

P-4000 Series

Polarimeter



Designed for you

Tailored to customer needs

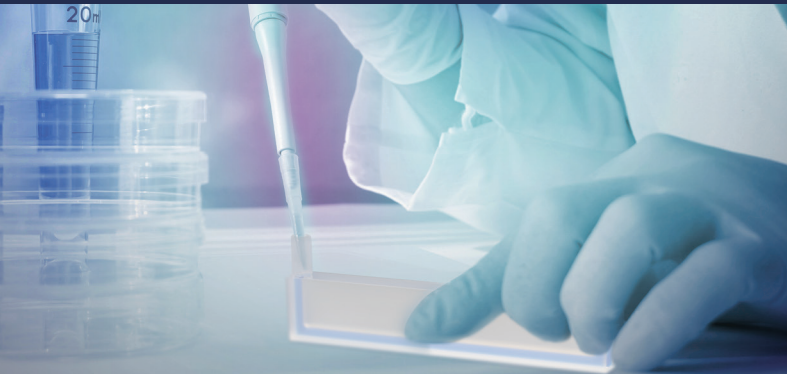


Accurate measurements compliant with pharmacopoeia

- Perform true determination of $[\alpha]_D$ using a sodium lamp with D emission line.
- Measuring with a broad lights source, such as LED or tungsten, still provides accurate determination using a correction function.

Effortless operation

- Easy-to-use interface for smooth operation
- Newly designed cell for bubble-free, small-volume sample handling
- Sample temperature control and monitoring included as standard

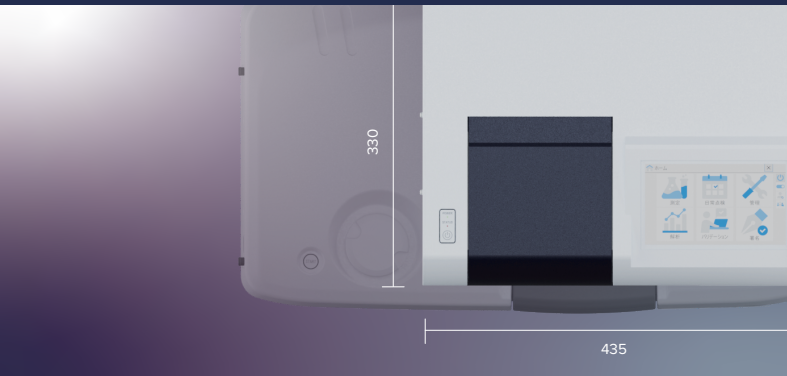
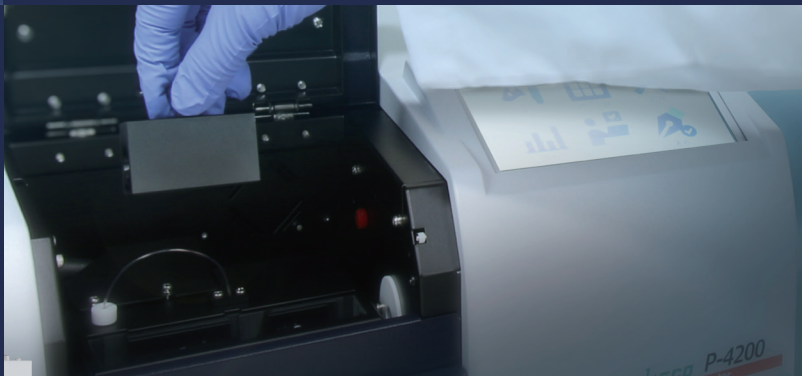


