

High Throughput Circular Dichroism

HTCD Systems



JASCO

Performance
Innovation
Reliability



For scientists in pharmaceutical, process- and biotechnology, and food chemistry labs who need reproducible and automated measurements and reliable structural analysis software, the high-throughput circular dichroism (HTCD) system eliminates human error and bias in measurement acquisition and biomolecular characterization.

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Automated Protein Screening

The evaluation of secondary and tertiary structure is important in the quality testing of protein and peptide based biologics. Circular dichroism (CD) is sensitive to a biomolecule's asymmetry and is ideal for pharmaceutical stability and processing studies, where even slight changes to the molecule or its environment can induce structural changes, altering its function. While CD measurements are known to be quick and easy to perform, the high-throughput system dramatically increases the amount of data obtained with automated measurements from two, 96-well microplates.



Flow Cell available in 0.2, 0.5, 1 and 2 mm pathlengths.

JFLC-515 | Peltier Thermostatted Flow Cell Unit for accurate temperature controlled CD and fluorescence measurements with a temperature range of 5 to 95°C.

ASP-849 | Syringe Pump high-speed, high-accuracy pump for transferring the precise amount of sample to the flow cell.

ASU-800 | Autosampler with Safety Cabinet performs automated measurements at predetermined parameters.

Sampling Needle with bias for piercing the plate sealer without risk of including debris.

The HTCD allows for automated scanning measurements using pre-programmed parameters and temperature ramping measurements using a Peltier temperature controlled flow cell. The autosampler can be set to maintain the microplate rack at a constant temperature to avoid sample denaturation or evaporation and a dust cover further protects from sample contamination. The wash cycle is customizable with up to three solvent reservoirs to eliminate sample carry-over.

In addition to CD and absorbance, fluorescence can be measured simultaneously. The system allows samples to be recovered following measurement, and batch data processing includes calculation of melting temperature, secondary structure analysis, and comparability analysis.

ADU-831 | Air Pump completely ejects sample from flow cell and tubing and dries flow path following the washing cycle.

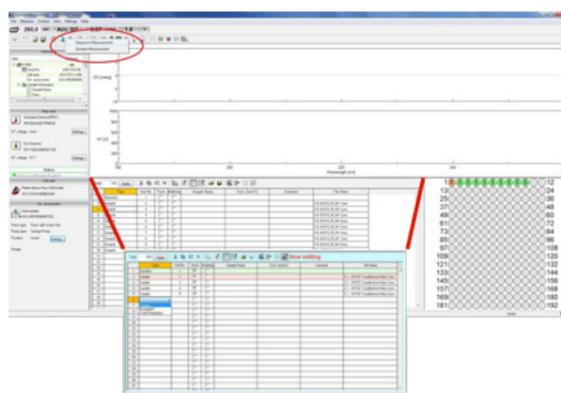
SRA-820 | Temperature Controlled Microplate Rack holds up to two, 96-micro well plates and a three solvent washing system.

Advanced Features

- Fully automated measurement for up to 192 samples (two 96-well plates)
- Conventional and high-throughput measurement modes can be selected
- Adjustable wash cycle with up to three solvent washes
- Air drying system to eliminate sample dilution
- Separate cell and well-plate temperature control for thermal stability studies

Spectrum Test Measurement

The [Sample Measurement] option allows a test measurement to be obtained before running a sequence program, while the [Sequence Measurement] option begins the pre-programmed measurement sequence.



Open Access Function

Allows the sequence to be edited during the measurement. Samples, baselines, and parameters can be added or removed, file name and location can be changed, and sample information can be supplied.

Air Volume Auto Optimization

Automatically determines the air volume for load needed to move the sample from the well plate to the flow cell by measuring the applied voltage.

