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product note

cHiPLC™-nanoflex system:
making nanoLC/MS easier and more reproducible

Proteomics researchers have widely adopted nanoLC for LC-MS analysis to take advantage of the technology's increased sensitivity over conventional LC techniques. Eksigent's cHiPLC-nanoflex system takes these performance improvements to the next level.

Superior sensitivity, column-to-column reproducibility, and exceptional ease of operation

The cHiPLC-nanoflex system is a "docking station" for up to three microfluidic chips. The system's flexible design and built-in 10-port nano valve allow for easy switching between different types of experiments such as direct injection and trap-loading.

Chips containing a nanoLC column or trap column can be exchanged in seconds. A perfect dead volume free connection is made every time as the cHiPLC column or trap column is automatically aligned with a special connector chip.

All alignment is achieved through the use of highly reproducible microfabrication techniques similar to those used in the microelectronics industry. Additionally, these techniques are used to define fluidic paths and to create a microfabricated weir structure for stationary phase particle retention. Chips are temperature controlled to guarantee reproducible retention times and improved separations.

Compared with nanoLC columns constructed from fused silica tubing with end-frits made by sintering stationary phase particles, the cHiPLC columns are much more robust and far easier to handle and connect without introducing dead volumes.

Eksigent has worked on microfluidics since its start in 2000, and has incorporated chip-based products such as UV flow cells and filters in its micro-LC products. The cHiPLC-nanoflex now applies this technology to making nanoLC more reproducible and easier.

cHiPLC·nanoflex

Benefits of the cHiPLC-nanoflex system

Column design

Special care has been given to the design of both the trap-chips and analytical column-chips in order to achieve separations that are equal or better than separations obtained using packed capillaries (see Figure 1). The use of fused silica allows for cylindrical channels for packing nanoLC columns and traps. Instead of conventional frits made out of fused stationary phase particles, our cHiPLC columns use a unique weir structure to retain the stationary phase particles in the column. These weirs are more reproducible to fabricate, while their dead-volume is virtually zero (~13 pL). In addition, adsorption of sample components that can occur with frit material is not an issue with these types of structures.

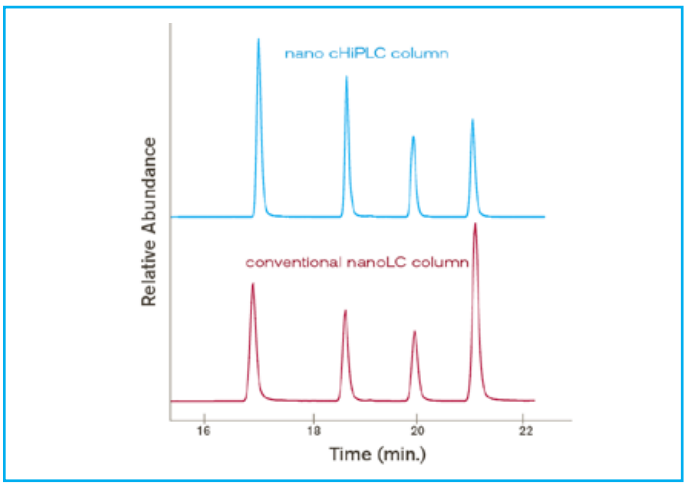

Figure 1. Comparison of the separation of a peptide test mix on a nano cHiPLC column and a conventional nanoLC column. Both columns are 15 cm x 75 µm, and packed with ChromXP C18-CL 3 µm 300Å. Flowrate is 250 nl/min; gradient slope 2% Acetonitrile/min.

Patented connection system

Connections to and from each chip are made using a patented connection system that can connect up to seven channels to the outside world with a dead volume of less than 1 nl. The force used to connect the chip is pre-set, so that every time the user exchanges a chip, a leak-free connection is obtained without any required user adjustments.

Increased column-to-column reproducibility

Besides the ease of replacing a nanoLC column or trap in seconds, the use of our cHiPLC columns also increases column-to-column reproducibility. All chips are exactly identical, and our packing procedure guarantees the best possible column-to-column reproducibility in nanoLC (see Figure 2). This is of importance for applications where retention time stability over longer periods of time and over multiple columns is important. Examples are the use of retention time in combination with accurate mass in peptide/protein identification and scheduling MRMs for peptide quantitation in biomarker validation.

