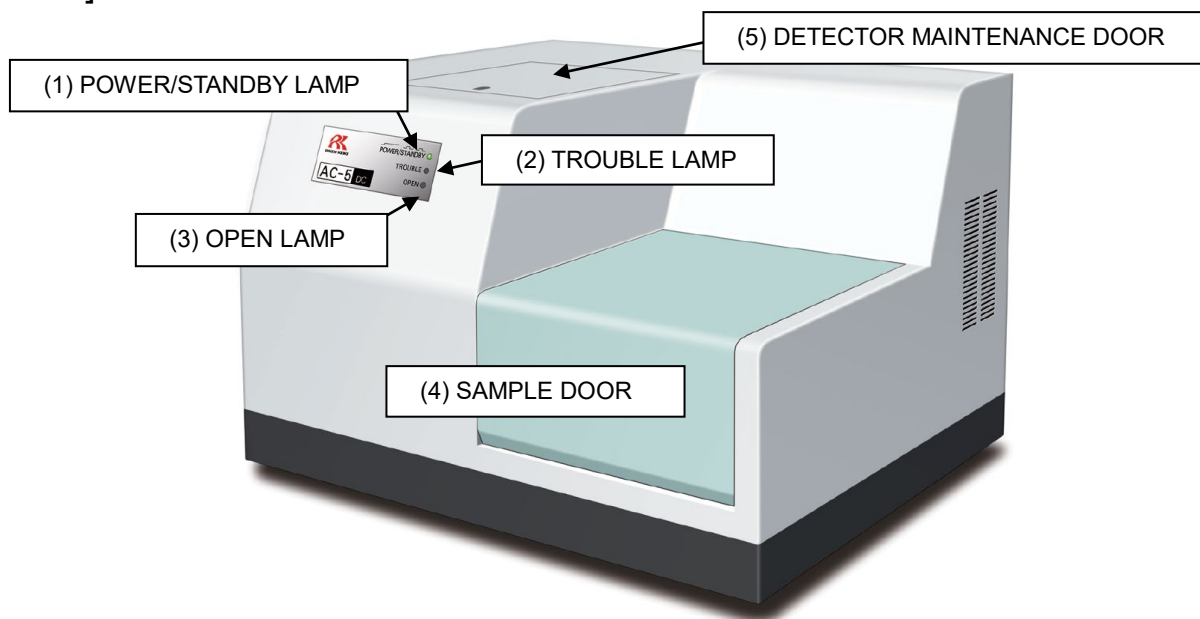
- (1) POWER/STANDBY LAMP: During measurement..... Lighting up in green
 During standby (warming-up) Blinking in green
- (2) TROUBLE LAMP: Normally..... Off
 Troubles occurred Lighting up in red
 During operation check (right after the power-on) .. Blinking in red
- (3) POWER SW: ON (|), OFF (O)

[Rear]



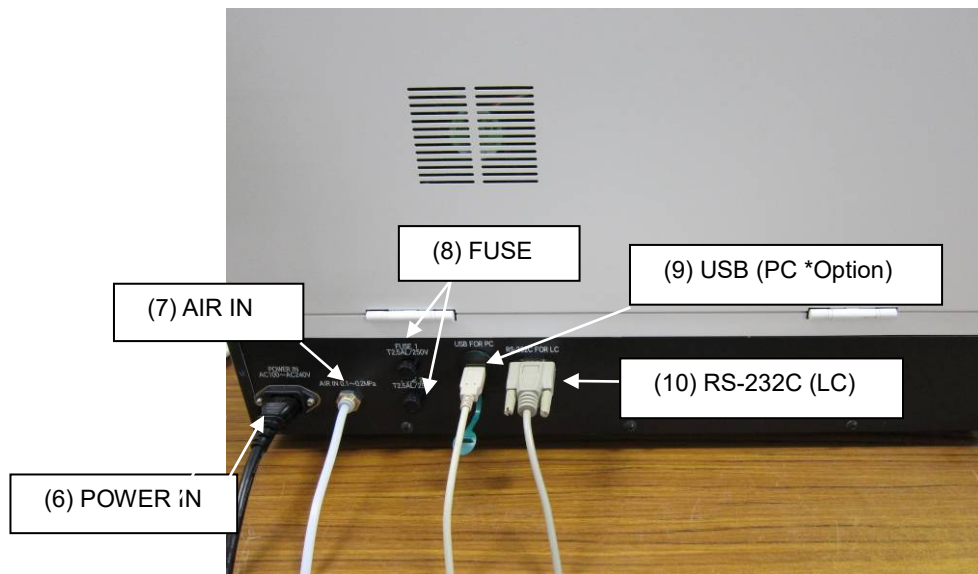
3-1.2 DC (Measuring part)

[Front]

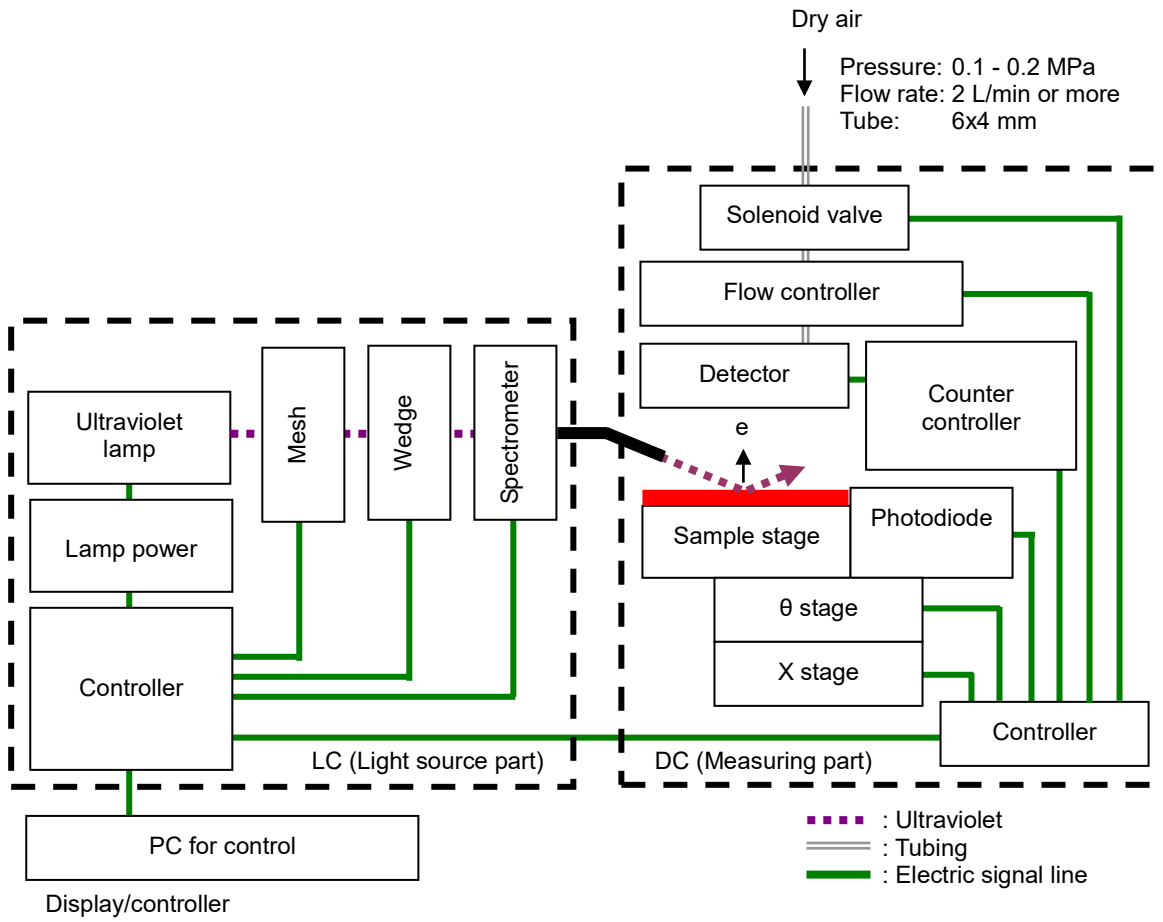


- (1) POWER/STANDBY LAMP: During measurement Lighting up in green
 During standby (warming-up) Blinking in green
- (2) TROUBLE LAMP: Normally Off
 Troubles occurred Lighting up in red
 During operation check (right after the power-on) ··· Blinking in red
- (3) OPEN LAMP: While the sample door is open Lighting up in orange

[Rear]



3-2. Block diagram



4

How to Use

4-1. WARNING and CAUTION for installation



WARNING

Make sure that two or more persons carry the unit holding the bottom of it.

Install this product on a table with adequate strength.

If it is used with methods other than we have specified, the protective functions provided by this unit may be deteriorated.



CAUTION

Use this product in a room such as a laboratory with stable temperature/humidity. Especially avoid installing the unit in places below. Ignoring this may result in failure or accident.

- Outdoors or places exposed to water
- Dusty or dump places
- Places with frequent vibrations
- Places with frequent temperature/humidity changes. Places with direct sun lights and wind from an air conditioner.
- Places with many chemical materials such as solvent/acid/alkali vapors and gasses in the air.

This product consists of sensitive electronic parts. Install it on a level surface in a stable place, with care not to drop or hit it against something.

Avoid noises from a high-capacity transformer, power sources for motors, driving power, etc. and others and noise sources of high voltage generators.

To prevent malfunctions caused by radio disturbance, a transceiver, mobile phone, and others should be used at least 1 m away from the unit.

Install the unit away from surroundings by 20 cm or more.

To remove the power plug immediately after an abnormality occurs, separate the rear side from the surroundings by 20 cm or more.

4-2. Cable connection

Connect the cables in the order below:

- (1) Connect LC and DC with the supplied power cable.
- (2) Connect LC and DC with the supplied RS-232C cable.
- (3) Connect LC and PC with the supplied USB cable.
- (4) Connect the supplied power cable to LC.
- (5) Connect DC and PC with the USB cable from the connector for a camera. (Option)



CAUTION

The cable connection shall be performed by our service engineer. Request service engineer for cable connection.

4-3. Tubing

- (1) Use the following teflon tube as the tube material.
Outer diameter: $\phi 6$ mm, internal diameter: $\phi 4$ mm, pressure resistance: 0.3 MPa or more
- (2) Check that the tube is cut vertically, circular in cross-section, and has no outer cracks.
- (3) Make sure to insert the tube all the way, and then pull it to check that it does not come off.
- (4) Connect it to the supply source (Pressure: 0.1 - 0.2 MPa).

4-4. Optical fiber connection



CAUTION

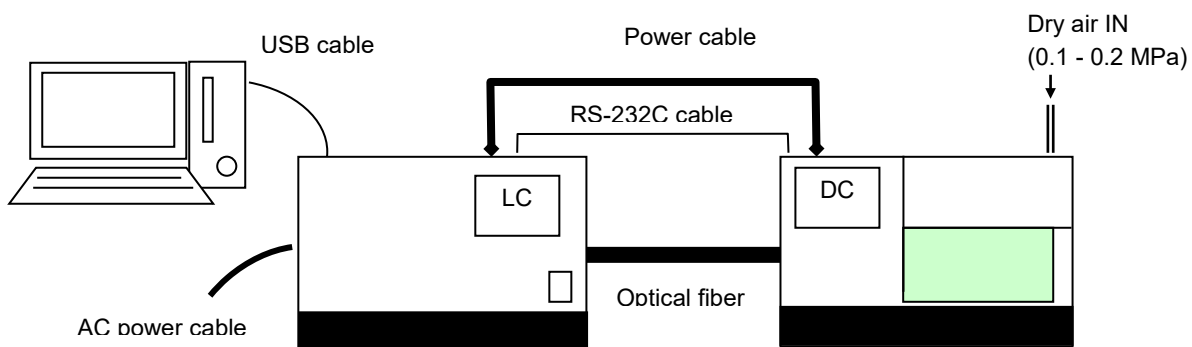
The optical fiber connection shall be performed by our service engineer. Request service engineer for optical fiber connection.

5

How to Operate

5-1. Check items

- Wiring: Check for correct connection of the main unit, PC, and others.
- Tubing: Check that the specified requirements (tube materials, pressure, etc.) are observed.



- * The number of USB cables is one for the unit with the standard specifications and two for one with an embedded camera (optional specifications).
- If the wall outlet has a switch, turn it ON. Also, understand the following and then turn on the power.
- Make sure that the power voltage matches the one displayed on this product.
- Connect the power cables of LC and PC to a grounded outlet.



WARNING

About grounding (earth)

- To prevent electric shocks, never fail to connect the power cables to a grounded outlet (3P).
- If the supplied conversion plug is used by necessity, ground the earth terminal.

5-2. Power on

Turn on the power in the order below:

- (1) Turn on the PC.
- (2) Check that the Windows is up.
- (3) Turn ON (| side) the power switch on the LC front panel.

5-3. Measurement

Use AC-5 measurement application for the measurement. For details, see "AC-5 Measurement Application Operating Manual".

In addition, note the following for correct measurement.



CAUTION

- (1) Prevent sample contamination as much as possible. Use tweezers or others when a sample is handled. Also, be careful not to blow out a breath or others to the sample.
(To prevent absorption of water or others in an exhaled breath)
- (2) Dust is much smaller than the measurement area; therefore, it does not affect the measurement in many cases. If you are worried about the dust, remove it with tweezers or blow it off with an air duster or others.
- (3) More than 90% of emitted ultraviolet is emitted on the square of 4mm at the center of the sample stage. Therefore, the square becomes the measurement area. If more than two types of materials exist on the surface of the measurement area, photoelectrons are emitted from the both materials. Also, extremely weak ultraviolet is emitted around the measurement area.
- (4) Use a sample stage corresponding to the thickness of the sample to be measured. Enter the incident UV with an angle of 30 degrees to the measurement surface from the optical fiber side. Therefore, when the height has 0.2 mm of misalignment, the emission location will have 0.35 mm of misalignment.
- (5) Be careful when a sample which is equal to or smaller than the measurement area is to be measured. For example, when the characteristics of the photoemission from ITO which has the patterning of 4 mm square on 20 mm aluminum plate square, even if the location and height are adjusted very strictly, about 10% of ultraviolet will be emitted on the aluminum. Because 50 times of ITO or more photoelectrons are emitted from the aluminum, this measurement result indicates the photoemission characteristics from aluminum. In this case, it is recommended that masking is executed with tapes or others which does not emit photoelectrons.
- (6) Measure the photoelectron counting rate in the area of 4000 cps or less. Because of the correction, the counting of 4000 cps or more provides dramatically-degraded accuracy. In addition, adjust the photoelectron counting rate with the UV intensity.

5-4. Analysis

Use the AC-5 analysis application for the analysis. For details, see "AC-5 Analysis Application Operating Manual".

6

Maintenance Check

To maintain the performance of this product and improve the reliability, perform regular maintenance and check.

6-1. Daily maintenance

6-1.1. Display lamp check

Check that POWER/STANDBY, TROUBLE, OPEN LAMPS are lighting up correctly.

- POWER/STANDBY LAMP: During measurement Lighting up in green
During standby (warming-up) Blinking in green
- TROUBLE LAMP: Normally Off
Troubles occurred Lighting up in red
During operation check (right after the power-on) ·· Blinking in red
- OPEN LAMP: While the sample door is open Lighting up in orange

6-1.2. Sample room check

Before the power is turned on, open the sample door to check for internal contaminants. If any contaminants exist, remove them with the following method:

- (1) Vacuum off powdery contaminants with a sweeper or something.
- (2) Wipe off contaminants attached to the stage with isopropyl alcohol.
- (3) If liquid such as solvent is used for contaminants removal, open and leave the sample door for a few hours, and use the unit after volatile matters are discharged from the sample room.



CAUTION

If the measurement is performed while charged fine powders and volatile solvent are left in the sample room, the detector may be damaged and have resulting shorter life.

Isopropyl alcohol is a combustible liquid; therefore, it may catch fire. Handle it with care.

6-2. Consumables



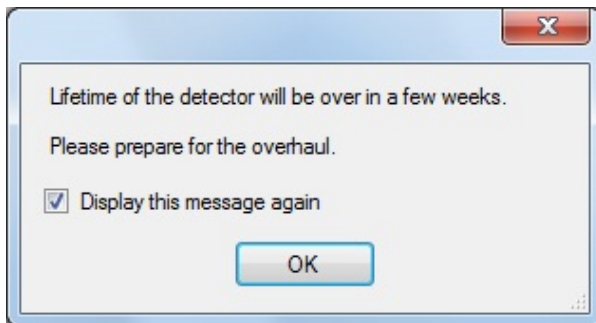
CAUTION

The consumables replacement shall be performed by our service engineer. Request RIKEN KEIKI for consumables replacement.

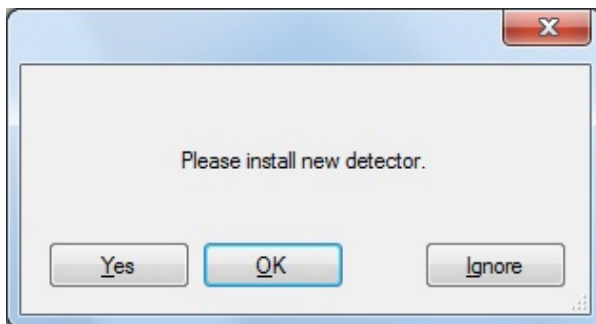
The following three consumables are for this product.

6-2.1. Detector

Contaminants on the anode of the AC-5 detector (LE-6118) disable the measurement. The following message is a notice message to indicate that the detector replacement time is near.



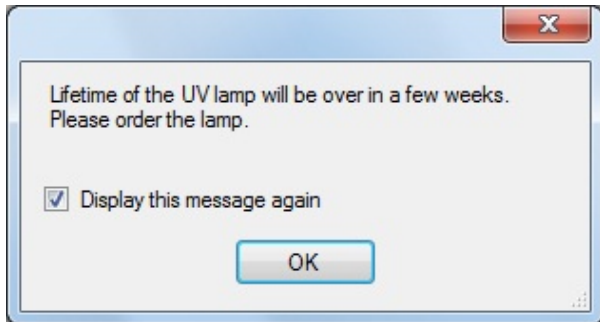
When the following message is displayed, the detector life has expired.



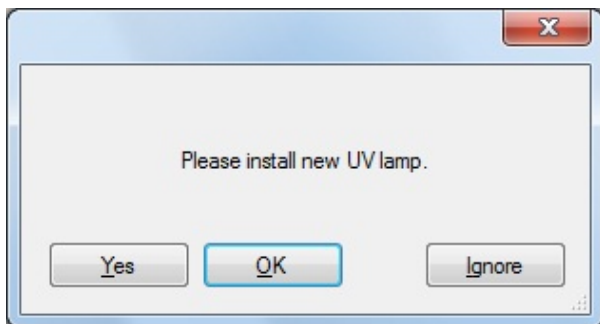
The detector must be replaced if this message is displayed or degradation phenomena such as lowered detection efficiency, high noises, and measurement values variation occur. The rough idea for the replacement period is one year, although it depends on the use frequency.

6-2.2. Lamp

The following message is a notice message to indicate that the lamp replacement time is near.



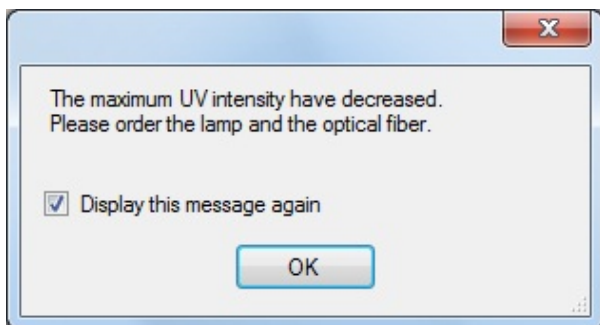
When the following message is displayed, the lamp life has expired.



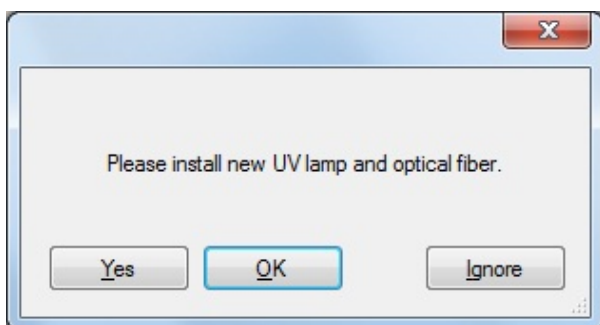
The lamp must be replaced if this message is displayed. The rough idea of the lamp life is 1500 hours.

6-2.3. Optical fiber

The following message is a notice message to indicate that the replacement time is near.



When the following message is displayed, the lives have expired.



They must be replaced if this message is displayed or the UV intensity to be used for the measurement becomes unavailable. The rough idea for the replacement period is one year, although it depends on the use frequency and used UV intensity.

7

Measures for Abnormalities

7-1. Diagnosis of abnormalities

This product includes a self-diagnosis function to check functions when it is started and while it is running. If an abnormality is detected, normal measurement is unavailable. Determine the cause and take a proper measure.

In addition, the unit notifies of an abnormality with the following two methods:

- AC-5 behavior:
When the main unit has an abnormality, TROUBLE lamp lights up (red).
- Control PC behavior:
When the TROUBLE lamp (red) is lighting up, an abnormal signal is received and displayed on the screen.
When the software has an abnormality, an error message is displayed on the screen. For details, see "AC-5 Measurement Application Operating Manual".



CAUTION

If the main unit and controller go out of control with an expected cause, the TROUBLE lamp may not light up or an error message may not be displayed. Turn the power off and disconnect the cable from the outlet.

7-2. User actions for abnormalities

Stop the operation to remove the abnormality causes seeing the next section. After the cause is removed, restart the product to check for reoccurrence of the abnormal phenomenon.

If the abnormality reoccurs without a clear cause or different abnormalities occur continuously, record the screen display of the control PC and the abnormal phenomenon, and contact RIKEN KEIKI.

If the abnormal phenomenon may damage a human body and object, contact RIKEN KEIKI immediately without reoccurrence confirmation.

When abnormal data is measured, never fail to save the data. This data helps the abnormality cause determination in many cases.

7-3. When you suspect a failure

- Impossible Power ON

Possible cause	Remedial action
The power cable plug is not inserted.	Turn OFF the switch of the main unit and insert the power cable to the correct outlet.
The power is not supplied to the outlet.	
The power fuse has blown out.	Check the cause of the fuse blowout. If there is no problem, replace the fuse.
LC rear circuit breaker has tripped.	Turn OFF the switch of the main unit, switch on the breaker, and then turn ON the power switch.

How to replace fuse

- Turn the cap of the fuse holder counterclockwise to remove it.
- Replace the fuse attached to the cap with a new one.
- Put back the cap.



CAUTION

Use a specified fuse.

If fuses others than the specified one are used, damages of the unit or abnormal operations may occur.

Fuse specifications and characteristics

250 Aac T2.5AL

- The power is turned on but the unit does not start normally.

Possible cause	Remedial action
The sample door cover is open.	Close the cover completely. The unit will start automatically.

- The AC-5 measurement application is up but communications are unavailable.

Possible cause	Remedial action
Communication cable (USB, RS-232C) connection failure	Reconnect the communication cable (USB, RS-232C).
Communications error with momentary electromagnetic noises	Restart the unit and the AC-5 measurement application.

- The TROUBLE lamp (red) blinks for a few minutes right after the power-on.

Possible cause	Remedial action
Blinking to indicate operation check	If it goes off after a few minutes, there is no failure.

- The TROUBLE lamp (red) lights up.

Possible cause	Remedial action
The compressed air pressure has become lower.	Check the compressed air and restart the main unit.
The ultraviolet lamp is not lighting up.	(1) Restart the main unit. (2) Replace the ultraviolet lamp.
The fan is not rotating.	Restart the main unit.

- The anode voltage setting is unavailable.

Possible cause	Remedial action
The detector has failed.	Replace the detector.

8

How to Stop Operation

- (1) If the AC-5 measurement application is running, exit it.
- (2) Switch the power switch on this product (LC) front panel from ON (I side) to OFF (O side).
- (3) Stop the supply of dry air.

NOTE

Even if this product is turned OFF, the AC-5 analysis application can be started to check the already measured data.



CAUTION

Never fail to exit the measurement application before the unit power is turned OFF. If the unit power is turned OFF while the AC-5 measurement application is running, the measurement application may have an error.

9

Definition of Terms

Slope

A slope of the graph for the incident UV energy and photoelectron yield. It becomes the rough indication of photoemission.

Threshold energy

This is the threshold energy of photoemission.

Work function

The minimum energy needed to remove an electron from a solid surface.

Ionization potential

The minimum energy necessary for molecule ionization. The energy of the top of the valence band.

State density

The number of states which exist between energy $E+dE$

Incident UV energy

Energy of incident UV 1 photon. It can be obtained with the incident UV wavelength by the formula below:
Energy [eV] = $1240/\text{Wavelength [nm]}$

Incident UV intensity

All energy of incident UV per unit time. It can be obtained with photodiode output current.
UV intensity [nW] = Number of incident UV photons per second x Energy [eV]/0.625

Light intensity correction

To correct the difference of incident UV intensity for each energy for the work function and ionization potential measurement. Assuming that the number of photoemissions is proportional to the irradiation UV intensity, correction is made with the formula below:

Calculated value after correction = counting rate before correction/number of incident UV photons X
Number of 5.90 eV incident UV photons

10

Detection Principle

10-1. Photoelectron detection principle

The AC-5 uses the open counter which can count photoelectrons in the air. Figure 10-1.1 shows the principle diagram of the open counter.

The sample is placed right under the detector, and the sample potential is 0 V. The detector consists of doubly overlapped metal grids (a suppressor grid and quenching grid) and metal wire (anode). And in the initial status they are applied with 80 V, 100 V, and about 2600 V potential respectively.