Automatic Calculation of Optical Constants

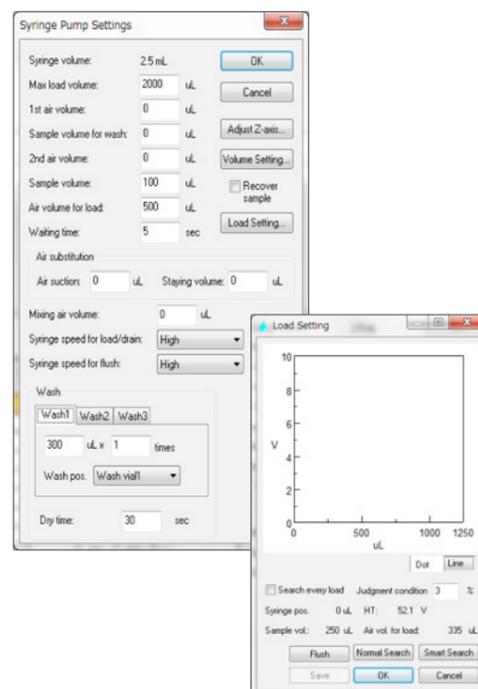
Optical constants are automatically calculated in the Multivariate SSE program when the path length and mean residue molar concentration are specified for the sample measurement.

Batch Processing

Secondary Structure Estimation Analysis and Thermal Denaturation Analysis can be performed automatically on a large number of data files.

Simultaneous Measurement Function

The HTCD system can simultaneously obtain CD, absorbance, and fluorescence measurements.



Specifications

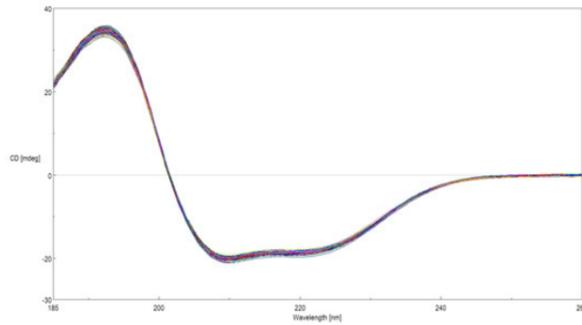
Flow Cell	0.2 mm Flow Cell	0.5 mm Flow Cell	1 mm Flow Cell	2 mm Flow Cell
Sample Volume for Measurement	80~250 μ L	80~250 μ L	80~250 μ L	150~250 μ L
Cell Volume	5 μ L	13 μ L	25 μ L	100 μ L

Dry Up Function	Available
Cleaning Solution	3 (Max: 200, 100, 100ml)
Measurement Program	[Spectra measurement], [Variable temperature measurement], [Temperature interval scan measurement], [Temp/wavelength scan measurement]
Capacity	2x96 well plates
Sample Environment	Storage: water circulation / Cell: Peltier controlled

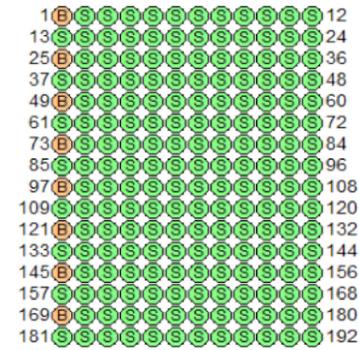
Applications

Small Pathlength Cell Reproducibility

Since CD is an absorption technique based on Beer's Law, the sample concentration and pathlength are critical to obtaining good CD data. Strongly absorbing samples and/or buffers can be measured by either decreasing the concentration or cell pathlength. However, for some samples the working concentration cannot be modified. The 0.2 mm pathlength cell allows for strongly absorbing samples to be accurately and reproducibly measured in the far-UV with the high-throughput CD system.

