RIKEN KEIKI

—For easy measurement of work function and ionization potential—

Photoemission Yield Spectroscopy in Air (PYSA)

AC-2S Series

AC-2S / AC-2S Pro α / AC-2S Pro β

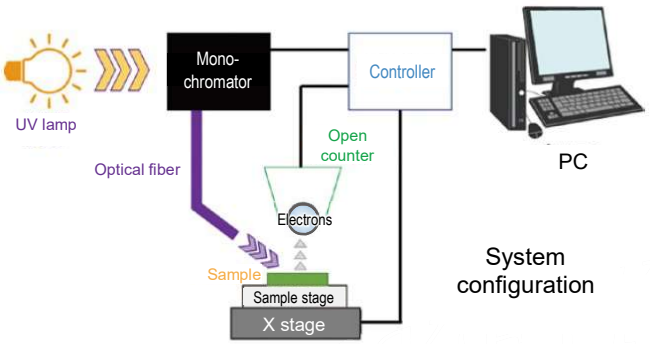
CE Marking (pending)

Features

- Allows easy measurement in air instead of vacuum environment.
  (Samples can be easily inserted and removed, measured in a short time.)
- Provides high repeatability with little damage to samples due to the low-intensity ultraviolet irradiation.
- Compact size and light weight
  (approx. 21 % smaller size and 38 % lighter than the previous model)
  * Comparison to the model AC-2
- Model lineup includes the AC-2S, which provides ease of operation compared to the previous model, and the AC-2S Pro α and AC-2S Pro β, which provide advanced functions (① High-temperature measurement, ② New light source, ③ Micro light spot irradiation, ④ Low-energy region measurement).

Principle

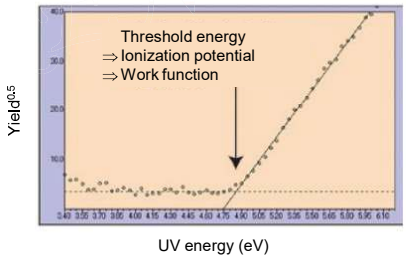
Ultraviolet photons emitted from a UV lamp undergoes wavelength (energy) selection in a monochromator before irradiated on the surface of a sample placed on the sample stage. The OPEN COUNTER (a unique electron counter in air) counts electrons excited by the photoelectric effect (a phenomenon that electrons are excited from material surface when absorbing light). The wavelength λ of the ultraviolet light is converted into light energy *E* as described by the following equation:



System configuration

$E = h * v = h * c / \lambda$
(*h*: Planck constant, *v*: frequency of the light,
c: speed of light, λ: wavelength)

Increasing the UV energy makes it possible to obtain the photoemission threshold energy (work function*1 and ionization potential*2) as shown on the PC screen to the right.



PC screen

*1 Photoemission threshold energy for metals
*2 Photoemission threshold energy for non-metals, such as semiconductors or organics

New Functions

The AC-2S Series includes the AC-2S Pro α/β models, which provide various new features compared to the previous model.

<High-temperature measurement> Capable of measuring at temperatures up to 100 °C
A heat sample stage allows measurement at user-specified temperatures up to 100 °C.
⇒ This makes it possible to evaluate characteristics at actual operating temperatures—such as new materials with temperature-dependent characteristics.

<New long-life, high-intensity light source> Lasts approx. ten times longer than the previous model
The laser-driven light source (LDLS) provides long service life (approx. ten times longer than the previous model), consistent measurements of materials requiring high light intensity (max. 2,500 nW: Pro α), and micro light spot measurement capability with easy spot focusing (Pro β).
⇒ No need to replace the light source due to extremely long service life . It also allows measurements of a wide range of materials, including those requiring high light intensity.

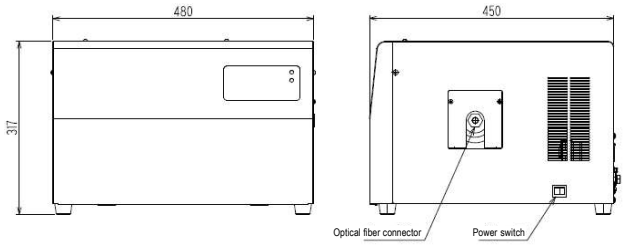
<Micro light spot measurement>
Allows measurements with small light spot (not larger than 0.4 mm square).
⇒ Small light spot measurement capability allows measurements of semiconductors and other small-sized materials.