Proper data management

- User management functions
- Optional software to ensure data integrity

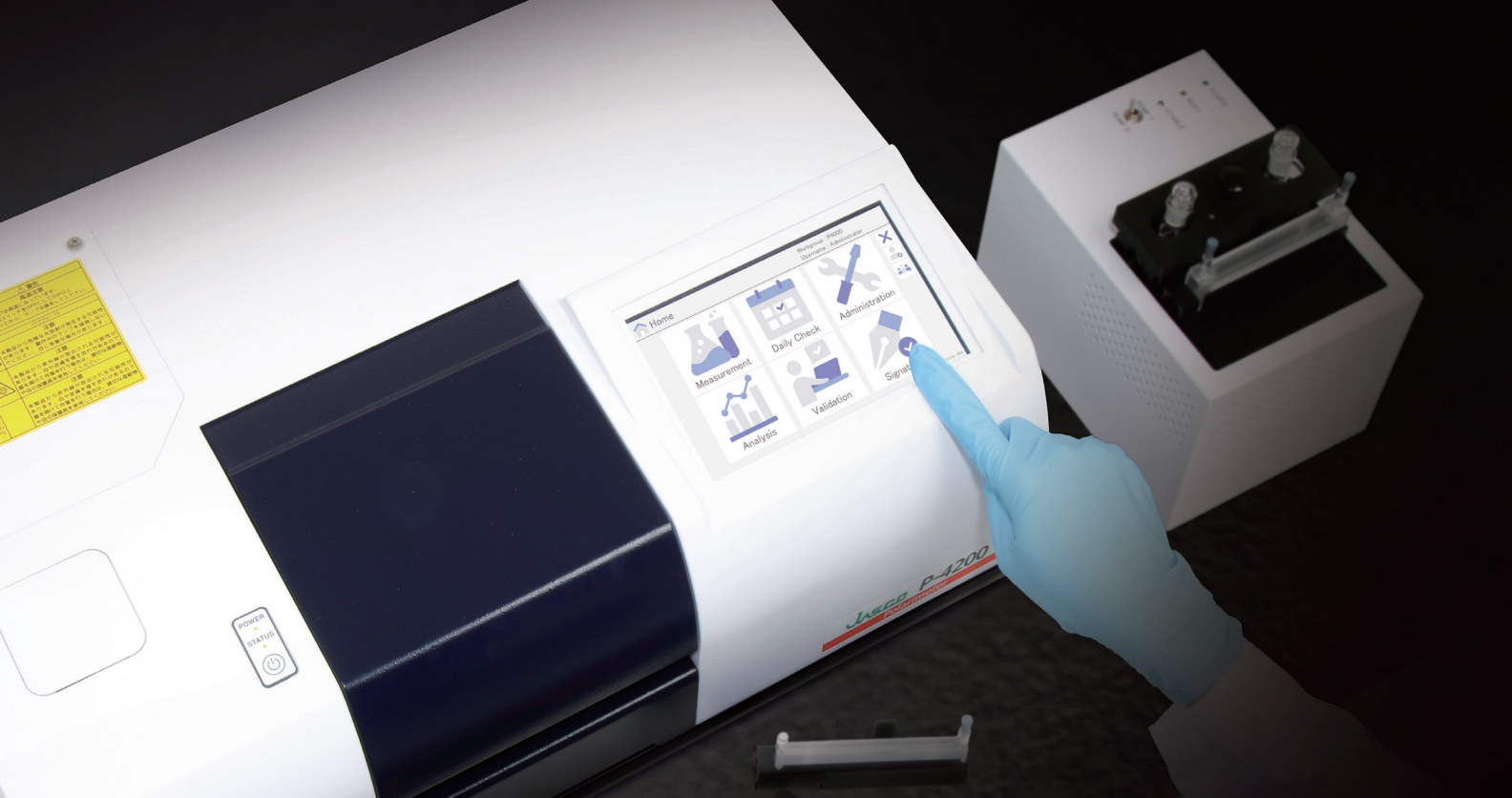
Ensure optimal instrument condition

- Validation using standard quartz control plate from our ISO/IEC 17025 compliant lab
- Daily performance check function
- Excellent durability against acidic samples



Space-saving installation

- Compact design (approximately A3 size) compared to conventional instruments
- All-in-one instrument featuring an integrated touch display.



Polarimeter P-4000 Series

Compact entry model with all essential functions

P-4100

- Smallest footprint in the P-4000 lineup
- Long-lifetime LED light source for 589 nm measurement
- Quartz control plate enables accurate determination of ORD at 589.6 nm
- Reliable optical rotation accuracy for routine analysis (± 10 mdeg)



Pharmacopoeia-compliant standard model

P-4200

- D-line of sodium lamp for measurement
- Easily measure small-volume samples
- Sample compartment exhaust function
- Capable of high-throughput measurement using sipper cell
- Excellent optical rotation accuracy suitable for R&D applications (± 2 mdeg)



