

# P-4000 series

Polarimeter



# Designed for you

## Polarimeter shaped by customer needs



### Accurate measurements compliant with pharmacopoeia

- Ideal optical rotation measurement (e.g.  $[\alpha]_D$ ) by using light source with specific emission line
- Correction function when using light source with broad wavelength emission range (such as LED and tungsten lamp)

### Effortless operations

- Easy-to-use interface for smooth operation
- Newly designed cell for smooth and simple small-volume sample handling
- Sample temperature control/monitoring available as standard

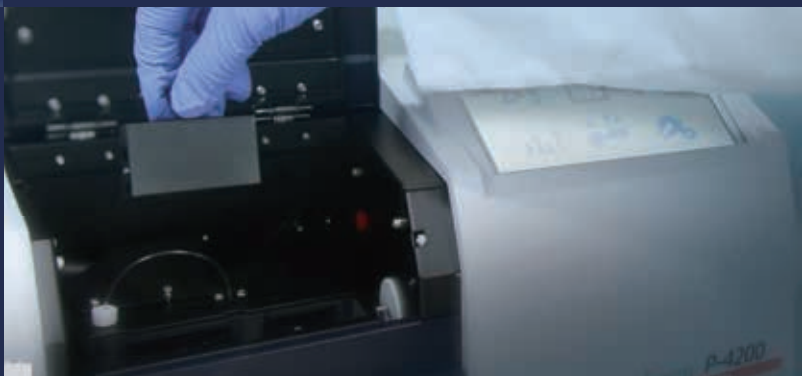


### Proper data managements

- User management function
- Optional software for ensuring data integrity

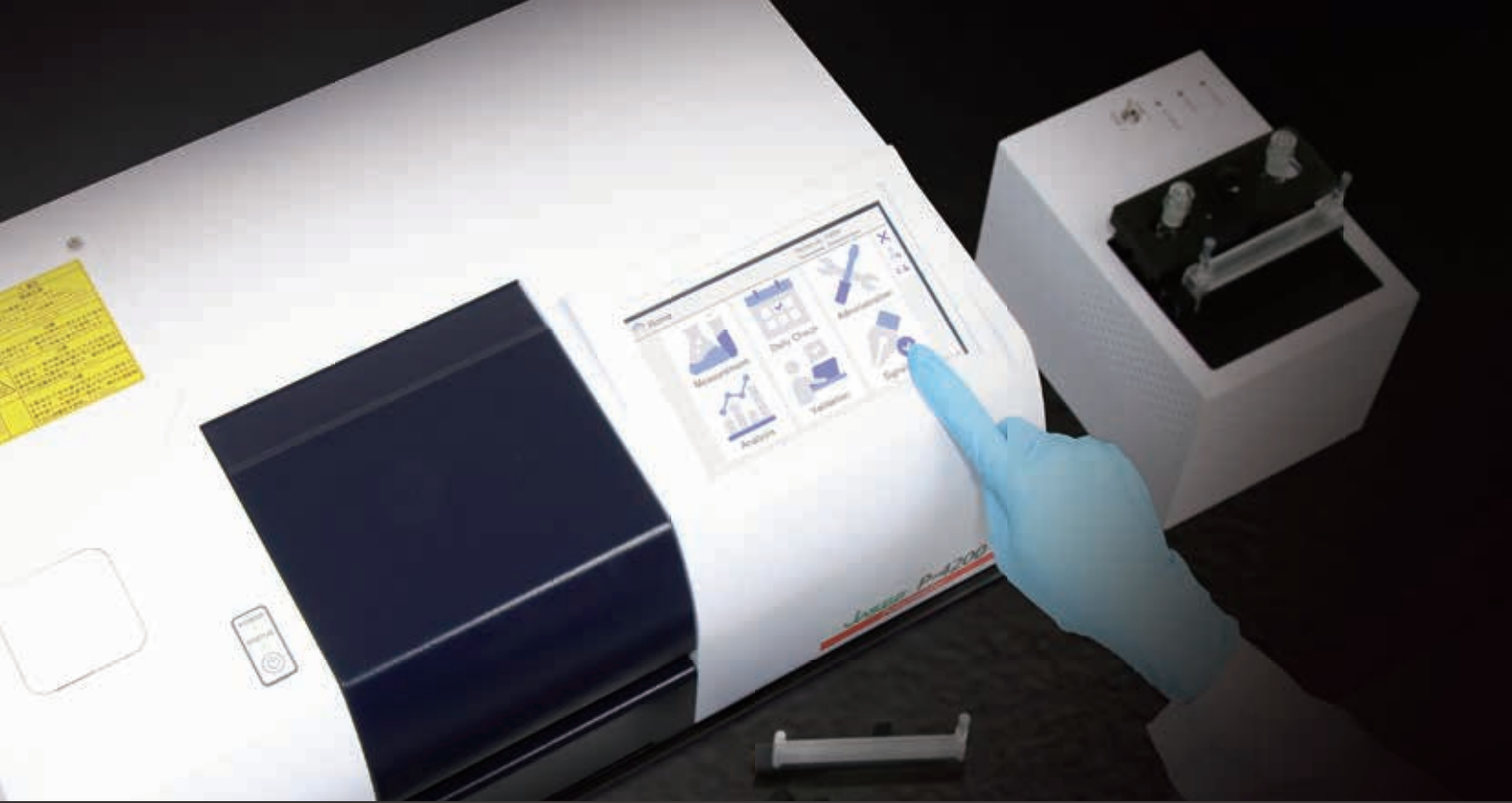
### Ensuring optimal instrument condition

