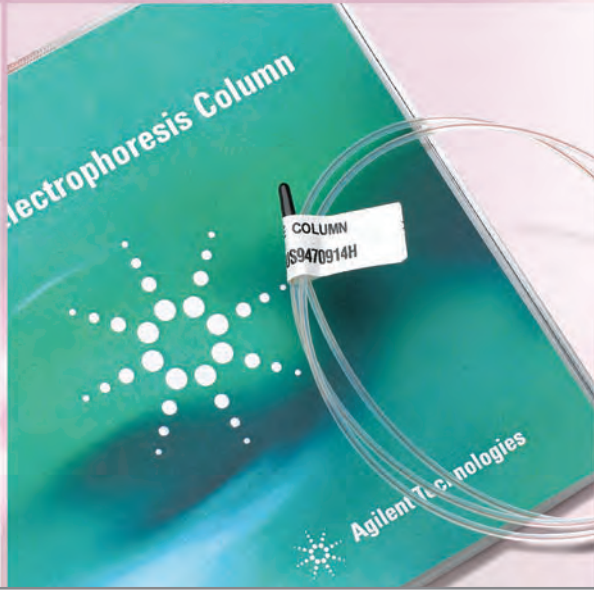
ELECTROPHORESIS



In this Chapter

CE and CE/MS

CE AND CE/MS

CE Solutions Kits

Agilent continues to introduce new CE solutions kits designed to simplify many of your applications:

- Inorganic anions
- Cations
- Organic acids
- Forensic anions
- µPage

These kits include all you need to begin your CE analyses, including buffers, capillaries, conditioning solutions, test samples, methods and detailed descriptions. Each kit is designed to take advantage of the automation of the Agilent CE system to make your time in the laboratory more efficient. All kits are prepared using the same quality procedures as our buffers and are thoroughly tested and supported.

While the kits have been optimized for use with the Agilent CE system, they may be used with virtually any commercial or home-built CE system.

Inorganic Anion Solutions Kit

The Inorganic Anion Solutions Kit contains all components needed for the analysis of common inorganic anions such as chloride, bromide, iodide, fluoride, sulfate, and phosphate. Applications include the analysis of inorganic ions in:

- Ultra pure water
- Waste water
- High purity chemicals
- Drug formulations
- Pulp and paper solutions
- Semiconductor solutions

Using an indirect UV detection system optimized for small anions, analyses are sensitive and rapid, and provide an alternative to traditional ion chromatography. The kit contains buffer, capillaries, test mixture, and instructions.