Pharmacopoeia-compliant high-end model for diverse applications

P-4300

- Versatile wavelength selection using sodium and mercury lamps
- Automatic filter changer for selecting the appropriate measurement wavelength
- Small-volume sample measurement capability
- Sample compartment exhaust function
- Capable of high-throughput measurement using sipper cell
- Excellent optical rotation accuracy suitable for R&D applications (± 2 mdeg)



Stable and Accurate Optical Rotation Measurement with the P-4000 Series

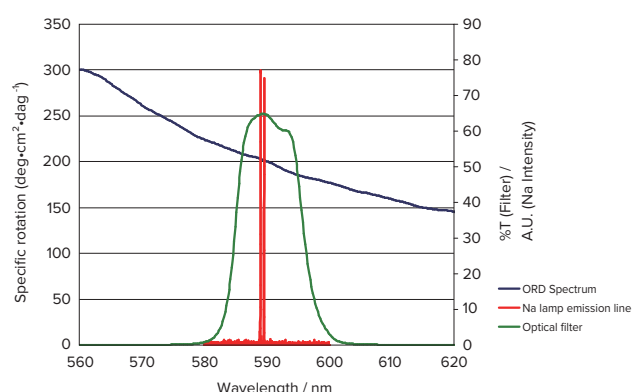
Sodium lamp **4200/4300**

JASCO provides optical rotation measurement using the sodium D-line ($[\alpha]_D$), in accordance with recommendations of major pharmacopoeias (USP, EP, JP). Optional LED and tungsten light sources are also available, enabling expansion of the selectable measurement wavelength range to support diverse analytical requirements.

Correction function when using LED and tungsten lamp

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

The P-4000 Series has an optical rotation correction function, allowing data measured with LED and tungsten lamps 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

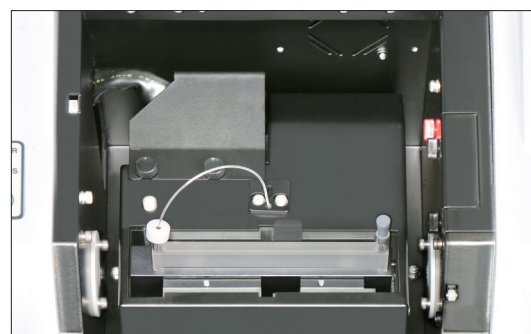
Sample temperature control/monitoring

The following functions for sample temperature control and monitoring are provided as standard:

- Use of a Peltier element for accurate temperature control
- In-cell temperature sensor for direct monitoring of the sample temperature

Importance of sample temperature

Several pharmacopoeias require control and documentation of sample temperature during optical rotation measurements, as optical rotation is temperature dependent. Accordingly, accurate temperature control and continuous monitoring are essential. The P-4000 Series incorporates an automatic measurement start function, ensuring that measurements commence only after the sample has reached the specified temperature.

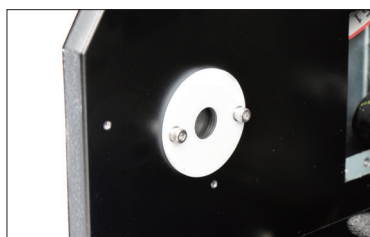


Sample temperature control	Specification
Setting temperature range	15 to 40 °C
Temperature control accuracy	± 0.2 °C (when using holder sensor)
Temperature monitoring accuracy	± 0.1 °C

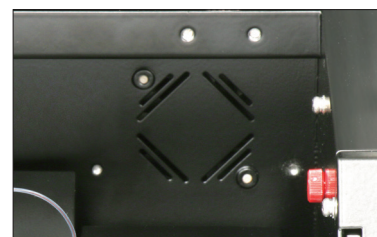
Durable sample compartment

Designed to prevent degradation caused by acidic samples

- Fluororesin coated temperature sensor
- Protective coating on the inner walls of the sample compartment
- Sample compartment window designed to prevent acid gas from entering the interior of the instrument **4200/4300**
- Acid gas exhaust function **4200/4300**
- Connection of exhaust duct (option) **4200/4300**



Sample compartment window



Exhaust port

Instrument validation with quartz plate reference standard

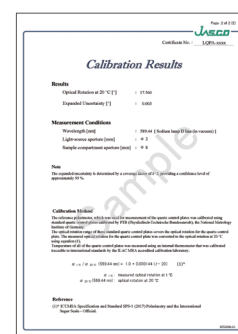
Validation as described in several pharmacopoeias can be performed by using calibrated standard quartz control plate.