- Validation by using standard quartz control plate with ISO/IEC 17025 compliant
- Daily check function
- Excellent durability against acidic samples



### Installation space-saving

- Compact design (approx. A3 size) compared to conventional instrument
- All-in-One instrument with control system



# ***Polarimeter P-4000 series***

## **Compact entry model with all essential functions**

***P-4100***

- Smallest footprint in the P-4000 lineup
- Measurement by using long-life time LED
- Correction support capable using light source with specific emission line
- Reliable optical rotation accuracy for routine analysis ( $\pm 10$  mdeg)



## **Pharmacopoeia-compliant standard model**

***P-4200***

- Measurement by using D-line of sodium lamp
- Small-volume sample capability
- Sample compartment exhaust function
- High-throughput measurement capability
- Excellent optical rotation accuracy suitable to R&D ( $\pm 2$  mdeg)



## **Pharmacopoeia-compliant high-end model for diverse applications**

***P-4300***

- Versatile wavelength selection with sodium and mercury lamps
- Automatic filter changer for selecting proper measurement wavelength
- Small-volume sample capability
- Sample compartment exhaust function
- High-throughput measurement capability
- Excellent optical rotation accuracy suitable to R&D ( $\pm 2$  mdeg)



# Stable and Accurate Optical Rotation Measurement with P-4000 series

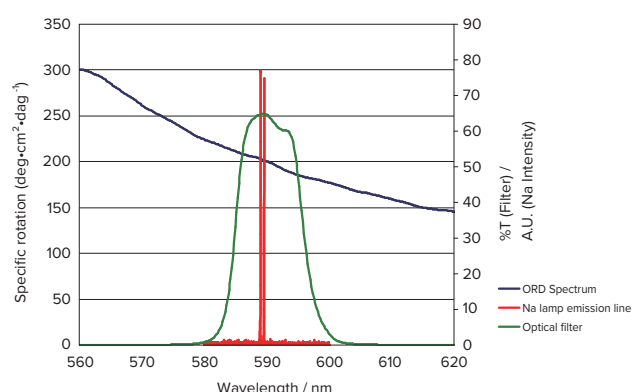
## Usage of sodium lamp 4200/4300

JASCO can offer the solution about optical rotation measurement by using sodium lamp ( $[\alpha]_D$ ), which several pharmacopoeias recommend. LED and tungsten lamp are also available as option, and the range of selectable measurement wavelengths can be expanded.

### Correction function when using LED and tungsten lamp

Compared to sodium and mercury lamps, measurement wavelength by using LED and tungsten lamp heavily depends on the performance of the selected optical filter (refer to the right figure).

