



product note

introducing the ExpressLC[®]-Ultra system: UHPLC with all the advantages of micro-LC

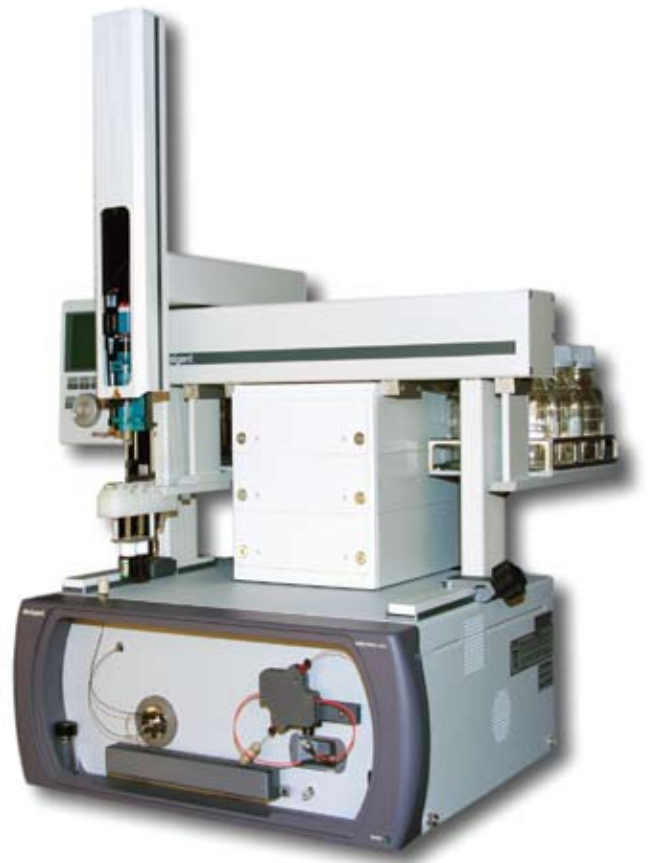
With the new ExpressLC-Ultra, Eksigent offers an LC system that delivers all the advantages of micro-LC at ultra high pressures with no compromises.

why micro-LC?

For more than a decade, Eksigent researchers and engineers have been developing micro-LC systems that deliver high performance with significant reductions in flow rates. In addition to solvent savings of greater than 90%, micro-LC (column ID <1 mm) offers several inherent advantages over both conventional HPLC and UHPLC, such as:

- Smaller required mixing volume as a fraction of column volume allows for faster gradient separations.
- A lower column flow resistance factor means the same separation can be run at lower backpressure.
- The much lower flow rates in micro-LC result in significantly less frictional heating, allowing accurate column temperature control even at UHPLC pressures. This ensures reliable and reproducible retention times across a much wider range of pressures and conditions.
- When combined with concentration sensitive detection (e.g., UV absorbance), the smaller ID columns used in micro-LC can provide significant improvements in sensitivity. For example, the same sample mass injected on a 0.5 mm ID column results in an 85-fold sensitivity improvement over a more conventional 4.6 mm ID column.
- Lower flow rates provide better compatibility with electrospray mass spectrometry with less source contamination and, depending on source design, also an increase in sensitivity.

With the introduction of Eksigent's state-of-the-art ExpressLC-Ultra, chromatographers can take advantage of the benefits of micro-LC running fast analyses with excellent reproducibility using 90% less solvent.



expressLC·ultra

expressLC-ultra® system at-a-glance

The ExpressLC-Ultra is designed to run 0.5 mm ID micro-columns at pressures up to 10,000 psi, allowing the use of separation columns packed with <math><2\ \mu\text{m}</math> particles. The system consists of a binary gradient pump (flow rate range 1-50 $\mu\text{l}/\text{min}</math>) with solvent selection for both pumps. Excellent flow control at these low flow rates is guaranteed through Eksigent's Microfluidic Flow Control technology. A novel CCD based detector offers outstanding UV sensitivity with full spectral capability, while a micro-fabricated flow cell, with fiber optic coupling, provides minimal post-column dispersion and highly linear response for accurate quantitation.$

The new ExpressLC-Ultra system is breaking new ground in micro-LC technology with its pneumatic pumps, integrated autosampler, ultra-sensitive, full-spectral UV detector, and temperature-controlled column oven. And with Eksigent's intuitive software, users get full system control as well as complete analysis and reporting capabilities.

