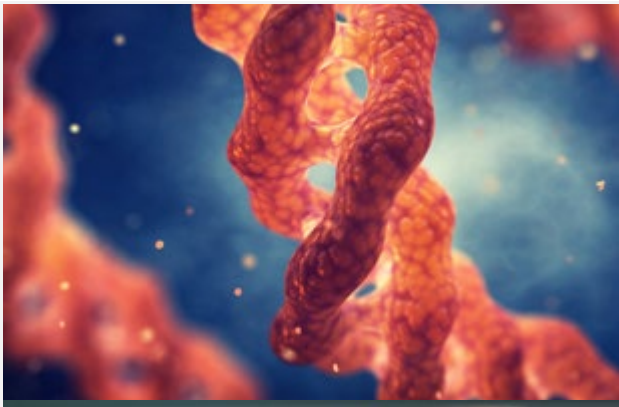
SPECTROMETERS

BioLogic

MOS-500.

Circular Dichroism Spectrometer



MOS-500 uses an innovative and patented three stage wavelength selection system to bypass the limitations of traditional prism-based monochromators.

This innovative design delivers outstanding performance in wavelength range, sensitivity, precision, speed, and modularity.

Operating costs are also reduced as the **MOS-500** requires optics purging only when working below 195 nm. A standard dual lamp box adds to the convenience of the system, and an optional tungsten lamp enhances IR performance.

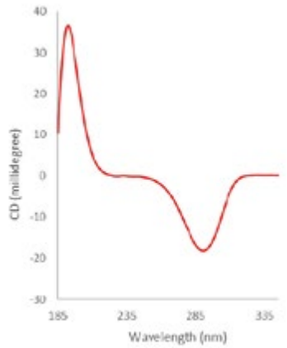
Thanks to its modular design, the MOS-500 is so much more than just a CD spectrophotometer.

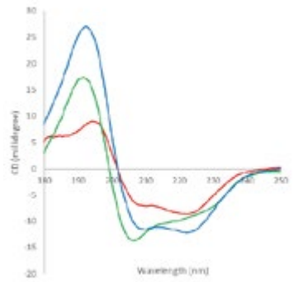
Multiple detection modes and a wide range of accessories from stopped-flow to ORD are available to allow you to adapt the system to your specific research needs.

GENERAL SPECIFICATIONS

- 163-950 nm, and 0 nm (white light) (up to 1,250 nm optional)
- Dual light source (Xe and XeHg)
- ±0.1 nm wavelength accuracy over full wavelength range
- Peltier temperature control optional
- Unsurpassed baseline stability
- Fast and sensitive
- Standard detection modes: CD/Absorbance/HV, Fluorescence, FD/CD, Fluorescence anisotropy and polarization, LD, HPLC-CD
- Optional modes: NIR-CD, ORD, DR-CD, Stopped-flow and titration, Emission fluorescence

Innovation and Performance





Unsurpassed stability

The combination of an extremely quiet light source with ultra stable optics and electronics make the MOS-500 the most stable spectropolarimeter on the market by a full order of magnitude.
It is ideal for measurements and titrations that take hours to complete.

Multiple scanning modes

The scanning speed can be set by the user, or automatically controlled in the software to optimize the quality of spectral data. Under software control the scanning speed is reduced for wavelengths where the level of light is low. The user can display raw data or apply post acquisition processing. Scans can be easily synchronized with temperature or titration steps through Bio-Kine software.

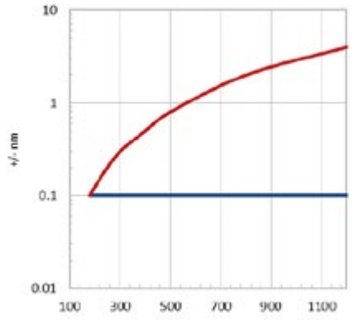
Low noise

High-quality optical components and design combine for the best quality, longevity, and efficiency. The optical path is optimized so the maximum amount of light reaches the detector from far UV to NIR. The photomultiplier detector has been chosen to offer the highest sensitivity from far UV to 950 nm. The wide range detector means the system can be used for no compromise fluorescence measurements, making the MOS-500 a more versatile and cost-effective instrument. Optional PMTs can be installed for specific applications if needed, without upgrading the hardware.