P-4000 series has the optical rotation correction function, allowing the data measured with LED and tungsten lamp to be corrected using sodium lamp and standard quartz control plate.



ORD spectrum of pirarubicin, sodium lamp emission line and the transmission spectrum of optical filter

## Sample temperature control/monitoring

Following useful functions to control/monitoring the sample temperature are available as standard.

- Usage of Peltier element for accurate temperature control
- Temperature sensor for direct sample temperature monitoring

### Importance of sample temperature

Several pharmacopoeias specify sample temperature during measurement because the optical rotation is affected by sample temperature. Therefore, proper temperature control and monitoring are required.

P-4000 series has the auto measurement start function, allowing measurements to begin automatically once the set temperature is reached.



Sample temperature control	Specification
Setting temperature range	15 to 40 °C
Temperature control accuracy	± 0.2 °C (when using holder sensor)
Temperature monitoring accuracy	± 0.1 °C



## Durable sample compartment

Following features prevent instrument degradation caused by the acidic samples.

- Temperature sensor coated with fluoresein
- Sample compartment inner wall coating
- Sample compartment window for inflow prevention of the acid gas into the inside of instrument **4200/4300**
- Acid gas exhaust function **4200/4300**
- Connection of exhaust duct (option) **4200/4300**



Sample compartment window



Exhaust port

## Instrument validation by using standard quartz control plate with ISO/IEC 17025 compliant

Validation which is described in several pharmacopoeias can be performed by using calibrated standard quartz control plate.



### ISO/IEC 17025 Accreditation

JASCO\* has received ISO/IEC 17025 accreditation to meet the calibration needs of measurement instrument. Calibration certificates issued by JASCO include accreditation symbols (JAB and ILAC-MRA), recognized worldwide.

\*JASCO calibration division



## User-friendly validation and daily check operations

Validation program in P-4000 series verifies the instrument performance using the inspection items described in pharmacopoeias (JP/USP/EP). The operation following the dialog is simple, allowing easy execution of validation.

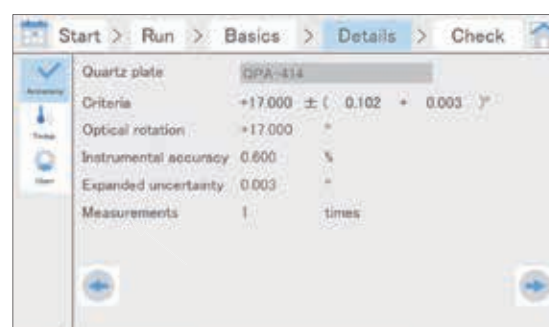
Test items	JP	USP	EP	Basic
Repeatability of zero optical rotation				✓
Repeatability of optical rotation		✓		✓
Accuracy of optical rotation	✓	✓	✓	✓
Temperature control		✓		
Linearity of optical rotation		✓	✓	

### Supports of daily check

Daily check program can monitor the instrument condition by checking the optical rotation of quartz control plate and the intensity of light source before/after daily measurements.

<Check items>

- Optical rotation of calibrated quartz control plate
- Intensity of light source (HT voltage)



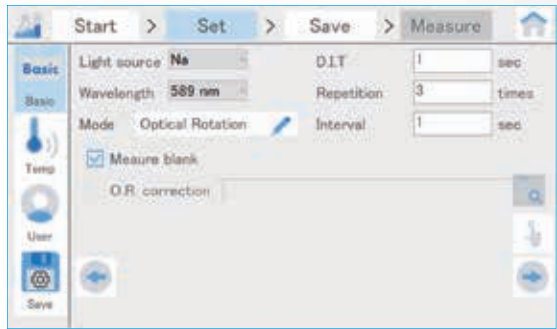
Registration of quartz control plate for check

# User Interface for Effortless Measurement

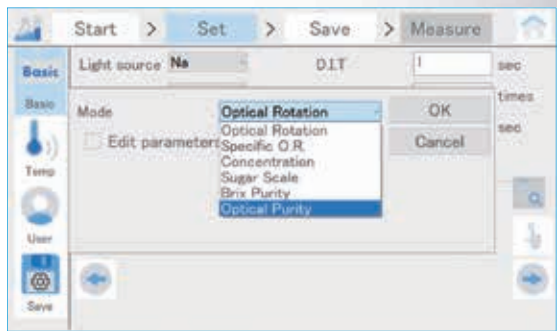


## Measurement

The window is designed to follow the measurement flow, with key information visibly arranged.



