P/ACE™ System MDQ
The Advanced Capillary Electrophoresis System for Methods Development and Quality Control

THE FAST TRACK TO MARKET
For Many Important Molecules, CE Provides Greatly Improved Results Compared to Other Techniques.

With capillary electrophoresis, methods are faster to develop, easier to validate, and less expensive to run. When it comes to many pharmaceutical applications, capillary electrophoresis is the most effective way to get to market. Since the introduction of our first commercial CE system (P/ACE 2000) in 1989, Beckman has established the largest productive base of instruments and users in the world. This unique experience allows us to listen to a broad range of customer suggestions and ideas which guide our product development. We learned, very early on, that a variety of system designs are required to optimize performance for different applications. From this we developed seven new systems.

- P/ACE Research Station
- P/ACE DNA Analysis System
- P/ACE Glycoprotein System
- P/ACE Education Platform
- Paragon CZE 2000—Clinical CE system for serum protein screening and identification — and now...
- P/ACE System MDQ Methods Development System
- P/ACE System MDQ Quality Control System

CE Excels in Many Demanding Applications.

For many established methods and applications, HPLC is fine. However, for some very demanding separations, such as highly polar pharmaceuticals, chiral isomers, and basic compounds — CE offers very significant advantages. It also allows for easy validation of quantitative assays, determination of identity and quantitation of trace impurities.

P/ACE System MDQ Provides These CE Advantages:

- High degree of system automation improves productivity
- Simplicity of hardware design provides enhanced reliability and ruggedness
- Wide selection of separation mechanisms promotes rapid methods development
- Minimal reagent consumption reduces both purchase and disposal costs
- Automated calculation of mobility provides additional evidence of identity

From basic research to industry, Beckman’s proven systems approach to bioseparations combines hardware, software, chemistries, and worldwide technical support that are truly unrivaled.

P/ACE System MDQ...From Research to Market in Record Time.

QC

If you need to develop new analytical methods rapidly and then transfer these methods into routine use — P/ACE System MDQ is the system of choice for you.
The high resolution of capillary electrophoresis simplifies the analysis of chiral impurities in samples of biochemical interest.

Separation of (1) an impurity, (2) doxepin, (3) nordoxepin, (4) imipramine, (5) desipramine, (6) amitriptyline, (7) nortriptyline, (8) protriptyline.

Like most great ideas, CE is simple and effective. Simple components, precisely controlled, provide the reproducibility and robustness required for validating methods for quality control.
P/ACE System MDQ Provides You with Flexible and Robust Pharmaceutical Solutions

Temperature Control

Beckman's patented capillary liquid cooling system is much more efficient than simple air cooling. Primary advantages of liquid cooling are:

- Use of high ionic strength running buffers (500 mM) to improve resolution of complex samples
- Use of large bore (150 - 200 μm i.d.) capillaries to accommodate larger mass loads and enhance sensitivity
- Improved migration time reproducibility

Quantitation

The P/ACE System MDQ is designed to provide improved limits of quantitation (LOQ) for trace impurity analysis. The LOQ is improved by both lowering the noise, and improving the ability to integrate the peaks at a lower signal-to-noise ratio by utilizing:

- Improved detection design
- Caesar Algorithm Integration

Automation

A combination of flexible software and XYZ robotics allows for a complete methods development process from a wide array of separation buffers.

Productivity

Very fast separations using short capillaries, coupled with P/ACE System MDQ's unsurpassed sample capacity, provides higher productivity.

Flexibility

The P/ACE System MDQ cartridge design allows its superior liquid temperature control to be compatible with all capillary types – including extended path and packed capillaries.

Robustness

Simplicity of CE technology provides enhanced reliability and ruggedness. Run after run P/ACE System MDQ provides reproducible results – even with complex samples.

Methods Development, Validation, and Transfer to QC are done quickly and easily on the P/ACE System MDQ platform.

An economical QC – dedicated configuration, using robust and traceable detection, is available for the validated GLP/cGMP compliance environment.