Now, any chromatographer can take advantage of Eksigent's state-of-the-art micro-LC, running fast analysis with excellent reproducibility, while requiring only a small fraction of the solvent used by conventional systems.

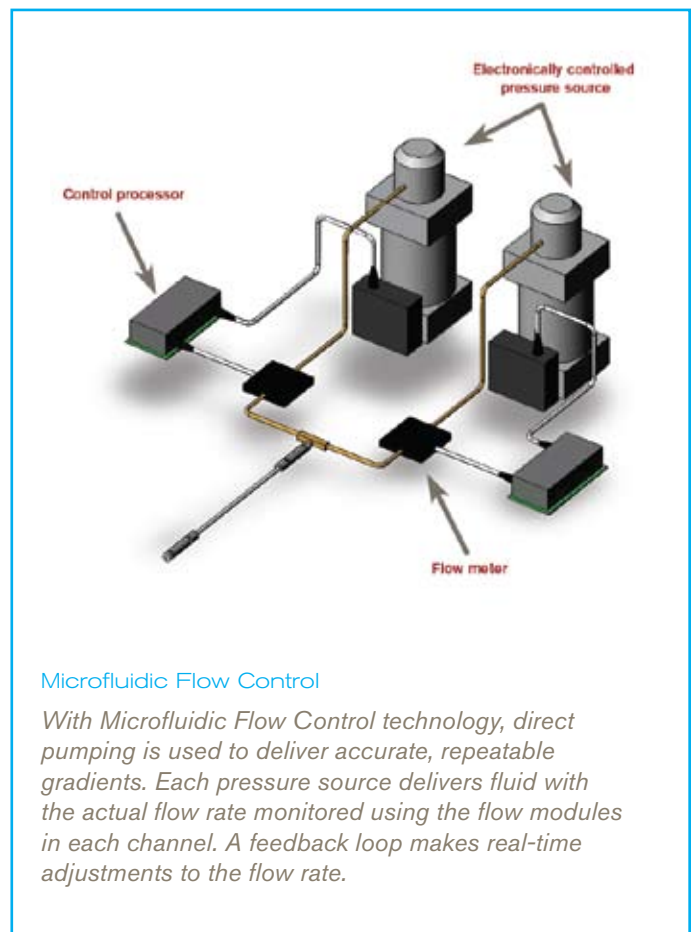
pneumatic pumps with Microfluidic Flow Control™ technology