Parameter setting



Selection of measurement mode

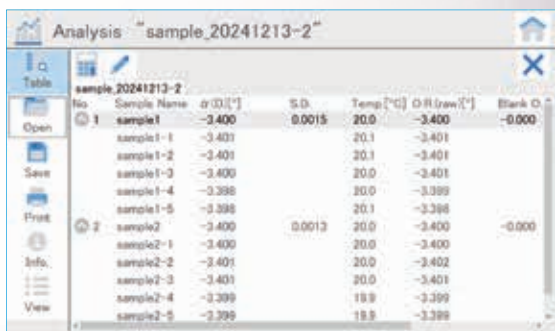


Measurement window



## Analysis

The users can review the measured/saved data along with measurement conditions.

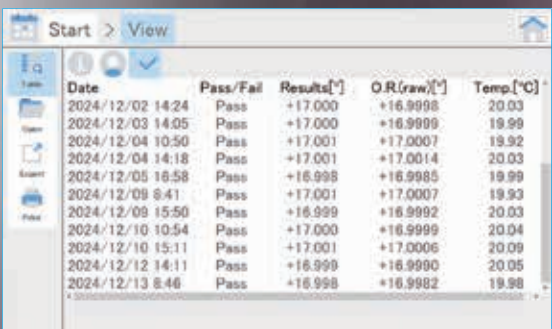


Analysis window

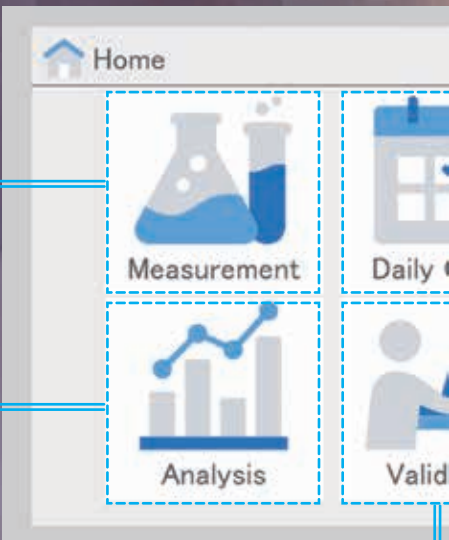


## Daily check (refer to page 5)

The users can check the instrument conditions for stable polarimeter operation.

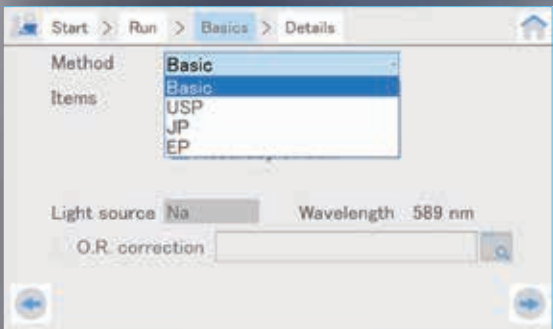


Result preview



## Validation (refer to page 5)

The users can verify the instrument performance using the test items described in pharmacopoeias (JP/USP/EP).

