

INTRODUCING THE ALL NEW

**PINNACLE PCX**

## The Culmination of 25 Years of Experience in the Post-Column Analysis

EASY INSTALLATION AND CONFIGURATION

- Complete package of optimized System, Reagents, Columns and Methods
- Guaranteed Chromatography
- Best performing system in the industry
- Only Post-Column system with a Column oven temperature gradient program

## Superior Sensitivity and Consistency

- Optimized for use in the Environmental, Clinical, Pharmaceutical, food and feedstuff industries
- Specifically designed for Post-Column Analysis
- Saves reagents and maintenance costs

**PICKERING**  
LABORATORIES



## PINNACLE PCX DELTA SERIES



### Delta Series

#### Post-Column Derivatization Instrument

Part of the complete integrated system of instruments, chemicals, columns, methods and support from Pickering Laboratories.

The Pinnacle PCX Delta Series is an optimized HPLC Post-column Derivatization system for analysis of Amino Acids, Carbamates, Mycotoxins, Antibiotics and many other applications. This completely new instrument is the

culmination of Pickering Laboratories 25 years of experience in the Post-Column analysis product manufacture. Each component is specifically designed for post column analysis to optimize the sensitivity and selectivity of your analysis.

Only Pickering Laboratories offers the complete package of chemicals, columns, methods and post-column systems. Because each part of the method is designed to work together, Pickering Laboratories can offer the extraordinary promise that the analysis is guaranteed to work for the intended application.

The Pinnacle PCX reflects the ease of use, reliability and ruggedness you have come to expect from Pickering Laboratories.

System design advancements result in optimized analysis:

- The electronic syringe pump provides true pulse-free flow for superior sensitivity and consistency. The pump cylinder and head is made from a single piece of inert ceramic for durability and non-reactivity.
- Electronic valves eliminate troublesome check valves and allow automated pump flushing.
- The quick-change reactor cartridge makes application switching easy and replacements quick and inexpensive.
- The Column oven utilizes circulating air for consistency of heating and quick cooling within 1°C of set point.
- Inert flow paths extend system life and reduce maintenance
- The PCX Control software allows for precise control of the reagent delivery and conservation.
- Column oven temperature gradient programming improves separation and run times. Pinnacle PCX is the only Post-column system with this feature.
- Works with any HPLC system.



FAST AND EFFICIENT METHODS



## FEATURES & BENEFITS

FEATURES	BENEFITS
<b>Works with all HPLC systems</b>	<i>Expand the usefulness of your existing HPLC</i>
<b>All components specifically designed for Post-column Derivatization</b>	<i>No disadvantages of 'off the shelf' component compromises</i>
<b>Electronic Syringe Pump</b>	<i>True pulse free flow for greater sensitivity</i>
<b>Automatic Piston Wash and Programmable System Flush</b>	<i>System protection and longer system life</i>
<b>Column Oven Programmable Temperature Gradient</b>	<i>Improves separation, provides analytical flexibility, improves run-times and speeds up column cleaning</i>
<b>Electronic Valves</b>	<i>No expensive check valves to service and replace</i>
<b>Quick Change Reactor Cartridges</b>	<i>Fast application switching and cartridge replacements</i>
<b>All Fluidics on Front Panel</b>	<i>Easy leak checks, easy access to finger tight fittings</i>
<b>Inert Flow Path</b>	<i>No metal contamination and long system life</i>
<b>Amino Acid Analysis</b>	<i>Use your existing HPLC, no need to purchase a dedicated amino acid analyzer</i>
<b>LCD Display</b>	<i>Continuous system monitoring</i>
<b>Full 32 bit PC Control Windows Software</b>	<i>Ease of operation and reagent conservation</i>
<b>Program Storage</b>	<i>Flexible application setup</i>
<b>Network Enabled</b>	<i>Enables remote diagnostics and systems communications</i>
<b>Remote Diagnostics System</b>	<i>Pickering Support Engineer receives real time data from your system to pinpoint solutions to problems preventing system downtime</i>

**The Chromatography is Guaranteed**

**EXTENSIVE  
APPLICATIONS WITH  
GUARANTEED  
RESULTS**



# TEMPERATURE GRADIENT FEATURES

## The Programmable Temperature Gradient Advantage

The Pinnacle PCX provides a unique opportunity to combine eluant gradient capabilities of modern HPLC instruments with programmable column temperature gradients. As might be expected this capability helps reduce analysis time. Even more significantly is the ability to resolve coelutions: consider such metabolic markers as alloIsoleucine (MSUD) and Agrininosuccinic acid (ASA). Under standard isothermal conditions these amino acids coelute with Cystathionine and Isoleucine respectively but are resolved using a targeted temperature gradient program.