Electrons emitted from the sample surface due to irradiation by UV collide with gas molecules during drifting and moves for the suppressor grid. Next, in the process, they attach to oxygen molecules and enter within the detector with the oxygen molecules as carriers to go near the anode. When the O₂-ion arrives near the anode, O₂-ion gains a kinetic energy. At the time of collision of O₂-ion with the gas molecules in air, electron is detached from the O₂-ion and then the electron is accelerated again to the anode. The accelerated electrons strike the gas molecules and produce additional electrons. This phenomenon is called an electron avalanche. The electrons multiplied with the electronic avalanche are gathered to the anode and generate electric pulses in external circuits. These pulses are caught by the electric circuit for electrons to be counted.

The electronic avalanche caused by electrons entered to the detector generates many positive ions also. Because the positive ions are large in mass, they move for the sample surface slower than electrons, but the electronic avalanche occurrence with the next electron may become unstable and crash to the sample occur.

Therefore, the electric circuit catches the signal pulses to count and simultaneously makes the quenching grid and suppressor grid potentials to 400 V and -30 V respectively only for 2 msec. The electron avalanche is suspended due to reduction of the electric field around the anode. During this, the positive ions are neutralized by both grids and disappear. Also, the suppressor grid prevents positive ions from crashing to the sample and prevents electrons from entering to the detector until positive ions disappear.

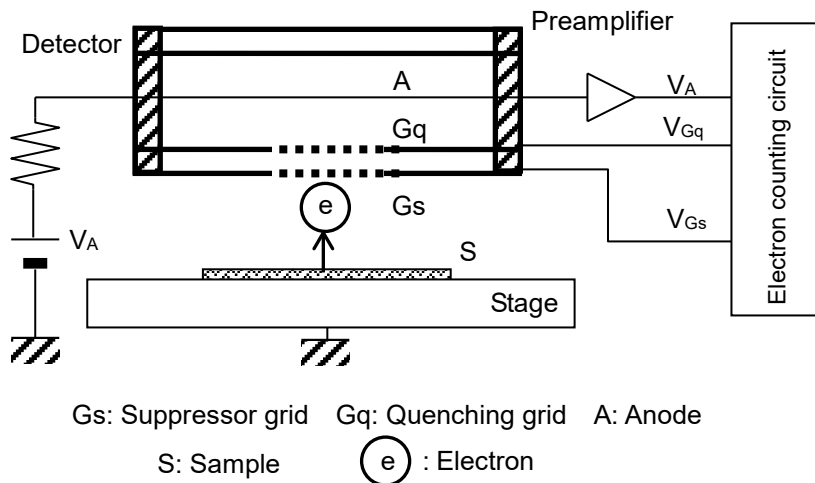


Figure 10-1.1 Open Counter Configuration Diagram

10-2. Photoelectric work function measurement

The AC-5 consists of the ultraviolet lamp, light adjuster, spectrometer, open counter, controller, X-θ stages, and personal computer as shown in Figure 10-2.1.

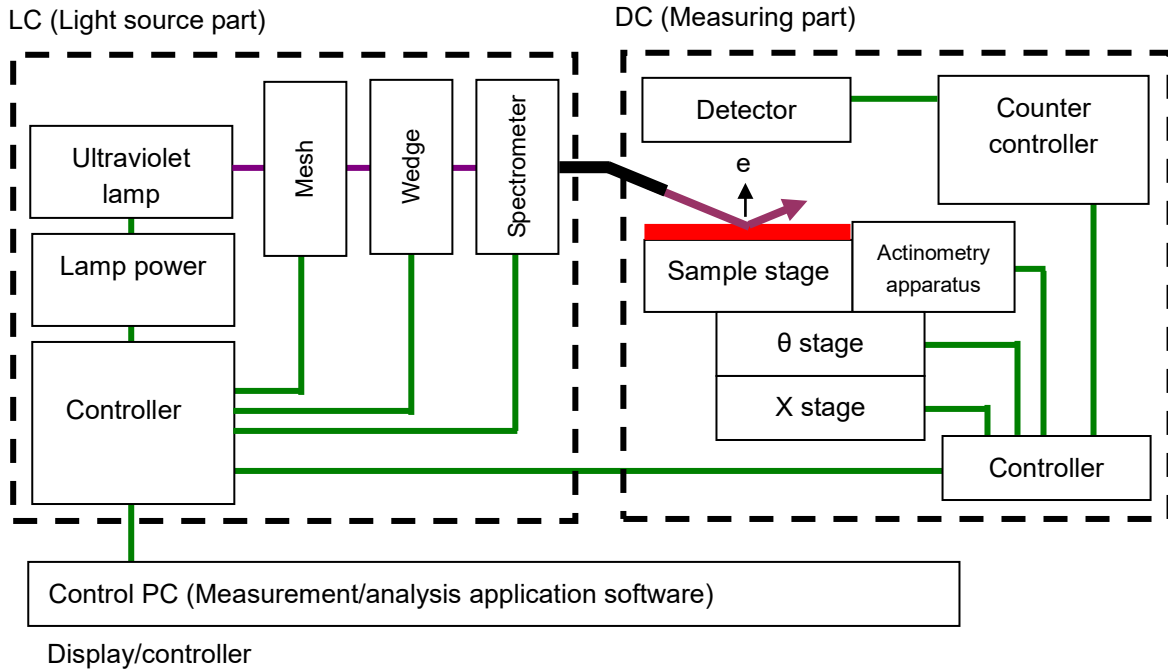


Figure 10-2.1 AC-5 Configuration Diagram

The light of wavelength 200 to 364 nm came from the ultraviolet lamp is dispersed to arbitrary wavelength with the spectrometer and emitted to the sample surface. The energy of one photon E is 6.2 to 3.4 eV when it is converted with $E=hc/\lambda$ (h : Plank's constant, c : Light speed, and λ : Wavelength). Photoelectron is emitted due to irradiation by UV photons whose energies are larger than the threshold energy. This energy is called a photoelectric work function. The photoelectric work function is considered as a work function for samples of metal and as a ionization potential for semiconductors.

As shown in Figure 10-2.2, when the horizontal axis represents the incident UV energy and the vertical axis represents the photoelectron yield actual measured value 0.5 power (square root), a straight line is obtained if the sample is metal. And the photoelectric work function is obtained from the intersection of the extrapolating straight line obtained with the least-square method and the background line. Also, the slope of the extrapolating straight line reflects, the surface contamination, oxidized film thickness, and others.

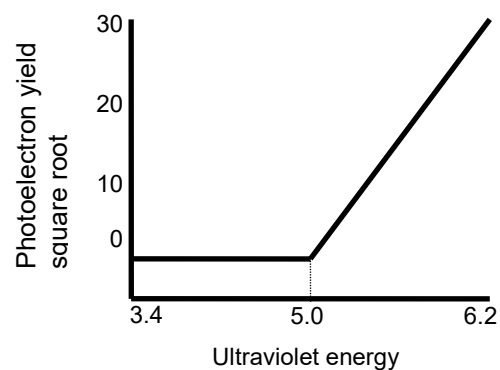


Figure 10-2.2 Relation of Ultraviolet Energy and Electrons

11

List of Product Specifications

11-1. Product specifications

11-1.1. Specifications of the main unit

Item	Standard specifications	Optional specifications
Model	AC-5	----
Measurement principle	Low energy electron counting method	----
Photoelectron measurement energy scan range	3.4 to 6.2 eV (364 to 200 nm)	----
Actinography energy scan range	3.4 to 6.2 eV (364 to 200 nm)	----
Repetitive accuracy (Standard deviation)	Work function 0.02 eV (Sample: Metal plate) Slope 1.0 Y/eV (When averaged slope 20 to 30 Y/eV)	----
Measurement time	Standard time necessary for work function measurement: (5 sec/1 energy)	----
Maximum count	4,000 cps	----
Ultraviolet lamp	D ₂ lamp	Xe lamp
Minimum UV intensity	1.0 nW or less (at 5.9 eV)	5 nW or less
Maximum UV intensity	500 nW or more (at 5.9 eV)	2,500 nW or more
Ultraviolet spot size	2 to 4 mm-square	----
Spectrometer	Grating monochrometer	----
Sample	195 mm X 195 mm Max Thickness 1.0 mm±0.2 mm	2 to 10 mm
Sample stage	195 mm X 195 mm Max For thickness 1 mm	For sample changer

Operating environment conditions	<ul style="list-style-type: none"> • Operation location: Indoor • 2000 meters above sea level or lower • TRANSIENT OVERVOLTAGES up to the levels of OVERVOLTAGE CATEGORY II • Short-term TEMPORARY OVERVOLTAGE: 1440 V • Long-term TEMPORARY OVERVOLTAGE: 490 V • POLLUTION DEGREE 2 	----
Power supply	100 - 240 VAC \pm 10 % 50/60 Hz 500 VA (MAX)	----
Power consumption	Approx. 240 W (only the main unit)	----
External dimensions	AC-5 LC (Light source part): About 470(W)X500(D)X300(H)mm AC-5 LC (Measuring part): About 600(W)X500(D)X380(H)mm	----
Weight	AC-5 LC (Light source part): About 35 kg AC-5 DC (Measuring part): About 50 kg	----

11-1.2. Display/controller specifications

Item	Specifications
Display	Size: 17 inch or more Resolution: 1024 x 768 or more
Control computer (PC)	Desktop type Processor: 1 GHz or more 32-bit (X86) processor Memory: 1 GB RAM Hard disk: 16 GB free space DirectX® 9 graphic processor with Windows Display Driver Model (WDDM) 1.0 or more USB port: two ports or more CD-ROM or DVD-ROM drive Mouse
OS	Windows 7 (32-bit version)

11-1.3. Software (measurement/analysis) function specifications

Functions	Details
Work function measurement	Photoelectron spectrum is measured to decide the work function or ionization potential.
Automatic UV intensity adjustment function	When the target UV intensity is input, the irradiation UV intensity is automatically adjusted.
Automatic device startup function	The device initial and detector anode voltage are set automatically.
Cut and paste function	The measured data can be used for other types of application software with the cut and paste function. (Some applications may be unavailable with the function.)
Repetitive measurement function	Repetitive measurement is executed.
Average calculation function	Averages of multiple data items can be calculated.
Differential calculation function	Differential values are calculated to support the state density measurement.

11-2. List of configuration

11-2.1. Standard components

Product name	Model	Quantity	Remarks
Measuring part	AC-5 DC	1	See the specifications of the main unit.
Light source part	AC-5 LC	1	See the specifications of the main unit.

11-2.2. Standard accessories

Product name	Quantity	Remarks
Display	1	See the display/controller specifications.
Personal computer	1	See the display/controller specifications.
Printer	1	See the display/controller specifications.
Operating system	1	See the display/controller specifications.
Power cable for LC	1	
Power cable for DC	1	
Conversion plug	1	
Communication cable (for PC-LC)	1	
Communication cable (for LC-DC)	1	
Detector	1	
Optical fiber	1	See the specifications of the main unit.
Ultraviolet lamp	1	See the specifications of the unit.
Reference sample	1	
Reference sample holder/cover	1	
Tweezers	1	
System software (CD-ROM)	1	
Operating manual	1	
Warranty	1	

11-2.3. Optional accessories

Product name	Remarks
Dedicated sample stage	Sample planar shape: 195 x 195 mm or less Specify the sample thickness within the range of 2.0 mm to 10.0 mm by 1.0 mm.
Sample changer (For plate sample) sample stage	25 sample sheets (max). Shape 10 x 10mm (min), 30 x 30 mm (max), thickness 0.2 mm (min) 2.0 mm (max)
Sample changer (For powder sample) sample stage	25 sample trays (max). Common for depth 1.0 mm and 0.5 mm
Powder sample tray (depth 1.0 mm)	30 trays/set
Powder sample tray (depth 0.5 mm)	30 trays/set
Embedded camera	With a USA cable
Xe lamp unit	(Note) Contact RIKEN KEIKI.
Dry air generator	Tube <ul style="list-style-type: none"> • O.D.Φ6 mm, I.D.Φ4 mm • Pressure proof 0.3 MPa or more Use a teflon tube.
Software for the sample changer	
Software for multipoint measurement	

11-2.4. Option (maintenance parts, etc.)

Product name	Remarks
Detector	
Optical fiber (For spot size 2-4 mm)	
Optical fiber (For spot size 1-2 mm)	
D ₂ lamp	
Xe lamp unit	(Note) Contact RIKEN KEIKI.
Activated carbon for ozone filters	

RIKEN KEIKI Co.,Ltd.

2-7-6 Azusawa, Itabashi-ku, Tokyo, 174-8744, Japan

Phone: +81-3-3966-1113

Fax: +81-3-3558-9110 GⅢ

E-mail: intdept@rikenkeiki.co.jp

Web site: <http://www.rikenkeiki.co.jp>

- AC-5 Measurement Application Operating Manual -

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1

Before Using

This chapter describes the information to be known before using this application.

1-1. Overview

Thank you for using our "AC-5 Measurement Application." This document includes the description of how to measure using the AC-5. Never fail to read the following "Software License Terms" and "Precautions" to use this software. Also never fail to read the contents of this document to use this software correctly.

1-2. Software license terms

Only when the following terms are agreed, this software use shall be granted. Also, when this software is started to be used, the agreement to the following terms shall be assumed.

1. License

RIKEN KEIKI (hereinafter we) shall grant the non-exclusive license of this software to customers under the condition specified in this license terms.

2. License range

Customers cannot use, copy, alter, adapt, or reprocess this software in whole or in part or lend or transfer it to a third party except as allowed in this license terms.

3. Copyright

The copyright of this software, manuals, and others shall belong to us and any rights shall not be given to customers except the license of this software granted with this license terms.

4. Contract term

The license of this software shall start at the point when the customer starts using this software.

5. Warranty

We shall not warrant anything about this software such that this software has no defect.

6. Indemnity

We shall not take any responsibility for any reason for customers' lost earnings, losses occurred with exceptional circumstances (including cases where we have foreseen or could have foreseen the loss occurrence), and direct/indirect losses based on the request for indemnity executed by a third party for customers which occurred in association with this software under any circumstances.

7. Contract termination

Customers immediately shall terminate the contract and discard all of this software and its duplicates when customers violate any of these license terms.

8. Others

When this software is brought out of Japan, Japanese export control rules shall be complied with.

Regardless of the country where this software is actually used, Japanese laws shall be applied to this contract.




1-3. Precautions

This document is described on the assumption of the following:

- The AC-5 units and personal computer have been installed and set correctly.
- The AC-5 for Windows has been installed correctly.
- The user understands the Windows operation method.
- The user understands the meanings and relation with the photoemission of the work function, ionization potential, and state density.
- It is prohibited to reproduce the contents of this document without permission.
- The contents of this document are subject to be changed in the future without prior notice.
- We take all possible measures to ensure the contents of this document; however, if ever questionable or missing descriptions are noticed, please contact RIKEN KEIKI.
- MS, Microsoft, and Windows are registered trademarks or trademarks of the US Microsoft Corporation in each country. Other company names and product names used in this document are registered trademarks or trademarks of each company in general.

Please read the AC-5 operating manual and operating manuals for Windows before you read this document.

1-4. Definition of DANGER, WARNING, CAUTION, and NOTE

 DANGER	This message indicates that improper handling may cause serious damage on life, health or assets.
 WARNING	This message indicates that improper handling may cause serious damage on health or assets.
 CAUTION	This message indicates that improper handling may cause minor damage on health or assets.
NOTE	This message indicates advice on handling.

1-5. How to use this document

If the user uses the AC-5 for the first time, prepare the supplied sample and tweezers to measure according to this document. For the setting conditions and others necessary for the measurement, refer to the example.

If the user has already used it, execute the measurement with reference to **NOTE**.


Please read this document carefully for correct measurement.

2

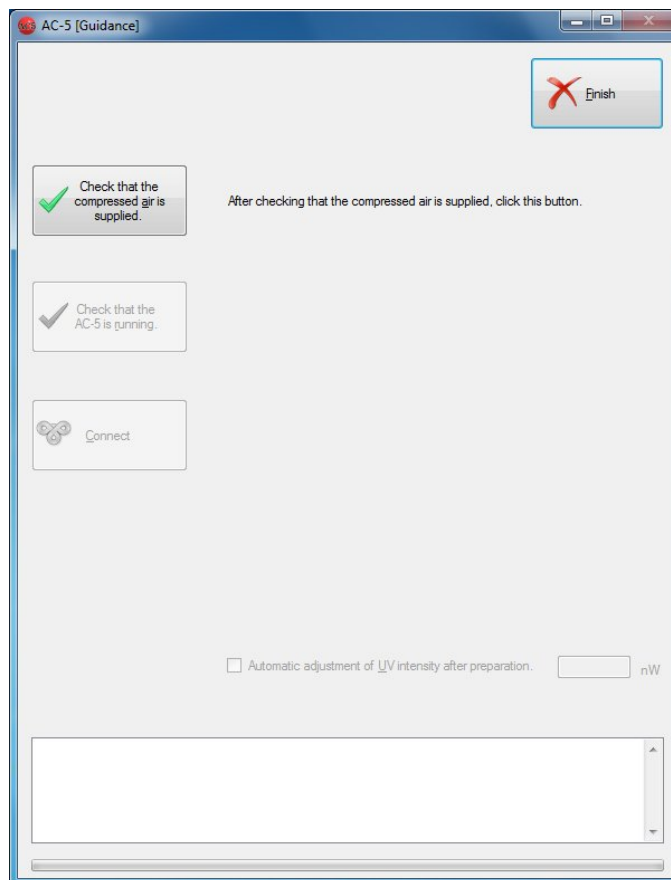
Equipment and System Preparation

The preparation for measurement with the AC-5 is described.

- (1) Turn on the personal computer to start Windows.
- (2) Start this application. Select it from the programs of the start menu or double-click on the shortcut icon created on the desktop.

Shortcut icon 

- (3) After the splash screen is displayed, the guidance screen is displayed.



- (4) Supply the compressed air. If it is supplied with the compressor, turn ON the compressor. If it is supplied from the factory tube, open the supply source.
- (5) Check the compressed air supply and click on "Check that the compressed air is supplied" button.

- (6) Turn ON (| side) the power switch on the LC front panel.
- (7) Warm-up is started with the power-on. (POWER/STANDBY lamp (Green) blinks. It lights up continuously after the warm-up is completed (after about 30 min..))
- (8) Click on "Check that the AC-5 is running" button.
- (9) Check that the TROUBLE lamps on the LC and DC front panels finish blinking and click on "Connect" button.



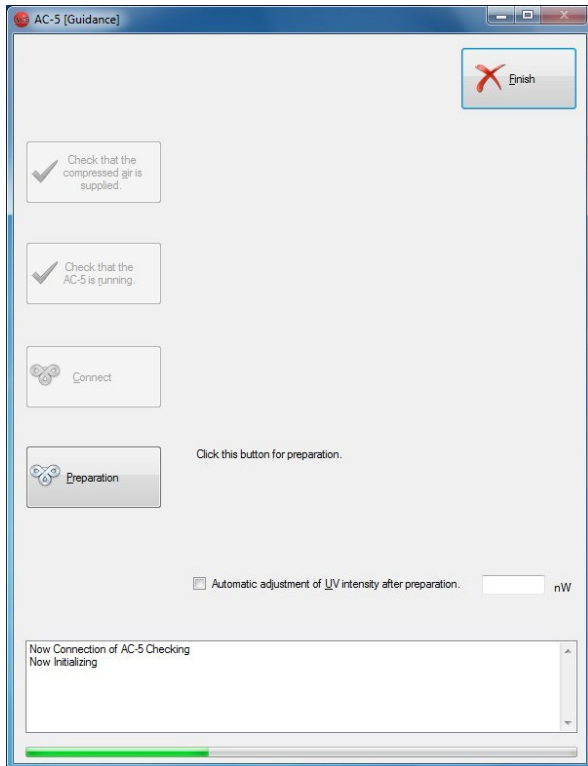
CAUTION

- Clicking on Connect button while the TROUBLE lamp is blinking may cause malfunctions of the units.
- If the consumables replacement message is displayed, replace the consumables according to "Consumables Replacement Method."

NOTE

When the TROUBLE lamp lights up, any trouble has occurred. Click on "Connect" button, record the displayed error number, turn off the unit power, and contact RIKEN KEIKI to inform of the error number.

When the connection is succeeded, the screen below is displayed.



- (10) Click on "Preparation" button.

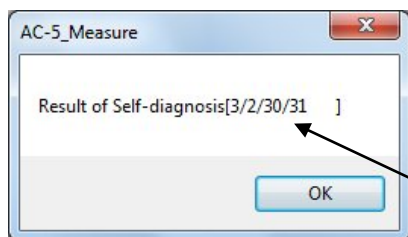
"Preparation" is started after the main unit warm-up is completed. "Preparation" means the light adjuster initialization and detector voltage setting. The current status is displayed in the status window.



CAUTION

If an error is found with the unit self-diagnostic, an error message is displayed. Also, the TROUBLE lamps (Red) of the units light up.

- For the compressed air (for the error string 3/2/30/31)



Error string

Check the compressed air supply and click on "OK."

- For other errors
Contact RIKEN KEIKI to inform the error string.

NOTE

Check the "Automatic adjustment of UV intensity" checkbox, input the specified UV intensity in the text box, and then click on "Preparation" for automatic UV intensity setting and UV intensity correction coefficient measurement after units preparation completion.

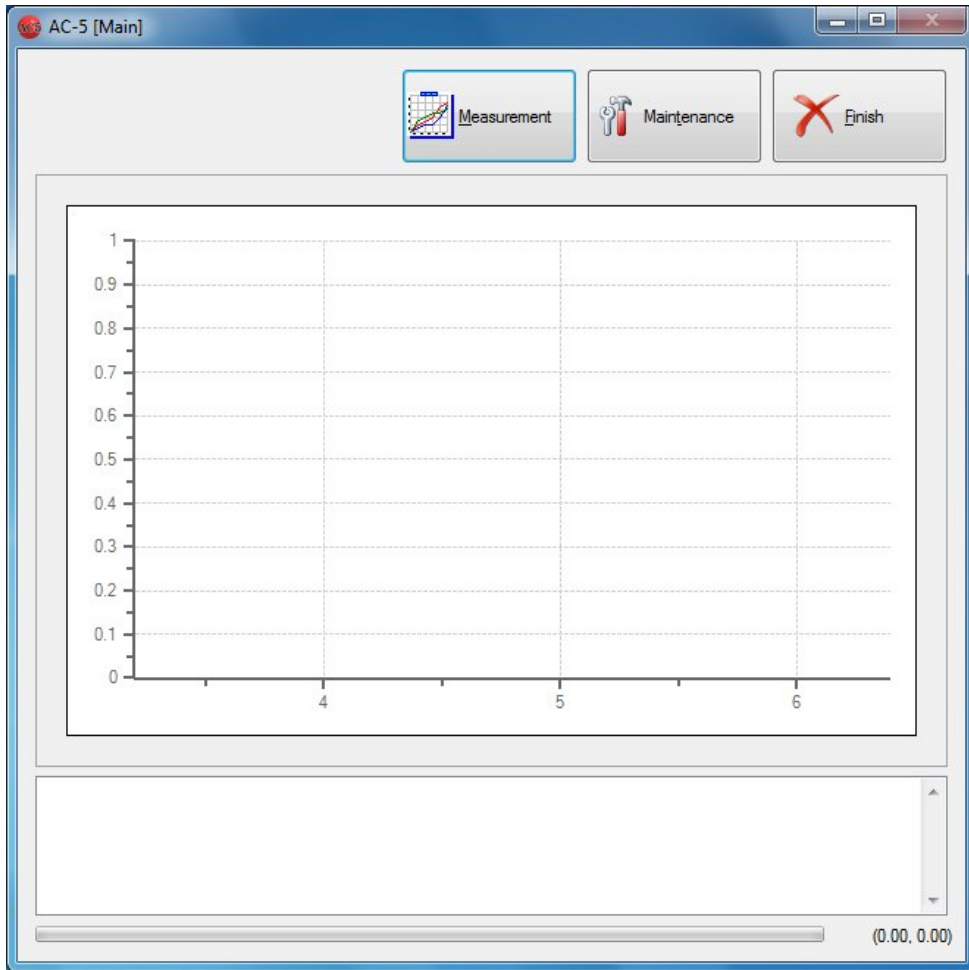
* Measure the UV intensity correction coefficient for 3.4 to 6.2 eV by 0.05 eV step.



CAUTION

Depending on the specifications of the OS, executing process by this application or other applications during connection or measurement may disable the connection with the main unit. Do not operate other processes with the computer while the process which communicates with the main unit such as connection and measurement is being executed with it.

(11) After "Preparation" is completed, the main screen is displayed.



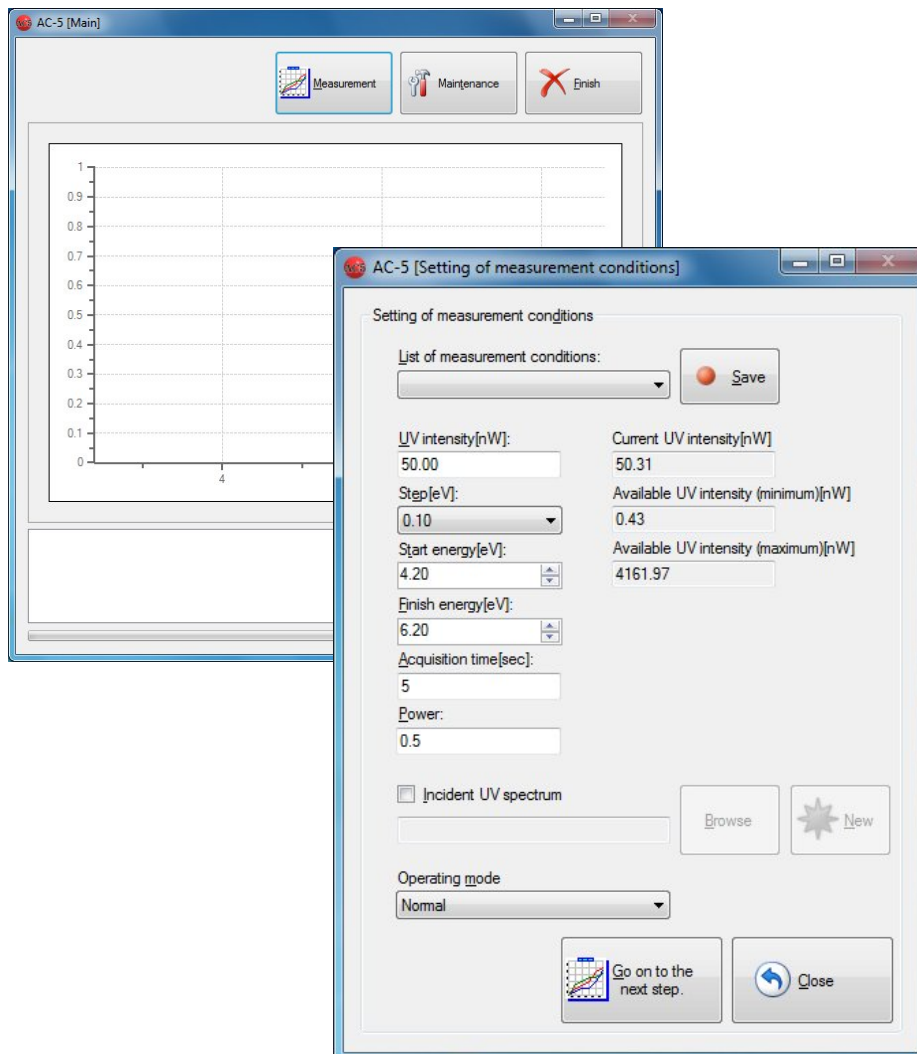
3

Measurement Basic Operation

This chapter describes basic operations along the measurement procedure.