High sample capacity, combined with short run times, maximizes throughput in pharmaceutical analysis. Shown: Separation of basic drugs on an amine capillary.
Optimized detector design, coupled with new CE algorithms, provides lower limits of quantitation. Shown: Measurement of Cobalt in the presence of excess Sodium. Sodium: Cobalt peak area ratio is 0.056 of Sodium.

The P/ACE System MDQ buffer array allows the automated analysis of a chiral methods development matrix. Chiral CE separations are quite dependent on pH and cyclodextrin. Shown: Illustration of resolution optimization (RS) in chiral methods development.

PACE System MDQ is designed to be compatible with all CE separation techniques. Shown: An example of capillary electrophoresis.

PACE System MDQ provides the robustness and reproducibility necessary for routine analysis in quality control. 1st and 240th runs of basic proteins (%RSD for absolute migration time): lysozyme (0.47), cytochrome C (0.51), myoglobin (1.05), ribonuclease A (0.96).
Designed as a combination of integrated modules, the P/ACE System MDQ may be configured to run a wide variety of applications with ultimate ease.

**A Autosampler Module**

The system is compatible with 96-well plates, 2 ml vials, 0.5 ml vials and PCR* vials. Sample containers may be stored in an optional temperature-controlled environment independent from the buffers.

**B Fluid Delivery Module**

High-precision syringe pump with closed-loop feedback mechanism controls variable pressure and vacuum sample introduction. Programmable pressure may be actuated to fill and condition the capillary between separations or can be applied during the separation.

**C XYZ-Robotics Module**

An array of up to 36 pairs of buffers accessed randomly allows flexibility in optimizing methods development. Once the method is developed, the array may be auto-incremented to provide buffer replenishment for high-throughput analyses.

**D Capillary Temperature Control Module**

The superiority of P/ACE liquid cooling over air cooling is clearly seen in Ohm’s law plots run on different instruments using identical test conditions. The P/ACE System MDQ utilizes improved, recirculating liquid coolant with five times greater flow, providing more effective thermostating of the capillary.

**E Capillary Housing Module**

The capillaries are housed in user-assembled cartridges which are compatible with all current CE capillaries. The cartridges integrate with the optical assembly module providing automatic alignment. Optical slits may be physically changed in seconds to optimize sensitivity and resolution.

**F Detector Modules**

Higher sensitivity diode array (DAD) and UV/VIS detectors interchange allowing for flexible methods development and rugged routine use. The system utilizes a design combining an optimized optical bench with fiber-optic light transmission. The DAD has an additional mercury lamp for external calibration.
Hardware advancements represent only one part of the equation to successful development of a new generation CE platform. Implementation of fundamental characteristics like on-column detection and separation by mobility, requires an investment in the development of specialized CE software. This investment is realized with the P/ACE System MDQ software.

**Discovery by Direct Control**

With a single click of the mouse, the researcher begins the CE discovery process by setting run parameters in real time. The true-to-life control allows the intuitive management of all the system parameters. High throughput screening (HTS) is enhanced with the programming of 96-well plates, a format compatible with Beckman's robotic workstations. Automatic collection of a detected peak allows the isolation of a newly resolved compound to further the identification process.

**Methods Development with an Array of Ideas**

Methods are defined and edited easily in a table format that can include post-run calculations. All functions for the system are programmed in a single window, including programming of the buffer array used for rapid method screening. Observed wavelengths may be changed during a run, while any wavelength within a scan range may be extracted and integrated. Peak spectra can be seen in real time. The spectral library can be generated and searched automatically. Data analysis may be performed before the end of the run, providing corrected peak area, mobility, and concentration values.

**Transferring a Validated Method to QC**

P/ACE System MDQ includes tools that ease the process of transferring validated methodology to the QC laboratory. These tools include system suitability using CE-specific calculations along with full GLP/cGMP compliance. Both pre-formatted and fully customizable reports enable the production of the appropriate Standard Operating Procedures. GLP features that help to maintain data integrity include multiple levels of password-based operational access and lock-outs to prevent data overwrites. Batch programming of the high-capacity autosampler allows for full walk-away automation. Tracking and documentation of lamp life, noise, and drift assist in the preventative maintenance of the system.
FOR CE, THAT REALLY PERFORMS

Time Program
All separation parameters are written to a single method table. An autocheck function ensures that the method is compatible with the hardware configuration.