The ability to accomplish this derives from the multiple retention mechanisms of the gel-type resins employed in ion-exchange. That all the amino acids appear in the same chromatogram is testament to the dominance of ion-exchange. However, the exact position is influenced by an array of mechanisms including partitioning, adsorption, charge exclusion, etc. So even though two amino acids might coelute their proximity is incidental. And since retention processes are affected differently by changes in pH, salt concentration and temperature all the parameters have significant influence on selectivity.

Column oven program

Time [min]	Temp [°C]
0	32
13	32
30	56
67	61
80	70
90	70
95	32

HPLC program

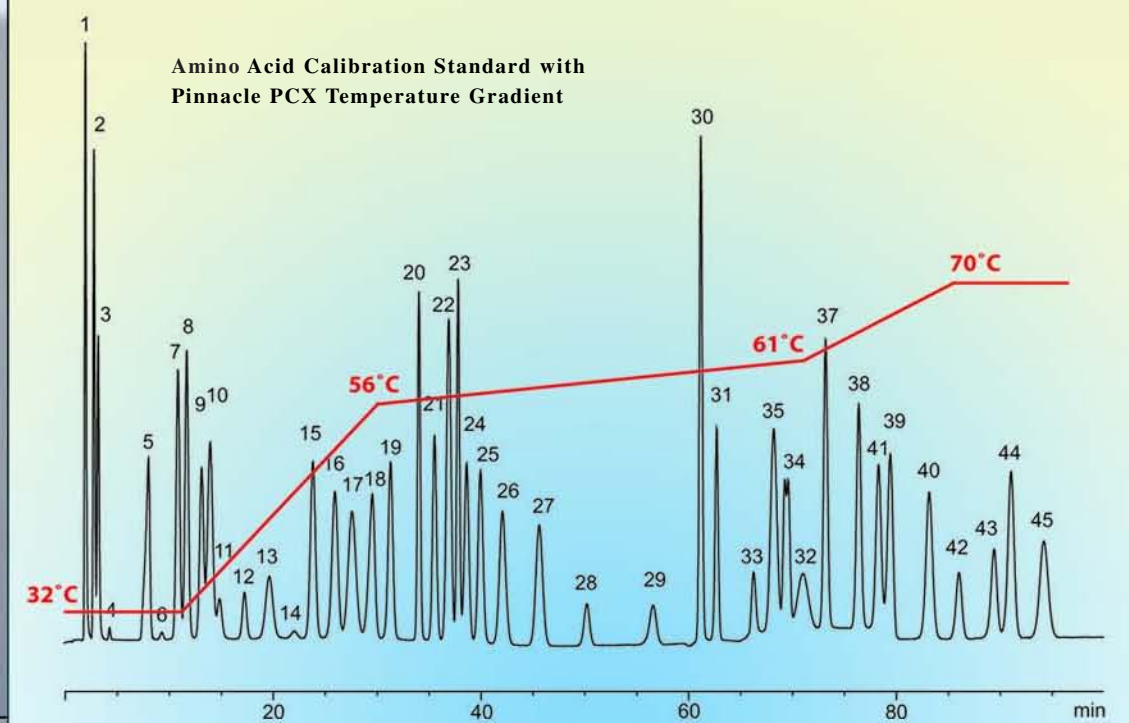
Time [min]	Li292 [%]	Li365 [%]	Li375 [%]	RG003 [%]
0	100	0	0	0
20	100	0	0	0
40	0	100	0	0
57	0	100	0	0
57.1	0	0	100	0
78	0	0	100	0
78.1	0	0	80	20
95	0	0	80	20
95.1	100	0	0	0