ISO/IEC 17025 Accreditation

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

*JASCO calibration division



User-friendly validation and daily check operations

Instrument validation

The validation program in the P-4000 Series verifies instrument performance using inspection items specified in pharmacopoeias (JP, USP, EP).

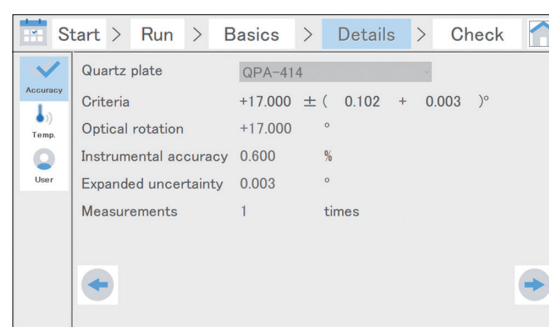
- Simple, dialog-guided operation enables easy execution of validation.

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		✓	✓	

Daily check

Monitor the condition of the instrument before/after daily measurements through two easy to run tests:

- Verify the optical rotation of a calibrated quartz control plate
- Measure the intensity of the 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.

Start > Set > Save > Measure

Basic

Light source: Na D.I.T: 1 sec

Wavelength: 589 nm Repetition: 3 times

Mode: Optical Rotation Interval: 1 sec

☒ Measure blank

☐ O.R. correction

Temp, User, Save buttons

Parameter setting

Start > Set > Save > Measure

Basic

Light source: Na D.I.T: 1 sec

Wavelength: 589 nm Repetition: 3 times

Mode: Optical Rotation Interval: 1 sec

☐ Edit parameters

OK, Cancel buttons

Optical Rotation, Optical Rotation, Specific O.R., Concentration, Sugar Scale, Brix Purity, Optical Purity

Selection of measurement mode

Start > Set > Save > Measure

Na Optical Rotation Temp.(Cell) [°C]

589 nm -3.399 20.0

Sample Name	α (D)[°]	O.R.(raw)[°]	Temp.[°C]	Memo
Blank	-3.400	+0.000	19.9	
Sample1	-3.401	-3.400	20.0	
Sample2	-3.401	-3.400	20.0	
Sample3	-3.400	-3.400	20.0	
Sample4	-3.401	-3.401	20.0	
Sample4-1	-3.402	-3.401	19.9	
Sample4-2	-3.401	-3.401	20.1	
Sample4-3	-3.401	-3.400	19.9	

Zero, Blank, Sample, Setting buttons

Measurement window



Analysis

Quickly review measured/saved data along with measurement conditions.

Analysis "sample_20241213-2"

No.	Sample Name	α (D)[°]	S.D.	Temp.[°C]	O.R.(raw)[°]	Blank O.
1	sample1-1	-3.401	0.0015	20.1	-3.401	-0.000
	sample1-2	-3.401		20.1	-3.401	
	sample1-3	-3.400		20.0	-3.401	
	sample1-4	-3.398		20.0	-3.398	
	sample1-5	-3.398		20.1	-3.398	
2	sample2	-3.400	0.0013	20.0	-3.400	-0.000
	sample2-1	-3.400		20.0	-3.400	
	sample2-2	-3.401		20.0	-3.402	
	sample2-3	-3.401		20.0	-3.401	
	sample2-4	-3.399		19.9	-3.399	
	sample2-5	-3.399		19.9	-3.399	

Table, Open, Save, Print, Info, View buttons

Analysis window



Daily check (refer to page 5)

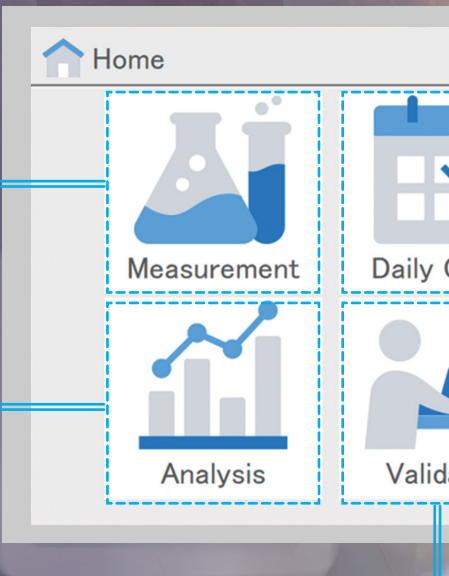
Verify day-to-day stability and condition of the P-4000 polarimeter.