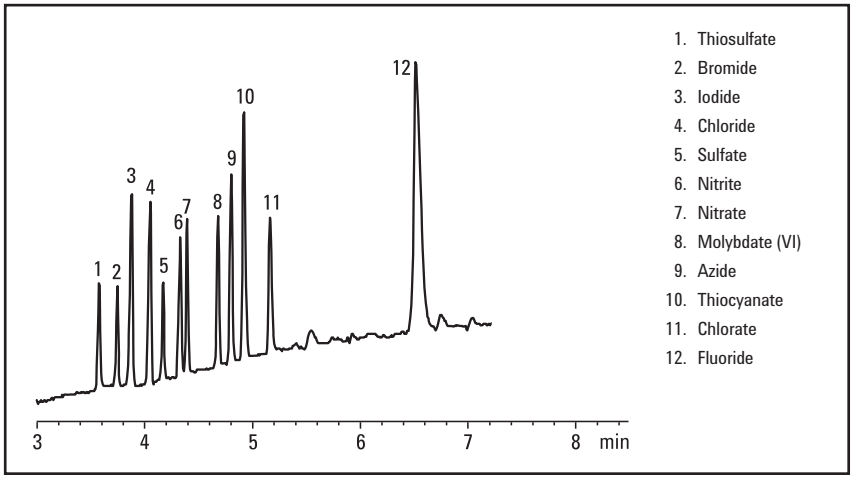
0.1 N sodium hydroxide, 5062-8575

Inorganic Anion Solutions Kit

Description	Unit	Part No.
Inorganic Anion Solutions Kit		5063-6511
Inorganic anion buffer	250 mL	8500-6797
Ultra pure CE water	500 mL	5062-8578
0.1 N sodium hydroxide	250 mL	5062-8575
1.0 N sodium hydroxide	250 mL	5062-8576
Bare fused-silica capillary, 50 µm ID, 72 cm long	2/pk	G1600-62211
Inorganic anion test mixture Includes 1000 ppm each of fluoride, chloride, bromide, nitrite, sulfate and 3000 ppm phosphate	10 mL	5062-8524

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for standard 50 µm ID capillary (P/N G1600-60210) for 1600 HP^{3}D CE
Alignment interface for standard 50 µm ID capillary (P/N G7100-60210) for 7100 CE

Inorganic anion test mixture, 5062-8524



Separation of common anions

Cation Solutions Kit

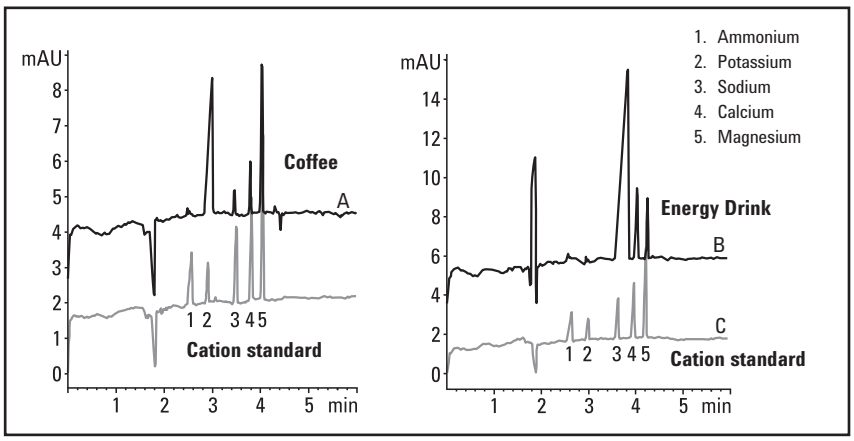
The Cation Solutions Kit provides everything you need for the analysis of inorganic and low-molecular-mass organic cations. It is specially designed for the separation of alkali metal ions, alkaline-earth metal ions and alkyl amines in a wide range of matrices.

Each kit contains a cation buffer, bare fused silica capillaries, cation standard, CE grade water and a detailed description of the analysis method and most common applications, including detection limits and reproducibility data. The Cation Solutions Kit and the separation methods were developed to fit perfectly with the Agilent CE system and to support its high automation capabilities. The methods are very easy to perform and provide accurate and quantitative analyses.

Cation Solutions Kit

Component	Unit	Part No.
Cation Solutions Kit		5064-8206
Cation buffer	250 mL	5064-8203
Ultra pure CE water	500 mL	5062-8578
Bare fused silica capillary, extended light path bubble factor (3), 50 µm ID, 56 cm long	2/pk	G1600-61232
Cation test mixture	25 mL	5064-8205

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for 50 µm ID extended light path capillary (P/N G1600-60230) for 1600 HP3D CE
Alignment interface for 50 µm ID extended light path capillary (P/N G7100-60230) for 7100 CE