**PINNACLE PCX**

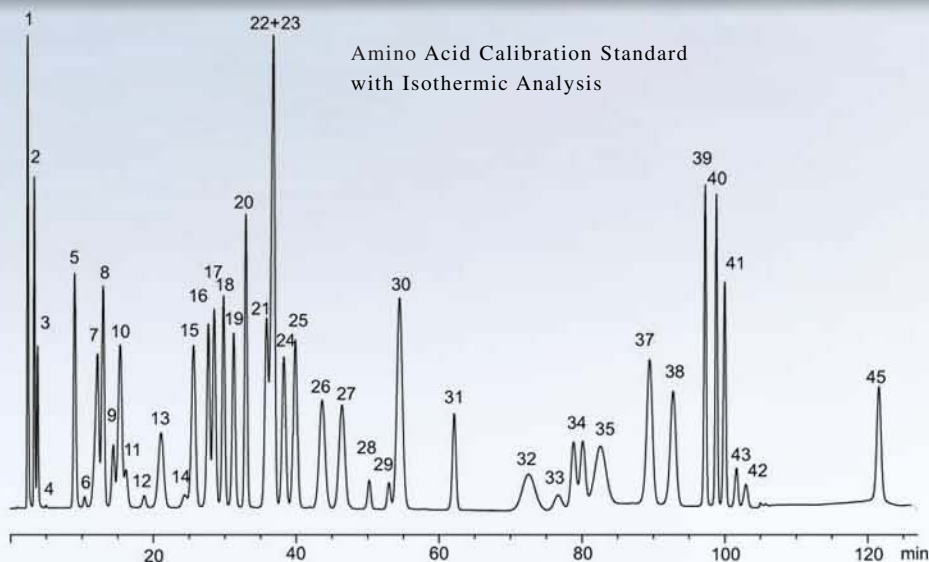


# TEMPERATURE GRADIENT FEATURES

Amino Acid Calibration Standard with  
Pinnacle PCX Temperature Gradient



Amino Acid Calibration Standard  
with Isothermic Analysis



1. Phosphoserine
2. Taurine
3. Phosphoethanolamine
4. Urea
5. Aspartic acid
6. Hydroxyproline
7. Threonine
8. Serine
9. Asparagine
10. Glutamic acid
11. Glutamine
12. Sarcosine
13.  $\alpha$ -Aminoadipic acid
14. Proline
15. Glycine
16. Alanine
17. Citrulline
18.  $\alpha$ -Amino-n-butyric acid
19. Valine
20. Cystine
21. Methionine
22. Allo-isoleucine
23. Cystathionine
24. Isoleucine
25. Leucine
26. Tyrosine
27. Phenylalanine
28. b-Alanine
29. b-Amino-i -butyric acid
30. Homocystine
31. g-Aminobutyric acid
32. Tryptophan
33. Ethanolamine
34. Hydroxylysines
35. Ammonia
36. Creatinine
37. Ornithine
38. Lysine
39. Histidine
40. 3-Methylhistidine
41. 1-Methylhistidine
42. Anserine
43. Carnosine
44. Homocarnosine
45. Arginine

**PINNACLE PCX**

## PCX CONTROL SOFTWARE

The Pinnacle PCX Delta Series is controlled by the PCX Control Software running on Microsoft Windows. Compatible with Windows 95, 98, XP and 2000. Using the same computer as the HPLC the PCX Control Software interfaces easily with HPLC software. The computer can physically connect to the Pinnacle PCX unit through RS-232 cable or Ethernet network protocol.

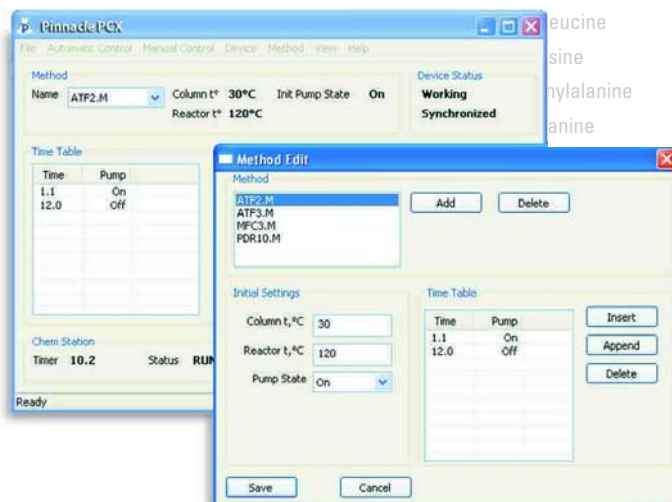
After an easy installation and configuration the software runs in a window or as an icon on the system desktop. The main screen displays an emulation of the digital LCD display of the system where all PCX functions of temperature, flow rate and system status are displayed in real time. This allows for monitoring and control of the PCX and HPLC from one computer.