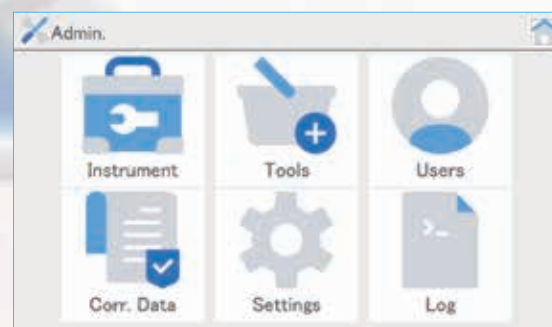


Test item selection

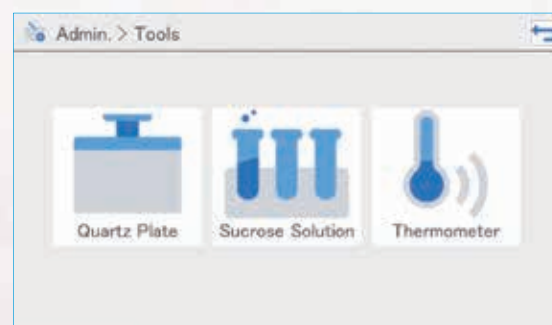


### Settings (refer to page 8)

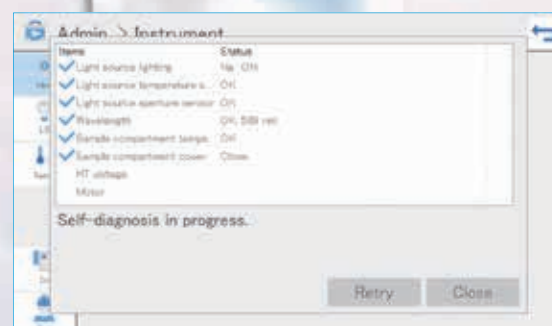
The users can manage (set or confirm) about general instrument settings, including usage condition, basic function, user/tool registration, and so on.



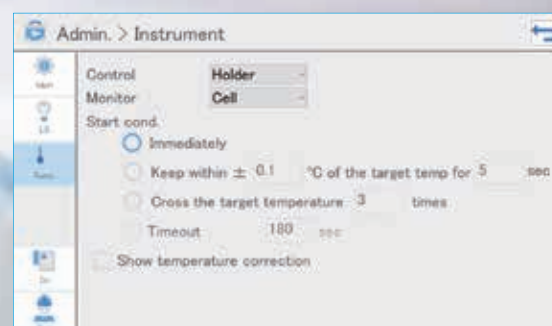
Administration window



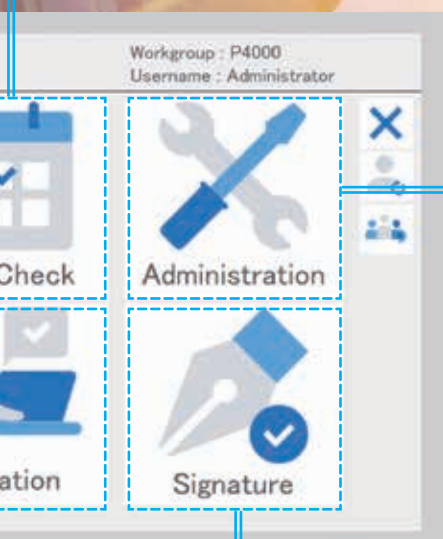
Tool registration window



Confirmation of instrument condition

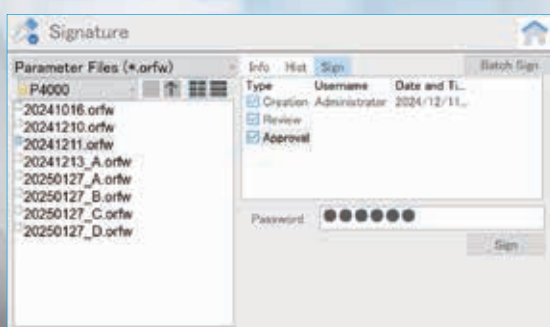


Setting of measurement start temperature



### Signature (refer to page 8) **GxP**

This function allows to electronically sign to parameter setting file and data file.



Confirmation of electronic signature

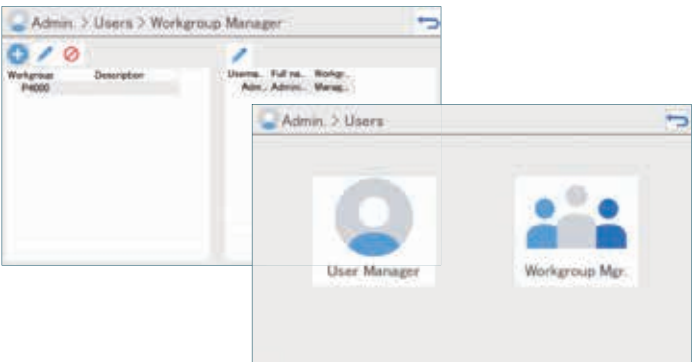


# Proper and Easy Data Management

## User account function

The user can be registered with two independent authorization levels(system settings and measurement operations) based on the their needs. Access to unnecessary functions can be restricted, preventing accidental changes to measurement parameters.