Cations in coffee and energy drinks

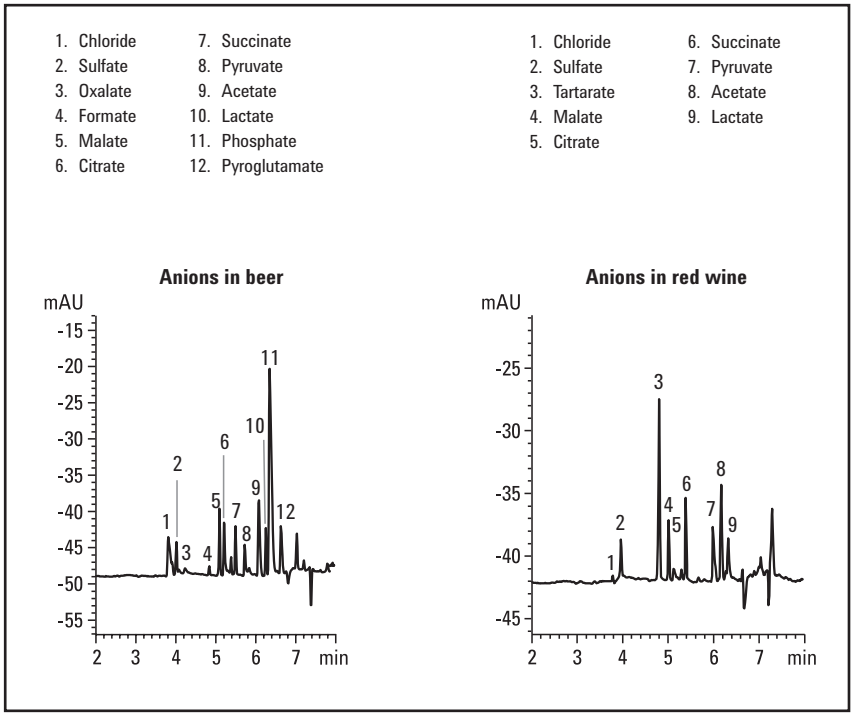
Organic Acids Solutions Kit

The Organic Acids Solution Kit is ideal for the analysis of short alkyl chain carboxylic acids. Employing an indirect UV detection agent optimized for organic acids, the methodology is simple, sensitive, and provides accurate quantitative analysis. Suited for the analysis of organic acids in a wide range of matrices, it is especially useful for determination of organic acids in beverages and food.

Organic Acids Solutions Kit

Description	Unit	Part No.
Organic Acids Solution Kit		5063-6510
Organic acids buffer	250 mL	8500-6785
Ultra pure CE water	500 mL	5062-8578
1.0 N sodium hydroxide	250 mL	5062-8576
Bare fused-silica capillary, 75 µm ID, 72 cm long	2/pk	G1600-62311
Organic acids test mixture Includes 1000 ppm each of malate, succinate, and lactate	20 mL	8500-6900

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for 75 µm ID capillary (P/N G1600-60310) for 1600 HP3D CE
Alignment interface for 75 µm ID capillary (P/N G7100-60310) for 7100 CE