Programs are managed in the Program windows. Here programs are created, edited and saved to create a library for all application parameters. A sequence table is used to schedule multiple runs of the same or different programs in a series. At the end of the sequence a full system flush can be programmed.

System performance can be evaluated in the configuration menu where you'll find a board system check test and a

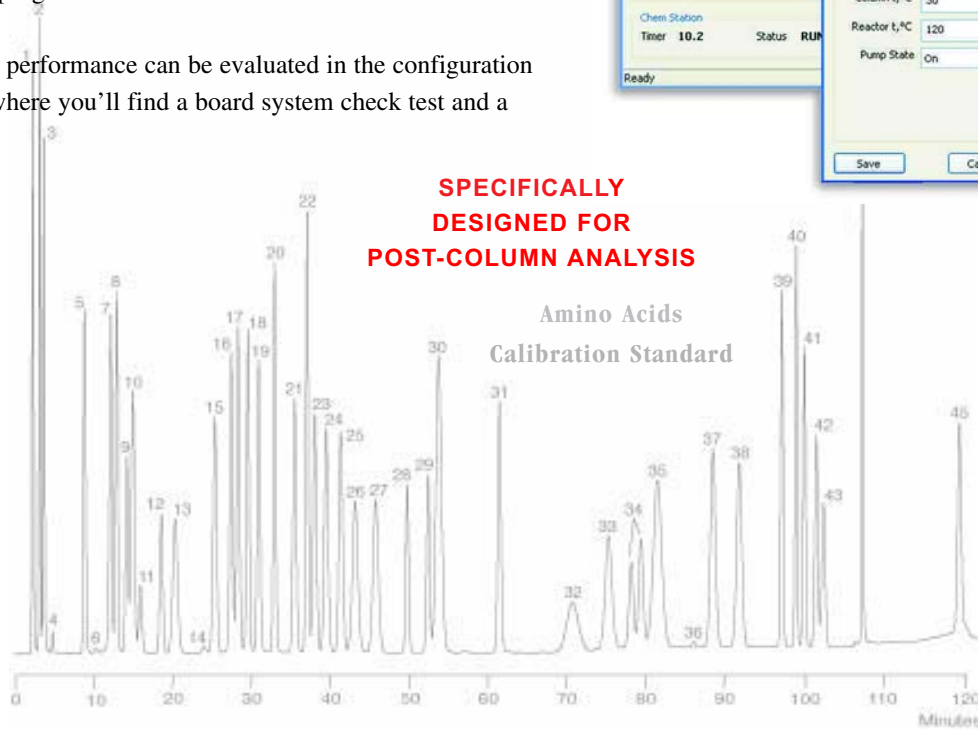
pump pressure test check. Each routine compares factory parameters with actual performance in a display report.

The program has a robust help function that includes automatic display of 'Guidance' windows when error messages occur for quick diagnostics and solutions. A system log file continually records system status and error messages for later reference and can be sent to Pickering Support for remote diagnostics. For specific trouble shooting a 'History log file' function can be turned on to record more detailed information about application issues and performance.



**SPECIFICALLY  
DESIGNED FOR  
POST-COLUMN ANALYSIS**

**Amino Acids  
Calibration Standard**



10 Glutamic acid  
11 Glutamine  
12 Cysteine  
13 a-Aminoadipic acid  
14 Proline  
15 Glycine  
16 Alanine  
17 Citrulline  
18 a-Amino-n-butyric acid  
19 Valine  
20 Aspartic acid  
21 Asparagine  
22 Isoleucine  
23 Isoleucine  
24 Leucine  
25 Leucine  
26 Tyrosine  
27 Phenylalanine  
28 Arginine  
29 Arginine  
30 Arginine  
31 Arginine  
32 Arginine  
33 Arginine  
34 Arginine  
35 Arginine  
36 Arginine  
37 Arginine  
38 Arginine  
39 Arginine  
40 1-Methyl histidine  
41 Carnosine  
42 Anserine  
43 a-Amino-b-guanidino-propionic acid  
44 Arginine