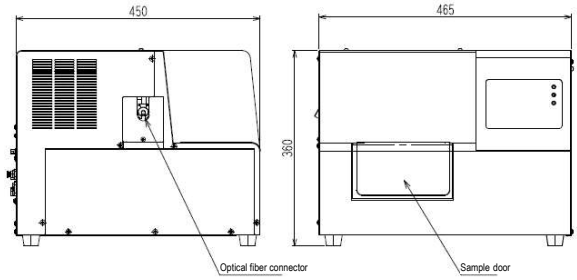
<Low-energy region measurement>
Capable of low-energy measurement as low as 2.0 eV
⇒ Allows measurements of new low-energy photoemission materials that previously could not be measured.

Function	AC-2S	AC-2S Pro α	AC-2S Pro β
High-temperature measurement	–	○	○
New long-life, high-intensity light source	–	○	○
Micro light spot measurement	–	–	○
Low-energy region measurement	–	○	–

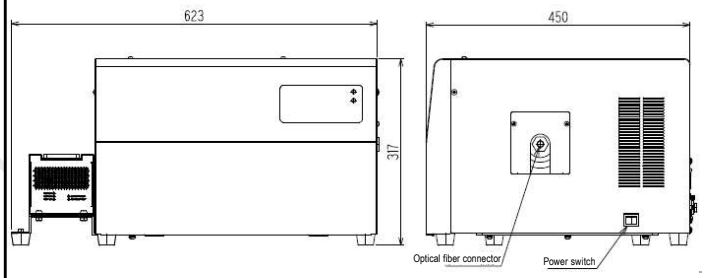
Exterior Drawings

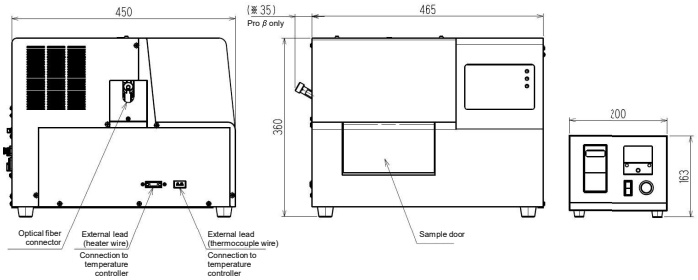
AC-2S light source unit (LC)		AC-2S measuring unit (DC)	
Front	Side (DC connection side)	Side (LC connection side)	Front





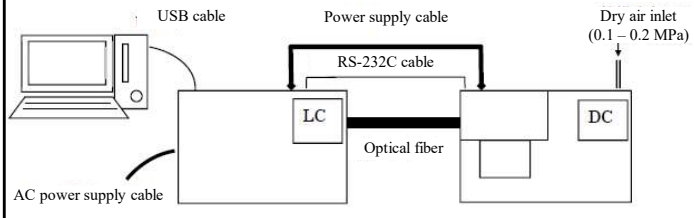
AC-2S Pro α/β light source unit (LC)		AC-2S Pro α/β measuring unit (DC)	
Front	Side (DC connection side)	Side (LC connection side)	Front

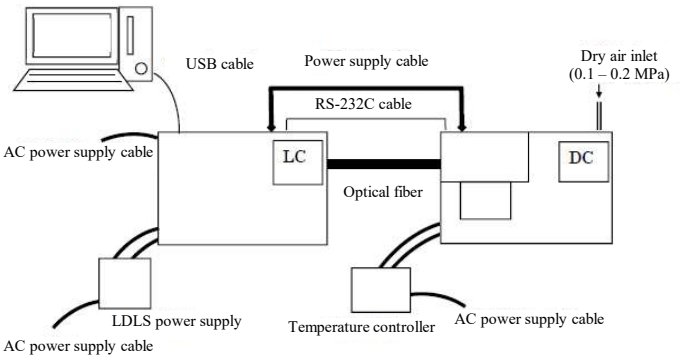




Product Configurations

AC-2S	AC-2S Pro α/AC-2S Pro β
[Overview] The product consists of the light source unit (LC), measuring unit (DC), and PC used for measurement. Supply compressed air (0.1 - 0.2 MPa) via the dry air inlet during measurement. [Installation/Dimensions] ▪ Width: Approx. 1,100 mm (LC + optical fiber + DC) ▪ Depth: Approx. 600 mm (LC/DC + rear cables)	[Overview] The product consists of the light source unit (LC), measuring unit (DC), laser-driven light source (LDLS) power supply, temperature controller, and PC used for measurement. Supply compressed air (0.1 - 0.2 MPa) via the dry air inlet during measurement. [Installation/Dimensions] ▪ Width: Approx. 1,400 mm (LDLS power supply + LC + optical fiber + DC + temperature controller) ▪ Depth: Approx. 600 mm (LC/DC + rear cables)