3-1. Setting measurement condition

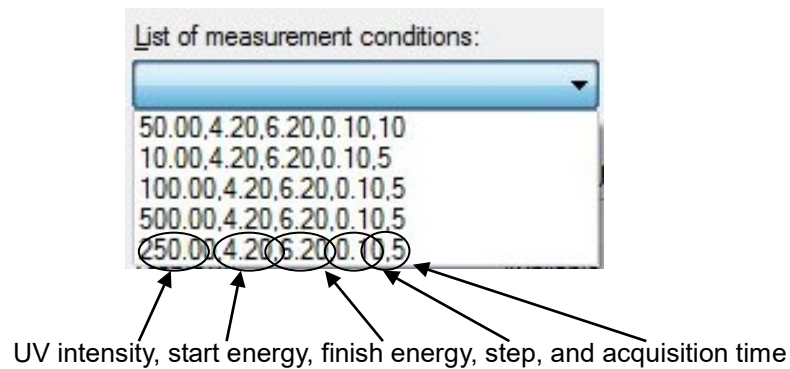
Click on the "Measurement" button to display the setting of measurement conditions screen.



Set the measurement condition.

If the measurement condition saved in the past is to be used, select it from the list, and then go to 3-2.

Example of the list



NOTE

The adequate UV intensity depends on the sample. Uncheck the checkbox for "Incident UV spectrum" described later to execute a preliminary measurement to obtain an appropriate slope.

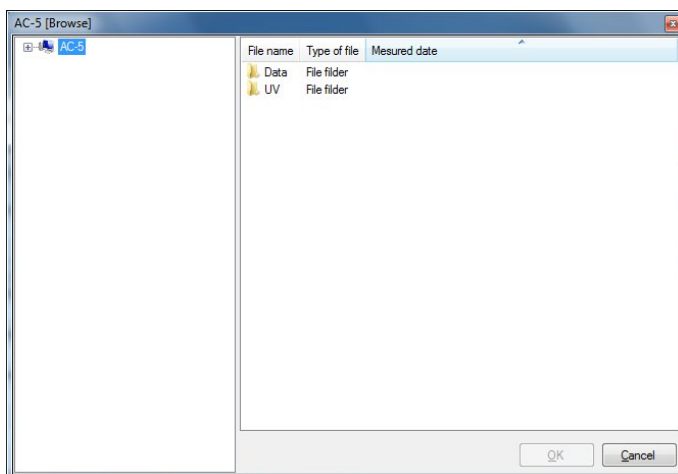
- (1) Enter the UV intensity. Enter the value between the available UV intensity (minimum) and UV intensity (maximum). Example) 10

NOTE

If the preliminary measurement is to be executed, have the step interval wider for short time measurement.

- (2) Select the step. Example) Select 0.10 from the list box.
- (3) Enter the measurement start energy. Example) Open the list box for start energy, and select 4.20 eV.
- (4) Enter the measurement finish energy. Example) Open the list box for finish energy, and select 6.20 eV.
- (5) Set the acquisition time. Example) 5
- (6) Enter the power. The power is the exponential of the vertical axis when the data is displayed in a graph. Enter the number with a decimal point less than 1. Example) 0.5
- (7) Click on "Save" button to record the measurement condition. (Up to 5 conditions)
- (8) If the UV intensity correction is to be executed, check the checkbox for "Incident UV intensity". If the UV intensity correction is to be executed later, uncheck the checkbox for "Incident UV intensity".

[When the UV intensity correction coefficient measured in the past is to be used]
Click on "Browse" to specify the file.



[When it is to be measured newly]

Click on "New".

* The button is displayed on the UV intensity correction coefficient measurement screen. When the measurement is completed, a box to indicate the completion is opened, and OK button is clicked, the setting of measurement conditions screen returns.

NOTE

If the specified UV intensity is close to the available minimum UV intensity or maximum UV intensity, the setting within $\pm 5\%$ of the set value may be unavailable.

3-2. Measurement

This section describes the example of "Normal" (one point measurement). See Chapter 6 for the sample changer and spot directed on photograph.



CAUTION

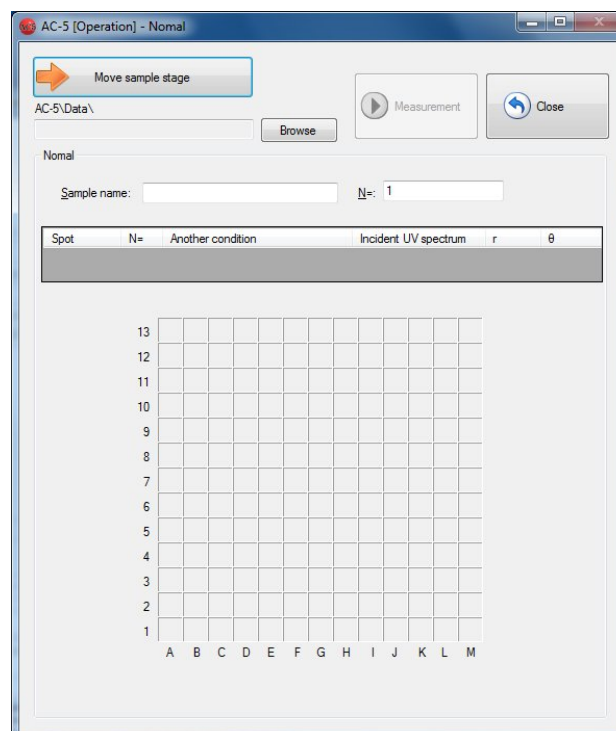
Depending on the specifications of the OS, executing process by this application or other applications during measurement may disable the connection with the main unit. Do not operate other processes with the computer while the process which communicates with the main unit is being executed with it.



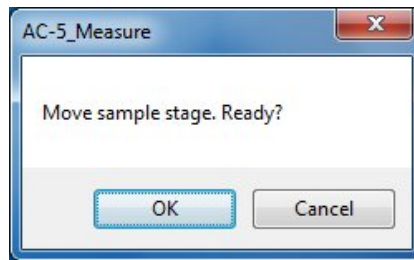
CAUTION

If the UV intensity is different, or if the measurement range (start, finish, and step) is not supported, the measurement is unavailable. Also, if it is not the measured value of the same day, a warning message is displayed.

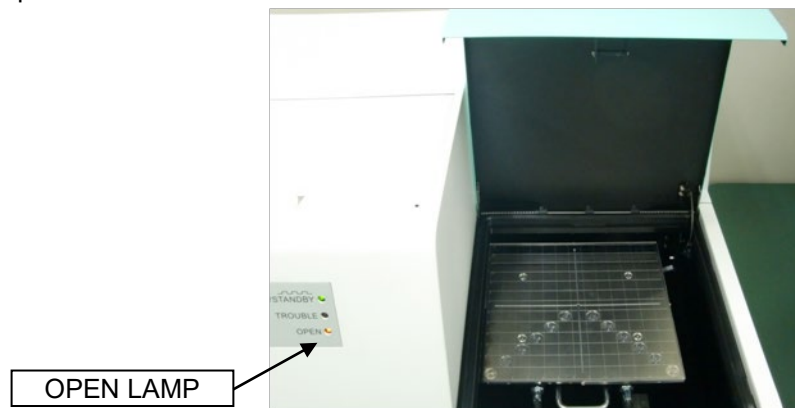
- (1) Select "Normal" from the list box of the operating mode, and click on "Go on to the next step" button. The operation screen (Normal) is displayed.



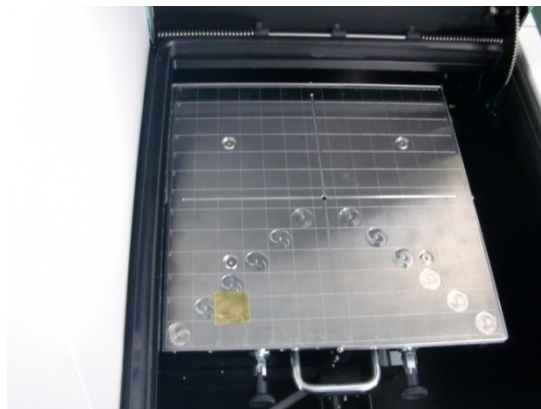
- (2) Click on "Move sample stage" button.
- (3) The message box is displayed to confirm the sample stage movement. Click on "OK" button.



- (4) The stage moves to the sample replacement location, and the sample door cover opens. Check that the OPEN lamp blinks.



- (5) Install and fix the sample. Example) Fix it at the location of 2C with a carbon tape.



WARNING

Use an appropriate sample stage according to the sample thickness. Measuring the sample which is thicker than the specified thickness for each sample stage may damage the units.

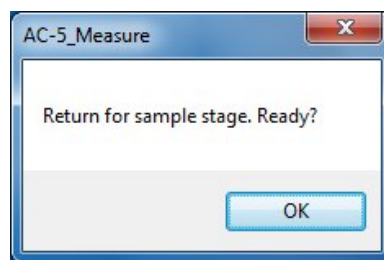
NOTE

There are various types of sample stages other than the standard. Select the type of sample stages according to the sample form. See Chapter 7 for the sample stage type, use method, and replacement method.

- (6) As shown in the picture, close the sample door cover pushing the center foreground of it.



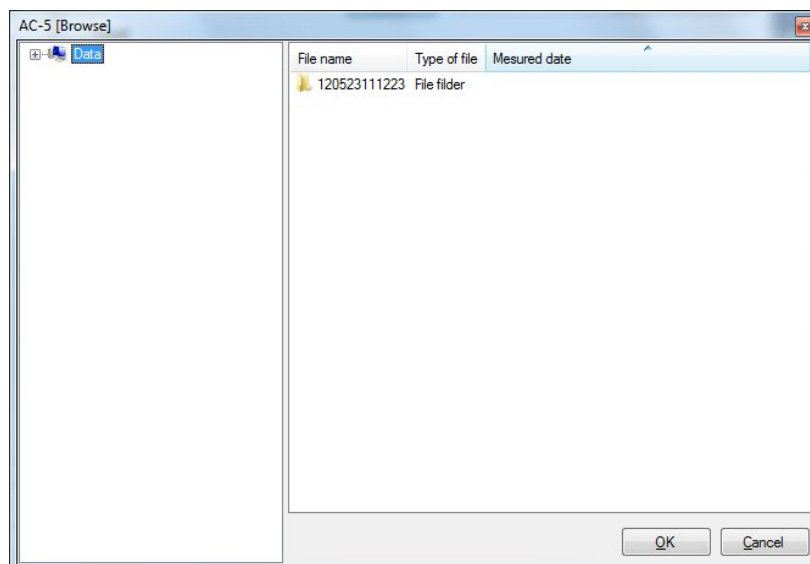
- (7) Check that the OPEN lamp is off, and click on the OK button on the screen.



NOTE

The button is unavailable while the sample stage is moving. Wait for a while until the moving is finished.

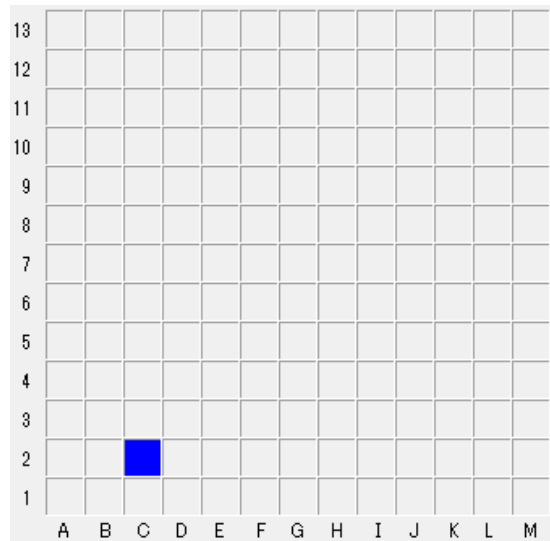
- (8) Click on "Browse" button to create or specify a saving folder.



NOTE

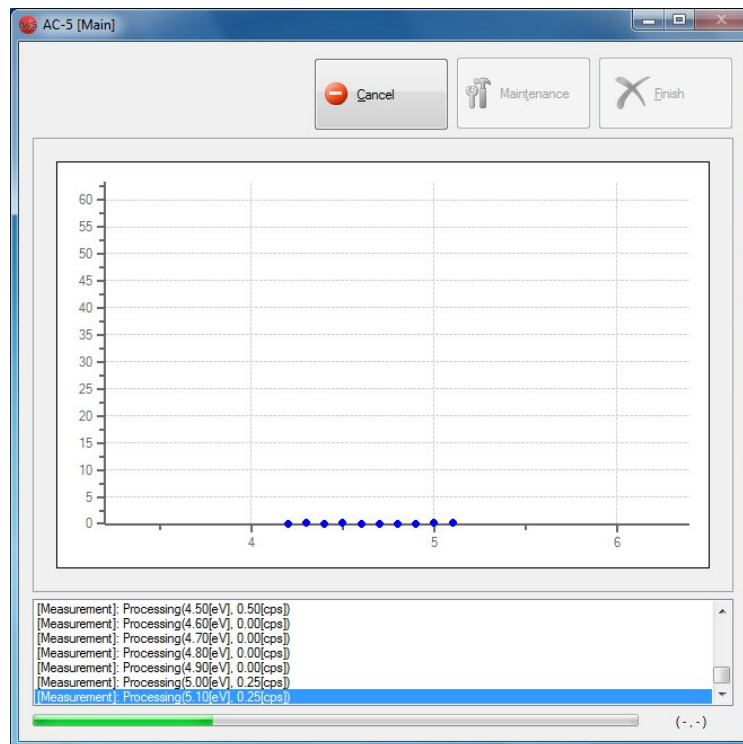
With "Create a folder" from right-click, a new saving folder can be created.

- (9) Enter a sample name.
(10) Enter the number of repetitive times.
(11) Specify the location of measurement. Example) 2C



(12) Click on "Measurement" to start the measurement.

After the background is measured, a graph is displayed, and the counted value for each energy is plotted sequentially. The horizontal axis of the graph represents the incident UV energy with eV unit. The vertical axis represents the power of the photoelectron yield. The upper limit of the vertical axis automatically becomes approx. 4000^n . This n is the power. For $n = 0.5$, the value becomes approx. 65.



NOTE

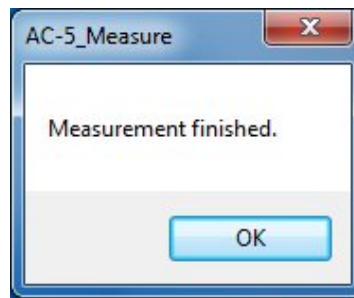
Use "Cancel" to stop the measurement.



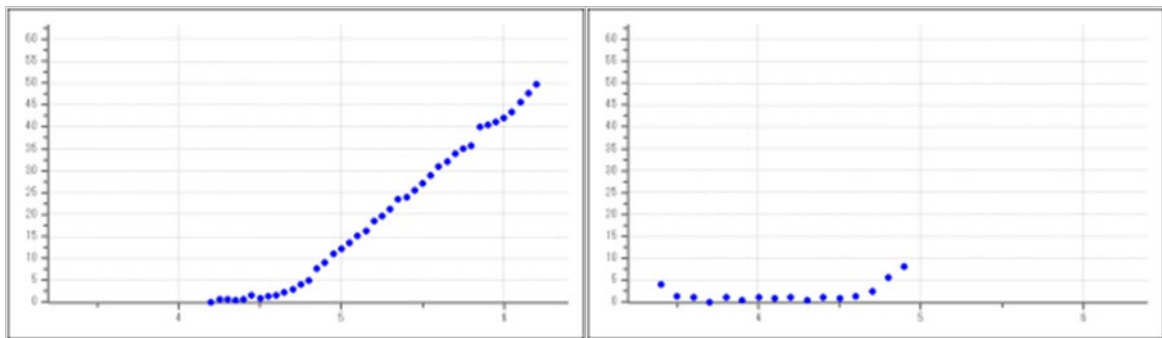
CAUTION

Depending on the specifications of the OS, executing process by this application or other applications during measurement may disable the connection with the main unit. Do not operate other processes with the computer while the process which communicates with the main unit is being executed with it.

- (13) When the measurement is finished, a message box to inform the finish is opened. Click on the OK button.



- (14) If the UV intensity is insufficient or the measurement energy range is inappropriate, adjust them and re-execute the measurement.



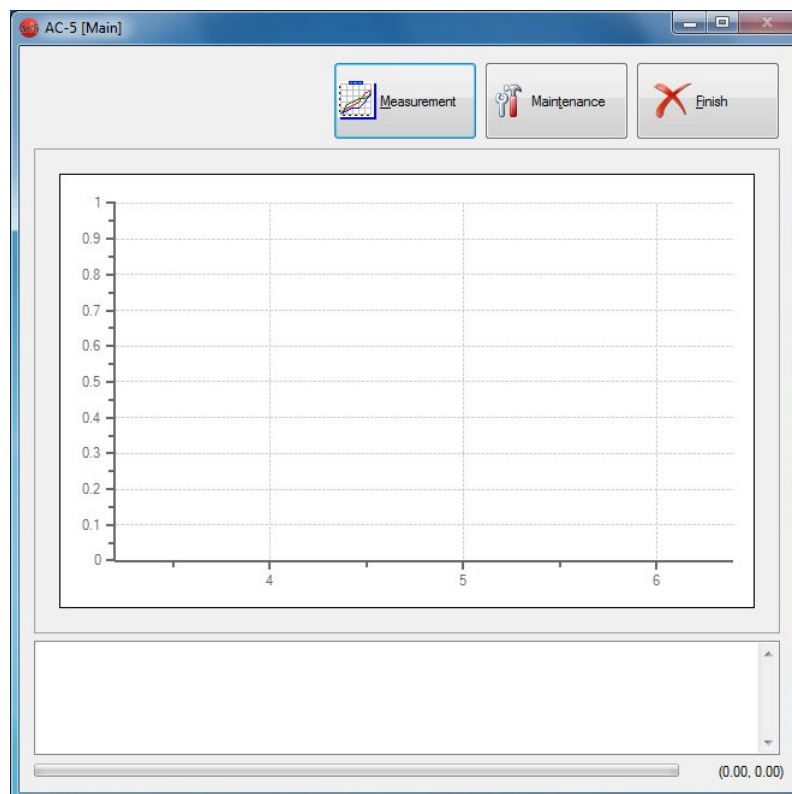
Measurement example for Step 0.05 eV

Measurement example for energy range defect

- (15) Take out the sample with "Operation screen".

4

Shutdown Process



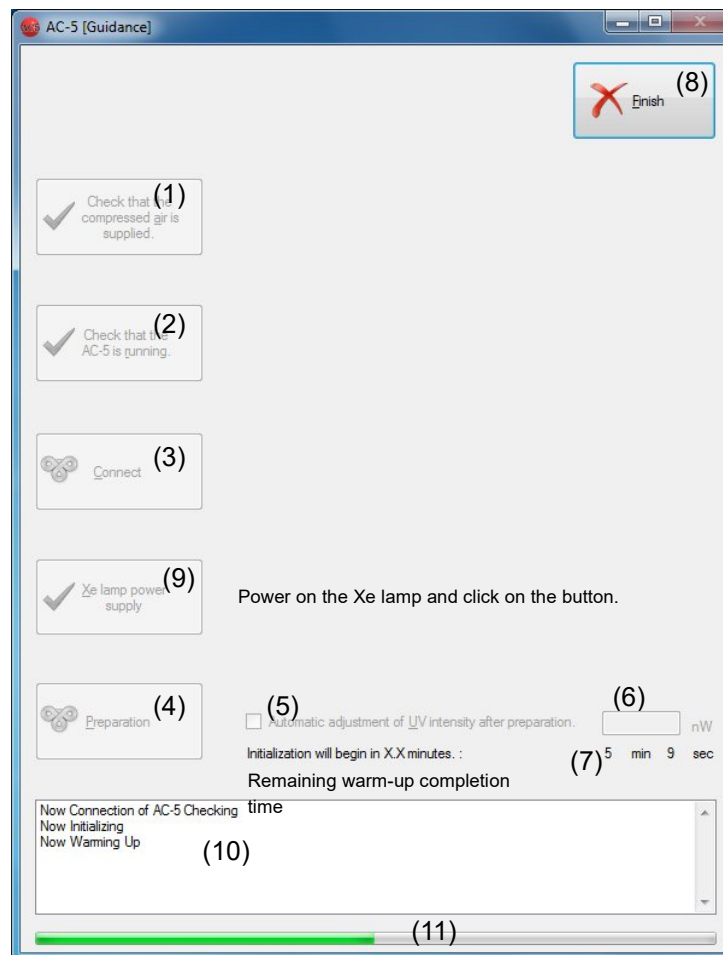
- (1) Click on "Finish" on the main screen to exit the application.
- (2) Switch from ON (I side) to OFF (O side) the power switch on the front panel and turn OFF the breaker on the rear panel.
- (3) Stop the supply of compressed air.

5

Screen Configuration

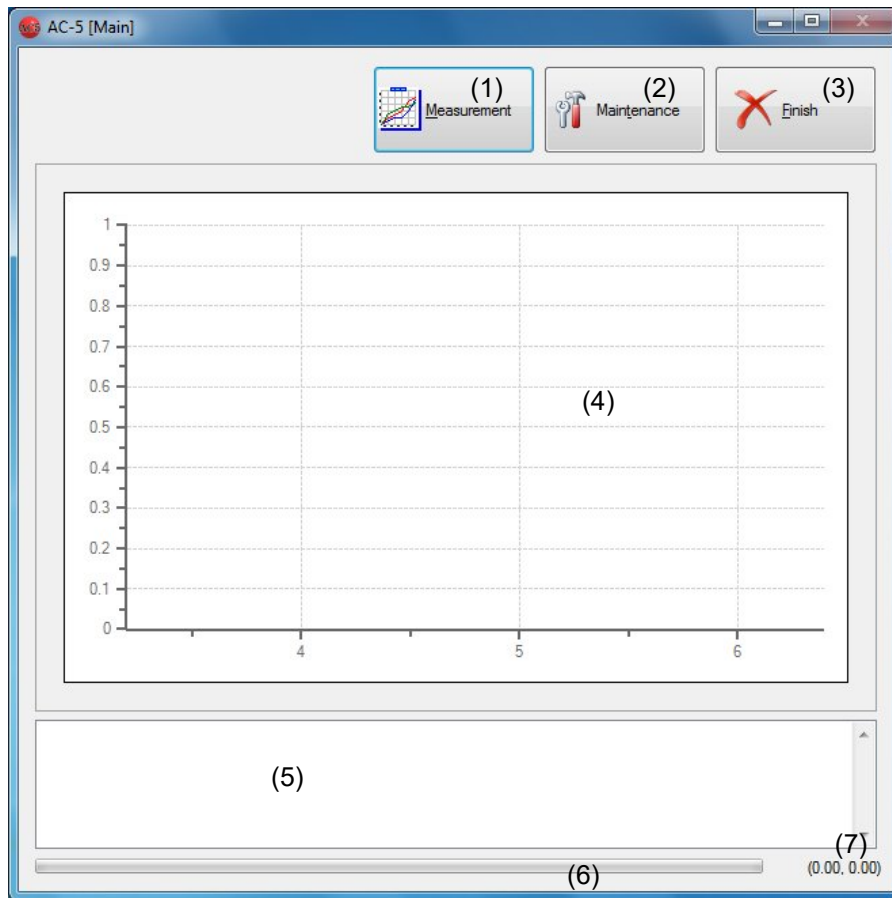
The screen configuration is described.