Start > View

Date	Pass/Fail	Results[°]	O.R.(raw)[°]	Temp.[°C]
2024/12/02 14:24	Pass	+17.000	+16.9998	20.03
2024/12/03 14:05	Pass	+17.000	+16.9999	19.99
2024/12/04 10:50	Pass	+17.001	+17.0007	19.92
2024/12/04 14:18	Pass	+17.001	+17.0014	20.03
2024/12/05 16:58	Pass	+16.998	+16.9985	19.99
2024/12/09 8:41	Pass	+17.001	+17.0007	19.93
2024/12/09 15:50	Pass	+16.999	+16.9992	20.03
2024/12/10 10:54	Pass	+17.000	+16.9999	20.04
2024/12/10 15:11	Pass	+17.001	+17.0006	20.09
2024/12/12 14:11	Pass	+16.999	+16.9990	20.05
2024/12/13 8:46	Pass	+16.998	+16.9982	19.98

Table, Open, Export, Print buttons

Result preview



Validation (refer to page 5)

Verify instrument performance using test items described in pharmacopoeias (JP/USP/EP).

Start > Run > Basics > Details

Method: Basic

Items: Basic, USP, JP, EP

Light source: Na Wavelength: 589 nm

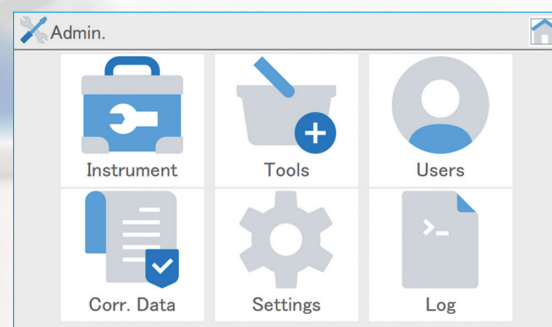
☐ O.R. correction

Test item selection

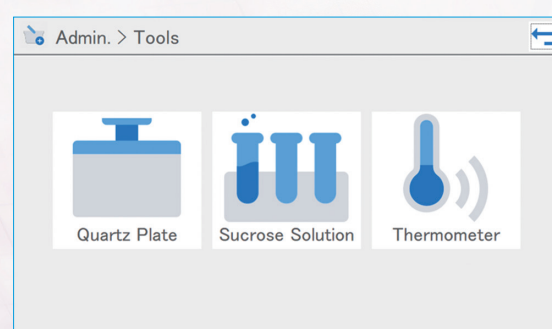


Administration (refer to page 8)

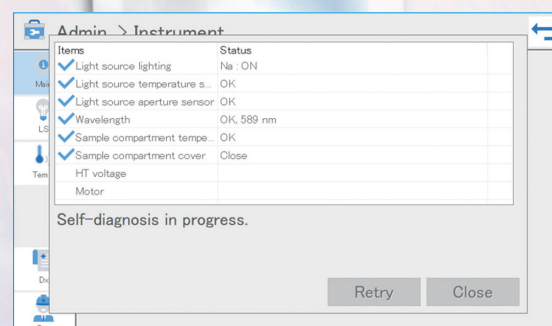
Users can establish general instrument settings, manage users, register tools, review admin logs and more.