Organic acids in beer and red wine

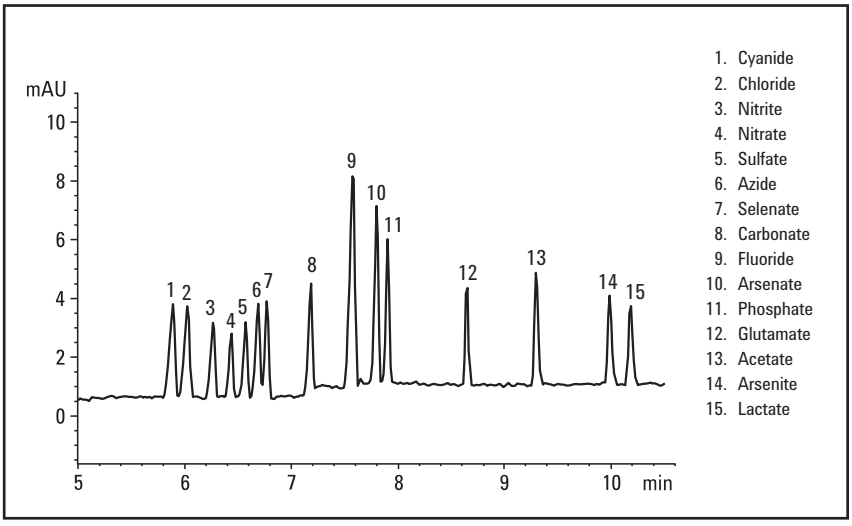
Forensic Anions Solutions Kit

This highly focused kit was developed specifically for the analysis of poisonous compounds, such as cyanide, azide, selenate, arsenate, and arsenite. In cases of poisoning, analytical tools are needed to determine the identity of toxins quickly and accurately. A rapid determination of anionic toxins in adulterated foods and beverages is possible using CE with indirect UV detection. Forensic and other anions can be detected within 15 minutes with minimal sample preparation.

Forensic Anions Solutions Kit

Description	Unit	Part No.
Forensic Anions Solutions Kit	5 x 50 mL	5064-8208
Basic anion buffer	50 mL	5064-8209
Ultra pure CE water	500 mL	5062-8578
Bare fused-silica capillary, 50 µm ID, 104 cm long	2/pk	G1600-64211
Inorganic anion test mixture Includes 1000 ppm each of fluoride, chloride, bromide, nitrite, sulfate and 3000 ppm phosphate	10 mL	5062-8524

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for standard 50 µm ID capillary (P/N G1600-60210) for 1600 HP3D CE
Alignment interface for standard 50 µm ID capillary (P/N G7100-60210) for 7100 CE



Analysis of an anion standard with the Forensic Anions Solutions Kit

µPAGE Solution Kits

µPAGE poly-acrylamide gel-filled capillaries are the most direct vehicles to transfer all of your applications from slab gel to CE, utlizing the automation, high speed, high resolution, and quantitative advantages of CE. The capillaries are ideal for high resolution separations of oligonucleotides, single-stranded and double-stranded DNA fragments, polymerase chain reaction (PCR) products, sequencing reaction products and oligosaccharides.

µPAGE capillaries are available in three different pore sizes. The size of the molecular sieving pores is controlled by the monomer concentration (%T) and the degree of polymer cross-linking (%C). Gels with higher %T and %C values have smaller pores and are, therefore, more effective at resolving smaller molecules. µPAGE-10 (10%T, 0%C) capillaries provide high resolution capabilities for separation of antisense therapeutic agents, primers and probes, as well as nucleotides.

µPAGE-5 (5%T, 5%C) allows single base resolution of oligonucleotides [pd(A)] ranging from 20 to 150 bases.

For your convenience, µPAGE capillaries and µPAGE buffers can be purchased together or separately. To achieve the highest reproducibility and provide optimal longevity, use µPAGE buffer with µPAGE capillaries.

µPAGE Starter Kits

Includes 3 µPAGE capillaries, 75 cm total length, 50 cm effective length, oligonucleotide standard and µPAGE buffer

Kit as defined by type of µPAGE capillary	ID (µm)	Part No.
µPAGE-10 (10%T, 0%C) µPAGE $pd(A)_{25\text{-}30}$ oligonucleotide standard for µPAGE-10 kit µPAGE buffer, 2 x 237 mL	100	192-1311
µPAGE-5 (5%T, 5%C) µPAGE $pd(A)_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5 kits µPAGE buffer, 2 x 237 mL	75	192-5211
µPAGE-3 (3%T, 3%C) µPAGE $pd(A)_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5 kits µPAGE buffer, 2 x 237 mL	75	192-3211

µPAGE Basic Kits

Includes 3 µPAGE capillaries, 75 cm total length, 50 cm effective length

Kit as defined by type of µPAGE capillary	ID (µm)	Part No.
µPAGE-10 (10%T, 0%C) µPAGE pd(A)$_{25\text{-}30}$ oligonucleotide standard for µPAGE-10 kit	100	191-1311
µPAGE-5 (5%T, 5%C) µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5 kits	75	191-5211
µPAGE-3 (3%T, 3%C) µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5 kits	75	191-3211