Double light source

The MOS-500 includes a Xenon/ Xenon (Hg) double light source. The xenon lamp is preferred for UV-Vis scans and XeHg for single wavelength applications.
The user can select either source in seconds, without handling or re-aligning the lamp. This makes the system especially valuable in a multi-user lab. The MOS-500 can accommodate lamps from 75 W to 200 W, and tungsten lamps are available for different applications or needs.

Unique technology



HV spectra with and without N_2 flushing (no effect above 195 nm)

You don't need to choose between prism and grating monochromator. The MOS-500 combines the best of both worlds

Tunable chromatic light source Coupled to a double grating monochromator

The MOS-500 combines a patented chromatic illumination system with a new grating design to provide wavelength range, diffraction efficiency, and accuracy.
The patented chromatic illumination system provides the initial selection of the wavelength. Like a prism monochromator it uses the variation of the refractive index of quartz. This is followed by the latest double grating monochromator design to give constant and optimal resolution, and precision at all wavelengths.
The chromatic illumination of the double monochromator also reduces the energy received by the monochromator and extend the lifetime of the optics. Monochromators are confined so the level of stray light is minimum, allowing high performance spectra in the far-UV. The slit mechanism is software controlled, and
bandwidth can be selected freely from 0 to 16 nm. The MOS-500 also includes a software controlled shutter for photosensitive samples.

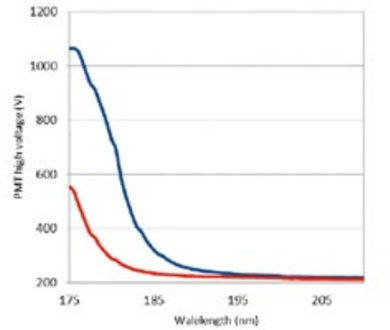
Grating vs Prism

Conventional CD spectrometers based on double prism monochromators use prisms to polarize light. Prisms provide good wavelength resolution in the UV region, but in the visible and IR region however, wavelength precision can be reduced by a factor of 20. Precision is also reduced when compared to gratings in the same wavelength ranges. This makes it difficult to run well resolved spectra using small slits.
In addition, prism monochromators are not ideal for rapid kinetics studies, even in the UV region. With the MOS-500 kinetics users are able to open slits widely and obtain as much light as possible, which is not always possible with prism monochromators.

The MOS-500 combination of a tunable chromatic light source with gratings offers the best performance over the full UV, visible and NIR range.

Low running costs - save more than €5,000 per year

Calculation is based on a daily use at a 3l/ min N_2 flushing of optics (recommended by other manufacturers) and cost of one N_2 bottle in 2021. Instrument being used above 200 nm only.



HV spectra with and without N_2 flushing (no effect above 195 nm)

Automatic variable focalization

A large sample compartment makes a wide range of options, such as MCD magnets or turrets for multi-cell measurements, easily accessible.

The focal point is automatically adjusted to accommodate the detection mode and accessory installed.

The light beam can be parallel, or be focused on the cell, or on the detector to offer the best signal to noise ratio for each experimental condition. A unique design ensures that the detector is located as close as possible to the cell.

These automatic adjustments are unique and ensure the instrument delivers the best possible performance in the most demanding of applications.