5-1. Guidance screen



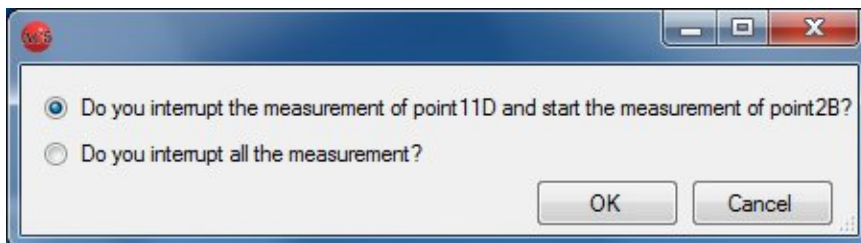
- | | |
|---|---|
| (1) "Check compressed air supplied" button | (8) "Finish" display |
| (2) "Check that AC-5 is running" button | (9) "Xe lamp power supply" button (Only Xe) |
| (3) "Connect" button | (10) Status window |
| (4) "Preparation" button | (11) Progress bar |
| (5) "Automatic adjustment of UV intensity" checkbox | |
| (6) "UV intensity" text box | |
| (7) "Remaining warm-up completion time" display | |

5-2. Main screen

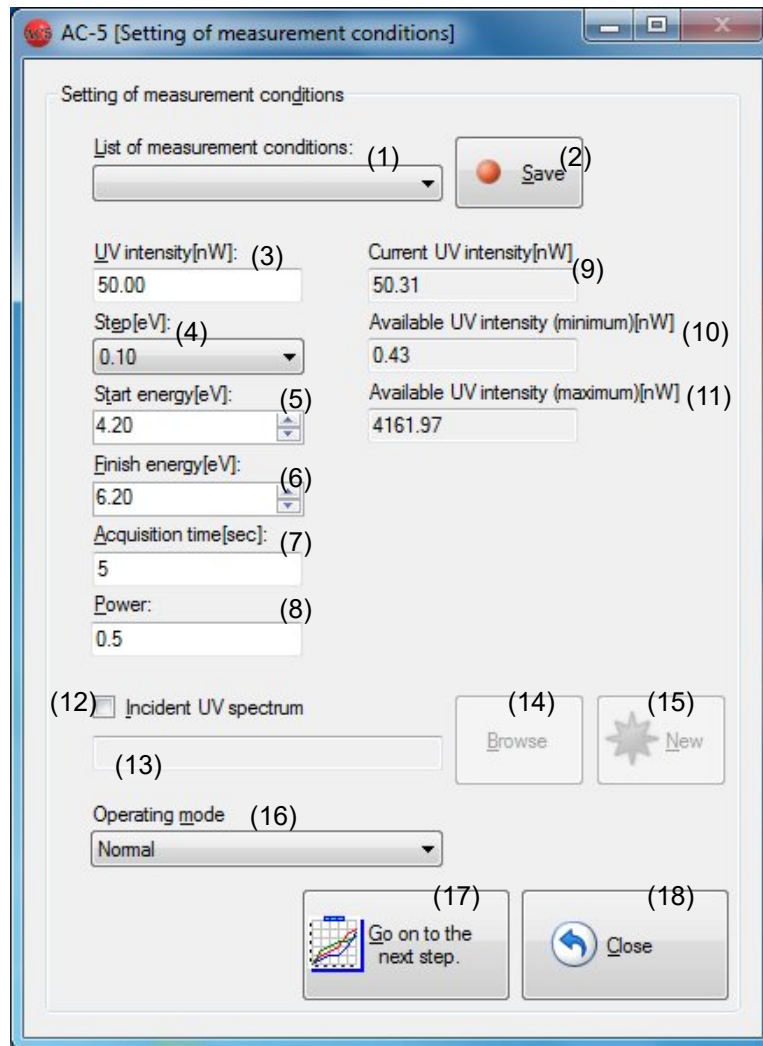


- (1) "Measurement" button
- (2) "Maintenance" button
- (3) "Finish" button
- (4) Graph area
- (5) Status window
- (6) Progress bar
- (7) Coordinate display

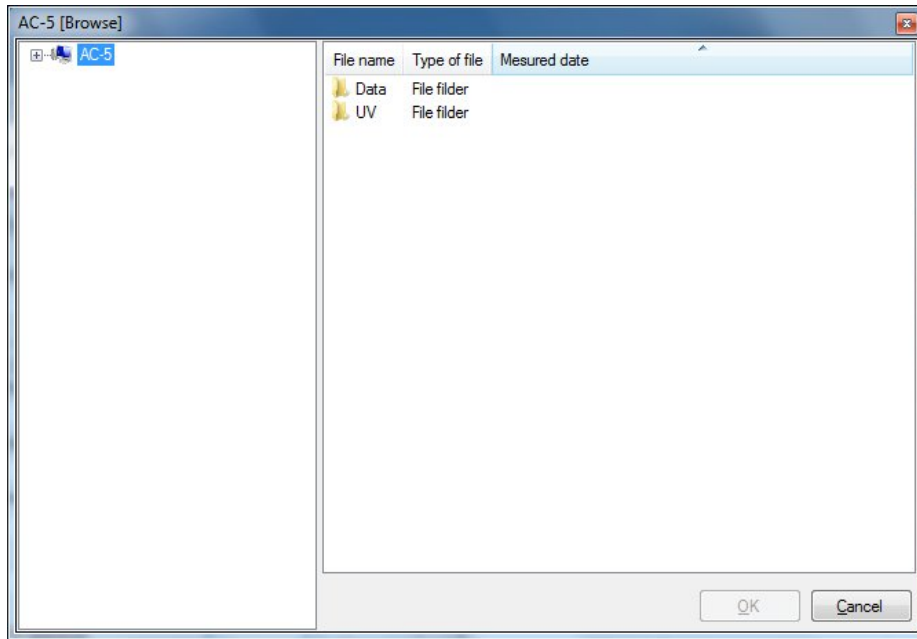
Interruption message (Only the sample changer and spot specification)



5-3. Setting of measurement conditions screen

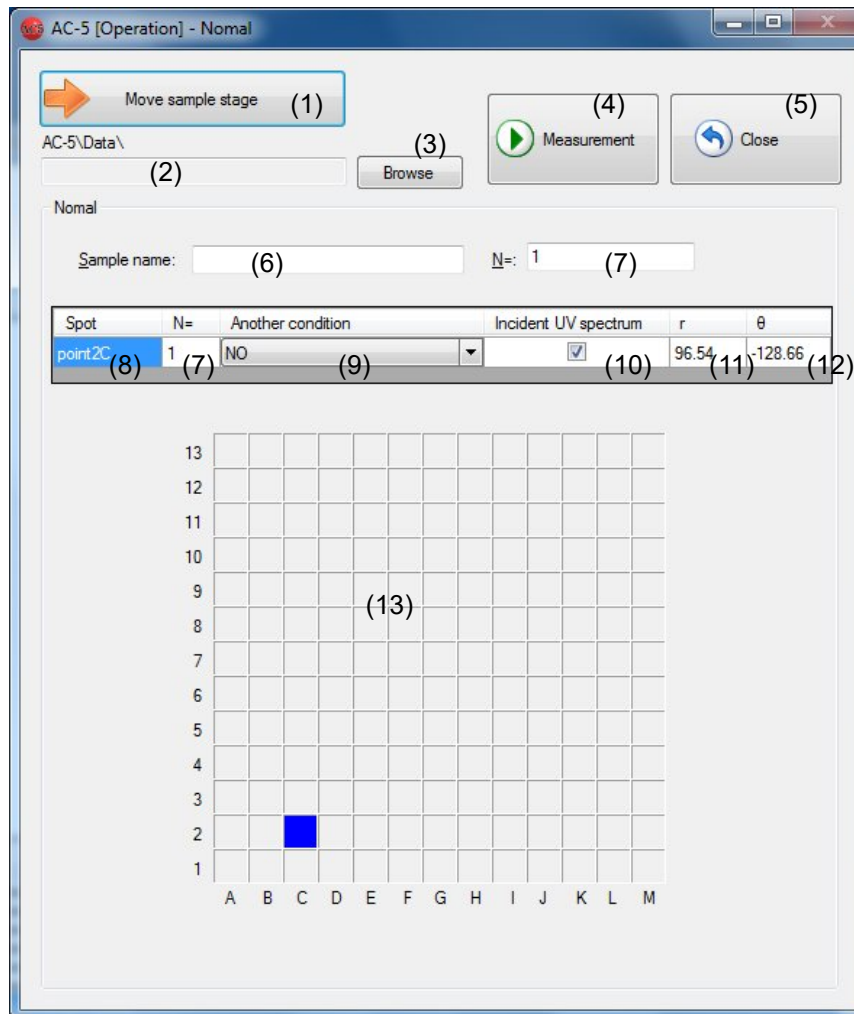


- (1) "Measurement conditions" drop-down list
- (2) "Save" button
- (3) "UV intensity" text box
- (4) "Step" drop-down list
- (5) "Start energy" drop-down list
- (6) "Finish energy" drop-down list
- (7) "Acquisition time" text box
- (8) "Power" text box
- (9) "Current UV intensity" text box
- (10) "Available UV intensity (minimum)" text box
- (11) "Available UV intensity (maximum)" text box
- (12) "Incident UV spectrum" checkbox
- (13) "Light intensity correction file name" text box
- (14) "Browse" button
- (15) "New" button
- (16) "Operating mode" drop-down list
- (17) "Go on to the next step" button
- (18) "Close" button

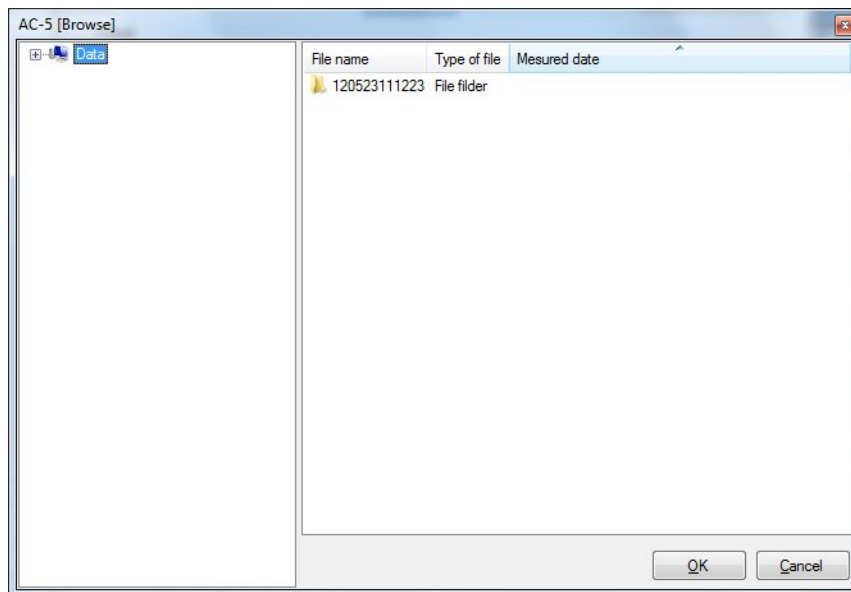


File selection dialog

5-4. Operation screen



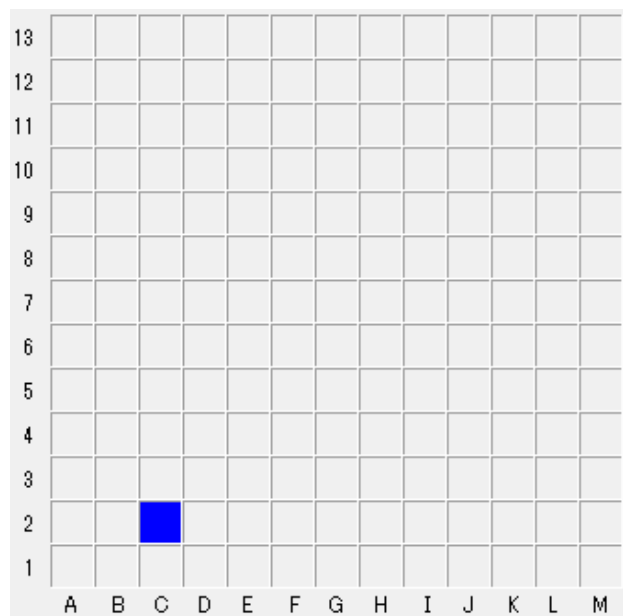
- (1) "Move sample stage" button
- (2) "Data storage destination" text box
- (3) "Browse" button
- (4) "Measurement" button
- (5) "Close" button
- (6) "Sample name" text box
- (7) "Number of repetitive times" text box
- (8) "Spot" text box
- (9) "Another condition" drop-down list
- (10) "Incident UV spectrum" checkbox
- (11) "r" text box
- (12) " θ " text box
- (13) "Stage"



File Selection Dialog




Example of Parameters Display

Spot	N=	Another condition	Incident UV spectrum	r	θ
point2C	1	NO	<input checked="" type="checkbox"/>	96.54	-128.66

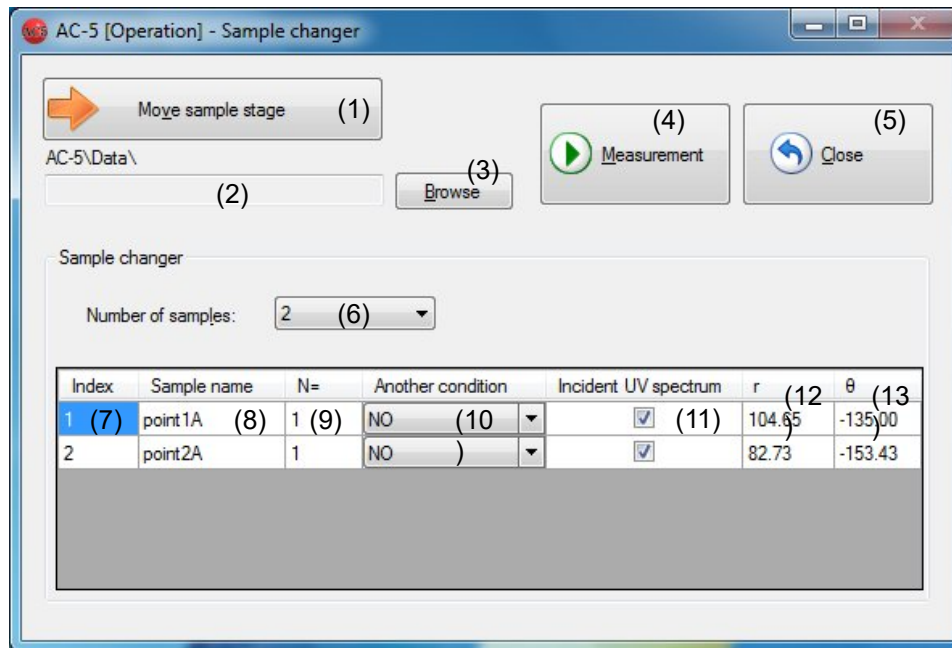


Example of Spot Display

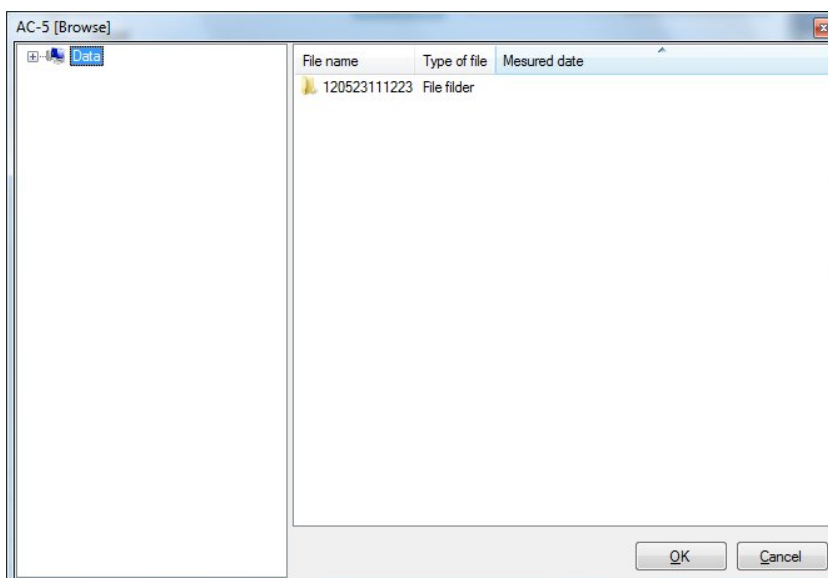
Color Coding Table

Measurement status	Mark color
Before measurement	 Blue
During measurement	 Red
After measurement	 Pink

5-5. Sample changer screen



- (1) "Move sample stage" button
- (2) "Data storage destination" text box
- (3) "Browse" button
- (4) "Measurement" button
- (5) "Close" button
- (6) "Number of samples" drop-down list
- (7) Index
- (8) "Sample name" text box
- (9) "Number of repetitive times" text box
- (10) "Another condition" drop-down list
- (11) "Incident UV spectrum" checkbox
- (12) "r" text box
- (13) "θ" text box



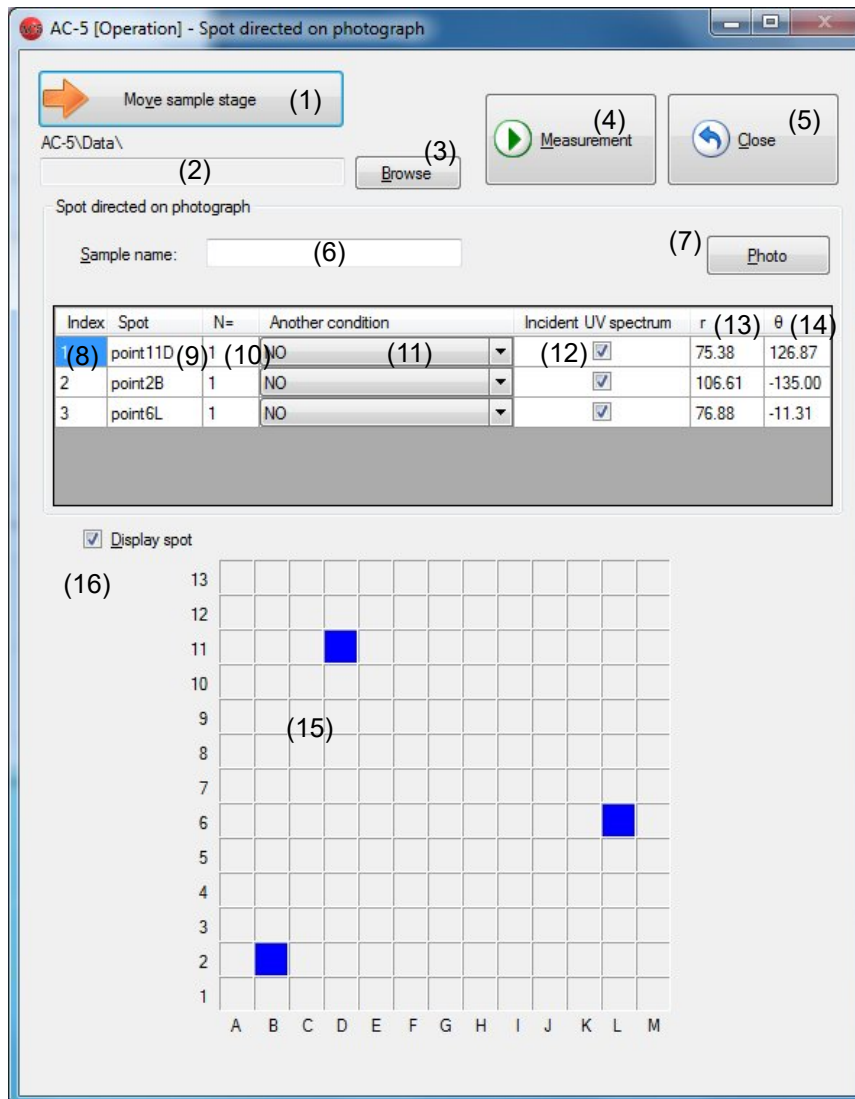
File Selection Dialog

Example of Parameters Display

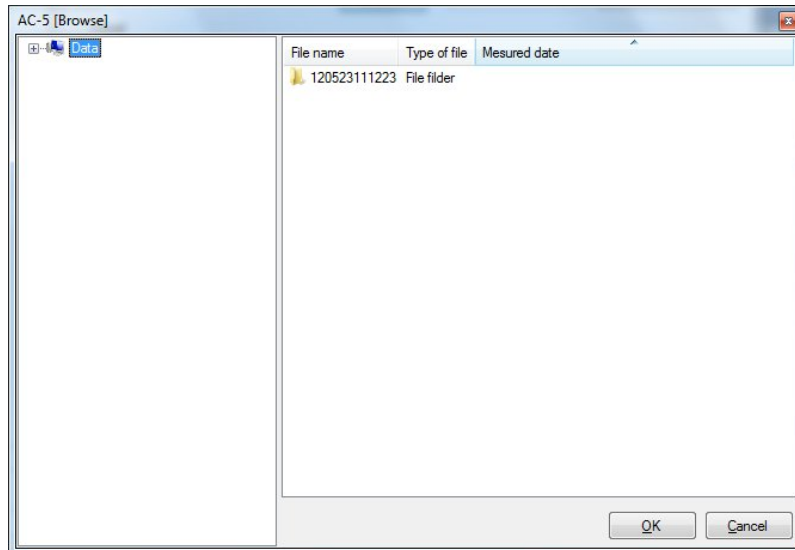
Number of samples: 5

Index	Sample name	N=	Another condition	Incident UV spectrum	r	θ
1	point1A	1	NO	<input checked="" type="checkbox"/>	104.65	-135.00
2	point2A	1	NO	<input checked="" type="checkbox"/>	82.73	-153.43
3	point3A	1	NO	<input checked="" type="checkbox"/>	74.00	180.00
4	point4A	1	NO	<input checked="" type="checkbox"/>	82.73	153.43
5	point5A	1	NO	<input checked="" type="checkbox"/>	104.65	135.00

5-6. Spot directed on photograph screen



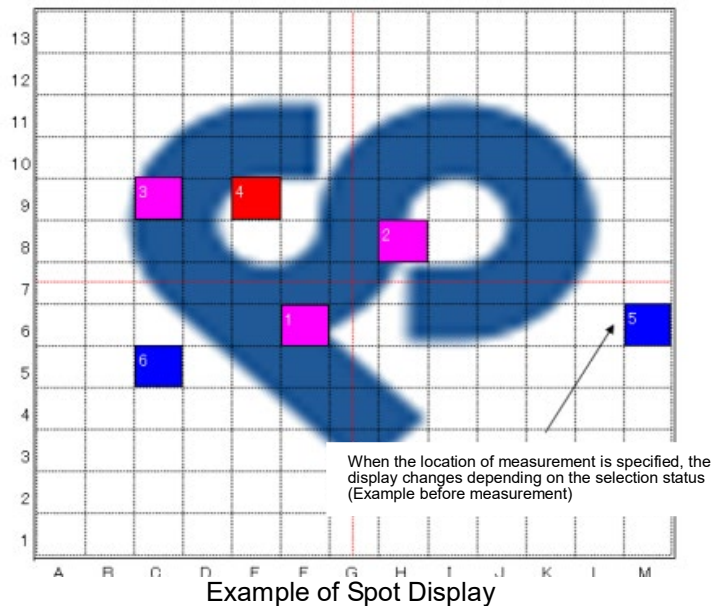
- (1) "Move sample stage" button
- (2) "Data storage destination" text box
- (3) "Browse" button
- (4) "Measurement" button
- (5) "Close" button
- (6) "Sample name" text box
- (7) "Photo" button
- (8) index
- (9) "Spot" text box
- (10) "Number of repetitive times" text box
- (11) "Another condition" drop-down list
- (12) "Incident UV spectrum" checkbox
- (13) "r" text box
- (14) "θ" text box
- (15) "Stage"
- (16) "Display spot" checkbox



File Selection Dialog

Example of Parameters Display

Index	Spot	N=	Another condition	Incident UV spectrum	r	θ
1	point11D	1	NO	<input checked="" type="checkbox"/>	75.38	126.87
2	point2B	1	NO	<input checked="" type="checkbox"/>	106.61	-135.00
3	point6L	1	NO	<input checked="" type="checkbox"/>	76.88	-11.31
4	point6I	1	NO	<input checked="" type="checkbox"/>	33.71	-26.57
5	point5F	1	NO	<input checked="" type="checkbox"/>	33.71	-116.57

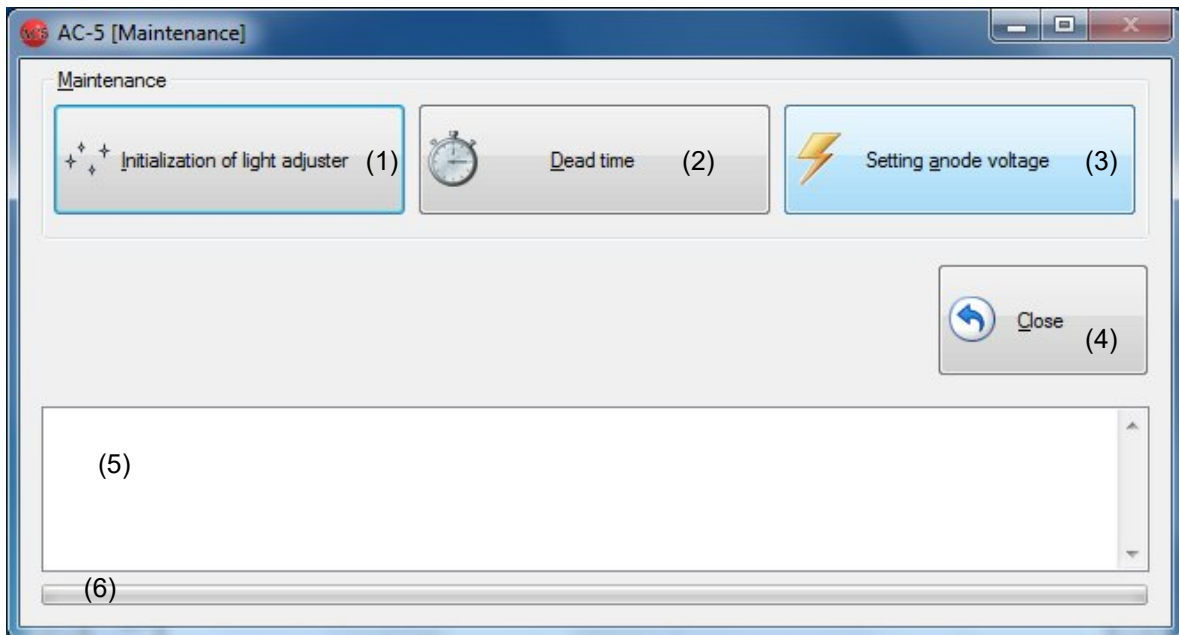


Example of Spot Display

Color Coding Table

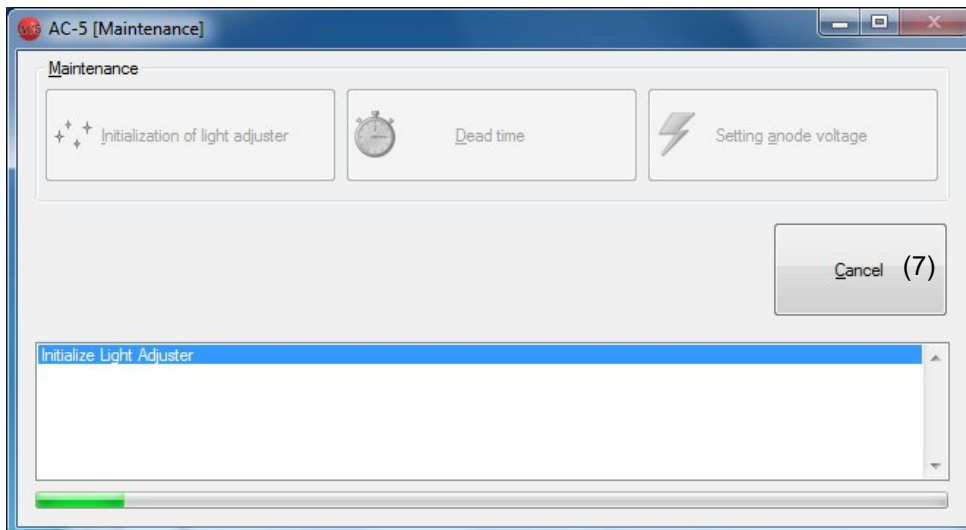
Measurement status	Mark color
Before measurement	Blue
During measurement	Red
After measurement	Pink

5-7. Maintenance screen



- (1) "Initialization of light adjuster" button
- (2) "Dead time" button
- (3) "Setting anode voltage" button
- (4) "Close" button
- (5) Status window
- (6) Progress bar

Screen during Process



- (7) "Cancel" button

6

Measurement Application Functions

This chapter describes functions not described in previous chapters.