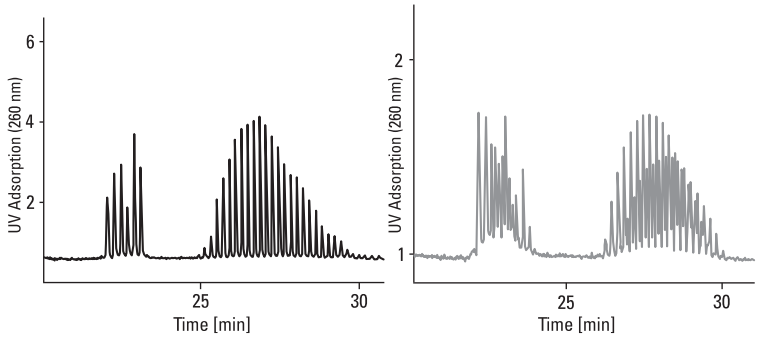
Note: The µPAGE capillaries are not pre-aligned for the G1600A CE and G7100 CE systems. To cut them to the correct length, use the CE column cutter (P/N 5183-4669). To create detection window, use the Window Etching Tool (P/N 590-3003).

µPAGE Buffer Solutions and Oligo Standards

Kit as defined by type of µPAGE capillary	Part No.
µPAGE tris-borate and urea buffer for µPAGE-10, 4 x 237 mL	590-4005
µPAGE tris-borate and urea buffer for µPAGE-3 and µPAGE-5, 4 x 237 mL	590-4001
µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5, 3 x 50 µL	590-4000

Single base pair separation of pd(A) on a 3%T, 3%C µPAGE capillary

Secondary peaks of identical base length as the primary peaks, but retarded in electromigration due to loss of the terminal 5' phosphate group

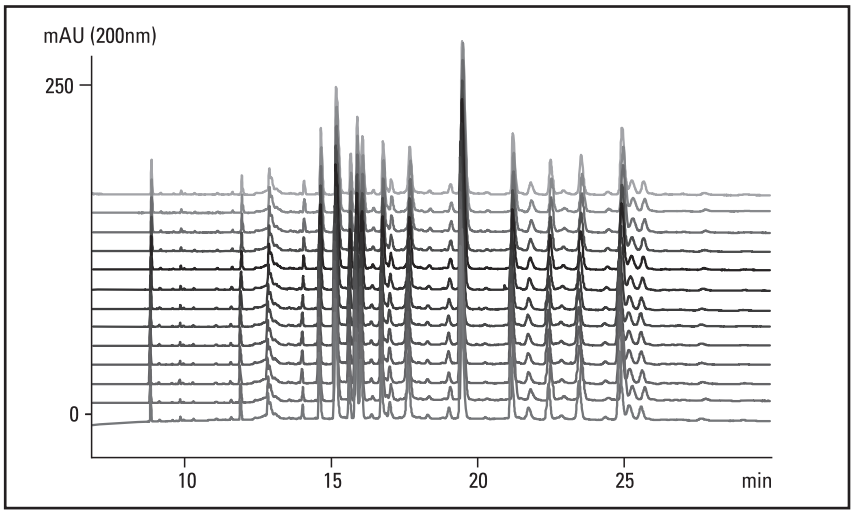


Oligonucleotide samples with or without terminal 5 phosphate group

CE and CE/MS Capillaries

Standard Bare Fused-Silica Capillaries

Fused-silica capillaries are the heart of CE. Pre-aligned capillaries from Agilent Technologies are designed and optimized for ease of use and reliability. All capillary ends are cut to a smooth, mirror-like finish. In addition, the polyimide outer coating is removed from the ends. These processes ensure minimal sample adsorption and help maintain sharp peak shapes. All capillaries have a pre-made detection "window" and a built-in alignment stopper that allows rapid and precise insertion in the alignment interface.