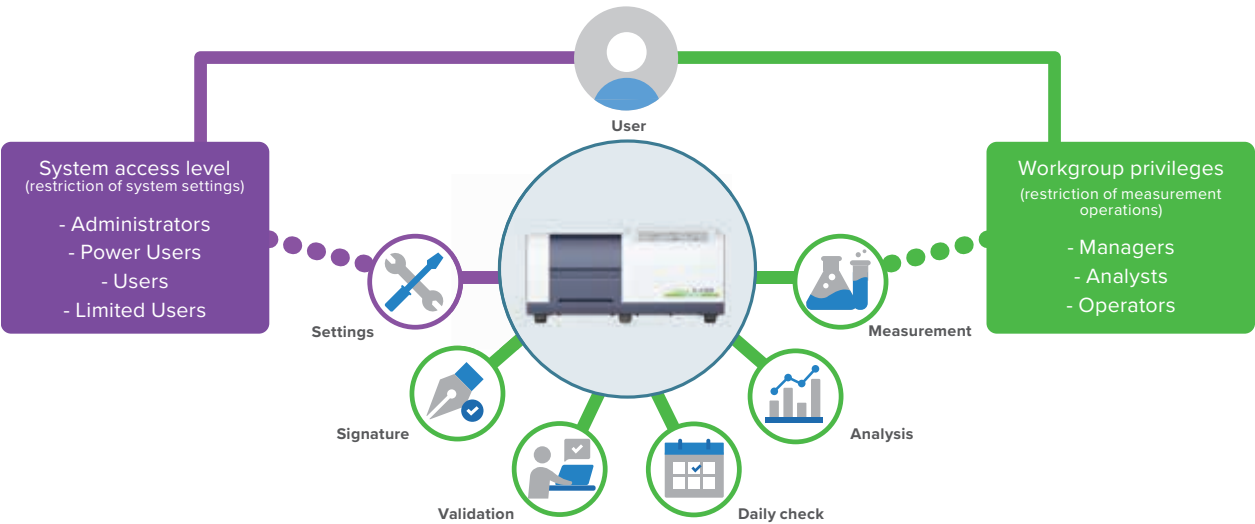
- \* [Workgroup] setting is available only in CFR version.
- \* In CFR version, the measured data and metadata are saved in the folder specified exclusively by the workgroup.



Workgroup Manager (CFR version)

## Supports for data integrity GxP

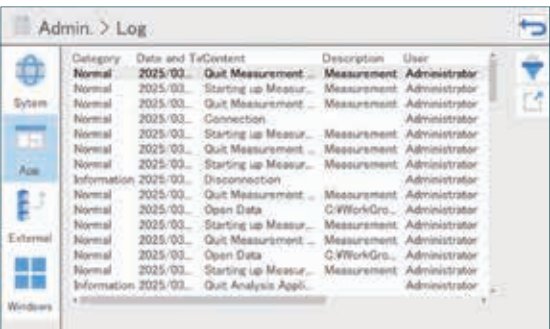
Spectra Manager CFR ensures the creation of complete and accurate data to satisfy the data integrity for practicing ALCOA+ principles.



Access levels and workgroup privileges

## Audit Trail GxP

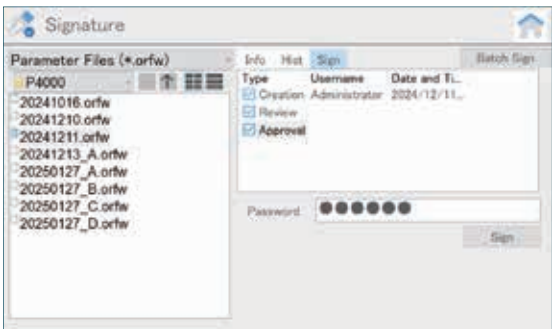
User actions in the software are recorded in logs under respective categories. These logs can be exported as text data to a specified folder.