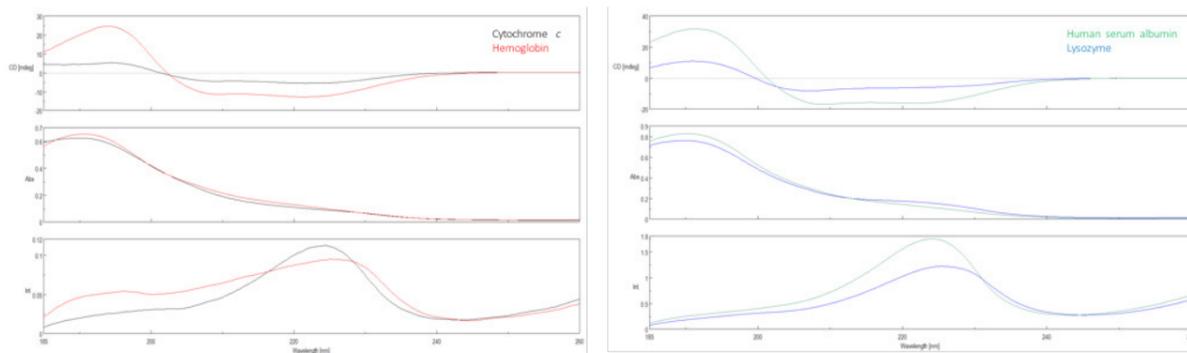


Far-UV spectra of 184 0.5mg/mL bovine serum albumin samples and the corresponding well plate set up for baseline and sample measurements.



CD, Absorbance, Fluorescence Measurements on Multiple Protein Samples

CD, absorbance, and fluorescence spectroscopy are complementary techniques in the structural analysis of proteins. CD spectroscopy can elucidate conformational changes occurring along the protein backbone, while absorbance measurements are used for quantitation and monitor changes to the chromophore. Fluorescence signal reflects environmental change of side chain of aromatic amino acids in protein. The combination of these techniques allows for secondary structure estimations, tertiary structure analysis and analysis of biomolecular binding interactions.



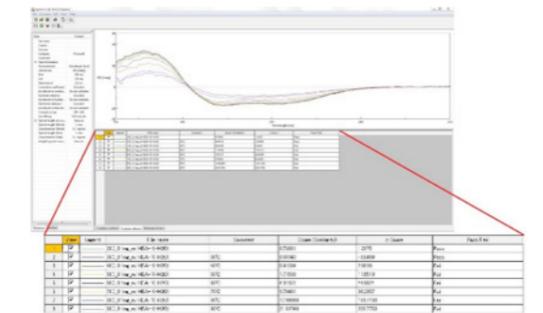
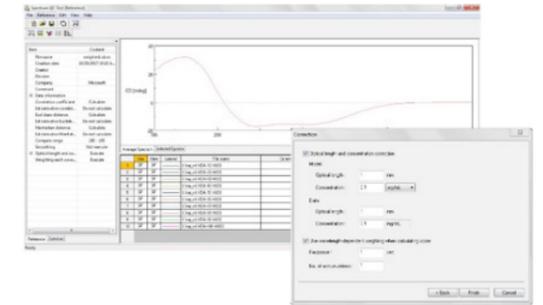
CD (top), absorbance (middle), and fluorescence (bottom) spectra of cytochrome c (black), hemoglobin (red), human serum albumin (green), and lysozyme (blue).

Powerful Analysis with Automated Post Measurement Processing

JWSQC-530 | Spectrum QC Test

The Spectrum QC Test program statistically evaluates the similarity and z-score between a measured sample spectrum and a previously recorded reference data, effectively eliminated operator bias. To account for noise in the CD spectrum, calculated weighted scores are performed at each wavelength using the relation between the standard deviation of the noise and the high tension (HT) voltage of the CD spectrometer.

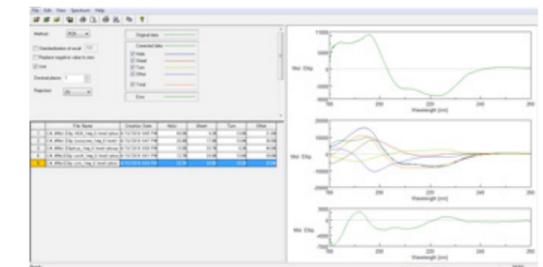
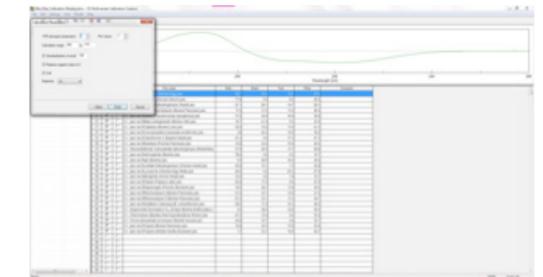
- Three algorithms are included: Correlation coefficient, Euclidean distance, Manhattan distance
- Sensitive to changes in spectral shape and intensity
- Optical pathlength and concentration correction for reference model and sample spectrum
- Pass/fail evaluation function using a z-score
- Compliant with 21 CFR Part 11