6-1. Data structure

The folder structure with the root of My Document¥AC-5 is used. Also, the data structure is as follows:

AC-5 Data Structure

Type	Description
Measurement data file (*.dat)	Measurement results are stored.
Multidata file (*.mdat)	An average obtained from repeated measurement results is stored. * It is generated for the following two cases: <ul style="list-style-type: none"> • The measurement is executed with the setting of twice or more of repetitive times with the measurement application. • "Average" is executed while multiple measurement results are displayed with the analysis application.
Differential result file (*.ddat)	Density of states obtained from measurement results is stored. * It is generated when "State density" is executed while the multidata file is open with the analysis application.
Light intensity correction coefficient file (*.ldat)	The UV intensity correction coefficient is stored.

* The measurement data file (*.dat), multidata file (*.mdat), and differential result file (*.ddat) are saved in the arbitrary folder under My Document¥AC-5¥Data, and UV intensity correction coefficient file (*.ldat) is saved in My Document¥AC-5¥UV folder.

When the measurement is executed with the setting of twice or more of number of repetitive times, a folder with the sample name is created and measurement data files (*.dat) and multidata file (*.mdat) which stores the average obtained from the measured data are saved in the folder.

6-2. Initialization of anode voltage and light adjuster

If the measurement is continued for 24 hours or more or with temperature or atmosphere change, reset the anode voltage and initialize the light adjuster.

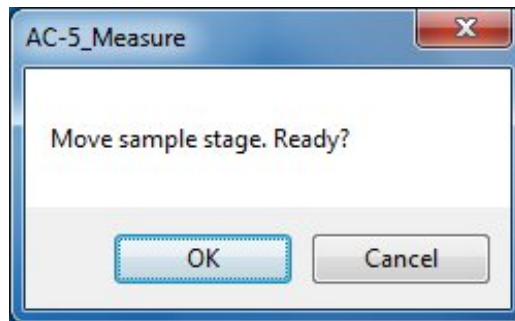
Executing "Setting anode voltage" on the maintenance screen resets the anode voltage automatically.

Executing "Initialization of light adjuster" on the maintenance screen initializes the light adjuster automatically.

6-3. Dead time

Executing "Dead time" on the maintenance screen readjusts the dead time.

- (1) The message box is displayed to confirm the sample stage transfer. Click on "OK" button.



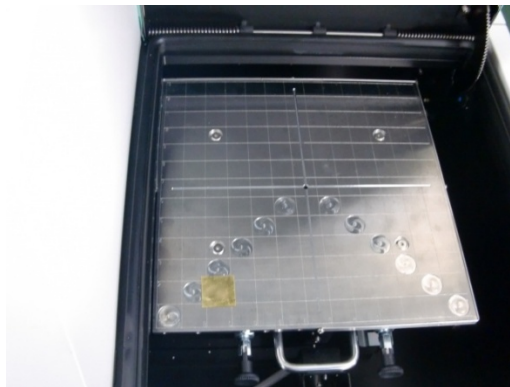
- (2) The stage moves to the sample replacement location, and the sample door cover opens. Check that the OPEN lamp blinks in red.



WARNING

If the OPEN lamp does not blink in red, the interlock may be broken. In this case, even if the sample door cover is open, the stage may move.

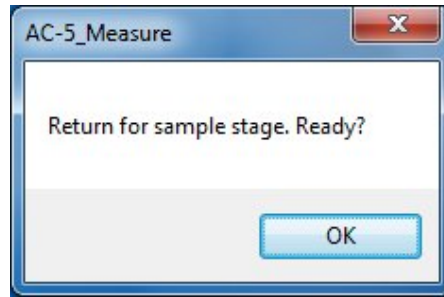
- (3) Install the sample stage for the standard thickness of 1 mm, and install the supplied sample on "2C".



- (4) As shown in the picture, close the sample door cover pushing the center foreground of it.



- (5) Check that the OPEN lamp is off, and click on the OK button on the screen.



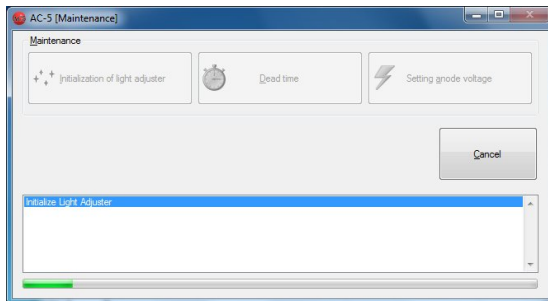
(6) The dead time is remeasured and readjusted.

NOTE

The dead time remeasurement takes about a half an hour.

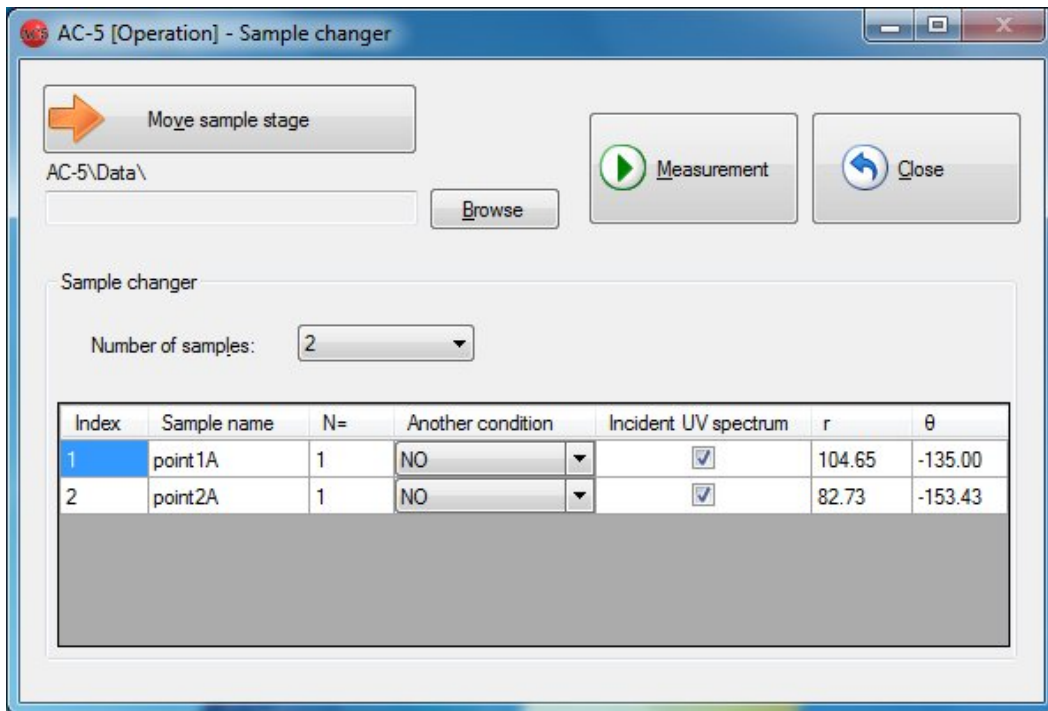
NOTE

To stop the process, use the Cancel button.



6-4. Sample changer

- (1) The measurement condition setting method is as described in Chapter 3. Selecting "Sample changer" with the operating mode selection enables the measurement with the sample changer.



- (2) Click on "Move sample stage" button.
 (3) The message box is displayed to confirm the sample stage movement. Click on Yes (Y).
 (4) Check that the stage operation sound has disappeared.



WARNING

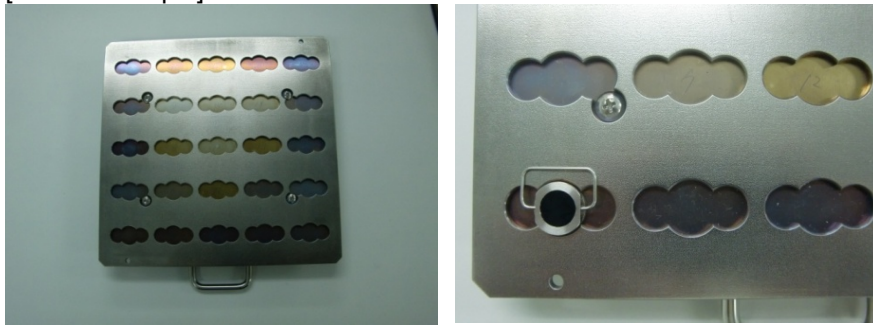
If the OPEN lamp does not blink, the interlock may be broken. In this case, even if the sample door cover is open, the stage may move.

- (5) The sample door cover opens. Check that the OPEN lamp blinks.
 (6) Install and fix the sample.
 For the sample stage replacement and installation of samples to the sample stage, see Chapter 7.

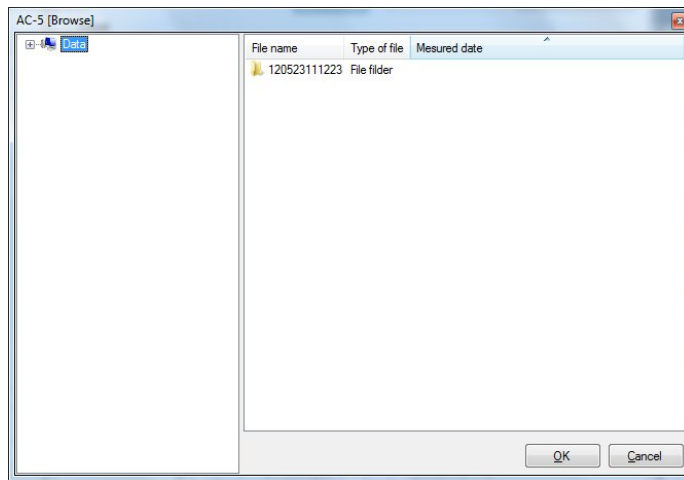
[Plate sample]



[Powder sample]



- (7) Close the sample door cover, press around the description of Push, and when you hear a clicking noise, take your hand off the cover.
- (8) Check that the sample door is closed, and click on the OK button on the screen.
- (9) Click on "Browse" button to specify a saving folder.

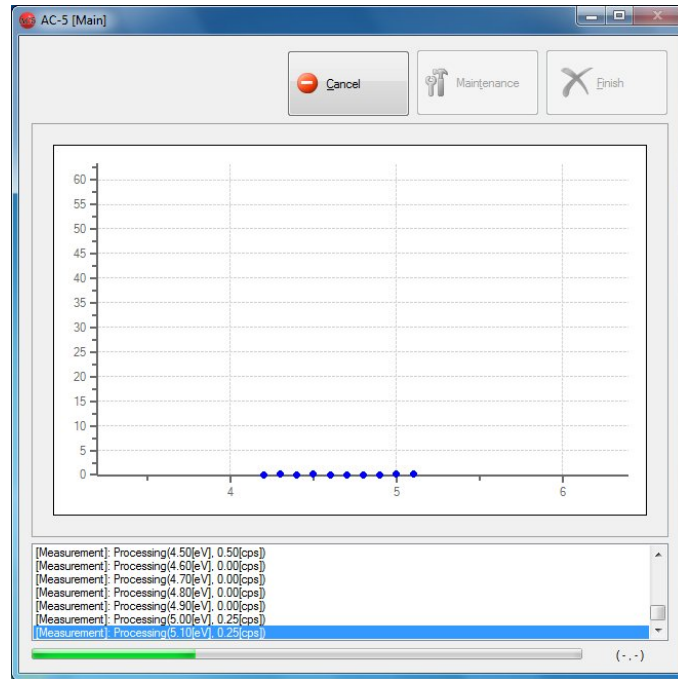


- (10) Select the number of samples installed.
- (11) Enter sample names and number of repetitive times. The measurement is executed under the condition set on the setting of measurement condition screen; however, selection of another saved measurement condition for each sample is available. In that case, specify the measurement condition with "Another condition". Also, specification of UV intensity correction availability for each sample is available with the checkbox for "Incident UV spectrum".

Number of samples:

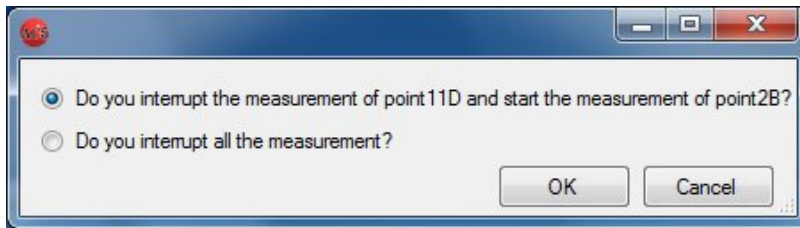
Index	Sample name	N=	Another condition	Incident UV spectrum	r	θ
1	point1A	1	NO	<input checked="" type="checkbox"/>	104.65	-135.00
2	point2A	1	NO	<input checked="" type="checkbox"/>	82.73	-153.43
3	point3A	1	NO	<input checked="" type="checkbox"/>	74.00	180.00
4	point4A	1	NO	<input checked="" type="checkbox"/>	82.73	153.43
5	point5A	1	NO	<input checked="" type="checkbox"/>	104.65	135.00

- (12) Click on "Measurement" to start the measurement.
 After the background is measured, a graph is displayed, and the counted value for each energy is plotted sequentially. The horizontal axis of the graph represents the incident UV energy with eV unit. The vertical axis represents the power of the photoelectron yield. The upper limit of the vertical axis automatically becomes approx. 4000^n. This n is the power. For n = 0.5, the value becomes approx. 65.



NOTE

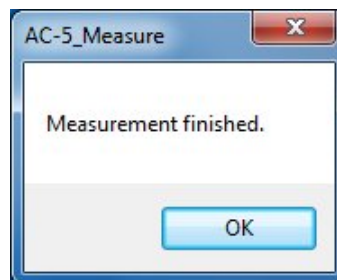
Use the button to stop the measurement.
Specify the interruption method and click on "OK".



CAUTION

Depending on the specifications of the OS, executing process by this application or other applications during measurement may disable the connection with the units. Do not operate other processes with the computer while the process which communicates with the units is being executed with it.

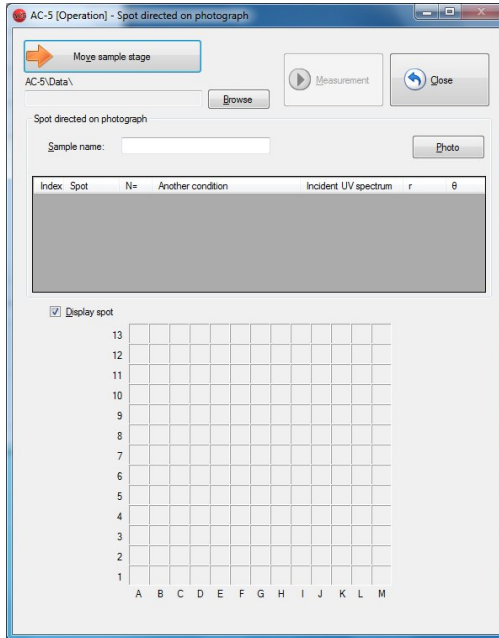
(13) When the measurement is finished, a message box to inform the finish is opened. Click on the OK button.



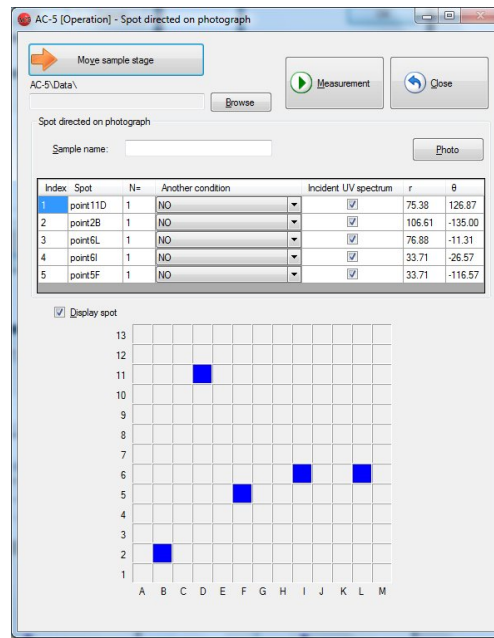
(14) Take out the sample with "Operation screen."

6-5. Spot directed on photograph

- (1) The measurement condition setting method is as described in Chapter 3. Selecting "Spot directed on photograph" with the operating mode selection enables the measurement with the spot specification function.



Before spot selected



After spot selected

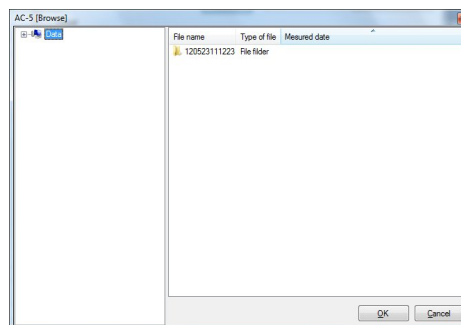
- (2) Click on "Move sample stage" button.
 (3) The message box is displayed to confirm the sample stage movement. Click on Yes (Y).
 (4) Check that the stage operation sound has disappeared.



WARNING

If the OPEN lamp does not blink, the interlock may be broken. In this case, even if the sample door cover is open, the stage may move.

- (5) The sample door cover opens. Check that the OPEN lamp blinks.
 (6) Install and fix the sample.
 (7) Close the sample door cover, press around the description of Push, and when you hear a clicking noise, take your hand off the cover.
 (8) Check that the sample door is closed, and click on the OK button on the screen.
 (9) Click on "Browse" button to specify a saving folder.



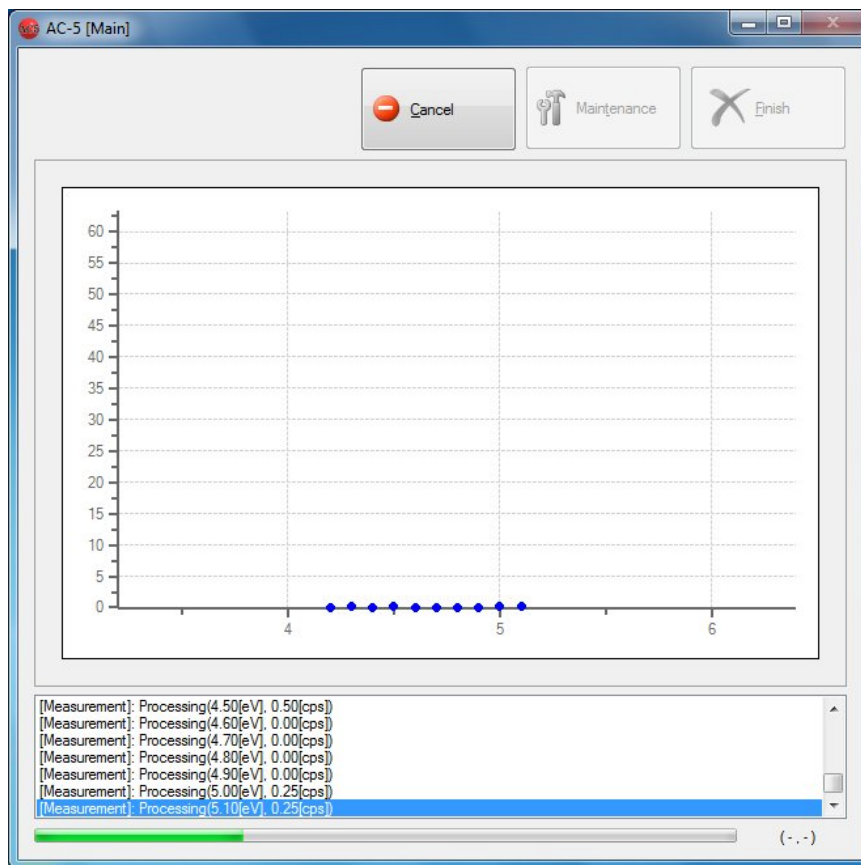
- (10) Select the sample name.
 (11) Click on "Photo" to obtain the sample image.
 (12) Enter spot names and numbers of repetitive times. The measurement is executed under the condition

set on the setting of measurement conditions screen; however, selection of another saved measurement condition for each spot is available. In that case, specify the measurement condition with "Another condition". Also, specification of UV intensity correction availability for each spot is available with the checkbox for "Incident UV spectrum".

Index	Spot	N=	Another condition	Incident UV spectrum	r	θ
1	point11D	1	NO	<input checked="" type="checkbox"/>	75.38	126.87
2	point2B	1	NO	<input checked="" type="checkbox"/>	106.61	-135.00
3	point6L	1	NO	<input checked="" type="checkbox"/>	76.88	-11.31
4	point6I	1	NO	<input checked="" type="checkbox"/>	33.71	-26.57
5	point5F	1	NO	<input checked="" type="checkbox"/>	33.71	-116.57

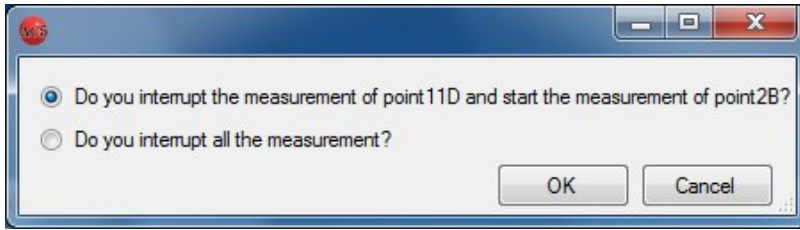
(13) Click on "Measurement" to start the measurement.

After the background is measured, a graph is displayed, and the counted value for each energy is plotted sequentially. The horizontal axis of the graph represents the incident UV energy with eV unit. The vertical axis represents the power of the photoelectron yield. The upper limit of the vertical axis automatically becomes approx. 4000^n . This n is the power. For $n = 0.5$, the value becomes approx. 65.



NOTE

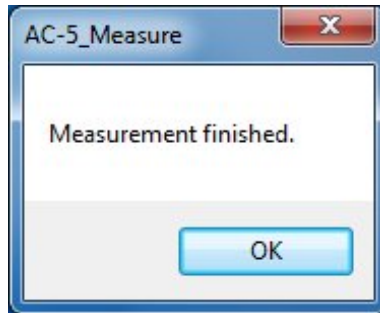
Use the button to stop the measurement.
Specify the interruption method and click on "OK".



CAUTION

Depending on the specifications of the OS, executing process by this application or other applications during measurement may disable the connection with the main unit. Do not operate other processes with the computer while the process which communicates with the main unit is being executed with it.

(13) When the measurement is finished, a message box to inform the finish is opened. Click on the OK button.

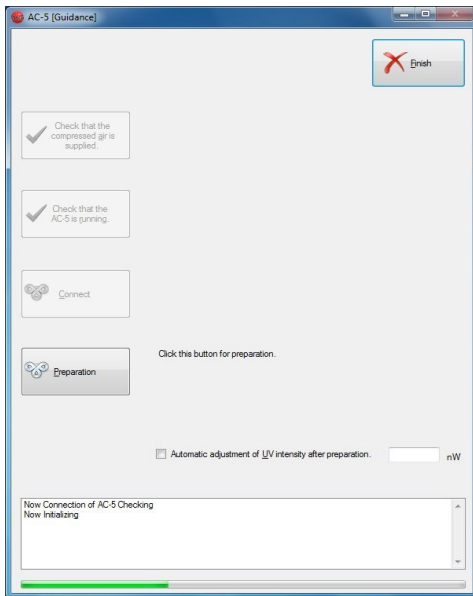


(14) Take out the sample with "Operation screen."

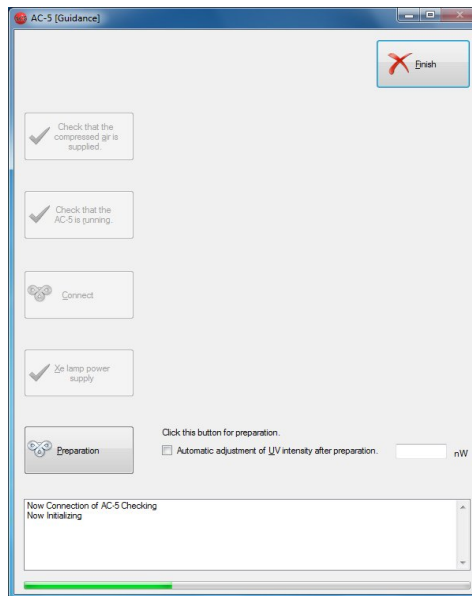
6-6. Xe lamp option guidance screen

- (1) Unlike the guidance screen of the application with the D2 lamp, the Xe lamp power button is displayed on the guidance screen of the application with the Xe lamp option.