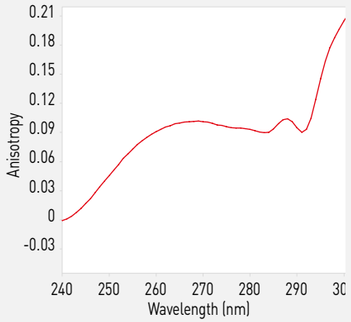
No need for N_2 flushing above 195 nm

Traditional CD instrument manufacturers have made nitrogen flushing a requirement for CD measurements. The main reason is the need to remove oxygen and to reduce its light absorption in the far-UV range. This is important for wavelengths shorter than 195 nm. However, N_2 flushing is useless from 195 nm to NIR. Another reason is the need to protect refective coatings from ozone generated by UV reaction with oxygen in the lamp compartment.

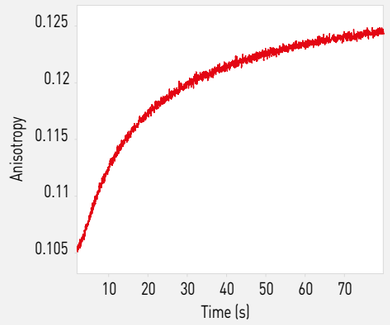
The **MOS-500's** design dramatically reduces the need for N_2 flushing. It has been designed without focusing mirrors in the lamp compartment, so there is no risk to the optics. The gas purge space is divided into three areas: the light source, the optical bench and the sample compartment.

The instrument is sealed so the N_2 purge can be stopped in the lamp housing and optical bench after 20 minutes of operation, whilst ensuring outstanding performances in the far UV range.

More than just a CD Spectrometer



Lysozyme fluorescence anisotropy spectrum



BSA/Phloxine reaction followed in anisotropy mode

Polarization and Fluorescence Anisotropy

The **MOS-500 includes** a unique fluorescence **anisotropy measurement** mode. The EMFA® method uses fast modulation of the polarized excitation light and synchronous detection of the fluorescence signal to achieve a highly sensitive and fast measurement of sample anisotropy.
Fluorescence anisotropy is a useful technique across a wide range of applications: binding, denaturation, aggregation and crystallization, or any reaction inducing a total or a partial change of flexibility of the molecule holding the chromophore.
Data can be displayed in anisotropy units, or as the two polarized signals. Total Fluorescence is also measured simultaneously.

Excitation Modulated Fluorescence Anisotropy

The EMFA method was developed and patented by BioLogic in 1999.

Fluorescence and FD-CD

The standard photomultiplier tube covers a wavelength range from 160 nm to 950 nm. It is ideal for fluorescence applications. The PMT housing can be easily relocated at 90° to the beam for fluorescence or FD-CD measurements. The PMT housing accepts 1 inch diameter filters to select emission light.
For Fluorescence Detected Circular Dichroism (FD-CD), the photo elastic modulator alternatively generates left and right circularly polarized light. The difference between the two polarization signals is measured with the PMT installed at 90° to the beam.

If the user wants to simultaneously record CD and fluorescence signals, or dual fluorescence, a second PMT is required.

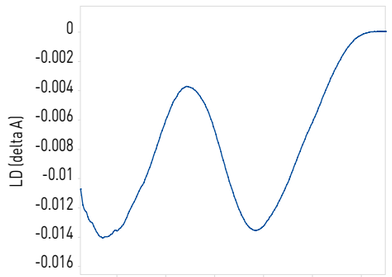
A multi-channel approach

The **MOS-500** was designed to provide a multi-modal approach. CD, absorbance and HV can be recorded simultaneously, and the user can add temperature and fluorescence signals with additional accessories. When temperature is controlled through a Peltier element, dynamic multimode spectroscopy measurements are possible.

The **MOS-500** is by far the most modular and highest performing system on the market, with outstanding specifications in every detection mode.

Linear dichroism

Linear dichroism (LD) is the difference in absorption of parallel and perpendicular linearly polarized light and gives information on the orientation of the bio-macromolecule. These two polarizations are generated by using half wave retardation with a photo elastic modulator.
The **MOS-500** includes hardware and software to measure LD signals in steady state and kinetics mode. To collect LD spectra the user can use commercial flow through cells or an optional couette cell to orient the sample in the cell.