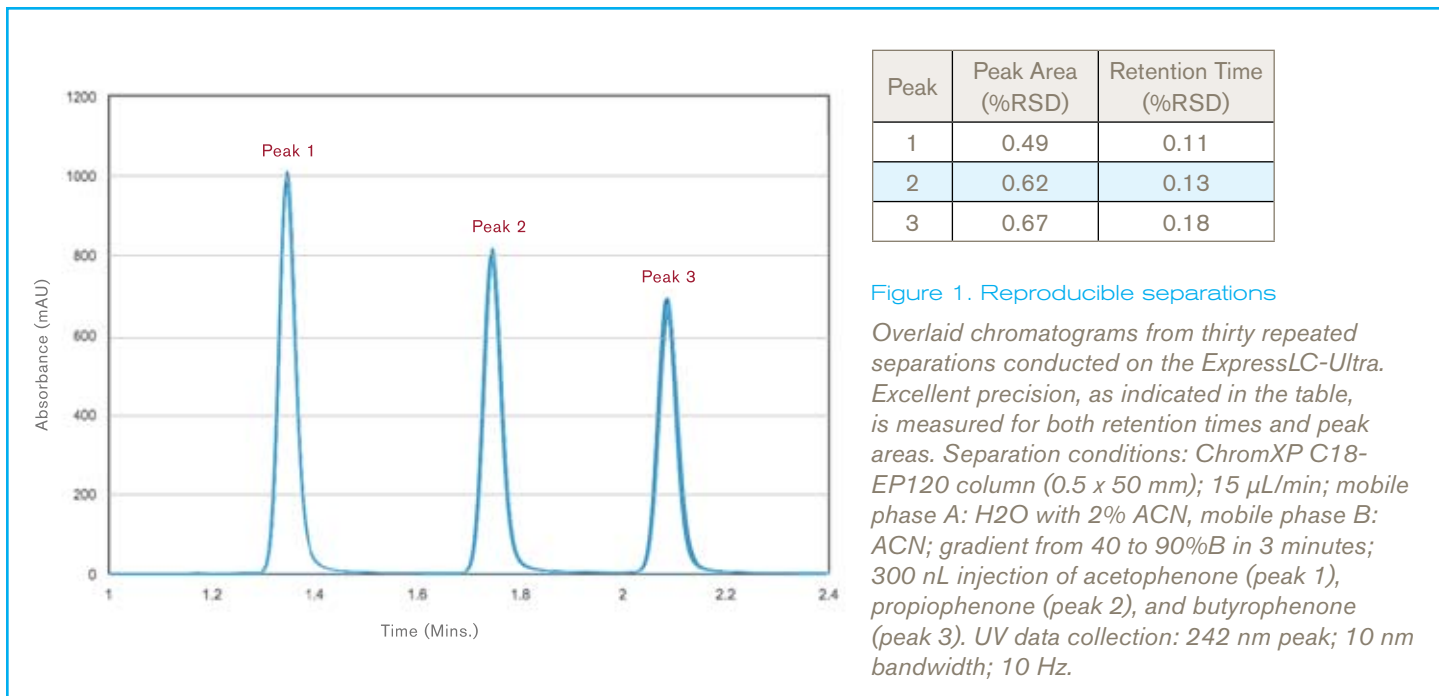
Eksigent's patented Microfluidic Flow Control technology in combination with unique pneumatically-driven pumps, work together to provide excellent reproducibility and reliability.

Microfluidic Flow Control technology ensures precise and stable flow rates. Compared with electric motor driven pumps, Eksigent's unique pneumatically-driven pumps have very few moving parts, and are therefore extremely reliable with very little maintenance required.

The flow rate of each pump is continuously monitored and a feedback loop makes fast, real-time adjustments to guarantee excellent flow and gradient precision at low flow rates. Typical retention time reproducibility is better than 0.5% RSD.

Solvent selection valves on both pump channels allow for the selection from up to six different solvents, making automated solvent changes possible when running different mobile phase conditions or conducting method development experiments.





integrated autosampler

An industry standard CTC autosampler is included with the ExpressLC-Ultra system. Injection volumes as small as 50 nl can be programmed using Eksigent's metered injection, using the precise and accurate pump flow control in combination with time slicing of a high speed injection valve. The filled injection loop is switched to the inject position for the length of time required to displace the programmed amount of sample to provide precise injections over a range of volumes.

The feature can also be useful in cases where the upper dynamic range of a linear calibration curve is insufficient to cover samples of unexpected high concentration. Instead of diluting the entire series of samples and then re-analyzing, one can simply re-inject the same samples using a smaller injection volume. Multiple injections of the same sample can also be conducted with the metered injection approach.

A dual-solvent fast-wash station ensures minimal carryover even for fast separations.