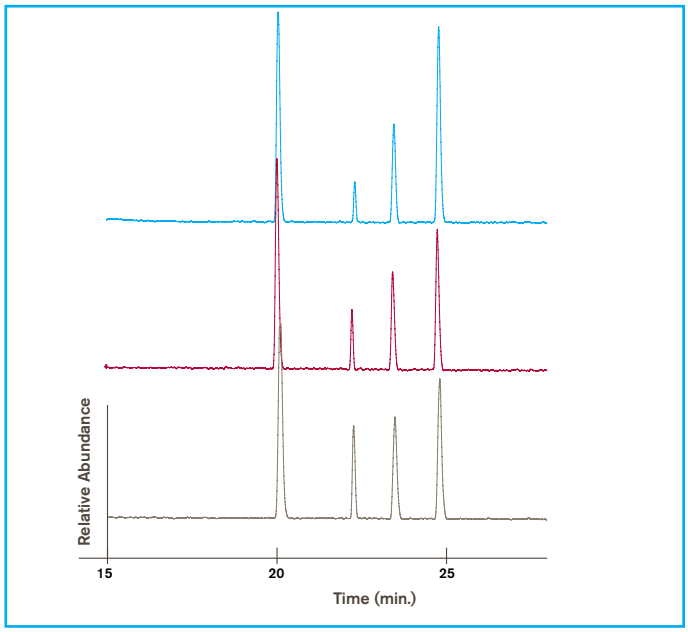

Figure 2. Excellent inter-column reproducibility is achieved for a peptide test mix between three 15 cm x 75 µm nano cHiPLC columns packed with ChromXP C18-CL 3 µm 300Å. Flowrate is 250 nl/min; gradient slope 2% Acetonitrile/min.

Simple operation

The cHiPLC-nanoflex allows for easy switching between direct injection, trap-loading and dual column with direct injection experiments. This is achieved through the use of a fluidic jumper chip, which routes fluid appropriately for the desired experiment. This jumper chip is as easily changed as the column and trap chips. Figure 3 shows a schematic of the set-up for a trap-loading experiment, showing the jumper, trap and column chip and the 10-port nano valve.

Nano-spray source compatibility

In addition, the cHiPLC-nanoflex can be used in combination with all Eksigent nanoLC systems along with any mass spectrometer/nanospray source.

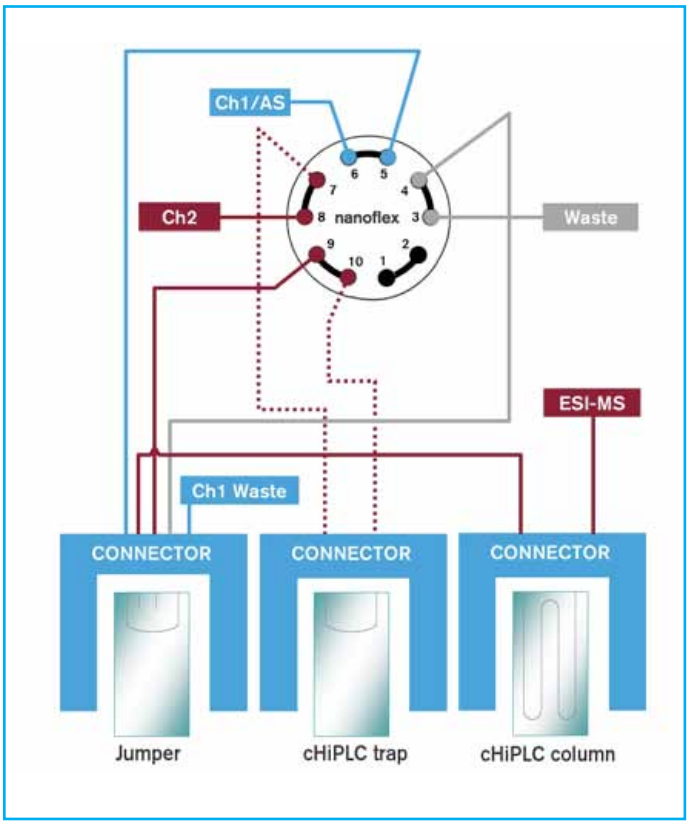

Figure 3. Schematic showing the set-up of the cHiPLC-nanoflex for a trap loading experiment.