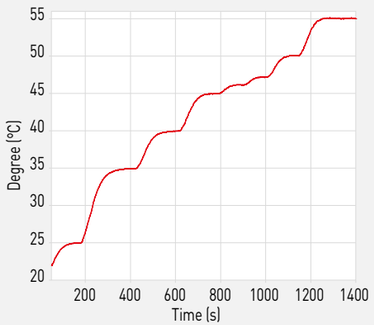
28 µg/ml DNA spectra using 1 second sampling

HPLC-CD

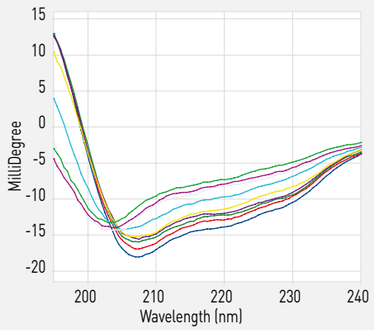
The **MOS-500** can be coupled to HPLC instruments using a commercial flow cell fitted into the sample compartment. Bio-Kine software can be triggered from the HPLC to record the chromatogram. The CD signal can also be fed back into the HPLC for data comparison and analysis.

The **HPLC-CD** signal can be recorded over the full wavelength range of the **MOS-500**.

Temperature Control



Precision of sample temperature recording without overshoot (10°C, 5°C and 1°C temperature steps)



Thermal denaturation of lysozyme (from 30°C to 85°C in a 1 cm cuvette)

Single cell Peltier Temperature controller

The **MOS-500** can be equipped with an optional Peltier temperature controller for precise and rapid temperature control of the cell. The temperature of the Peltier element is regulated according to the real temperature of the cell for smooth control without overshoot. The measured temperature corresponds exactly to the target temperature without any gradient due to the distance between the Peltier and the cell.

Temperature ramping is easily programmable with Bio-Kine software. At each temperature step a CD spectrum can be measured automatically. For single wavelength thermal stability studies it is also possible to directly measure the CD signal versus temperature to determine thermodynamic properties of a protein (Tm, ΔCp, ΔS).

Specifications

- Full control via software
- 0.01°C precision
- Magnetic stirring standard
- Temperature range: -10°C to 110°C
- Temperature of the cell and Peltier can both be measured
- Easy programming

Multi-cell Peltier Temperature controller

The **MOS-500** can be fitted with a 4-cell Peltier temperature controller for precise temperature regulation of up to four samples. Each cell has its own magnetic stirrer. The operating range is -40°C to 105°C using a circulating chiller unit.

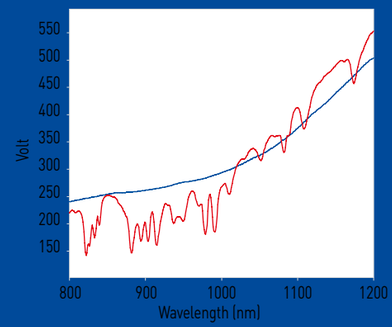
The Multi-cell temperature controller is fully controlled from Bio-Kine software, including cell position in the beam, temperature ramping, or single temperature scans.