Industry standard autosampler

CTC Analytics HTC PAL autosampler has been configured to seamlessly intergrate with the ExpressLC-Ultra instrument.



ultra-sensitive, full-spectral UV detector

A CCD-based UV detector with digital signal processing achieves state-of-the-art noise levels for HPLC detectors with full spectral capabilities. Using microfluidic-based flow cells, with 5 or 10 mm optical pathlength and volumes as small as 90 nL, UV detection without sensitivity sacrifice and no extra-column band broadening is achieved. The detector has a maximum data acquisition rate of 100 Hz to keep-up with the fastest UHPLC separation.

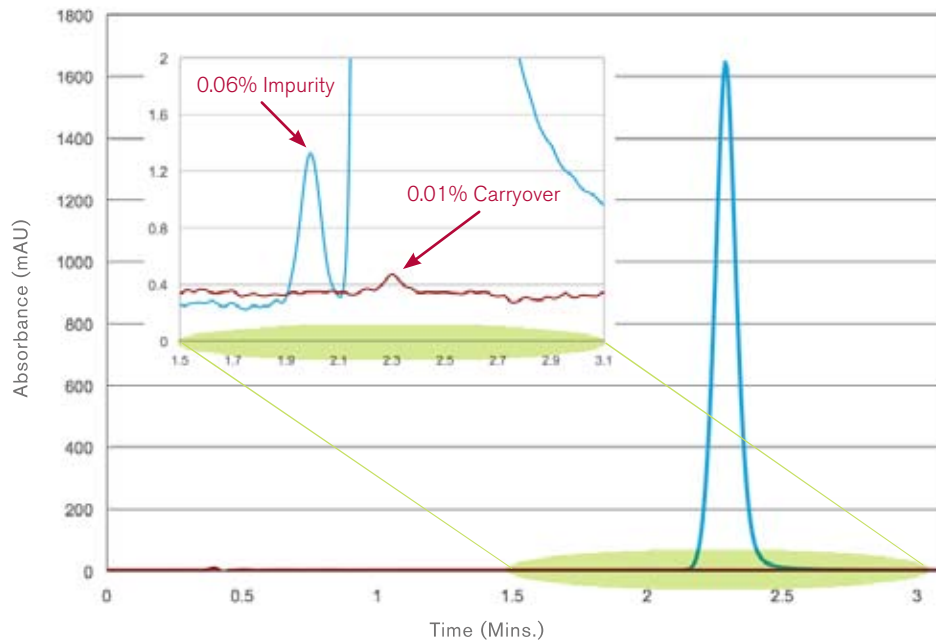
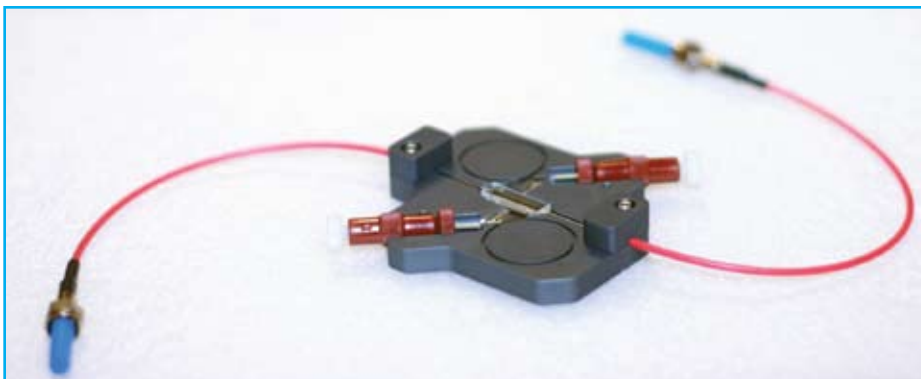


Figure 2. Impurity quantitation with low carryover.