For D2



For Xe



For the device with Xe lamp option, after connection is established, power on the Xe lamp, click on "Xe lamp power" button, and then click on "Preparation".

7

Sample Stage

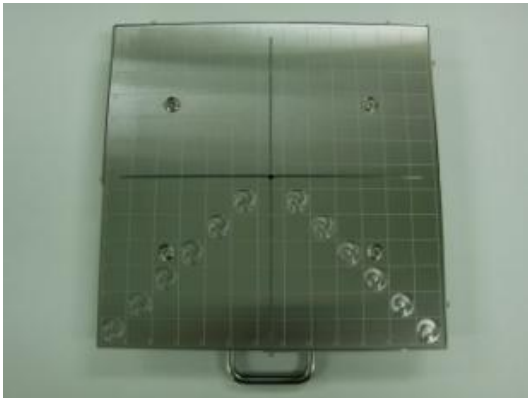
This chapter describes the sample stage.

7-1. Type and use method of sample stage

The types of sample stages are as follows:

1. Standard sample stage

This type is used to measure plate type samples with the size of 195 mm x 195 mm or less and thickness of 1 mm \pm 0.2 mm.



The thickness (1 mm) of samples is impressed on the side.



How to use

Place the sample on the arbitrary location and fix it with conductive tape such as carbon tape.

2. Dedicated sample stage (option)

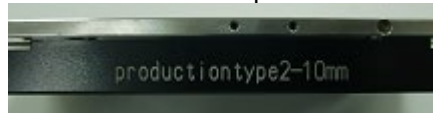
This type is used to measure plate type samples with the size of 195 mm x 195 mm or less. The thickness is custom-made; therefore, each one has different thickness. (The thickness is described on the side.)



Side surface for sample thickness 2 mm



Side surface for sample thickness 10 mm



How to use

Place the sample on the arbitrary location and fix it with conductive tape such as carbon tape.

3. Sample changer (for plate-type) sample stage (option)

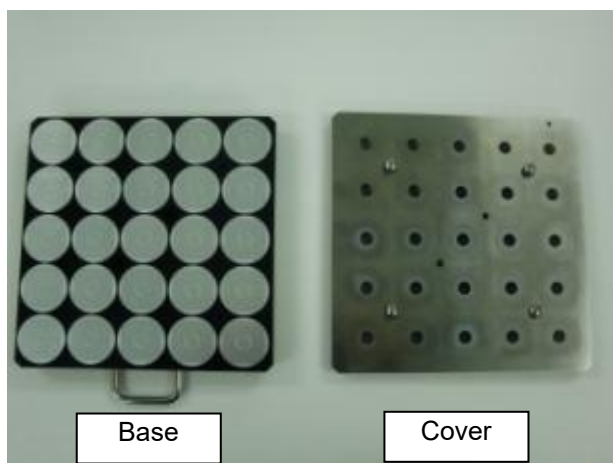


How to use

(1) Loosen the cover fixing screws (four) with a Phillips screwdriver.



(2) Remove the cover from the base.



- (3) Place samples to cover the circle in the center of the sample stage of the base. Be careful for samples not to be placed outside the guide.



NOTE

Place samples in the order of the number on the Index correspondence table below.

Measurement is executed in the order of the Index number.

5	10	15	20	25
4	9	14	19	24
3	8	13	18	23
2	7	12	17	22
1	6	11	16	21

Index Correspondence Table

- (4) Install the cover to the base and tighten the fixing screws (four screws).



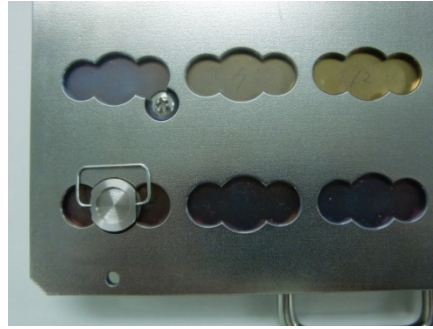
WARNING

Install the cover correctly. If the measurement is executed while the cover is installed at an angle or the head of cover fixing screws is higher than the measurement surface, the unit may be damaged.

4. Sample changer (for powder-type) sample stage (option)



5. Powder sample tray



How to use

(1) Place the powder to cover all the bottom of the powder sample tray.



NOTE

Place samples in the order of the number on the Index correspondence table below. Measurement is executed in the order of the Index number.

5	10	15	20	25
4	9	14	19	24
3	8	13	18	23
2	7	12	17	22
1	6	11	16	21

Index Correspondence Table

(2) Install the powder sample tray to the sample changer (for powder) sample stage.



NOTE

If the sample size is 10 x 10 mm or more and 30 x 30 mm or less and the thickness is 0.2 mm or more and 2.0 mm or less, the sample stage for the changer cannot be used.



WARNING

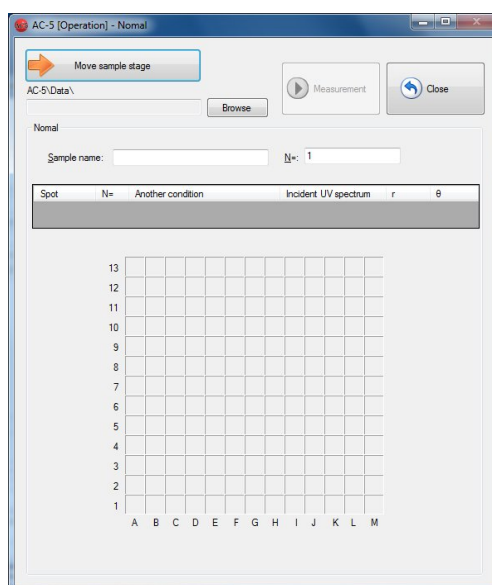
Use an appropriate sample stage according to the sample thickness. Measuring the sample which is thicker than the specified thickness for each sample stage may damage the units.

No.	Product name	Remarks
1	Standard sample stage	Sample planar shape: 195 x 195 mm or less Sample thickness: 1.0 mm
2	Dedicated sample stage	(Option) Sample planar shape: 195 x 195 mm or less Specify the sample thickness within the range of 2.0 mm to 10.0 mm by 1.0 mm.
3	Sample changer (For plate sample) sample table	(Option) 25 sample sheets (max). Shape 10 x 10mm (min), 30 x 30 mm (max), thickness 0.2 mm (min) 2.0 mm (max)
4	Sample changer (For powder sample) sample stage	(Option) 25 sample trays (max). Common for depth 1.0 mm and 0.5 mm
5	Powder sample tray (depth 1.0mm)	(Option) 30 trays/set
6	Powder sample tray (depth 0.5 mm)	(Option) 30 trays/set

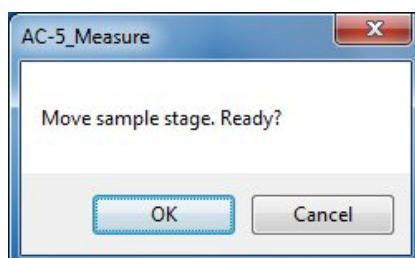
7-2. Sample stage replacement

The replacement method is as follows:

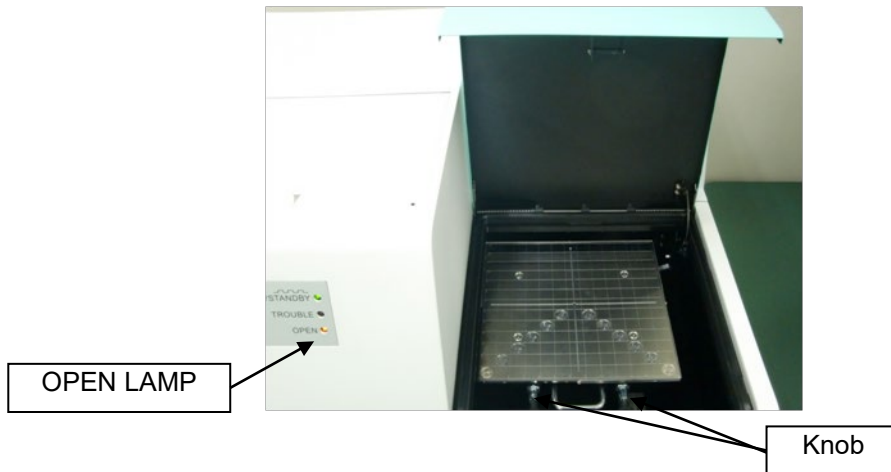
- (1) See Chapter 3 to open the operation screen.



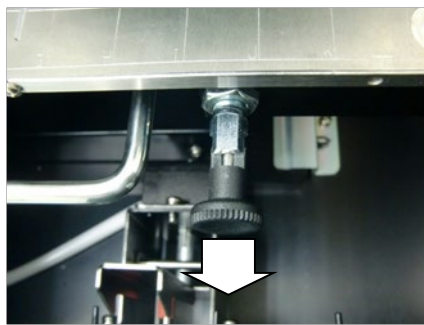
- (2) Click on "Move sample stage" button.
- (3) The message box is displayed to confirm the sample stage movement. Click on "OK" button.



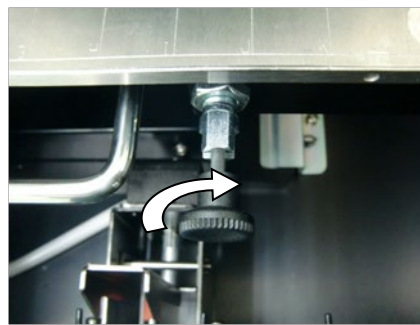
- (4) The stage moves to the sample replacement location, and the sample door cover opens. Check that the OPEN lamp blinks in red.



- (5) Pull and turn the knob 45 degrees. It is fixed in a pulled status. Fix both two knobs in a pulled status.



Pull the knob.

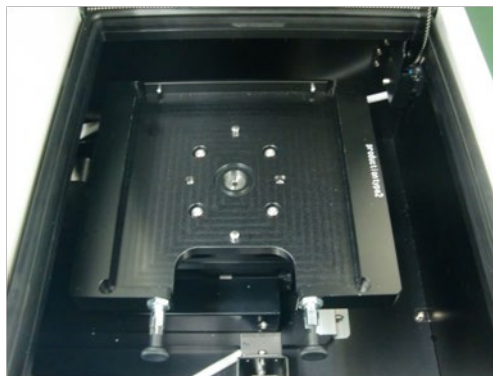


Turn it in a pulled status.

- (6) Raise the handle a little and pull it on an angle to remove the sample stage.



Removal



Removed status

- (7) Install the sample stage to be replaced in the reverse order of (1) to (6).

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1

Before Using

This chapter describes the information to be known before using this application.

1-1. Overview

Thank you for using our "AC-5 Analysis Application." This document describes the methods to obtain the photoemission threshold values and to quote the state density from AC-5 measurement results. Never fail to read the following "Software License Terms" and "Precautions" to use this software. Also never fail to read the contents of this document to use this software correctly.

1-2. Software license terms

Only when the following terms are agreed, this software use shall be granted. Also, when this software is started to be used, the agreement to the following terms shall be assumed.

1. License

RIKEN KEIKI (hereinafter we) shall grant the non-exclusive license of this software to customers under the condition specified in this license terms.

2. License range

Customers cannot use, copy, alter, adapt, or reprocess this software in whole or in part or lend or transfer it to a third party except as allowed in this license terms.

3. Copyright

The copyright of this software, manuals, and others shall belong to us and any rights shall not be given to customers except the license of this software granted with this license terms.

4. Contract term

The license of this software shall start at the point when the customer starts using this software.

5. Warranty

We shall not warrant anything about this software such that this software has no defect.

6. Indemnity

We shall not take any responsibility for any reason for customers' lost earnings, losses occurred with exceptional circumstances (including cases where we have foreseen or could have foreseen the loss occurrence), and direct/indirect losses based on the request for indemnity executed by a third party for customers which occurred in association with this software under any circumstances.

7. Contract termination

Customers immediately shall terminate the contract and discard all of this software and its duplicates when customers violate any of these license terms.

8. Others

When this software is brought out of Japan, Japanese export control rules shall be complied with.

Regardless of the country where this software is actually used, Japanese laws shall be applied to this contract.

1-3. Precautions

This document is described on the assumption of the following:

- The AC-5 units and personal computer have been installed and set correctly.
- The AC-5 for Windows has been installed correctly.
- The user understands the Windows operation method.
- The user understands the meanings and relation with the photoemission of the work function, ionization potential, and state density.
- It is prohibited to reproduce the contents of this document without permission.
- The contents of this document are subject to be changed in the future without prior notice.
- We take all possible measures to ensure the contents of this document; however, if ever questionable or missing descriptions are noticed, please contact RIKEN KEIKI.
- MS, Microsoft, and Windows are registered trademarks or trademarks of the US Microsoft Corporation in each country. Other company names and product names used in this document are registered trademarks or trademarks of each company in general.

Please read the AC-5 operating manual and operating manuals for Windows before you read this document.

2

File Basic Operation

This chapter describes basic operations along the procedure.

2-1. Application preparation

- (1) Start the application. Select it from the programs of the start menu or double-click on the shortcut icon created on the desktop.
- (2) After the splash screen is displayed, the data manager screen is displayed.

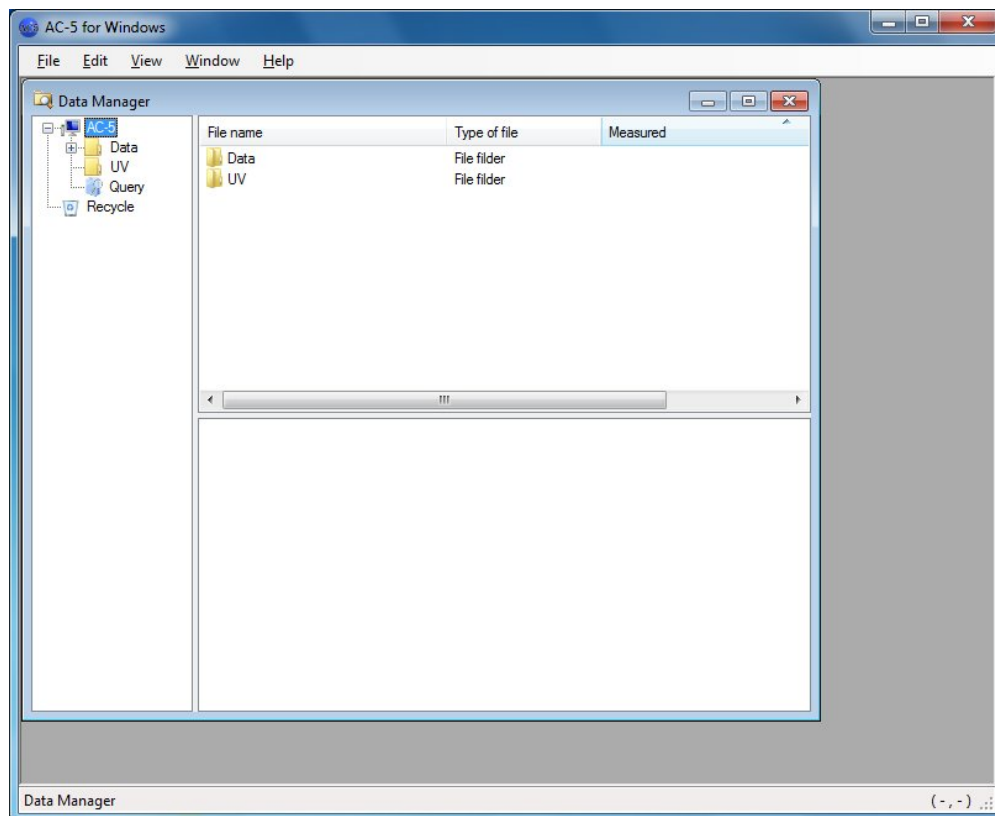


Figure 2-1.1 Screen on Start-up

The AC-5 analysis application can handle the following files in a folder under My Documents\AC-5.

Table 2-1.1 AC-5 File Group

Type	Description
Measurement data file (*.dat)	Measurement results are stored.
Multidata file (*.mdat)	An average obtained from repeated measurement results is stored. * It is generated for the following two cases: <ul style="list-style-type: none"> • The measurement is executed with the setting of twice or more of repetitive times with the measurement application. • "Average" is executed while multiple measurement results are displayed with the analysis application.
Differential result file (*.ddat)	Density of states obtained from measurement results is stored. * It is generated when "State density" is executed while the multidata file is open with the analysis application.
Light intensity correction coefficient file (*.ldat)	The UV intensity correction coefficient is stored.



CAUTION

- Save the measurement data file (*.dat), multidata file (*.mdat), and differential result file (*.ddat) are saved in the arbitrary folder under My Document\AC-5\Data, and UV intensity correction coefficient file (*.ldat) in My Document\AC-5\UV folder.
- Files other than the files described in Table 2-1.1 will not be displayed even when they exist. Also, if the file formats have any error, those files will not be displayed.
- Sample images taken with the "Spot directed on photograph" option will not be displayed with the AC-5 analysis application.

NOTE

Regular backups are recommended.

See Chapters 4 and 5 for details of the data manager.

2-2. Graph display

Select the data to be displayed with the data manager. Right-click on the data to display the pop-up menu and click on "Open" or click on "Open" on "File (F)" menu.

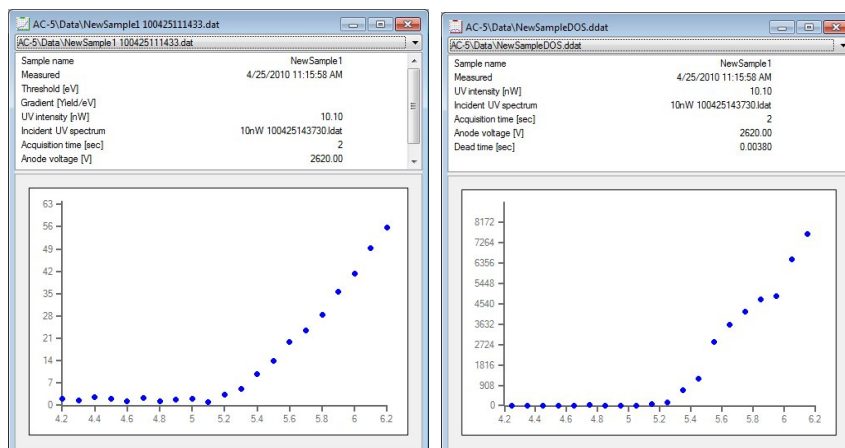


Figure 2-2.1 Graph Display Example (Left: Measurement data file or multidata file, Right: Differential result file)

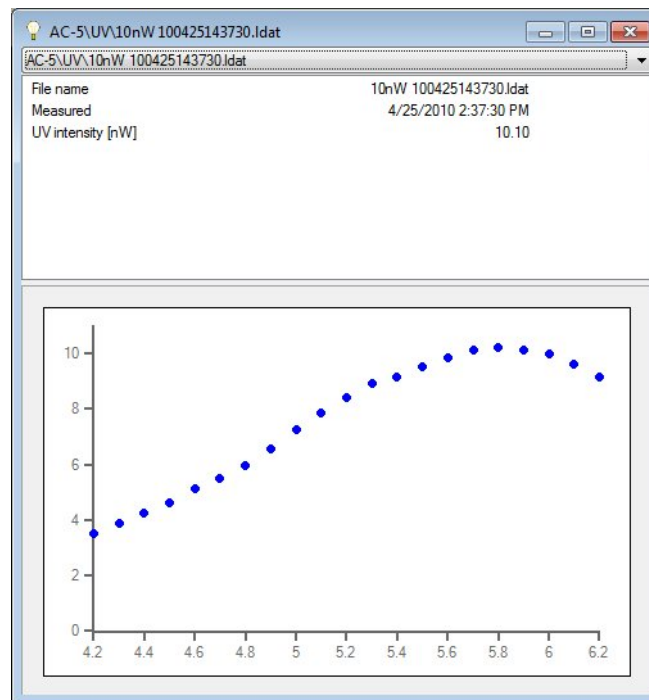


Figure 2-2.2 Graph Display Example (Light Intensity Correction Coefficient File)

For multidata files, right-clicking on the graph to open the pop-up menu and selecting "Display details" display data items used for average calculation.

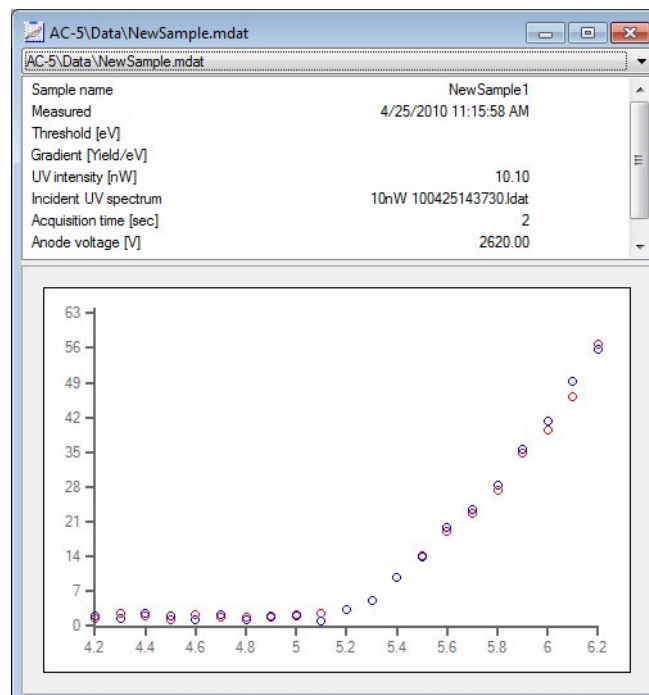


Figure 2-2.3 Graph Display Example (Multidata File Details Display)

2-3. Setting axes

(1) Right-click on the graph to open the pop-up menu and select "Zoom".

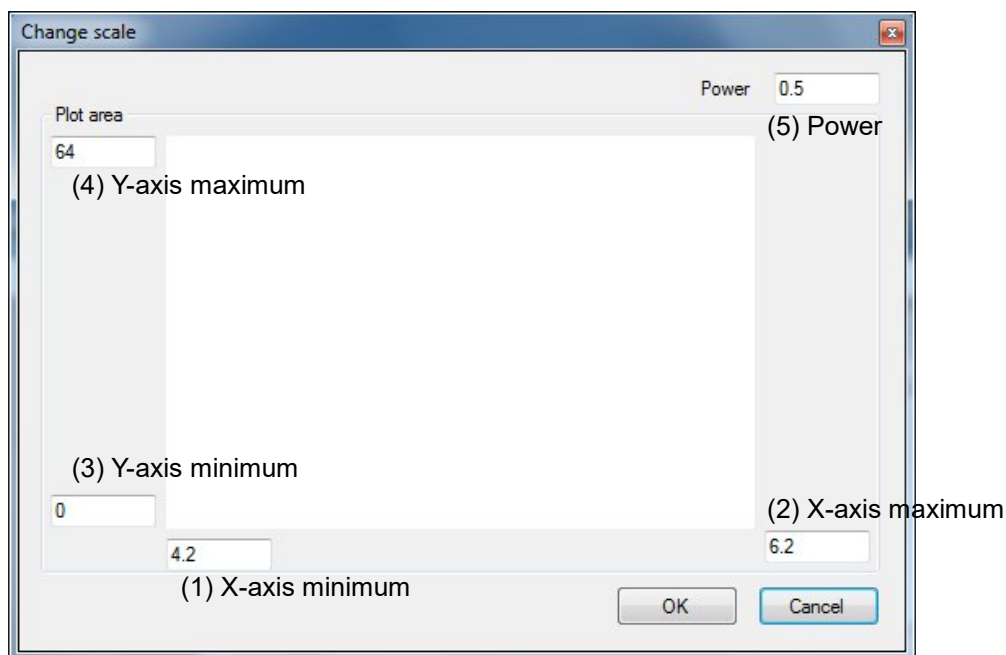


Figure 2-3.1 Zoom screen

Enter the X-axis minimum, X-axis maximum, Y-axis minimum, and Y-axis maximum and click on "OK" button. For the measurement data and multidata, the power can be changed.

NOTE

The power depends on the material. Confirm it with articles or others. In generally, it is said that 0.5 power is used when the sample is metal and 0.3 power (1/3 power) is used when it is a semiconductor. For organic substances, it can be said that the 0.5 power is often used.

(2) Right-clicking on the graph to open the pop-up menu and selecting "Set initial value" resets the drawing range back to the setting on the measurement.

To save the axis setting, right-click on the graph to open the pop-up menu and select "Save".

2-4. Comparing data

Up to ten data items of the same file type can be graphed simultaneously for comparison.

- (1) With the data manager, hold down the Ctrl key and then click on multiple data items for selection.
- (2) Right-click on them to open the pop-up menu and select "Open".
- (3) The multigraph form is displayed.

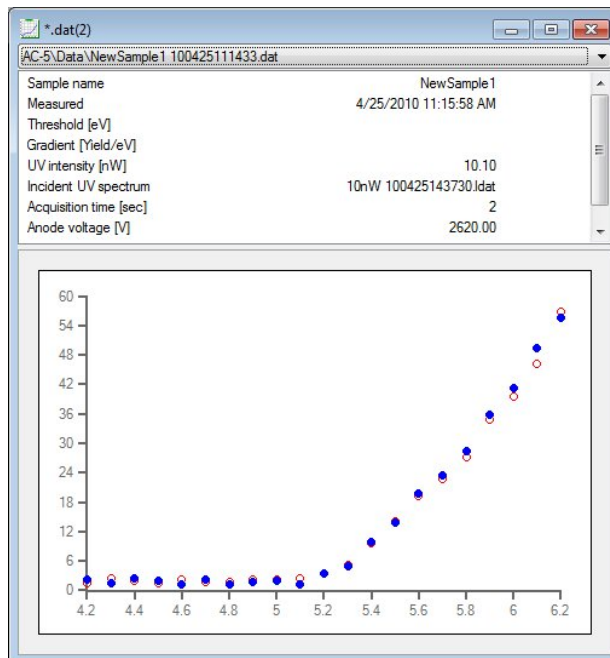


Figure 2-4.1 Multigraph Form

Right-click on the graph to open the pop-up menu, and select "Superpose data" to lay another data item over. Also, right-click on the graph to open the pop-up menu and select "Exclude" to close only the selected data item.