Confirmation of log

## Electronic signature GxP

Electronic signature can be applied to parameter files and data files. Data integrity requires clear identification of individuals who create or modify the saved information.



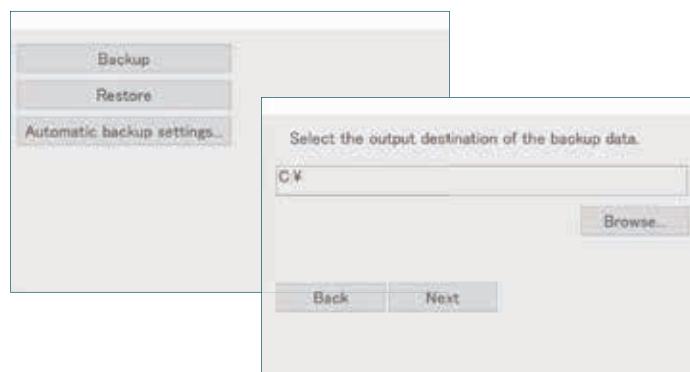
Signature window



## Management of measurement/maintenance data

### Backup function

Data backup can be performed at any time. In addition, the backup can be set to run automatically when the instrument is turned off.

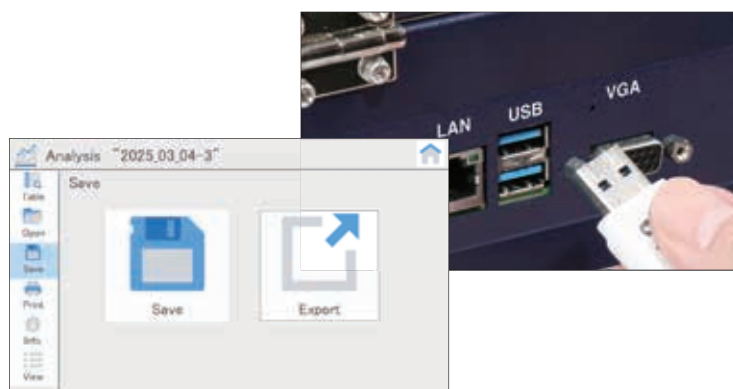


Backup setting

## Supports for data outputs to external devices to meet the user's purposes

### Export function

Text data can be exported to a specified folder. USB port supports data export to external media.



Data export

### Printer output

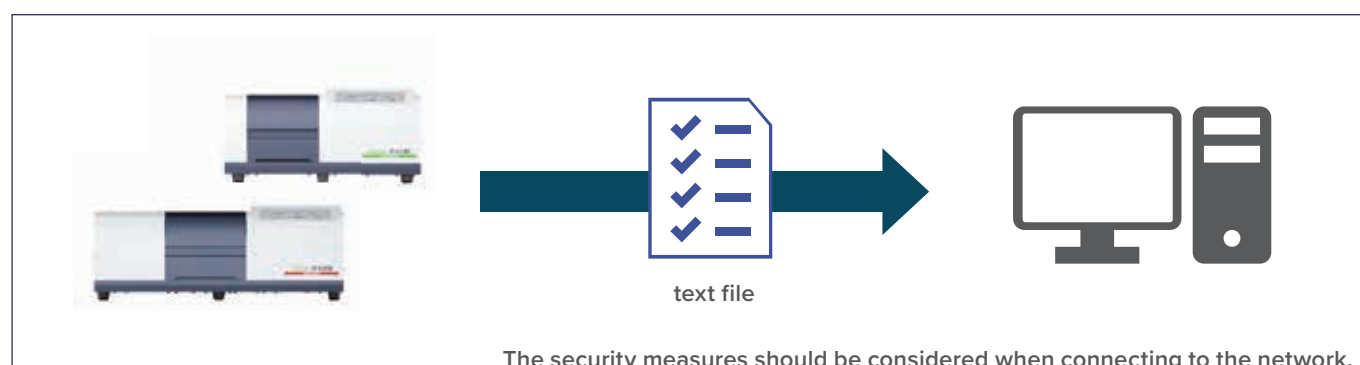
The data can be printed directly from the printer, and the user can confirm the layout before printing. The PDF output with the same layout as the printed version is also available.