NIR upgrade

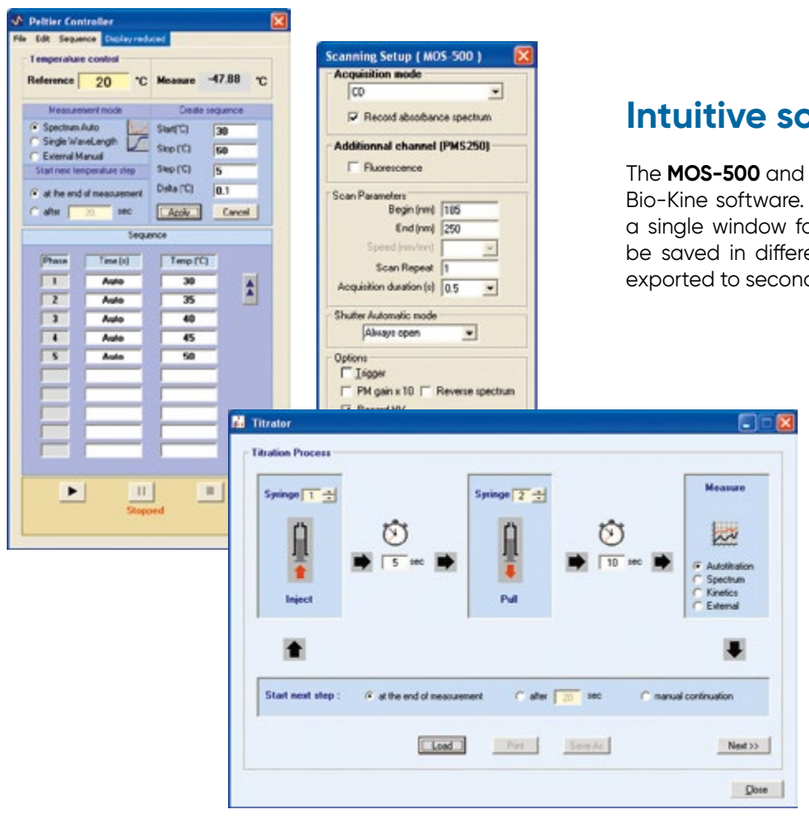
The NIR option extends the wavelength range to 1,250 nm. It includes a photomultiplier tube optimized for NIR range, and a tungsten lamp.

Conventional CD spectrometers based on prism monochromators are optimized to separate light in the far UV. However, the longer the wavelength, the worse the wavelength resolution, and it is impossible to work with small slits and to detect narrow CD peaks. BioLogic's new wavelength focusing system with grating monochromators gives the user the same wavelength resolution over the full wavelength range. In the NIR region the **MOS-500** offers 20 times better accuracy compared to a prism based system.

Xenon lamps have sharp intensity peaks in the NIR region which makes lamp regulation difficult. For this reason, a tungsten lamp is used in the NIR accessory as its spectrum is more homogeneous and further enhances performance.



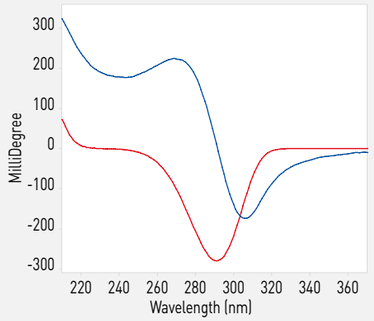
Comparative HV spectra of Xenon and Tungsten lamp in NIR region (xenon peaks are clearly observed)



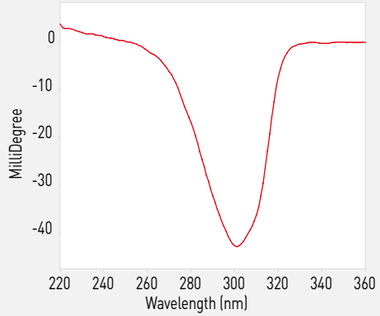
Intuitive software

The **MOS-500** and all accessories can be fully controlled from Bio-Kine software. Acquisition parameters are selected from a single window for easy experiment design. Data files can be saved in different formats for internal analysis, or easily exported to secondary structure analysis software.