Tray Position
Selection of injection and buffer positions from the high-capacity trays is accomplished via a simple point-and-click interface.

Direct Control
Provides a graphical display of system status and allows real-time changes to instrument run parameters without editing the pre-programmed method.

Array View
This graphical tool allows the user to access the abundance of data collected by the DAD detector. Electropherograms may be generated at any wavelength and scans derived from any peak—even during the run.

Offline Electropherogram Overlay
Super Compare function allows up to 32 electropherograms to be viewed at once in either tiled or overlayed formats.
P/ACE System MDQ Chemistries

Designed to ensure consistent performance and to accelerate the methods development and optimization process, P/ACE System MDQ chemistry kits are available for a wide variety of separations. Each kit contains capillaries, standards, buffers, instructions, software methods, and test mix. Once method development is complete, individual kit components are available in bulk to simplify transfer to routine analysis.

Pharmaceutical Methods Development Kit

The P/ACE System MDQ Methods Development Kit is intended for the analysis of basic pharmaceuticals which would otherwise interact with a bare-fused silica capillary. Each kit contains a set of neutral- and amine-coated capillaries, buffers, small and large molecule test mixes, and a development guide.

Chiral Methods Development Kit

The P/ACE System MDQ Chiral Methods Development Kit consists of neutral-(polyacrylamide) coated capillaries, a variety of cyclodextrins, a set of blendable buffers, and a methods development guide. This kit, combined with the methods development capabilities of the P/ACE System MDQ, provides a rapid means to develop a chiral separation method.

Several of Beckman's eCAP™ chemistry kits are also compatible with the P/ACE System MDQ, including kits for isoelectric focusing and automated SDS molecular weight and purity determination.

Diverse Range of Capillary Surfaces

Diversity in sample type demands an equally diverse range of capillaries in order to minimize surface interactions. Beckman supplies the following range of stable capillary surfaces:

- Neutral Capillary (polyacrylamide)
- N-Linked Carbohydrate Capillary (polyvinylalcohol)
- Amine Capillary (cross-linked amine)
- DNA Capillary (polyacrylamide)
- SDS MW Capillary (polyacrylamide)
Validation

As an ISO 9001 company, Beckman Instruments, Inc. utilizes a qualified development process. The P/ACE System MDQ has been developed under this process to comply with all CE, UL, and CUL mark requirements. Software validation packs provide basic information regarding development and performance testing of product software, which can be used to support customer validation requirements.

Comprehensive instrument installation and certification programs are available to document delivery, installation, basic training, and instrument performance testing. The instrument certification program provides a simple calibration process that ensures that the instrument is performing to published specifications. Specially trained engineers perform the certification using calibrated testing equipment traceable to national standards.

Operator training, from basic to applied technology concepts, is offered. The customer training program covers instrument technology, operation, and application. The program includes documentation of course materials and assessment of training effectiveness.

As capillary electrophoresis is a fundamental change in technology from HPLC, method validation must be approached in a new way. Beckman, the leader in CE, delivers the tools necessary to develop validated methods ready for transfer to the Quality Control Laboratory.

P/ACE System MDQ software is designed strictly for capillary electrophoresis. The system can automatically utilize CE calculations such as mobility, corrected peak area, and molecular qualities to verify that system performance is within expected limits.

The Caesar Integration Algorithms are designed to work with the typical non-Gaussian peak shapes found in CE. The hardware control system can be programmed to react to out-of-limit conditions by starting a shut-down method, stopping the run, or repeating the run.

Validation kits are available to provide the ability to track the robustness of the method using different lots of capillaries. Diode array detector (DAD) calibration is confirmed with both a built-in mercury lamp and holmium oxide filter. UV/VIS detection options with traceable filters may also be utilized.