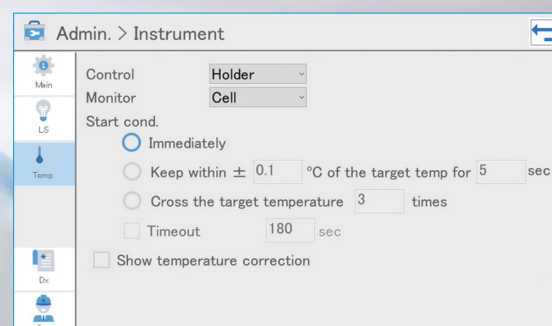
Administration window



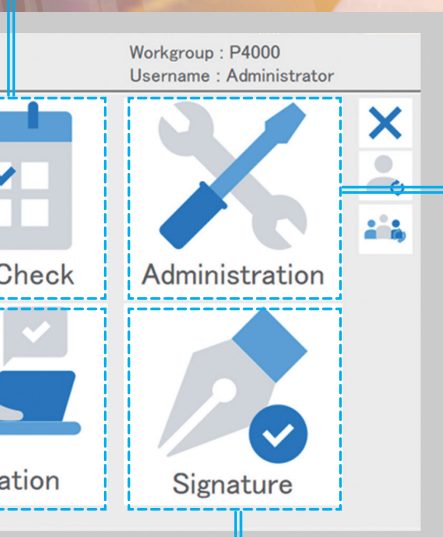
Tool registration window



Confirmation of instrument condition

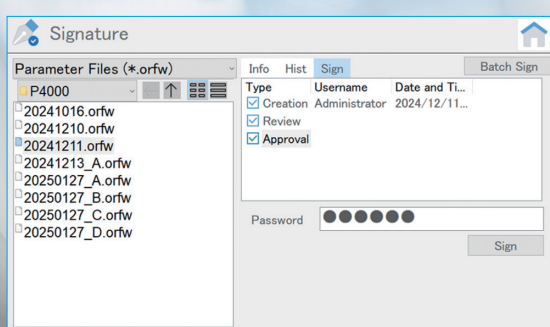


Setting of measurement start temperature



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

Electronically sign parameter and data files.



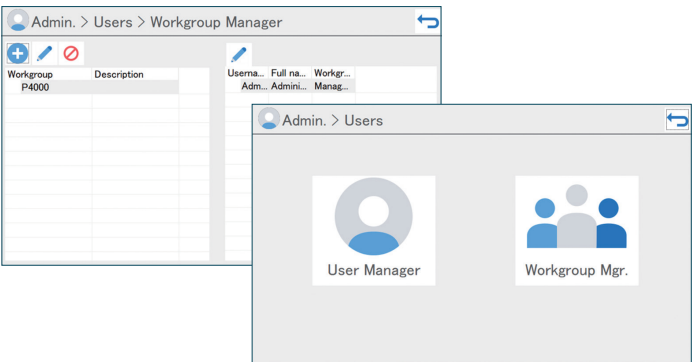
Confirmation of electronic signature

GxP compliance with CFR software

User account function

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

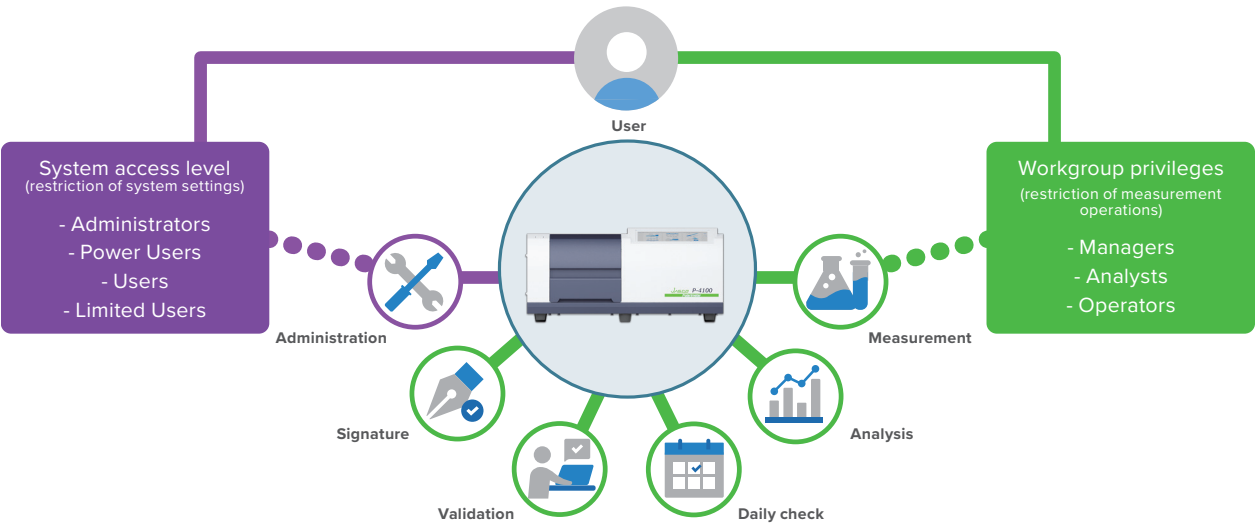
- * Workgroup management setting is available only in the CFR version.
- * In the CFR version, measured data and metadata are saved exclusively in the folder specified for each workgroup.