Options



CD and ORD spectra of camphor sulfonic acid showing positive cotton effect



DR-CD spectra of camphor sulfonic acid

ORD accessory

ORD (Optical Rotary Dispersion) and CD are closely related techniques. ORD is used to study the chirality of a biomolecule by passing a beam of linearly polarized light through the sample. If the sample is chiral, then the light will be rotated as a function of wavelength. From this rotation, the user can determine the left or right-handed chirality of the molecule. No physical rotation of the polarizer is required during acquisition so an ORD spectrum can be collected over tens of seconds with a outstanding sensitivity. The ORD accessory is mounted on a standard photomultiplier tube. It includes one polarizer and a special PMT holder equipped with a micrometric screw, allowing fine adjustment of the polarizer position before measurements. Electronics in the MOS-500 do not need to be upgraded when adding the ORD accessory.

The ORD accessory can also be used for steady state measurements.

Specifications

- 210-900 nm (1,200 nm when combined with IR accessory)
- ±10 degrees
- Detection limit: 0.01 mdeg

DR-CD: CD-powder

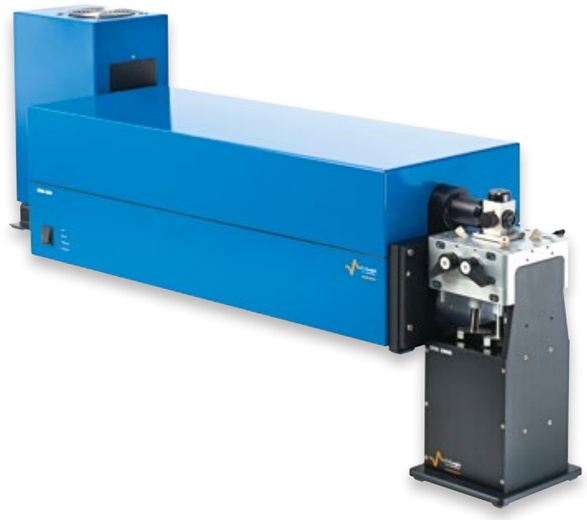
Measuring CD spectra on powder has long been desired as a way to eliminate solvent contribution. A Pellet technique can be used, but the quality of results is highly dependent upon the quality of sample preparation. BioLogic has designed a Diffuse Reflectance CD accessory based on an integration sphere using an internal coating specially chosen for its high reflectance.

The **DR-CD** accessory can be installed in seconds in the sample compartment. The powder holder is designed to minimize linear dichroism artifacts, and is installed directly into the integration sphere.

High quality spectra can be obtained in minutes on solid samples like powders and other samples like leaves.

Specifications

- 200-900 nm (1,200 nm when combined with IR accessory)



Stopped-Flow

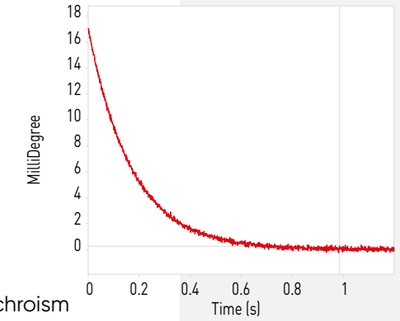
All stopped-flow mixing systems manufactured by BioLogic can be attached to the **MOS-500** in minutes.

The latest generation **SFM-2000**/**3000**/**4000** mixers deliver outstanding kinetics specification. Our **SFM** models are based on independent stepping motor technology and Berger Ball mixers which provide the highest kinetics performance on the market. A series of experiments such as concentration dependence studies can be performed quickly and automatically, without changing syringes or doing manual dilution. This saves time for the user.
Stopped-flow kinetics can be measured in all detection modes. A dead time of 0.2 ms can be obtained in all detection modes with the optional micro-cuvette.

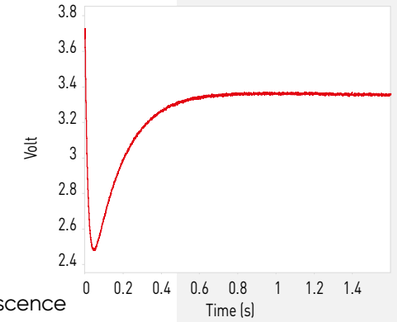
Nitrogen flushing of optics is not necessary when the **MOS-500** operates in stopped-flow configuration. To obtain an optimum signal to noise ratio in kinetics mode users should prioritize a XeHg lamp (222 nm alpha helix, Trp fluorescence etc). The MOS-500's dual light source allows switching from Xe to XeHg lamp in seconds without handling or realigning the bulb. It is the easiest to use lamp system available.