CAUTION

Up to ten data items can be laid over.

With the drop-down list, the selected data can be switched.

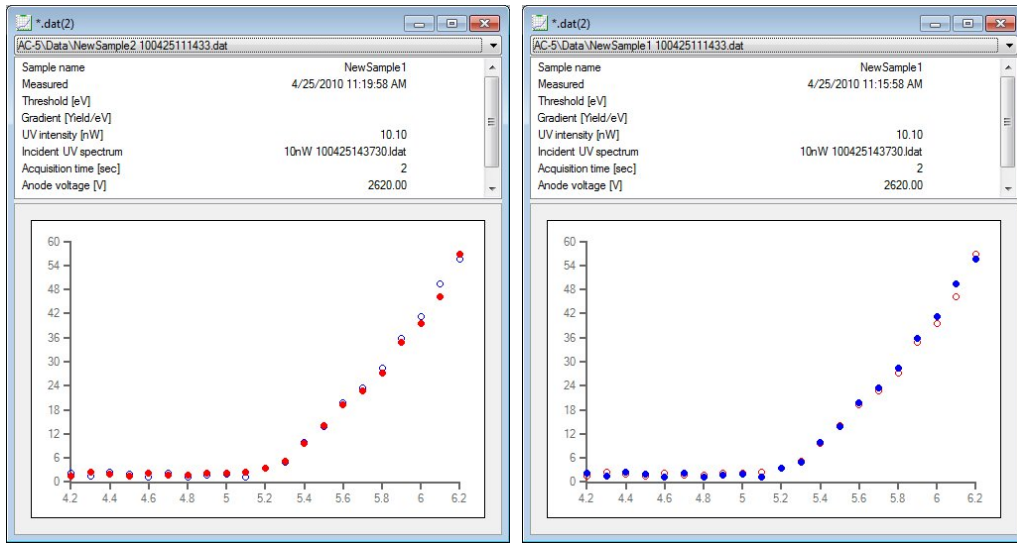


Figure 2-4.2 Data Switching with Drop-down List
 Left: File 2 is selected (red plots). Right: File 2 is selected (blue plots).

2-5. Combination with other applications

Right-clicking on the graph to open the pop-up menu and selecting "Copy graph" copies the graph onto the clipboard.

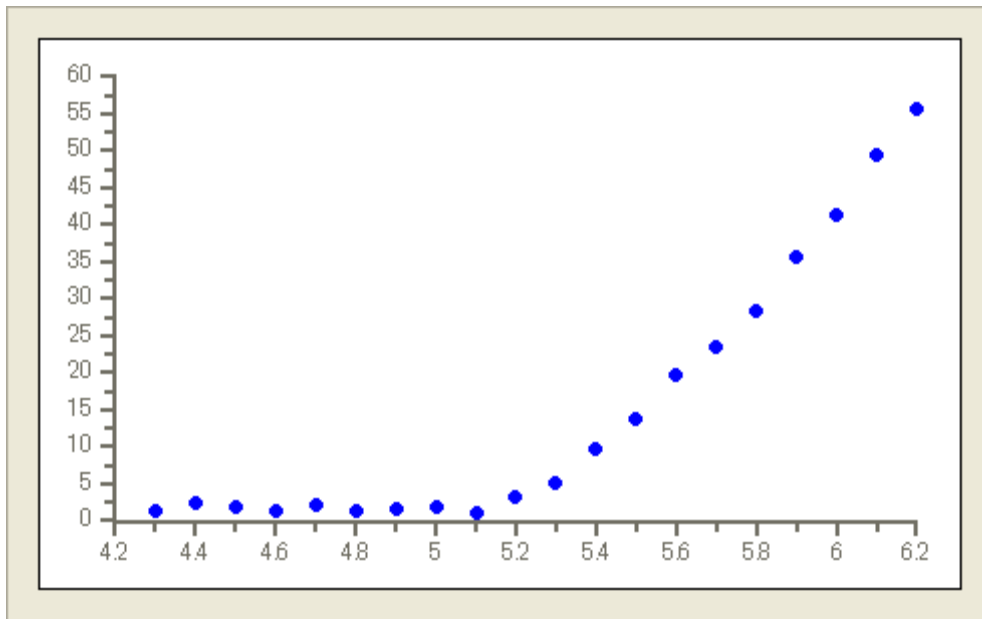


Figure 2-5.1 Example of Graph Copy

Right-clicking on the graph to open the pop-up menu and selecting "Copy data" copies the numerical data onto the clipboard.

```
Energy(eV),Yield^0.5
4.20,2.18
↓ (Numerical data of the graph)
6.20,55.62
```

When multiple data items are graphed, the data copy is as follows:

```
Energy(eV),Yield^0.5
4.20,2.18
  ↓ (First numerical data item of the graph)
6.20,55.62
(Line feed)
Energy(eV),Yield^0.5
4.20,1.54
  ↓ (Second numerical data item of the graph)
6.20,56.68
```

Right-clicking on the graph to open the pop-up menu and selecting "Copy parameter" copies the numerical data item and parameters onto the clipboard. For example, the measured data is described as follows:

```
Sample name,NewSample1
Measured,2010/04/25 11:15:58
UV intensity,10.1
Light intensity correction coefficient,10nW
100425143730.ldat
Acquisition time,2
HV,2620
Dead time,0.003800
Start energy,4.20
Finish energy,6.20
Step,0.1
Threshold,
Slope,
Power,0.5
(Line feed)
Energy(eV),Yield^0.5
4.20,2.18
  ↓ (Numerical data of the graph)
6.20,55.62
```

3

Analysis Basic Operation

This chapter describes basic operations along the analysis procedure.

3-1. Light intensity correction

The UV intensity correction of measurement data can be changed/deleted.
Right-click on the graph to open the pop-up menu and select "Light intensity correction" → "Change" or "Light intensity correction" → "Delete".



CAUTION

Changeable conditions are as follows:

- Same UV intensity
- All energy values of the measurement data are included.
- Same measurement date

3-2. Obtaining average

While multiple measurement data items are opened with the method described in Chapter2, right-click on the graph to open the pop-up menu and select "Obtain average". The multidata file is created and displayed in another window.

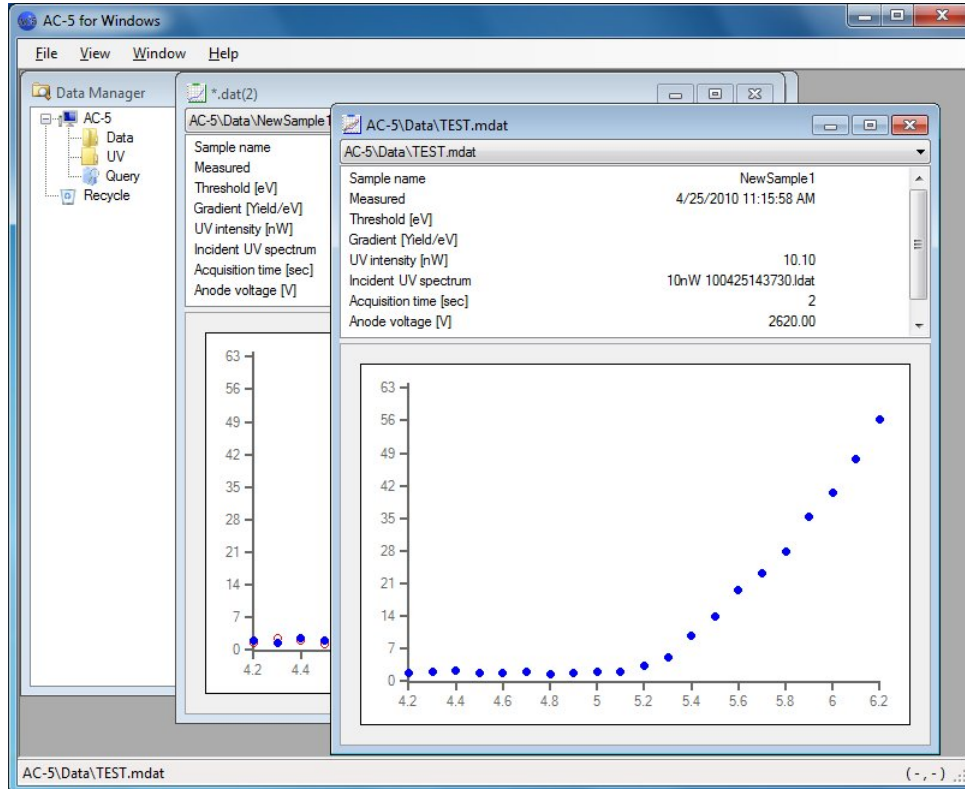


Figure 3-2.1 Multidata File Creation

3-3. Obtaining photoemission threshold

- (1) Open one measurement data item. Or, open the multidata item and display the average.
- (2) Adjust the graph display status with the method described in Chapter 2.
- (3) Judge the flat part of the graph and select the range with the click and drag function. Right-click on the graph to open the pop-up menu and select "Background".

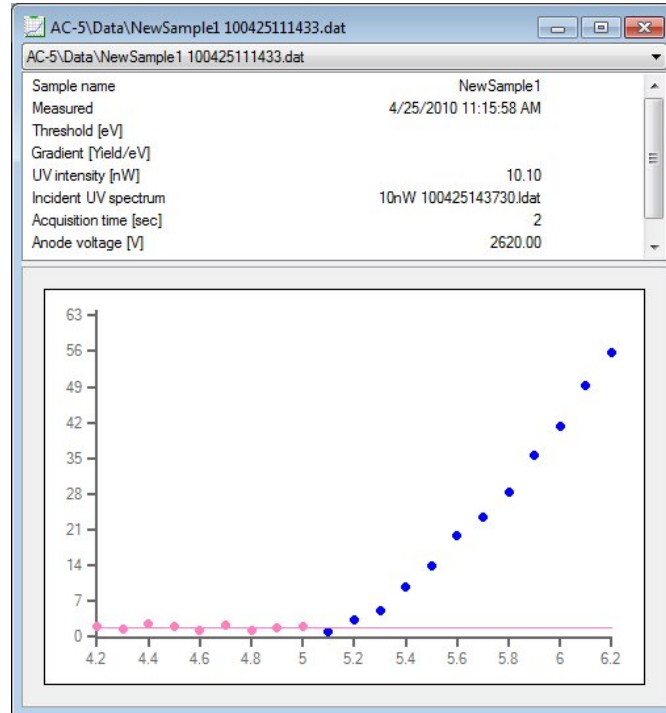


Figure 3-3.1 Background Straight Line

Holding down the Ctrl key and clicking on the range adds/deletes it.

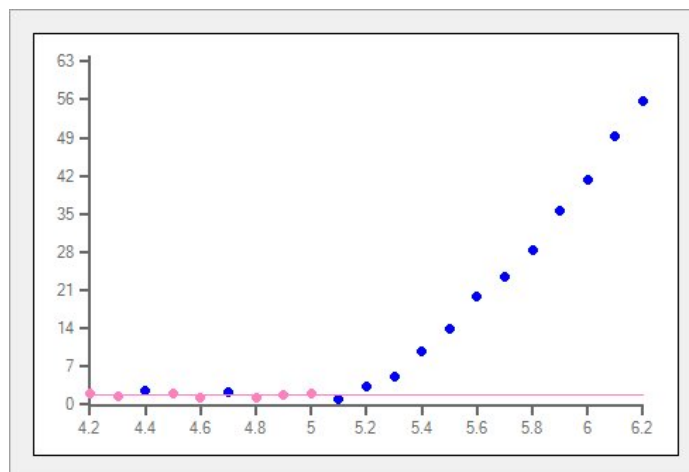


Figure 3-3.2 Background Straight Line (Example of exclusion)

- (4) Judge the regression line range and select it with the click and drag function. Right-click on the graph to open the pop-up menu and select "Regression line".

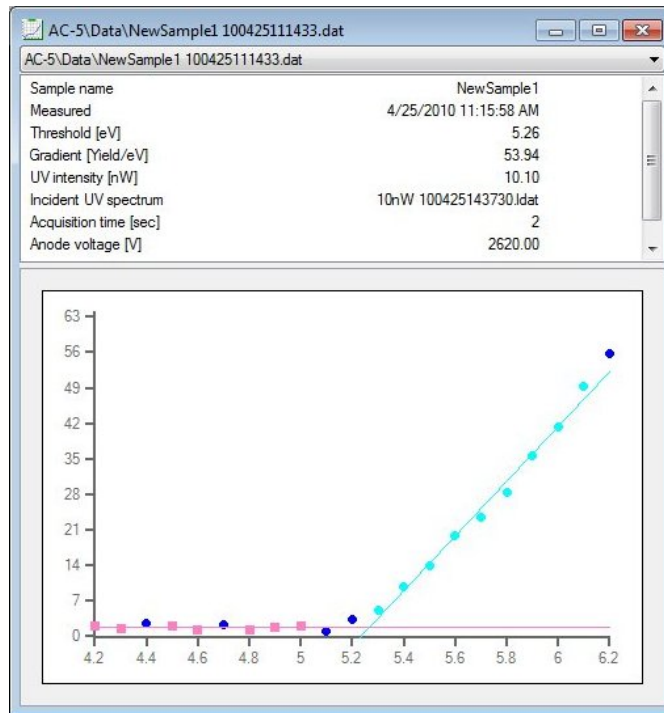


Figure 3-3.3 Regression Line

Holding down the Ctrl key and clicking on the range adds/deletes it.

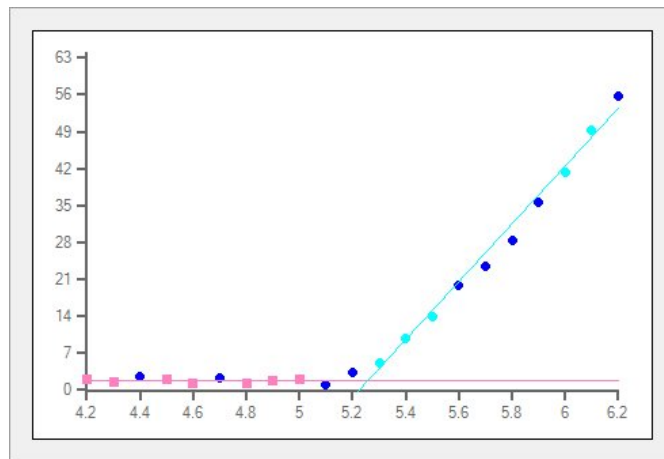


Figure 3-3.4 Regression Line (Example of exclusion)

- (5) The threshold value and slope are displayed.

To save the threshold value and slope, right-click on the graph to open the pop-up menu and select "Save".

3-4. Estimating state density

- (1) Open the multidata item and display the average.
- (2) Right-click on the graph to open the pop-up menu and select "State density".
- (3) The differential result file is created and the estimated state density is displayed in another window.

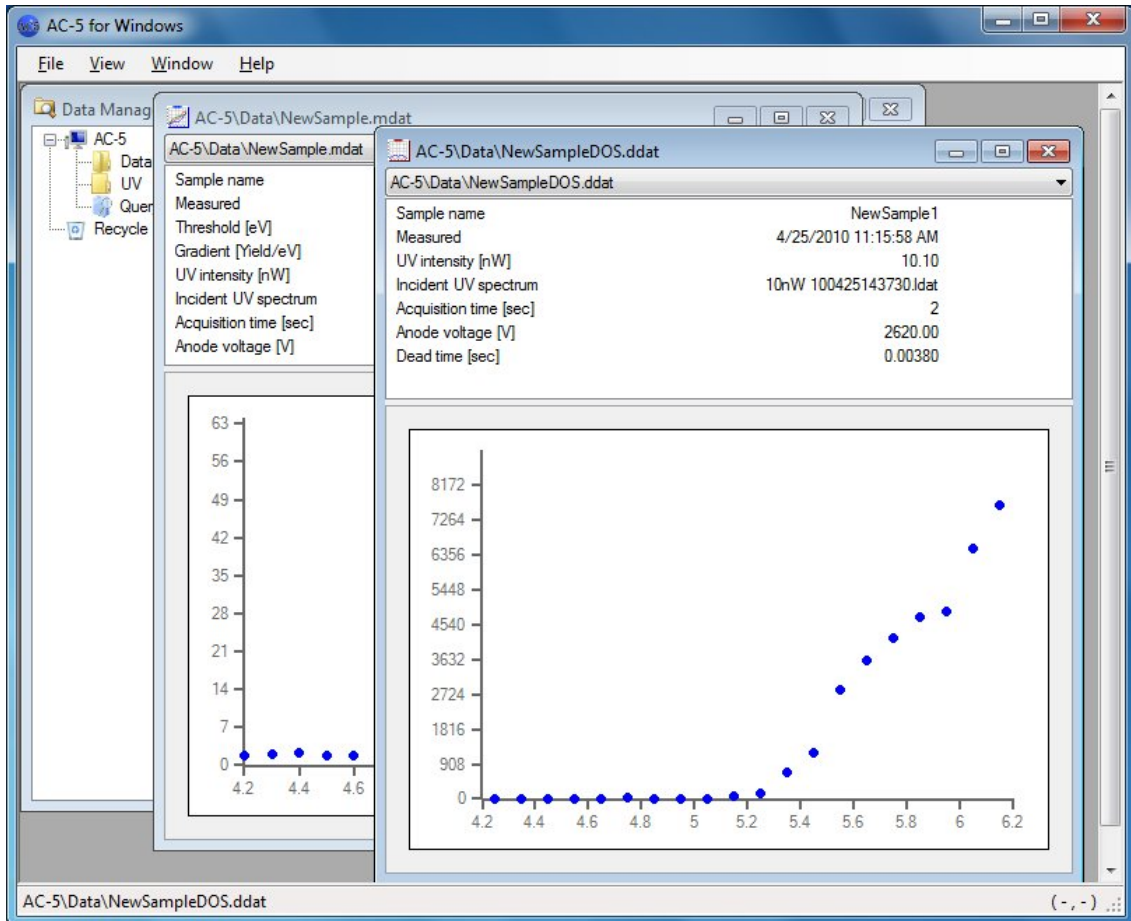


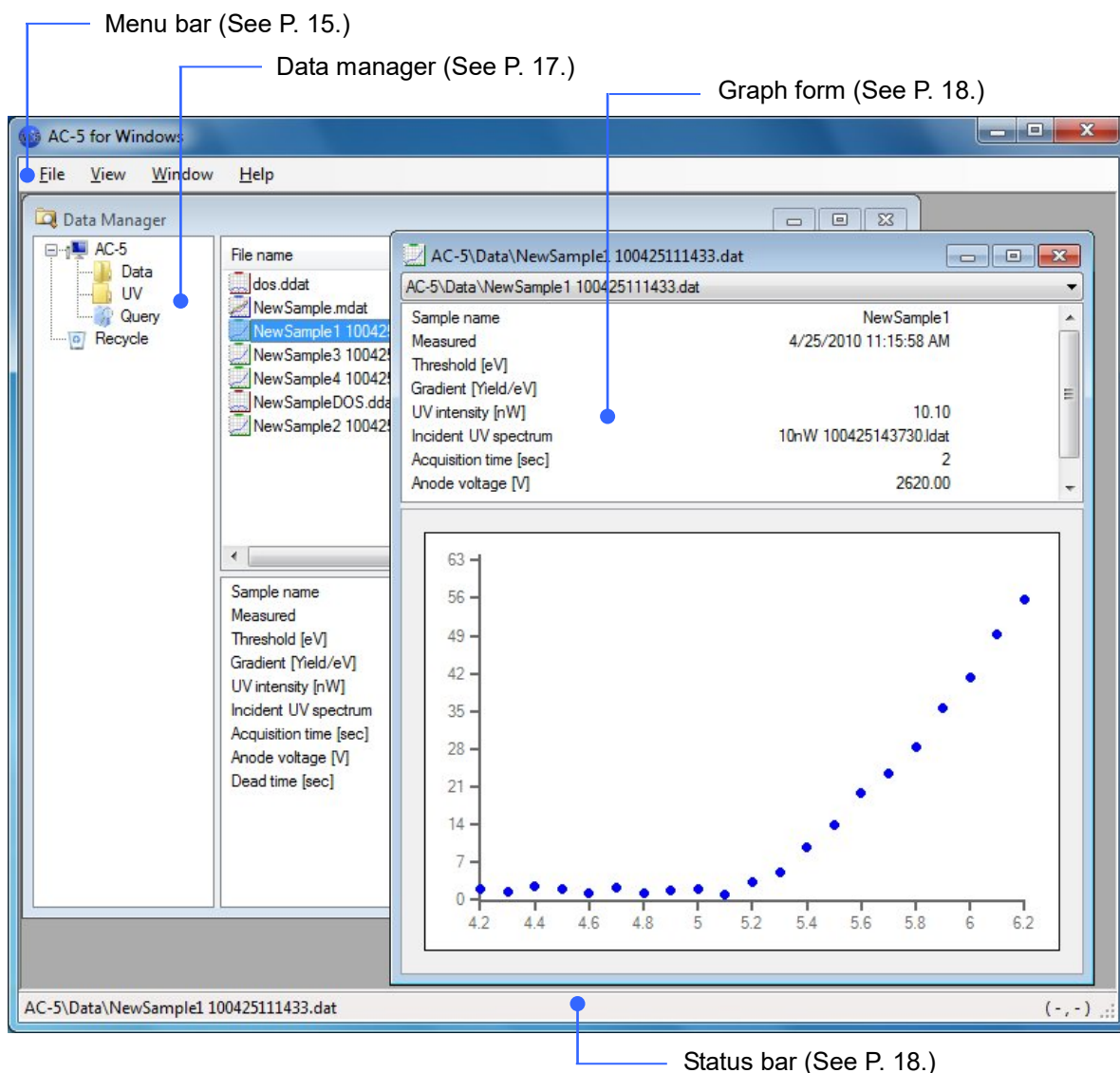
Figure 3-4.1 Differential Result File Creation

4

Screen Configuration

The screen configuration is described.

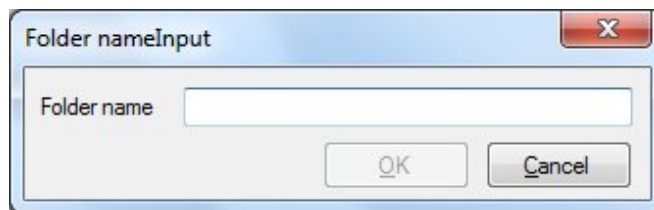
4-1. Basic screen



4-2. Menu bar

"File" menu

Command	Description
Open	Opens the selected file. Or, opens the selected folder. Multiple files can be selected and opened; however, if different file types are selected, an error message will be displayed. Up to 10 files can be opened simultaneously. * This command is displayed only when the data manager is active.
New Folder	Displays the name entry dialog for the folder to be created. A new folder is created with the entered folder name. * This command is displayed only when the data manager is active.
Delete	Moves the selected file (folder) to the AC-4 recycle bin folder. * This command is displayed only when the data manager is active.
Rename	Changes the selected file (folder) name. * This command is displayed only when the data manager is active.
Close	Ends the application.



Folder Name Entry Dialog

"Edit" menu (* Displayed only when the data manager is active)

Command	Description
Copy	Specifies the selected file (folder) as the copy source.
Cut	Specifies the selected file (folder) as the cut source.
Paste	Duplicates or moves the specified file (folder).
Search	Displays the search screen (4-8). Only when the Query folder is selected and clicked, the search screen with entry of the last search condition is opened.

"View" menu

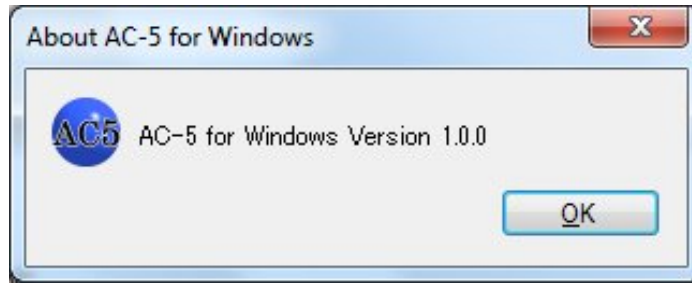
Command	Description
Status Bar	Switches display/hide of the status bar.
Refresh	Renews the current folder information.
Graph Setting	Displays the customize screen.

"Window" menu

Command	Description
Cascade View	Displays the displayed windows overlapping.
Horizontally Tile	Displays the displayed windows next to each other horizontally.
Vertically Tile	Displays the displayed windows next to each other vertically.
All Close	Closes all child windows.
Data Manager	Displays the data manager screen in the foreground.
Window list	Displays the opened windows list. The foreground window can be switched.

"Help" menu

Command	Description
About AC-5 Windows...	Displays the version information screen.