After Methods Development and Validation, built-in software features may be activated to assist in GLP and cGMP compliance. P/ACE System MDQ offers the following features:

- Direct Control may be locked out
- Raw data is protected
- Methods are protected against modification
- System may be protected by multi-level privilege passwords
- Methods are permanently linked to data files

Automated generation of both custom and pre-formatted reports is available to assist in documenting compliance. Such reports include:

- QC reports
- Calibration reports
- Suitability reports
- Batch reports
### Product Specifications

**Modes of Operation**
- Constant/Gradient Voltage
- Constant/Gradient Current
- Constant/Gradient Power
- Variable pressure

**Injection Modes**
- Pressure
- Vacuum
- Electrokinetic

**Voltage Range**
- 1 - 30 kV (1 - 10 kV for injections), Programmable in 0.1 kV increments
- Reversible voltage programmed through user interface.

**Current Range**
- 3 - 300 μamps

**Pressure Range**
- -5 to +100 psig (Rinse/ Separations)
- -5 to +25 psig (Injections)

**Sample Temperature Environment**
- 5°C to 60°C (When ambient is defined as 25°C)
- Sample temperature environment is independent of the ambient buffer environment.

*Simultaneous pressure may be applied for these modes.*

### System Capacity

**Sample Tray**
- 2 x 96-well plates
- 2 x 48 PCR vials
- 2 x 36 2 mL vials

**Buffer Tray**
- 2 x 36 2 mL vials

**Capillary Cartridge**
- Recirculating liquid coolant 15° to 60°C
- (Ambient is defined as 25°C)

**Temperature**
- Diode Array 190 - 600 nm
- UV/VIS 200, 214, 254, 280 nm standard filter
- 190 - 600 nm (with custom filter options)

**Wavelength Range**
- Diode Array 190 - 600 nm
- UV/VIS 200, 214, 254, 280 nm standard filter
- (with custom filter options)

**Detectors**
- Diode Array
- UV/VIS

**Wavelength Accuracy**
- Diode Array ± 1 nm
- UV/VIS ± 2 nm

**Scan Collection Frequency**
- Diode Array 0.5 - 32 Hz (user selected)

**Data Rate Collection Frequency**
- 0.5 to 32 Hz

**Electrical Dimensions**
- Voltage 90 - 240 V 50/60 Hz
- Height 27.13 inches (68.90 cm)
- Door Open 36.5 inches (92.70 cm)
- Width 22.38 inches (56.83 cm)
- Depth 24.13 inches (61.28 cm)

**Weight (uncrated)**
- 132 lbs. (60kg) without sample cooling option
- 155 lbs. (70.5kg) with sample cooling option

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**Product Descriptions**

**P/ACE® System MDQ Methods Development System**
- Includes the P/ACE System MDQ with UV/VIS and Diode Array Detection, Temperature-controlled Sample Environment, P/ACE System MDQ Software configured on a Pentium Computer Workstation, P/ACE System MDQ Methods Development Kit, P/ACE System MDQ Chiral Development Kit, pH Meter, ChemSoft pKa Database, CompuDrug pKalc 3.1, Application Literature Package.

**P/ACE System MDQ Quality Control System**
- Includes the P/ACE System MDQ with UV/VIS detection, P/ACE System MDQ Software configured on a Pentium Computer Workstation.

**P/ACE DNA Analysis System**
- For separation, evaluation, and quantitation of nucleic acids and determination of protein nucleic acid interactions.

**P/ACE Glycoprotein System**
- For separation and characterization of glycoproteins and associated oligosaccharides.

**P/ACE Research Station**
- Flexible capillary electrophoresis-based analytical research platform.

**P/ACE Education Platform**
- Modular capillary electrophoresis platform for the introduction of CE technology to the laboratory workplace.

**Paragon CZE® 2000**
- Clinical CE system for serum protein screening and identification

**P/ACE System MDQ Chemistry Kits**
- P501300 P/ACE System MDQ Chiral Methods Development Kit
- P501310 P/ACE System MDQ Methods Development Kit
- P501306 P/ACE System MDQ Neutral Capillary Validation Pak
- P501305 P/ACE System MDQ Amine Capillary Validation Pak

**Other Compatible Application Kits**
- 477490 eCAP clEF 3 - 10 Kit
- 477420 eCAP SDS 14 - 200 Kit
- 477480 ssDNA 100 - R Kit

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**Packaging – Processing**

**Bid on Equipment**

1-847-683-7720

www.bid-on-equipment.com