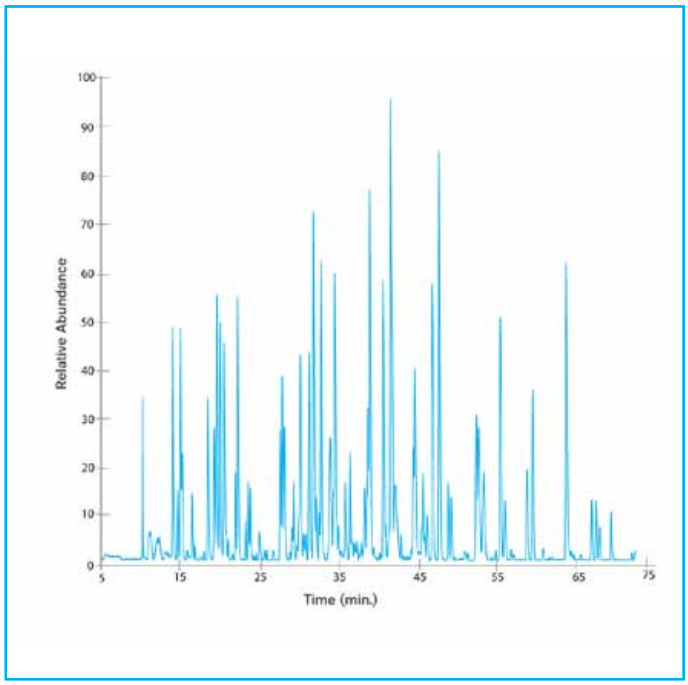

Figure 4. Separation of a BSA digest on a nano cHiPLC column of 15 cm x 75 µm, packed with ChromXP C18-CL 3 µm 300Å. Flowrate is 250 nl/min; gradient slope 0.5% Acetonitrile/min.

Ordering information

description	part number
cHiPLC nanoflex	950-00070
Nano cHiPLC column 75 µm x 15 cm ChromXP C18-CL 3 µm 120 Å	804-00001
Nano cHiPLC column 75 µm x 15 cm ChromXP C18-CL 3 µm 300 Å	804-00003
Nano cHiPLC column 75 µm x 15 cm ChromXP C18-CL 5 µm 120 Å	804-00002
Nano cHiPLC column 75 µm x 15 cm ChromXP C18-CL 5 µm 300 Å	804-00004
Nano cHiPLC Trap column 200 µm x 0.5 mm ChromXP C18-CL 3 µm 120 Å	804-00006
Nano cHiPLC Trap column 200 µm x 0.5 mm ChromXP C18-CL 3 µm 300 Å	804-00008
Nano cHiPLC Trap column 200 µm x 0.5 mm ChromXP C18-CL 5 µm 120 Å	804-00007
Nano cHiPLC Trap column 200 µm x 0.5 mm ChromXP C18-CL 5 µm 300 Å	804-00009
Direct injection jumper chip	800-00408
Trap-elute jumper chip	800-00389
Dual column jumper chip	800-00421
Chip based particle trap (weir) (between autosampler and cHiPLC nanoflex)	800-00354

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System specifications

Dimensions	6.5” (17 cm) x 10” (25 cm) x 10.5” (26 cm) (Width x Depth x Height)
Weight	10 lbs (5 kg)
Power	100-240 VAC, 50/60 Hz, 2.5 A
Working temperature	15 to 30 °C
Temperature control	25 to 60 °C +/- 0.1 °C
Maximum pressure	4000 psi
Valve	▪ PAEK 10 port valve ▪ 1/32” connections; 100 µm bore ▪ Port-to-port volume < 25 nl ▪ Max. pressure 5,000 psi
Wetted Parts	PEEK, PAEK, Valcon E, fused silica, tefzel
Column dimensions	75 µm ID x 15 cm
Trap column dimensions	200 µm ID x 0.5 mm
Instrument control	All temperature control is achieved through the LCD interface on the nanoflex; valve control is achieved through the Eksigent software which controls the pump system. Valve control can be disabled at the nanoflex through the LCD interface.

Eksigent’s new cHiPLC-nanoflex, in combination with the nanoLC-Ultra system, delivers superior sensitivity, column-to-column reproducibility, and exceptional ease of operation.

About Eksigent Technologies

Eksigent is creating new possibilities for life science research and drug discovery & development with its innovative MicroFlow™ and NanoFlow™ fluid delivery systems. Eksigent’s LC systems deliver dramatic increases in analysis speed, throughput, and sensitivity. Today, leading research, pharmaceutical, and biotechnology firms around the world use Eksigent’s innovative solutions.

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