Workgroup Manager (CFR version)

Supports for data integrity GxP

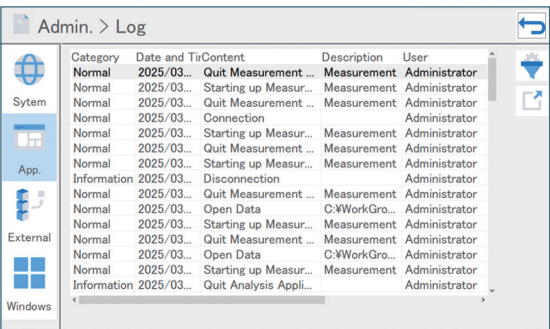
P-4000 CFR software ensures the creation of complete and accurate data to satisfy the data integrity for practicing ALCOA+ principles.



Access levels and workgroup privileges

Audit Trail GxP

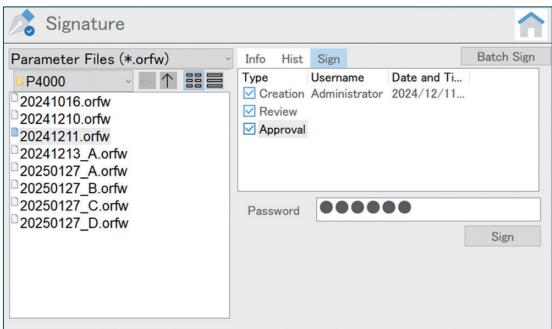
User actions within the software are recorded in logs under respective categories. These logs can be exported as text data to a specified folder.



Confirmation of log

Electronic signature GxP

In order to meet compliance standards, electronic signatures are applied to parameter and data files. Data integrity is ensured by clearly identifying individuals who create or modify saved information and how the information is modified.

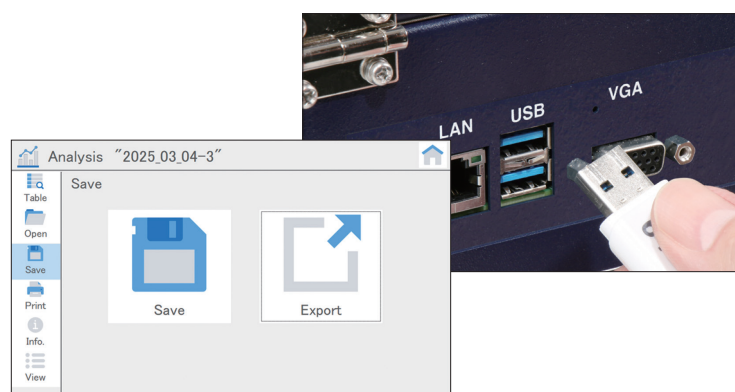


Signature window

Data Management and Output

Export function

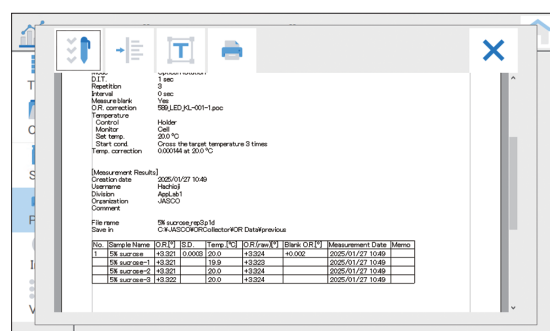
Text data can be exported to a specified folder. USB port supports data export to external media.