JWMVS-529 | Multivariate SSE Analysis

The quantitative multivariate analysis (PCR/PLS) program is used for the estimation of protein secondary structures from CD spectra. The reference data set includes 26 proteins with the option to add additional spectra. In addition, users can create their own unique reference data set.

- Verifies the calibration model using cross-validation
- Minimizes residual error in the concentration by calculating abundance ratio
- Validates the analysis result using an F-test
- Verification of recalculation and calculated results (GLP/GMP compliant)
- Compliant with 21 CFR Part 11



JWTDA-519 | Thermal Denaturation Multi-Analysis

Calculates thermal melting parameters including temperature (T_m), ΔH , and ΔS from temperature dependent measurements.

Spectra Manager™ HTCD

The J-1500 Series HTCD system includes the following measurement and analysis programs:

Spectra Measurement

Routine spectrum measurement and analysis program.

Temperature/Wavelength Scan Measurement

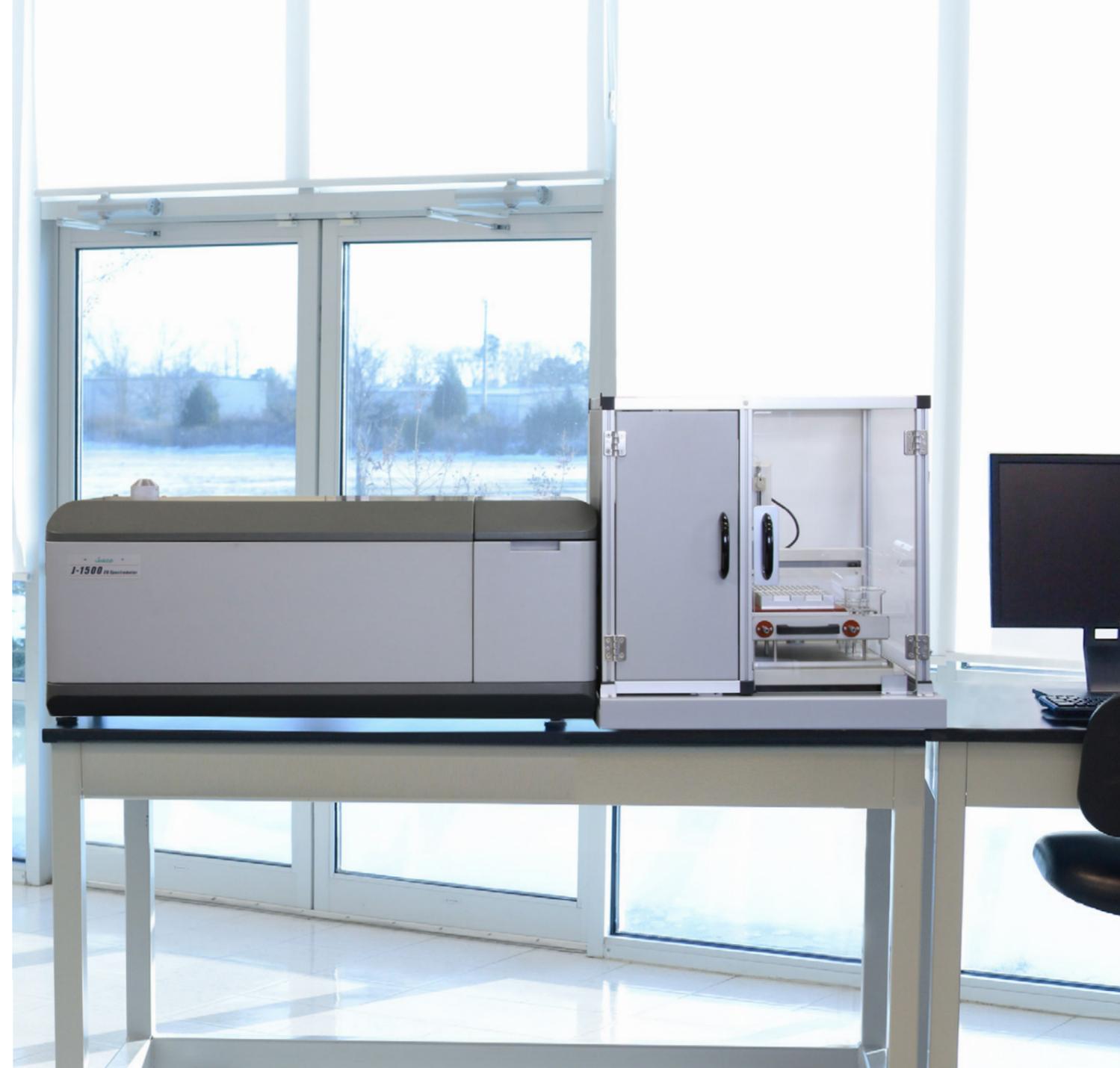
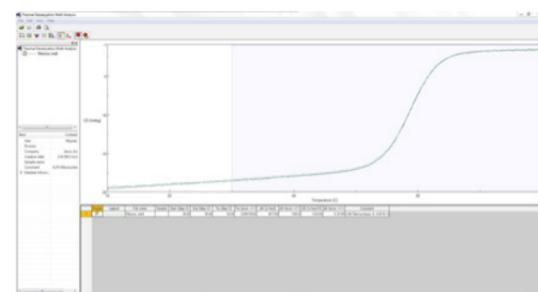
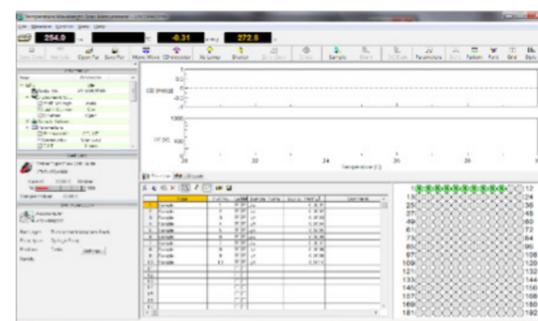
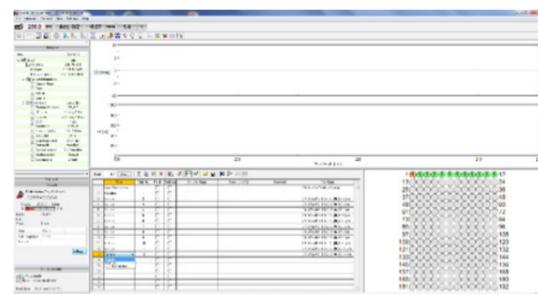
Used to evaluate temperature-dependent CD data by measuring both the change in the CD intensity as a function of temperature at fixed wavelengths and CD spectra at pre-programmed temperature intervals.

Variable Temperature Measurement

Measures the change in CD intensity as a function of temperature at up to eight user selected wavelengths to obtain the melting temperature and other thermodynamic parameters.

Regulatory Compliance with Spectra Manager CFR

Spectra Manager CFR ensures regulatory compliance for 21 CFR Part 11. System access is secured with a username and password, assigned by the Workgroup Administrator. Individual access levels can be customized by the administrator to control user level access to instruments and analysis applications, as well as system and application history logs. To ensure compliance with FDA legislation for electronic records, three levels of electronic signatures are required to authorize measurement parameters, measured data and processing. These include creation, review, and approval. An Windows monitored audit trail observes changes in every file.



HIGH-SPEED AUTOMATED BIOMOLECULAR ANALYSIS SYSTEM

The J-Series HTCD system brings walk up automation with open-access unattended measurement, analysis and reporting for laboratories that can't afford to wait.



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