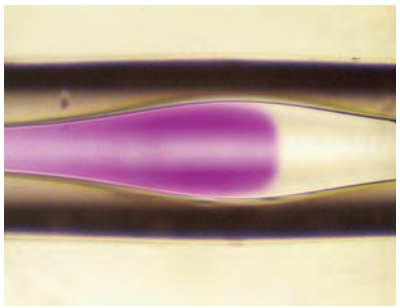
CZE of a tryptic digest of recombinant human growth hormone using a standard fused-silica capillary with 75 µm internal diameter

Tips & Tools

Different inner diameters of capillaries need to use different alignment interfaces to guarantee optimal detection. The color coding of the capillary and the alignment interface allow you to easily match the correct interface with the capillary.

Standard Bare Fused-Silica Capillaries, 2/pk

ID (µm)	Total Length (cm)	Effective Length (cm)	Color Code	Part No.
50	33	24.5	Green	G1600-63211
	48.5	40	Green	G1600-60211
	64.5	56	Green	G1600-61211
	80.5	72	Green	G1600-62211
	112.5	104	Green	G1600-64211
75	33	24.5	Blue	G1600-63311
	48.5	40	Blue	G1600-60311
	64.5	56	Blue	G1600-61311
	80.5	72	Blue	G1600-62311
	112.5	104	Blue	G1600-64311
100	33	24.5	Gray	G1600-63411
	48.5	40	Gray	G1600-60411
	64.5	56	Gray	G1600-61411
	80.5	72	Gray	G1600-62411
	112.5	104	Gray	G1600-64411



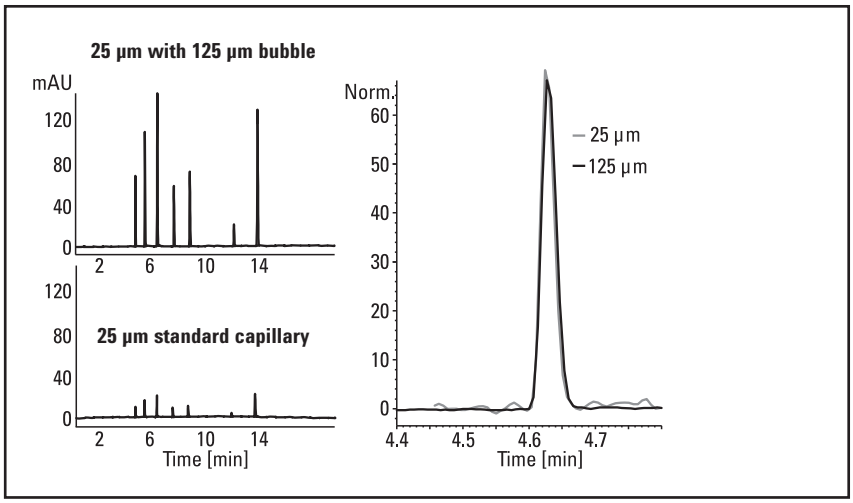
Electroosmotic flow maintains the "plug" flow in the bubble. Optical slits matched to the zone geometry maintain resolution.

Extended Light Path (Bubble Cell) Bare Fused-Silica Capillaries

Use Agilent Technologies extended light path capillaries ("bubble" cell capillaries) to improve sensitivity 3- to 5-fold over standard capillaries. With extended light path capillaries, the inner diameter is increased only at the detection window, offering the sensitivity of a wide inner diameter capillary and the low current generation of a narrow one.

Resolution is not sacrificed when used with matching optical alignment interfaces from Agilent.

Through a computer-controlled proprietary process, the diameter is increased three to five times, with a manufacturing precision better than 3%. Take advantage of this process to extend the detection pathlength of 25 µm ID capillaries to 125 µm, 50 µm to 150 µm, and 75 µm to 200 µm.