Version Information screen

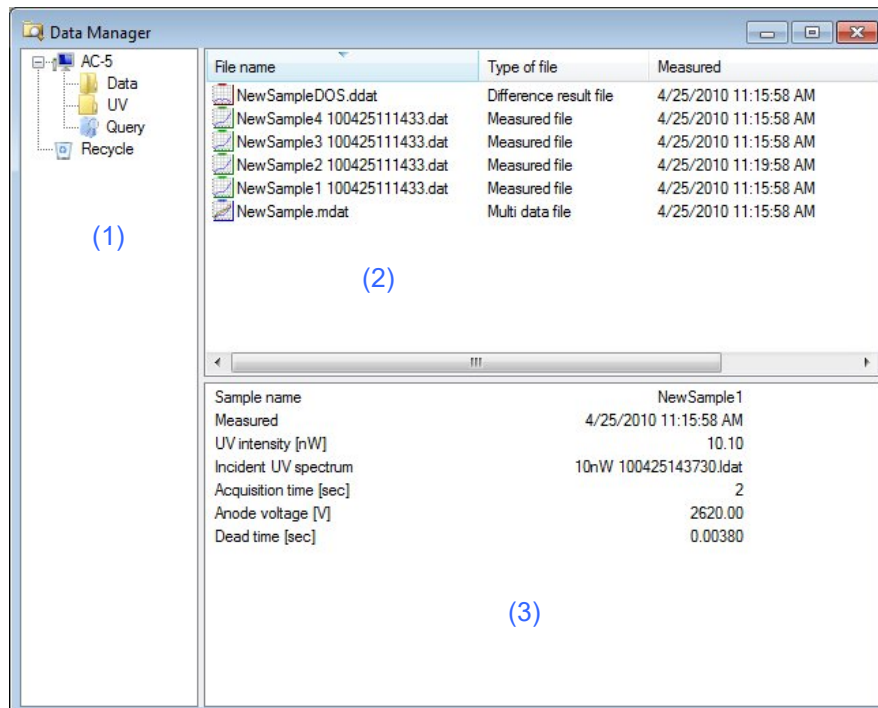
4-3. Status bar



- (1) The foreground window is displayed.
- (2) When a graph is displayed, the coordinate of the cursor location is displayed.

4-4. Data manager

The data manager is a window to control data items.



- (1) Tree view
 - The AC-5 application hierarchy structure (folders and files) is displayed in a tree view.
 - The root folder is My Document\AC-5.
 - Icon types differ by folder types.

Tree View Right-click Menu

Command	Description
Open	Same as "Open (O)" of the menu bar "File (F)"
Copy	Same as "Copy (C)" of the menu bar "Edit (E)"
Cut	Same as "Cut (C)" of the menu bar "Edit (E)"
Paste	Same as "Paste (P)" of the menu bar "Edit (E)"
Search	Same as "Search (S)" of the menu bar "Edit (E)"
New Folder	Same as "Create folder (F)" of the menu bar "File (F)"
Delete	Same as "Delete (D)" of the menu bar "File (F)"
Rename	Same as "Change name (M)" of the menu bar "File (F)"
Close	Same as "Close (C)" of the menu bar "File (F)"

(2) List view

The contents of the folder selected with the tree view are displayed.

- Icon types differ by file (folder) types.
- Clicking on the column header executes sorting. Every click switches ascending/descending.

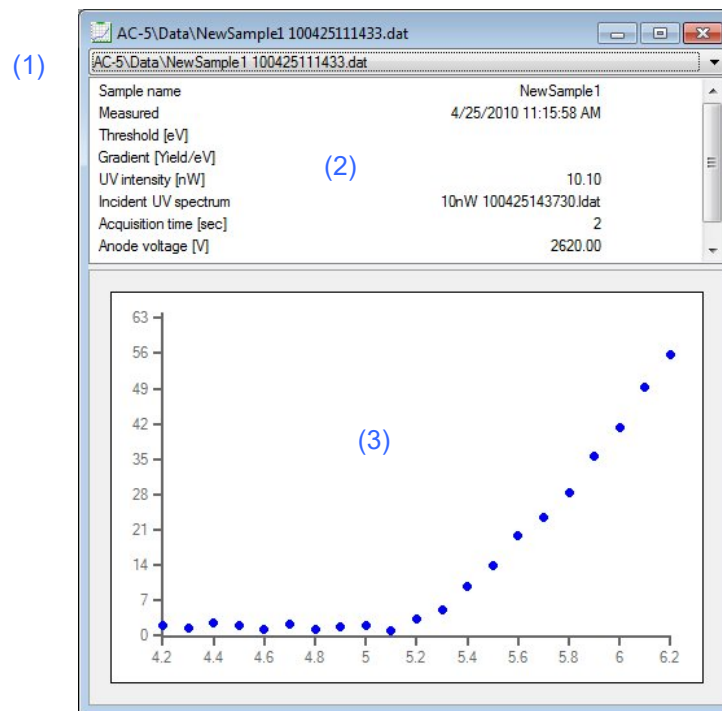
List View Right-click Menu

Command	Description
Open	Same as "Open (O)" of the menu bar "File (F)"
Copy	Same as "Copy (C)" of the menu bar "Edit (E)"
Cut	Same as "Cut (C)" of the menu bar "Edit (E)"
Paste	Same as "Paste (P)" of the menu bar "Edit (E)"
Search	Same as "Search (S)" of the menu bar "Edit (E)"
New Folder	Same as "Create folder (F)" of the menu bar "File (F)"
Delete	Same as "Delete (D)" of the menu bar "File (F)"
Rename	Same as "Change name (M)" of the menu bar "File (F)"
Close	Same as "Close (C)" of the menu bar "File (F)"

(3) File information

The information of the file selected with the list view pane is displayed.

4-5. Graph form

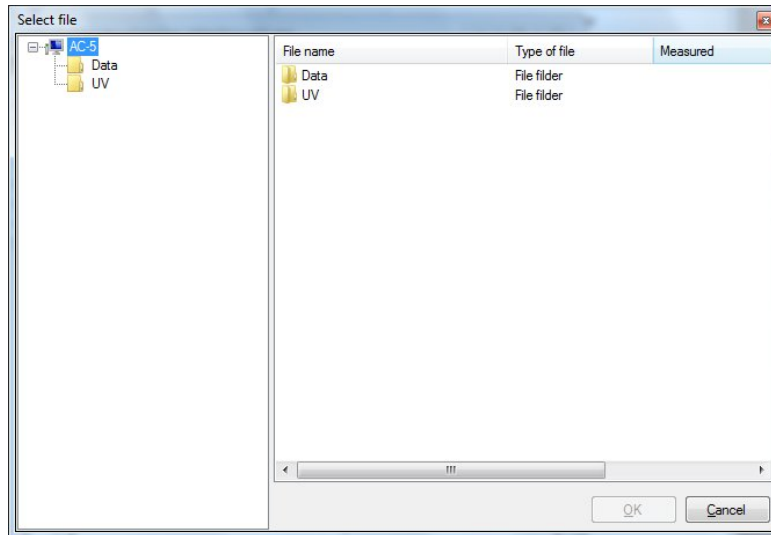


- (1) "File name" drop-down list
Lists the displayed data items.
- (2) File information
Displays the same contents of the file information of the data manager.
- (3) Graph plot section
Displays the graph. On the measurement data and multidata, the click & drag function enables area selection.

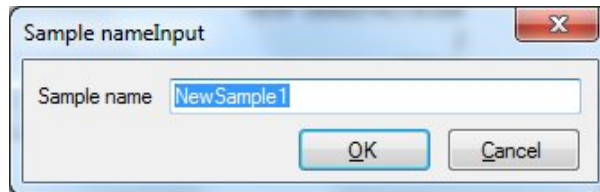
Graph Plot Section Right-click Menu

	Measurement data file (single)	Measurement data file (multiple)	Multidata file (single)	Multidata file (multiple)	Differential result file (single)	Differential result file (multiple)	Light intensity correction coefficient file (single)	Light intensity correction coefficient file (multiple)	Description
Background	○	△	○	△	×	×	×	×	Obtains the background from the selected area data.
Regression line	○	△	○	△	×	×	×	×	Obtains the regression line from the selected area data.
Data clear	○	△	○	△	×	×	×	×	Clears the background and regression line.
Incident UV spectrum	○	△	×	×	×	×	×	×	-
Change	○	×	×	×	×	×	×	×	Changes UV intensity correction coefficient. Select it from the file selection dialog.
Delete	○	×	×	×	×	×	×	×	No UV intensity correction
Save	○	△	○	△	○	△	○	△	Saves the analysis result.
Change the sample name	○	△	○	△	×	×	×	×	Changes the sample name. Enter the sample name into the entry dialog.
Add	○	○	○	○	○	○	○	○	Superposes the data items. Select the data items from the file selection dialog.
Remove	△	○	△	○	△	○	△	○	Excludes the selected data item.
Average	△	○	×	×	×	×	×	×	Obtains the average. The multidata is created and displayed in another window.
Density of states	×	×	○	△	×	×	×	×	Estimates the state density. The differential result is created and displayed in another window.
Details	×	×	○	△	×	×	×	×	Displays data used for average calculation.
Change scale	○	○	○	○	○	○	○	○	Sets the axis minimum/maximum values.
Initial scale	○	○	○	○	○	○	○	○	Returns the axis minimum/maximum values to the default.
Copy graph	○	○	○	○	○	○	○	○	Copies the graph.
Copy data	○	○	○	○	○	○	○	○	Copies the data.
Copy data and parameters	○	△	○	△	○	△	○	△	Copies the data and parameters.

○=Enabled △=Disabled (gray out) ×=Hidden

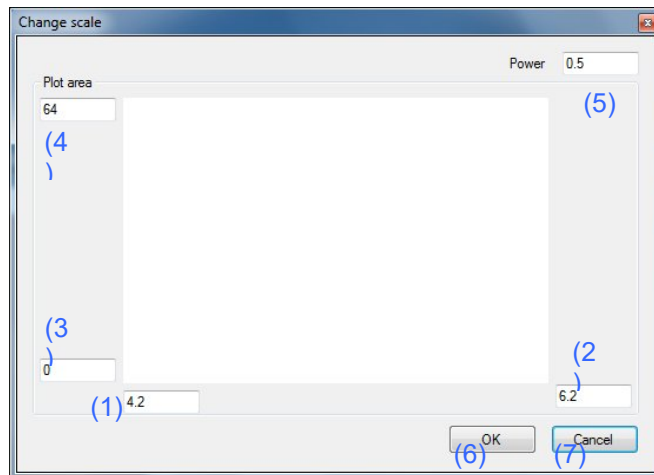


File Selection Dialog



File Name Entry Dialog

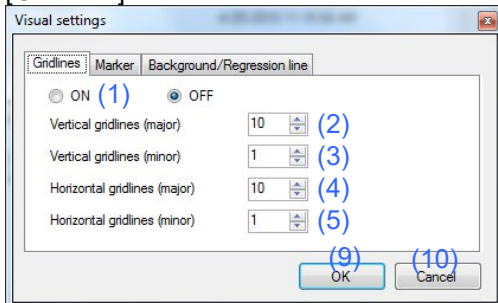
4-6. Zoom window



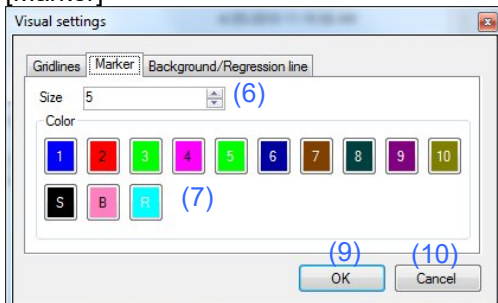
- (1) X-axis minimum value entry text box
- (2) X-axis maximum value entry text box
- (3) Y-axis minimum value entry text box
- (4) Y-axis maximum value entry text box
- (5) Power entry text box
- (6) OK button
- (7) Cancel button

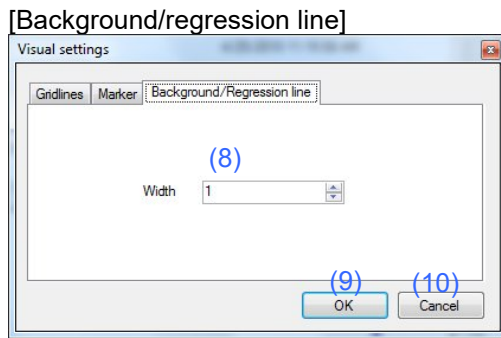
4-7. Customize window

[Gridlines]



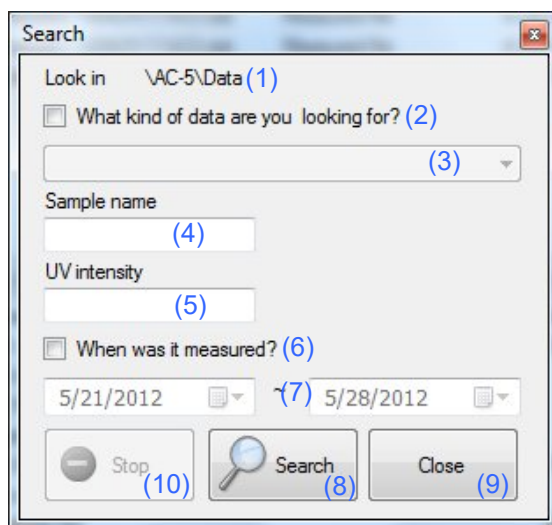
[Marker]





- (1) Gridlines display/hide setting button
- (2) Vertical gridlines (major) specification box
- (3) Vertical gridlines (minor) specification box
- (4) Horizontal gridlines (major) specification box
- (5) Horizontal gridlines (minor) specification box
- (6) Size specification button
- (7) Color setting button
- (8) Line thickness button
- (9) OK button
- (10) Cancel button

4-8. Search window



- (1) Search location display
- (2) File type checkbox
- (3) File type list box
- (4) Sample name entry text box
- (5) UV intensity entry text box
- (6) Measurement date checkbox
- (7) Measurement date specification list box
- (8) Search button
- (9) Close button
- (10) Stop button

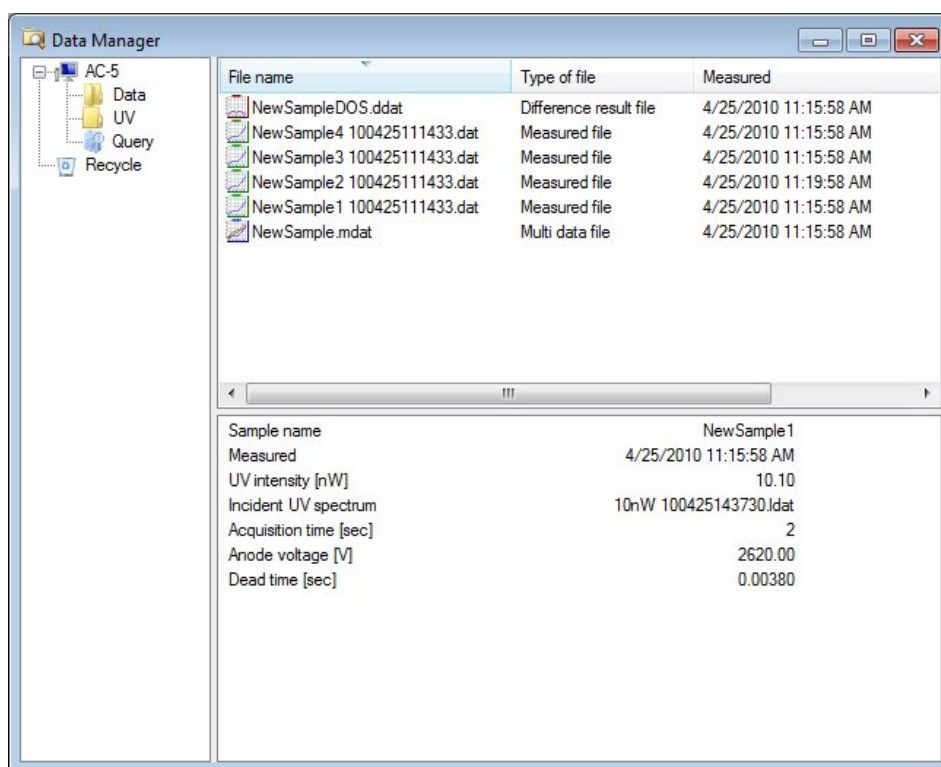
5

Other Functions

This chapter describes functions not described in Chapter 2 to 4.

5-1. Data manager

The data manager can handle files with the same operations as the Windows Explorer. However, it can handle only the hierarchy under My Document\AC-5.



The data deleted with the data manager moves to "Recycle" in the tree view which is the AC-5-dedicated recycle bin. When the data is deleted from "Recycle", it moves to the recycle bin of Windows. If the data manager is closed wrongly, it can be displayed again with the data manager in "Window (W)" menu.

The data manager list view displays files in the ascending order of measurement date on start-up. Clicking on the column header sorts the files. Also, every click switches ascending/descending.



CAUTION

- The data manager file operation uses the Windows clipboard. Be careful using the clipboard in combination with other applications (such as Explorer).
- Execute the backup operation with the Explorer or others.
- Use the AC-5 analysis application data manager for file operations within the AC-5 folders Use operations with the Explorer or others only for backup.

5-2. Search

Locations for search are layers under the folder selected in the data manager list view. Right-click to open the pop-up menu and select "Search" or select "Search" in "Edit (E) " menu.

[What kind of data are you looking for?]

The data types to be searched can be refined.

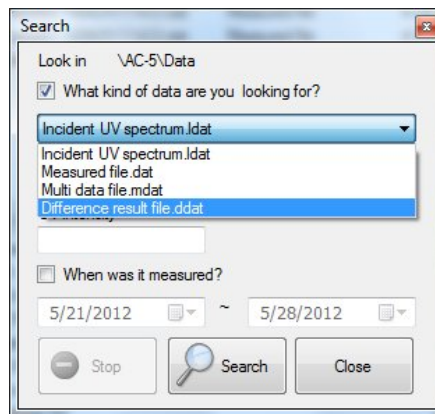
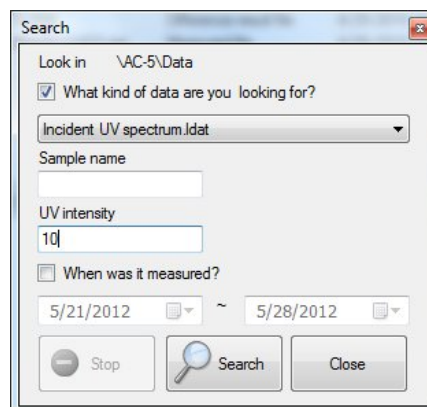
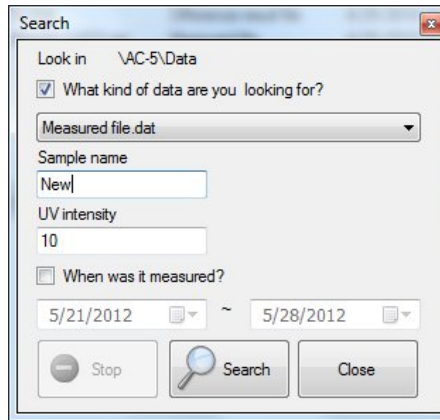


Figure 5-2.1 Refinement with Data Types

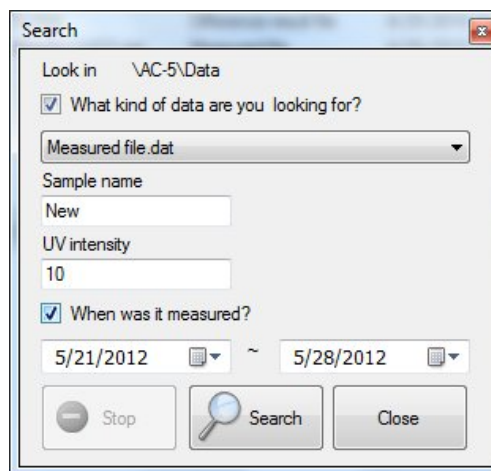
When the Incident UV spectrum .ldat has been specified, searching can be executed with entry of the UV intensity.



When others than the Incident UV spectrum .ldat has been specified, searching can be executed with entry of the sample name.

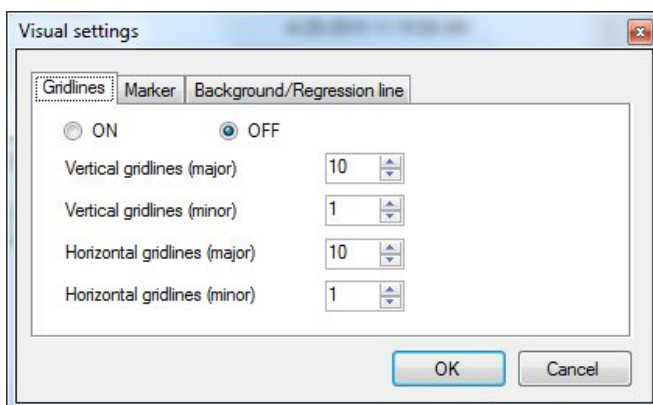


[When was it measured?]
 Only the data items measured during the specified period are search targets.



5-3. Visual settings

With the visual settings window "Gridlines" tab, the gridline setting can be changed.



The gridlines display/hide can be switched with the gridline display/hide setting button.
 The gridline interval can be changed with the vertical gridlines (major), vertical gridlines (minor), horizontal gridlines (major), and horizontal gridlines (minor) values change.
 The gridlines interval depends on the axis maximum/minimum and the step.

When the vertical gridline is 4.2 to 6.2 eV and 0.1 eV step, the horizontal gridline is 0 to 63, vertical gridline (major) = 5, vertical gridline (minor) = 10, horizontal gridline (major) = 5, and horizontal gridline (minor) = 10, the calculation below is executed.

$$(6.2-4.2) \div 0.1 \div 5 \div 10 = 0.4$$

Draw the vertical gridlines (minor) by 1 step with rounding up or 0.1 eV.

$$1 \times 10 = 10$$

Draw the vertical gridlines (major) by 10 steps or 1 eV.

$$(63-0) \div 1 \div 5 \div 10 = 1.26$$

Draw the horizontal gridlines (minor) by 2 steps with rounding up or 2.

$$2 \times 10 = 20$$

Draw the horizontal gridlines (major) by 20 steps or 20.

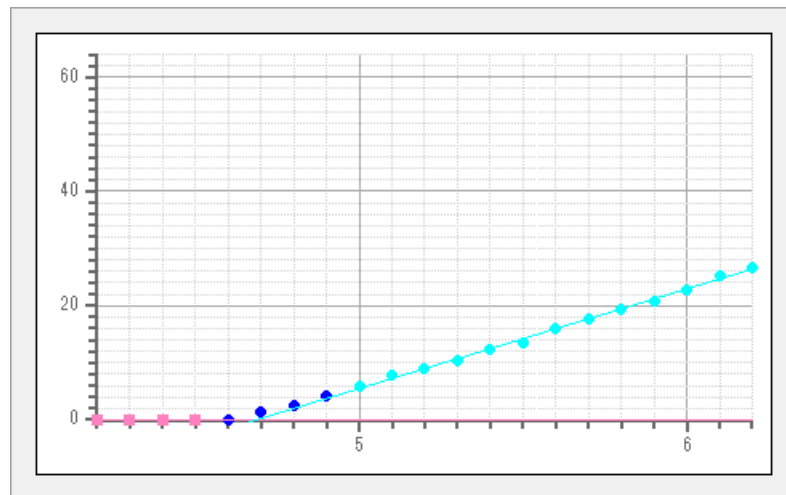
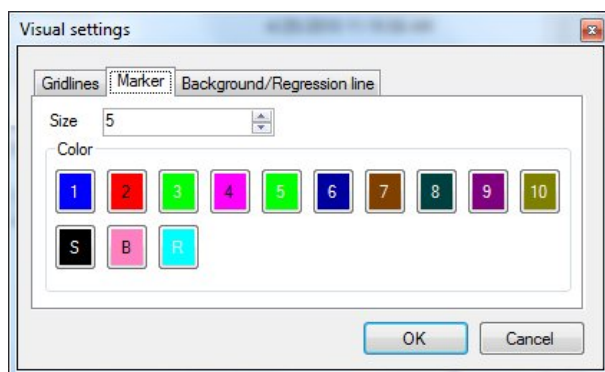


Figure 5-3.1 Example of Gridlines

With the visual settings window "Marker" tab, the plot color and size can be changed.



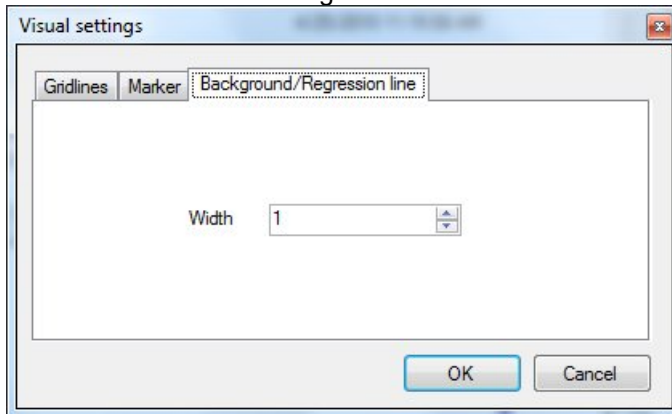
1 to 10 mean the first to 10th data items when multiple data items are superposed.

S is the selected dot, B is the dot specified on the background, and R is the dot specified on the regression line.

NOTE

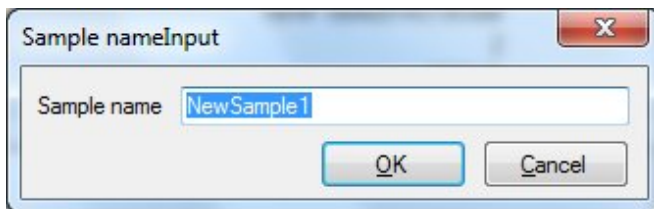
The 11th data item is same as the first one, and the 12th data is same as the second one.

With the visual settings window "Background line/regression line" tab, the background line and regression line thickness can be changed.



5-4. Changing sample name

The sample name can be changed from the right-click menu of the graph form graph plot section.



Declaration of Conformity

We, **RIKEN KEIKI Co., Ltd.**

2-7-6, Azusawa, Itabashi-ku,
Tokyo, 174-8744, Japan

declare in our sole responsibility that the following
product conforms to all the relevant provisions.

Product Name	:	Photoemission Yield Spectroscopy In Air
Model Name	:	AC-5
Council Directives	:	LVD : 2006/95/EC (Until 19 April 2016) 2014/35/EU(From 20 April 2016) EMC : 2004/108/EC(Until 19 April 2016) 2014/30/EU(From 20 April 2016) RoHS : 2011/65/EU
Applicable Standards	:	LVD : EN61010-1 (2010) EMC : EN61326 -1(2013) RoHS : EN50581(2012)

Year to begin affixing CE Marking : 2016

Place: TOKYO, Japan

Signature: 
Full name: Toshiyuki Takakura

Date: Apr. 1, 2020

Title: Director, Quality control center