**PINNACLE PCX**

## COMPONENTS

### Electronic Syringe Pump and Valves

The syringe pump cylinder and head is made from a single piece of 99.9% Alumina for ruggedness and non-reactivity. The piston surface is made from PEEK with an inert o-ring seal. The piston seal is protected by an automatic piston wash system that provides long seal life. The programmable flow rates range from 50  $\mu\text{L}$  to 1500  $\mu\text{L}$ /minute with less than a 60 second refill cycle.

The electronic valves utilize PEEK in an interference fit interface with a port layout that eliminates cross contamination.



### Reactor

The reactor is designed for Quick heating and ease of application switching. The heating and control electronics are in a base unit of the reactor while the coil volumes are inserted with a 'Quick-Change' cartridge in the front of the fluidics panel.



### Column Heater

The column heater utilizes re-circulating air flow technology to provide quick, uniform column heating. Fast column cooling is assisted by the introduction of a fresh air flow into the chamber. The temperature range holds within 1°C resolution from 5°C above ambient to 75°C. The temperatures can be programmed for a gradient with as many steps as required for fine-tuning an analysis.

### Usability Design

The design of the Pinnacle PCX Delta Series is focused on ease of use, quick monitoring, and rapid service. Lab bench space is conserved by the narrow and tall configuration. All the fluidics are on the front panel for easy monitoring and configuration. A convenient drip tray is locked below to catch fluids during tubing changes. The side panels quickly slide off to reveal all the mechanical components on one side and all the electronics on the other side. A removable reagent tray is integrated into the top of the unit for easy inspection and access. The gas manifold is integrated into the system for ease of set-up and especially for reagent preparation and switching. The temperature gradient column oven is oriented for easy column attachment and switching. The LCD provides real time monitoring of the system status and programs.



PINNACLE PCX

AUTOMATIC PISTON  
WASH SYSTEM

EASE OF USE, QUICK MONITORING AND REPID SERVICE

## COMPONENTS

THE CULMINATION  
OF 25 YEARS OF  
EXPERIENCE IN THE  
POST-COLUMN ANALYSIS

Reagents

Display

Pump Valve

Valve One

Column Oven

Ambient Reactor Coil

Reactor Coil

Transducer

Valve Two

Pump Two

Drip Tray

PINNACLE PCX

QUICK CHANGE REACTOR CARTRIDGE





# SPECIFICATIONS

## DIMENSIONS:

- 21.25" H x 10.5" W x 18.25" D

## WEIGHT

- 48 lbs

## ELECTRICAL:

- 100-120V, 50/50 Hz, 1.7 A, 200 W or 200-240 V, 50/60 Hz, 0.8 A, 200 W
- Mains voltage  $\pm 10\%$  of nominal
- Installation (over voltage) category II, pollution degree 2

## ENVIRONMENTAL

- Indoor use only
- Altitude up to 6500 ft
- Ambient Temperature 5°- 40° C
- Relative humidity up to 80% at 31°C

## Reagent Pumps

- True pulse-free syringe pump
- Single piece ceramic barrel
- Completely inert flow path
- Maximum operating pressure 500 psi
- Programmable flow-rate
- Flow range; 50  $\mu$ L to 1500  $\mu$ L/minute
- Refill cycle of 60 seconds
- Automatic piston wash
- Automatic reagent flush cycle
- No check valves

## Reactor

- Heated reactor for temperature from 5° C above ambient to 130° C
- Easy replacement coil cartridges

- Range of reactor dwell volumes; 0.1 mL to 3mL
- Reaction coil withstands up to 42 bar (600 psi) inlet pressure at 130° C
- Thermal safety switch limits temperature to 150° C to prevent damage
- Fast response

## Safeguards

- In-line check valve: Prevents reagent back flow into the column when HPLC pressure drops
- Replaceable column and reagent filters: Prevent reactor and column fouling
- Post-column system over pressure: A pre-calibrated relief valve opens at 35 bar (500 psi) to prevent rupture of the post-column reactor tubing in the event of down-stream blockage
- Back-pressure regulator: Applies 7 bar (100 psi) to the detector flow cell outlet (waste) to prevent detector noise and precipitation due to out-gassing or boiling