Combining the low noise and the highly linear response of the UV detection system in the ExpressLC-Ultra, low level impurity analysis can be conducted. In one separation, a main peak (naphthalene) with an intensity of 1600 mAU is measured along with a minor impurity peak with an intensity of 1.1 mAU shown in the inset. Peak quantitation by peak area indicates a 0.06% impurity. For this separation the impurity has a S/N of approximately 22 indicating a potential LLOQ of approximately 0.03% and a LLOD less than 0.01%. Also shown is a blank injection run immediately after the separation shown. Carryover for the naphthalene at a retention time of 2.3 minutes is measured to be less than 0.01%. Separation conditions: ChromXP C18-EP120 column (0.5 x 50 mm); 15 μ L/min; mobile phase A: H₂O with 2% ACN, mobile phase B: ACN; isocratic at 60%B; 125nL injection; 15 μ L/min. UV data collection: 214 nm peak; 10 nm bandwidth; 10 Hz acquisition.



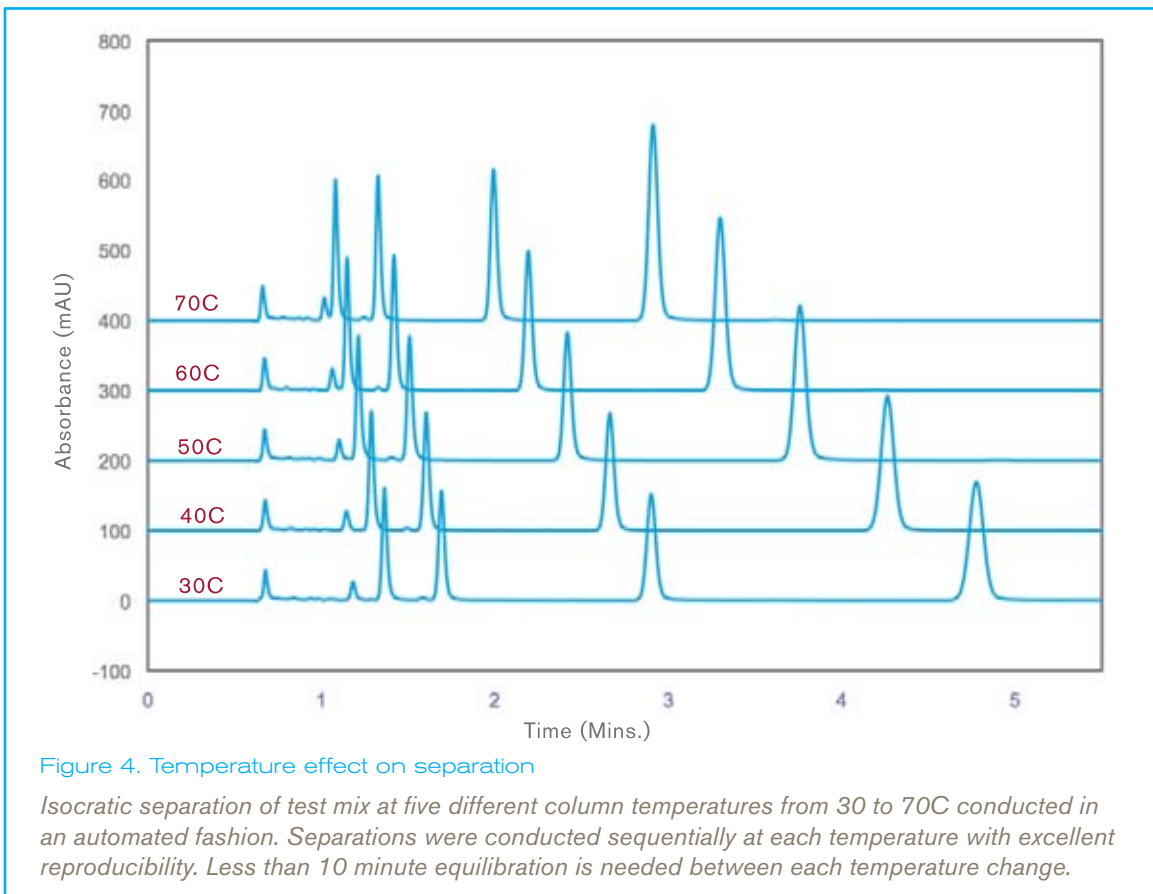
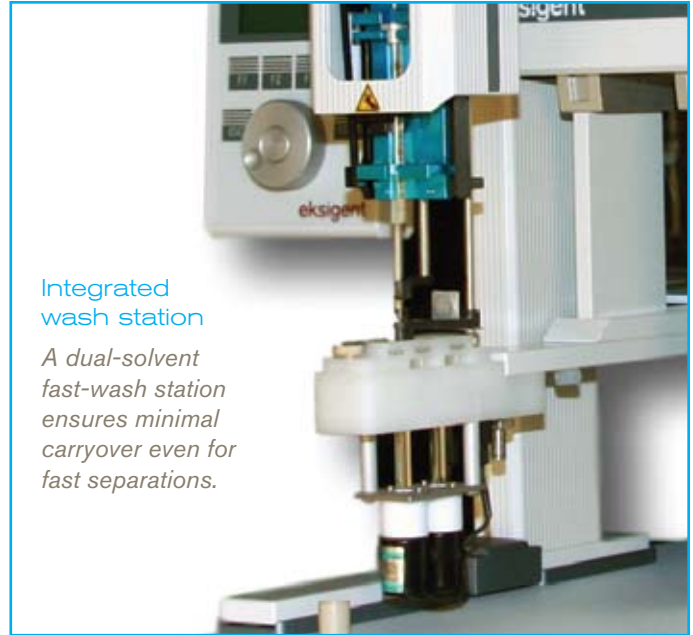
Eksigent's proprietary flow cell