Print settings window

### LIMS connection

Measurement data and audit trails obtained from polarimeter can be transferred/managed in LIMS (Laboratory Information Management System). Output data is in text format, and the users need to follow the LIMS setting for data handling.



Data transfer from P-4000 series to the network PC

# Optional accessories for comfortable measurement

## JASCO unique rectangular cell with superior usability

Novel sampling cell was developed based on the customer feedback and needs.

(US patent: US D925,381, Europe patent: DM/205719, UK patent: GB 82057190001000, China patent: ZL201930223409.3)

### Efficient pouring and flushing

RQC cells are designed for easy, bubble-free sample pouring and thorough flushing.

### Superior temperature control

RQC cells quickly reach the set temperature due to the large contact area between cell jacket and cell.

### Small-volume sampling

Minimum sample volume of 3 mm RQC cell with 100 mm optical pathlength is approx. 1 mL.



RQC cell jacket

## Plenty cell lineup

Each sampling cell is used with the dedicated cell jacket.

Model	P-4100	P-4200	P-4300
Rectangular quartz cell			
RQC-450	8.5 mm × 8.5 mm × 100 mm ①		
RQC-451	8.5 mm × 8.5 mm × 50 mm		
RQC-452	8.5 mm × 8.5 mm × 20 mm		
RQC-453	-*	3 mm × 3 mm × 100 mm	
RQC-454	-*	3 mm × 3 mm × 50 mm	
RQC-455	-*	3 mm × 3 mm × 20 mm	
Cylindrical quartz cell			
J/39.105/Q/100/12	φ10 mm × 100 mm		
J/39.105/Q/50/12	φ10 mm × 50 mm		
J/39.35/Q/100/6	-*	φ3.5 mm × 100 mm	
J/39.35/Q/50/6	-*	φ3.5 mm × 50 mm ②	
J/39.35/Q/10/6	-*	φ3.5 mm × 10 mm	
Cylindrical glass cell			
J/39.105/PX/100	φ10 mm × 100 mm		
J/39.105/PX/50	φ10.5 mm × 50 mm		
J/39.105/PX/10	φ10.5 mm × 10 mm ③		
SUS demountable cell			
PAC1-100	φ10 mm × 100 mm ④		
PAC3-100	-*	φ3.5 mm × 100 mm	

\* 3 × 3 mm rectangular cell and φ3.5 mm cylindrical cell do not work with P-4100.



## Dedicated accessories



### SHP-403 Peltier sipper

SHP-403 allows sample loading from the front nozzle, followed by measurement and flushing. It saves time and effort in mounting and dismounting the cell.



### TSR-411 Thermostatted plate

TSR-411 can preheat the sampling cell before the measurement, reducing the overall measurement time, including the heating after cell placement.



### QPA-412/413/414/415

#### Practical standard quartz control plate

QPA is used for calibrating the instrument. JASCO also offers the quartz control plate with calibration certificate compliant with ISO/IEC 17025 compliance.



### Optical filter

Optical filters must be changed according to the measurement wavelength. P-4300 has the automatic filter changer as standard.

## Calibration services

JASCO offers the calibration for the optional parts used in measurement and validation.

- Optical filter
- Optical pathlength of cell

## Available measurement wavelength of each light source

Model	Light source	Wavelength [nm]						
		365	405	436	546	[α] <sub>D</sub>	589	633
P-4100	LED							
P-4200	Sodium lamp							
	Mercury lamp							
	LED							
	Tungsten lamp							
P-4300	Sodium lamp							
	Mercury lamp							
	LED							
	Tungsten lamp							

\* Please contact your local JASCO representative if you wish to perform optical rotation measurements at 880 nm or shorter wavelengths (such as 253 nm).

Standard Option



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