Specifications

Model	AC-2S	AC-2S Pro α	AC-2S Pro β
Measurement principle	Photoemission yield spectroscopy in air (PYSA) (Detector: Low-energy electron count method)		
Measurement energy scanning range	3.4 - 6.2 eV (364 - 200 nm)	2.0 - 6.2 eV (620 - 200 nm)	3.4 - 6.2 eV (364 - 200 nm)
Repeatability (standard deviation)	Work function 0.02 eV (sample: Au plate)		
Measurement time	Standard time required for work function measurement: 10 s / energy step		
Maximum count	4,000 cps		
UV lamp	Deuterium (D_2) lamp	Laser-driven light source (LDLS)	
Minimum light intensity	Up to 1.0 nW (at 5.9 eV)	Up to 5.0 nW (at 5.9 eV)	Up to 1.0 nW (at 5.9 eV)
Maximum light intensity	At least 500 nW (at 5.9 eV)	At least 2,500 nW (at 5.9 eV)	At least 200 nW (at 5.9 eV)
UV spot size	Not larger than 4 mm square	Not larger than 4 mm square	Not larger than 0.4 mm square
Spectrometer	Grating-type monochromator		
Maximum sample size	50 mm × 50 mm, thickness 10 mm		
Sample stage	115 mm × 122 mm	120 mm × 122 mm Heated sample stage	120 mm × 122 mm Heated sample stage
Operating temperature/ humidity range	15 °C - 35 °C (no sudden changes), up to 60 % RH (no condensation)		
Power supply	100 - 240 V AC 50/60 Hz, 5 A (max)	Main unit: 100 - 240 V AC, 50/60 Hz, 5 A (max) LDLS (AC adapter): 100 - 240 V AC, 50 - 60 Hz, 2.5 A LDLS (main unit): 12 V DC, 120 W Temperature controller: 100 V (±10 %) AC, 50/60 Hz, 1 A (max)	
Compressed air supply conditions	0.1 - 0.2 MPa		
External dimensions	LC (light source unit): Approx. 480 (W) × 450 (D) × 317 (H) mm DC (measuring unit): Approx. 465 (W) × 450 (D) × 360 (H) mm	LC (light source unit)*: Approx. 623 (W) × 450 (D) × 317 (H) mm DC (measuring unit): Approx. 465 (W) × 450 (D) × 360 (H) mm Temperature controller: Approx. 200 (W) × 150 (D) × 280 (H) mm * The LDLS power supply is housed in the LC (light source unit).	
Weight	AC-2S LC (light source unit): Approx. 25 kg AC-2S DC (measuring unit): Approx. 31 kg	AC-2S LC (light source unit): Approx. 30 kg AC-2S DC (measuring unit): Approx. 31 kg Temperature controller: Approx. 5 kg	

Accessories

- Display monitor
- Desktop PC
- Power supply cable (for LC)
- Power supply cable (LC-DC)
- Adapter plug (3-pin → 2-pin + ground wire)
  * AC-2S: ×1, Pro α/β: ×3
- USB cable (PC-LC)
- RS-232C (9 pin) cable (LC-DC)
- Detector
- Optical fiber
- Standard sample set
- Tweezers
- Measurement/analysis/data conversion software (CD-ROM)

Optional Accessories (sold separately)

- Tray for powder samples (1.0 mm deep)
- Tray for powder samples (0.5 mm deep)
- Compressor (with dry air generator)
- Optical fiber protective acrylic cover
- Different-diameter union joint (for dry air)
- Detector (for replacement)
- Optical fiber (for AC-2S/Pro α replacement)
- Optical fiber (for Pro β replacement)
- D_2 lamp (for AC-2S)
- Ozone filter

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