## Column Heater and Reactor Controller

- Heater accepts 6 or 8 mm OD (0.25 or 0.31 inch) x 50-250 mm in length Column and guard
- Programmable Temperature gradient
- Temperature holds within  $\pm 0.4^\circ$  C from the set point. Could be set with 1°C resolution from 5° C above ambient to 75° C
- Easy column access

## Instrument Package and Flow path

- Advanced fluidics valve management system
- Easy access to internal components
- Standard fittings
- Post-column pressure relief valves
- Side panels easily remove for service

- Integrated Reagent reservoir tray
- Corrosion proof pan and panels

## Display

- Back light LCD
- Real time temperature and pressure display
- System Status icons
- Simple system control interface

## Gas Pressure Manifold and Regulator

- Panel mount manifold
- Regulator maintains 0.3 bar (3-5 psi) on reagent reservoirs with 3-5 bar (45-75 psi) source pressure
- Safety Pressure-relief valve opens at 6 bar (8 psi)
- Manifold with anti-siphon valves has two 1/4-28 fittings

## Pressurized Reagent Reservoir

- One liter capacity (2 and 5 L reservoirs available)
- Maintained under inert gas pressure to inhibit oxidation of oxygen-sensitive reagents
- Valve built into reservoir cap permits sparging during reagent preparation
- Reagent reservoirs fitted with 3.1 mm (1/8") OD (oxygen-impermeable) SARAN tubing for oxygen-sensitive reagents

## Software System Requirements

- Windows 95 or higher, 2 MB hard drive space, Pentium processor
- RS-232 cable included
- Network enabled

**AUTOMATE  
REAGENT FLUSH WASH**





## APPLICATIONS

- **Amino Acids**
- **Carbamate Pesticides**
- **Glyphosate Herbicide**
- **Multi Residue Mycotoxin in Feeds**
- **Aminoglycoside Antibiotics**
- **Biogenic Amines**
- **Polyether Antibiotics**
- **Bromate**
- **Formaldehyde**
- **Chromium VI**

## Application Switching Made Easy

**SPECIALIZED ANALYTICAL  
CHEMISTRY INSTRUMENTS  
AND SOLUTIONS**

- **Guanidinos**
- **Hexosamines**
- **Paralytic Shellfish Toxins**
- **PKU / MSUD**
- **Paraquat & Diquat**
- **Polyphosphates/Phosphonates**
- **Sulfa Drugs**
- **Transition/Rare Earth metals**
- **Vitamins B1, B6**
- **Custom applications**

**PINNACLE PCX**

# INTEGRATED SYSTEM

## Completely Integrated Analysis System

Only Pickering Laboratories offers the complete package of reagents, columns, methods and post-column systems. Because each part of the method is designed to work together, Pickering Laboratories can offer the extraordinary promise that the analysis is guaranteed to work for the intended application.



## Columns

Pickering Laboratories manufactures optimized cation-exchange and reverse-phase columns for specific analyte applications. Each column is guaranteed to separate the analytes of interest when used according to the specific protocol. Each column is manufactured to GMP quality standards and each column packaged with the specific quality assurance application chromatogram.

Cation-exchange columns are packed with fully sulfonated polystyrene divinylbenzene resin. These resins are very durable under high pressures with wide pH stability and high selectivity and reproducibility. These columns offer long lifetimes and reproducibility over hundreds of injections.

## Chemistry

All Pickering Laboratories chemistries are Chromatographic Grade™ and optimized for analytical use. Through exhaustive validation and confirmation by analytical laboratories the Pickering Laboratories Reagents and Chemicals have a reputation worldwide for quality and reliability in all analytical systems and methods.



## Support

All applications, systems and products are supported by a team of application chemists available for phone and email consultation. We believe the quality of our products includes the quality of our support for your analysis.

## Factory Authorized Service Contracts

Now Pickering Laboratories offers Services Contracts that include on site visits and Preventative Maintenance visits. Visit our web site for more information.

**TO LEARN MORE ABOUT US,  
OR OUR PRODUCTS.  
PLEASE CONTACT:**