A microfabricated 90 nL (10 mm path-length) flow cell employing fiber optic coupling provides sensitive detection for quantitative UV absorbance measurements in micro-LC. The cell, which is easily exchanged on the instrument, provides very low peak broadening, low UV noise, and linear response to greater than 2AU.

column oven

The ExpressLC®-Ultra includes a column oven designed to allow rapid heat-up and cool-down for use in method development. The oven is designed for easy column changes and accepts columns up to 15 cm in length while allowing close-coupling of the column to both the injection valve and the UV detection cell—keeping delay times and extra-column dispersion to a minimum.

Contrary to conventional UHPLC, in microUHPLC the column temperature can be locked to a specified temperature without the loss of efficiency caused by the radial temperature gradient generated by the much higher frictional heating in larger ID columns. This improvement in column temperature control with the new ExpressLC-Ultra system ensures reproducible separations over a much larger range of column backpressures.



ease of operation

Special attention has been given to making the ExpressLC®-Ultra system as easy-to-use as any conventional LC system. The pumps are self-priming, and solvent selection allows for automated solvent changes during a batch of samples. Plus, the system is designed to allow easy access to the front panel where all of the major components and plumbing are located. The PEEKSil™ tubing and fingertight fittings provide easy-to-use connections even at UHPLC pressures. The fiber optic connected flow cell is easily installed and exchanged without any required alignment.

Designed for easy plumbing

The front panel of the ExpressLC-Ultra is designed to allow easy connections of user configurable plumbing. The 1/32" OD tubing and fingertight fittings provide ease-of-use even for UHPLC pressure separations. Connections to the column oven and the UV flow cell can be made easily with very low volumes providing minimal bandbroadening even for the fastest, high performance separations.



green HPLC

In general, HPLC with 2.1 or 4.6 mm ID columns use flow rates from 200 $\mu\text{L}/\text{min}$ to over 1 mL/min . The ExpressLC-Ultra system running 0.5 mm ID columns at a flow rate of ca. 15 $\mu\text{L}/\text{min}$ results in solvent savings of > 90%. Not only will this save money for purchasing solvents and reduce disposal costs, it means you will be contributing to a better environment when you use the ExpressLC-Ultra for your analysis!