Specifications

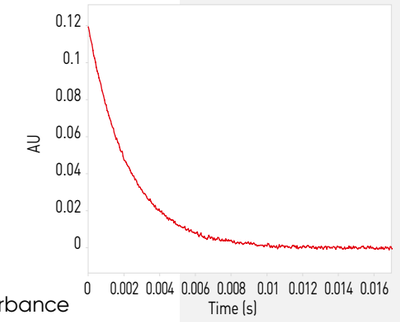
- 0.2 ms dead time (with optional microcuvette)
- Mixing ratio fully controllable form 1:1 to 1:100
- Single, double, and triple mixing
- Automatic concentration dependence studies
- Choice of 10 cuvettes
- Low sample volume requirement
- For absorbance, fluorescence, CD, anisotropy, LD, chemiluminescence, 90° light scattering



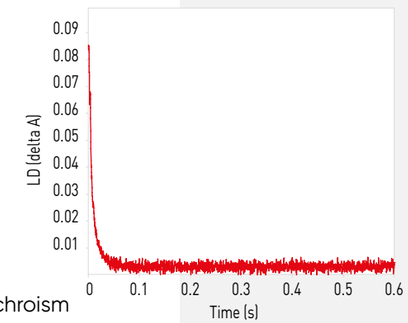
Circular dichroism



Fluorescence



Absorbance



Linear dichroism

Specifications

SPECIFICATIONS

Light source	Extremely quiet 150 W Xe and Xe (Hg) air-cooled, tungsten available in option (air-cooled)
Monochromator	Tunable chromatic light source coupled to double grating (patented)
Wavelength range	163-950 nm (standard), 163-1250 nm (with optional detector)
Nitrogen gas purge	Only for scans < 195 nm (no risk of damaging optics), high efficiency N_2 purge optimized for light source, optical bench and sample compartment
Wavelength accuracy	±0.1 nm from 163 to 1,250 nm
Wavelength precision	±0.05 nm from 163 to 1,250 nm
Bandwidth	0 to 16 nm on full wavelength range
Stray light	< 2 ppm at 200 nm
CD resolution	0.00001 mdeg
CD range*	±7,500 mdeg
Baseline stability	±0.007 mdeg/hour
Scanning speed	0.1 ms to 20 s per data point
Data interval	0.1 nm to 10 nm in scanning mode, 10 µs to 20 s in kinetics mode
Scanning modes	Step scan, adaptive scan, temperature scan, kinetics (slow or using stopped-flow)
Rms noise**	0.015 mdeg at 185 nm using 1 nm BW, 16 s sampling 0.01 mdeg at 200 nm using 1 nm BW, 16 s sampling 0.007 mdeg at 500 nm using 1 nm BW, 16 s sampling
Standard detection modes	CD, Absorbance, HV (standard all simultaneous) Fluorescence, FD/CD, Fluorescence anisotropy, HPLC-CD, LD
Optional detection mode	NIR-CD, ORD, DR-CD
UV measurement	Accuracy ±0.001 AU (built-in filters to remove second order)
Shutter	Built-in, software control
External input/output	4 in, 3 out (for external connections)
PC interface	Windows 7, 32 or 64 bits
Other options	Titrator (concentration and pH), emission monochromator
Dimensions	139 x 32 x 39 (cm, W x D x H)
Weight	35 kg

Specifications are subject to change
**Typical value. Customization to higher values is possible, please contact your local distributor.*
***Wavelength enhanced customization available, please contact your local distributor.*