Data export

Printer output

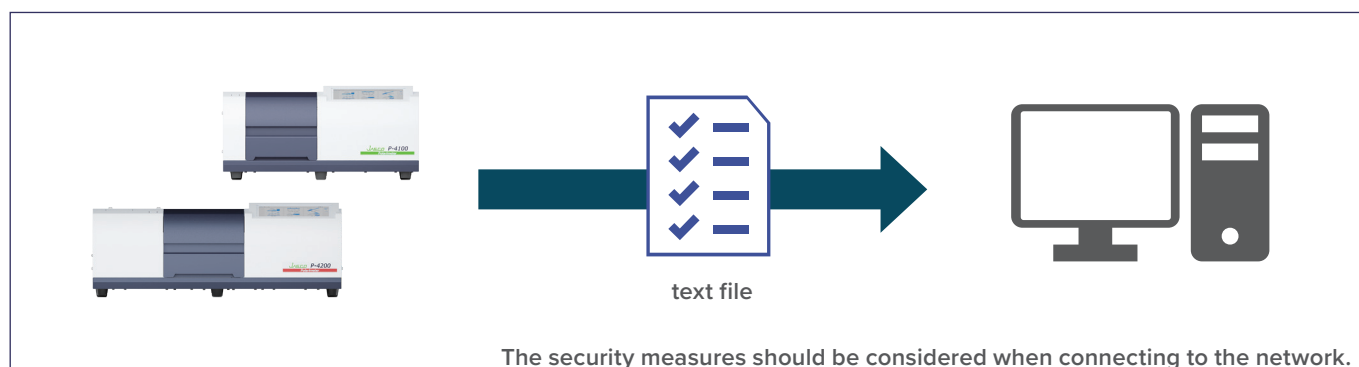
Directly print data to a paired printer. Print preview is visible before printing and PDF output is also available.



Print settings window

LIMS connection

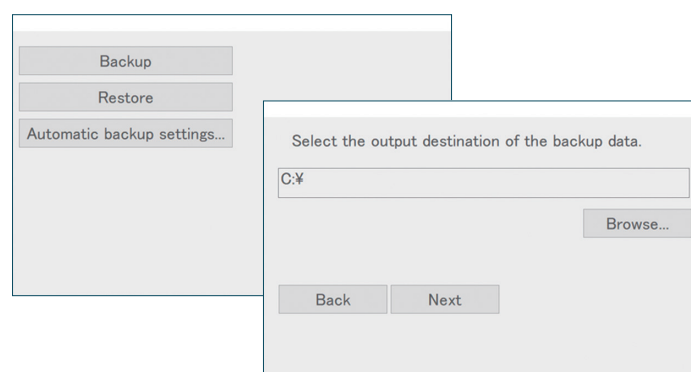
Measurement data and audit trails obtained from polarimeter can be transferred/managed in LIMS (Laboratory Information Management System). Output data are provided in text format, and users need to follow the LIMS setting for data handling.



Data transfer from P-4000 series to the network PC

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

Sample cells

RQC: JASCO's unique rectangular cell for operational simplicity

The novel RQC 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

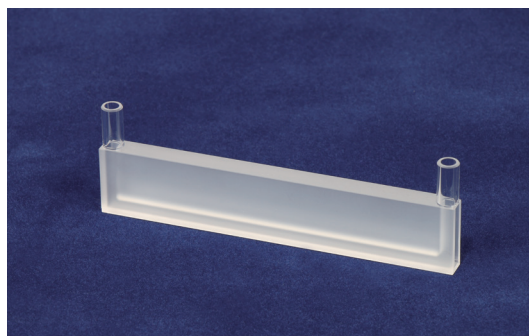
RQC cells are designed for easy, bubble-free sample pouring and thorough flushing.

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 for a 3 mm RQC cell with 100 mm optical pathlength is approx. 1 mL.



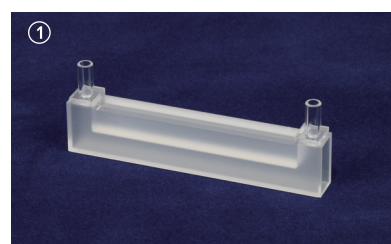
RQC cell jacket

The complete 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.



Optional accessories



SHP-403 Peltier sipper

Allows sample loading from the front nozzle, followed by measurement and flushing. Saves time and effort in mounting and dismounting the cell. Sample temperature control and monitoring are also available.



TSR-411 Thermostatted plate

Preheat the sampling cell before the measurement, reducing the overall measurement time, including the heating after cell placement. Useful for back-to-back measurement using multiple cells.



QPA-412/413/414/415

Practical standard quartz control plate

Used for instrument calibration. JASCO also offers the quartz control plate with calibration certificates compliant with ISO/IEC 17025 compliance.



Optical filter

Used to select wavelength according to the measurement needs. 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] _D	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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6917-2601ENG

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