State-of-the-art micro-LC

The ExpressLC-Ultra runs fast analysis with excellent reproducibility using 90% less solvent.

powerful software

Controlling the ExpressLC-Ultra is the Eksigent CDS software. An intuitive interface makes the system easy to learn, and specialized diagnostics tools for troubleshooting are included. Users can rapidly create or modify separation methods, and active displays for flow rates and pressures allow real-time monitoring of the system operation. With full data analysis and reporting capabilities, Eksigent CDS software is 21CFR compliant and can save data files in AIA standard format.

Drivers for integrating the ExpressLC-Ultra control into Mass Spectrometry software are provided for ThermoFisher Xcalibur, Bruker Daltonics HyStar and ABI/MDS Sciex Analyst.

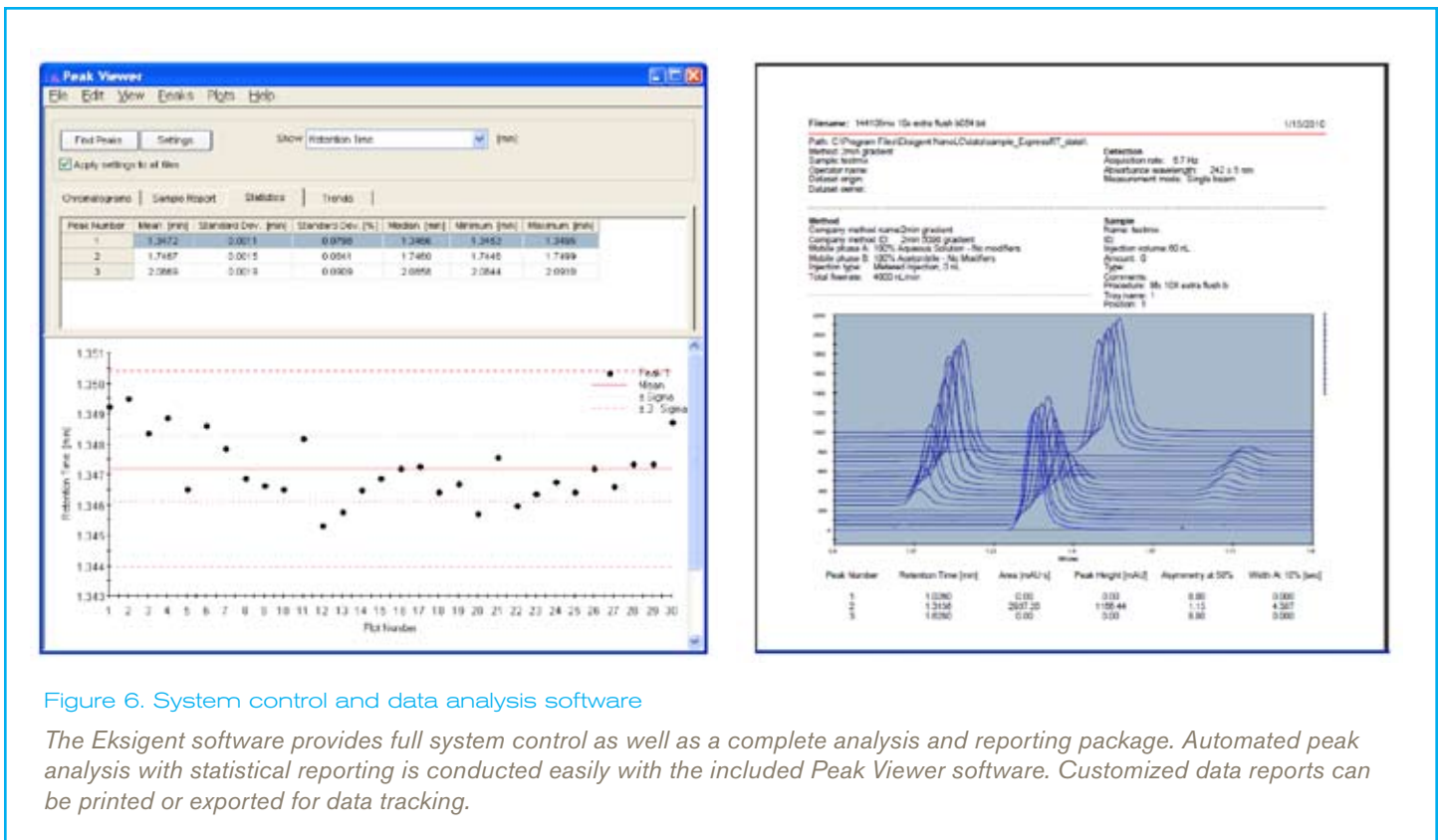


Figure 6. System control and data analysis software

The Eksigent software provides full system control as well as a complete analysis and reporting package. Automated peak analysis with statistical reporting is conducted easily with the included Peak Viewer software. Customized data reports can be printed or exported for data tracking.

ordering information

description	part number
ExpressLC®-Ultra system with injection valve, detector flow cell, autosampler mounting clamps, personal computer, Eksigent control software and system installation kit. Does not include installation/training.	950-00080
CTC Analytics HTC PAL autosampler configured for use with the ExpressLC-Ultra instrument. Includes dual wash stations, 50mL syringe and installation kit. Does not include tray holder or sample trays. Does not include installation/training.	620-00093
Six-position deep well-plate hotel for HTC PAL autosamplers	620-00073
Six-position, cooled deep well-plate hotel for HTC PAL autosamplers	620-00077

system specifications

expressLC®-ultra (LC only)

Dimensions	29" (74cm) x 25" (64 cm) x 32" (82 cm) (Width x Depth x Height)
Weight	70 lbs (32 kg)
Power	100 – 240 V AC; 350 W

binary gradient pump with MFC and high pressure mixing

Solvent selection	Up to 6 solvents /pump channel
Maximum pressure	10,000 psi
Flow rate range	1 – 50 µL/min (gradients 5-50 µL/min)
Gradient delay volume	1.2 µL (standard configuration)
Flow rate accuracy	< 1%
Gradient composition accuracy	< 1%
Flow rate precision	< 0.5% RSD
Retention time reproducibility	< 0.5% RSD

UV detector with full spectral acquisition

Wavelength range	200-375 nm
Minimum selectable bandwidth	1 nm
Noise	< 40 µAU (per ASTM)
Drift	< 1 mAU/hr
Linearity	> 2AU
Data acquisition rate	Up to 100 Hz
Available flow cells:	10 mm path length, 180 nl 5 mm path length, 90 nl

column oven

length	For columns up to 15 cm
Ambient	+5 °C to 80 °C
Temperature precision	0.1 °C
Temperature accuracy	+/- 1 °C

software

Full control and data analysis software	Plug-ins for ThermoFisher Xcalibur, Bruker Daltonics HyStar and ABI/MDS Sciex Analyst.
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autosampler

injection valve	10,000 psi with less than 65 nl port to port volume
Injection volume	Programmable from 0.05 – 1 µL with standard injection loop (larger volumes possible with larger loop)
Injection reproducibility	< 1 % RSD for full loop and partial loop
Carryover	Typically < 0.05 %
Sample capacity	Three-drawer sample stack <ul style="list-style-type: none"> ▪ Six tray positions ▪ 54 – 2mL vials ▪ Standard or deep 96-well microplates ▪ 384-well microplates
Sample compartments	Temperature control from 4 to 40 °C
Weight	~65 lbs (30 kg) varies with configuration
Power	100-240 V AC; 4A (additional 2A with cooled sample stack)

About Eksigent Technologies

Eksigent is creating new possibilities for life science research, drug discovery & development, and medical devices with its innovative MicroFlow™ and NanoFlow™ fluid delivery systems.

Eksigent's LC systems deliver dramatic increases in analysis speed, throughput, and sensitivity. Eksigent's drug delivery systems bring new levels of precision to portable drug delivery.

Today, leading research, pharmaceutical, and biotechnology firms around the world use Eksigent's innovative solutions.

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