Analysis of cold medicine ingredients in a standard capillary (25 µm ID) and an Agilent Extended Light Path Capillary

Extended Light Path (Bubble Cell) Bare Fused-Silica Capillaries, 2/pk

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Color Code	Part No.
25	48.5	40	5	125	Black	G1600-60132
	64.5	56	5	125	Black	G1600-61132
	80.5	72	5	125	Black	G1600-62132
50	43.5	35	3	150	Red	G1600-60233
	48.5	40	3	150	Red	G1600-60232
	64.5	56	3	150	Red	G1600-61232
	80.5	72	3	150	Red	G1600-62232
	112.5	104	3	150	Red	G1600-64232
75	48.5	40	2.7	200	Yellow	G1600-60332
	64.5	56	2.7	200	Yellow	G1600-61332
	80.5	72	2.7	200	Yellow	G1600-62332
	112.5	104	2.7	200	Yellow	G1600-64332

Tips & Tools

Use narrow 25 and 50 µm ID "bubble" cell capillaries for highly conductive buffers without sacrificing sensitivity.

Universal Bare Fused-Silica Capillaries

Universal Bare Fused-Silica Capillaries have a window, 75 cm effective length and 363 µm OD, fitting into any CE instrument. To cut them to the correct length we recommend using the CE column cutter (P/N 5183-4669).

Universal Bare Fused-Silica Capillaries

ID (µm)	Total Length (cm)	Effective Length (cm)	Part No.
20	100	75	190-0431
50	100	75	190-0131
75	100	75	190-0231
100	100	75	190-0331

Bulk Fused-Silica Capillaries

ID (µm)	Total Length (m)	Part No.
20	5	160-2660-5
50	5	160-2650-5
75	5	160-2644-5

Polyvinyl Alcohol (PVA) Coated Capillaries

PVA coated capillaries contain a permanently adsorbed layer of polyvinyl alcohol. This coating minimizes hydrophobic and electrostatic solute/wall interactions and eliminates electroosmotic flow (EOF). Using a proprietary deposition process, the PVA coating is stable over a wide pH range, even under basic conditions from 2.5 to 9.5. This stability allows the use of many common CE buffers. Because the silica surface is covered, many proteins and amines can be analyzed without the peak tailing found with uncoated capillaries. In addition, since EOF is eliminated, cumbersome washing procedures are unnecessary and migration time reproducibility may be improved.

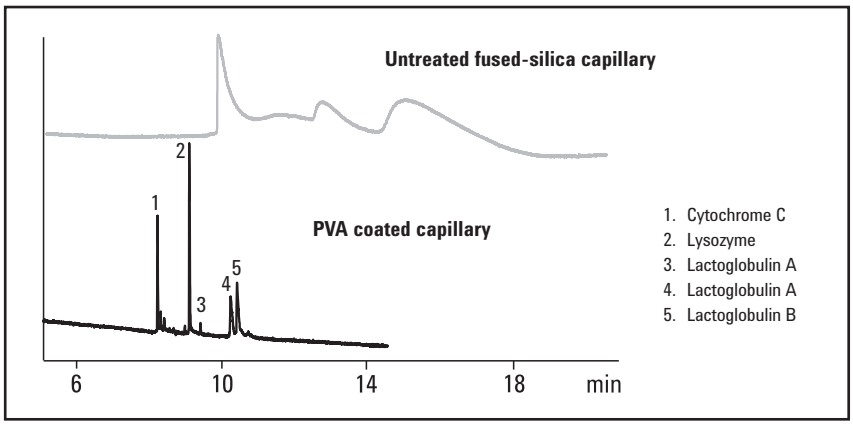
Each batch of PVA coated capillaries is rigorously tested by Agilent Technologies and includes a representative electropherogram to assure quality.

The color coding of the capillary (alignment stopper) and the alignment interfaces allow you to easily combine the correct interface with the capillary. Capillaries for non-Agilent CE systems have removable alignment stoppers without color code.

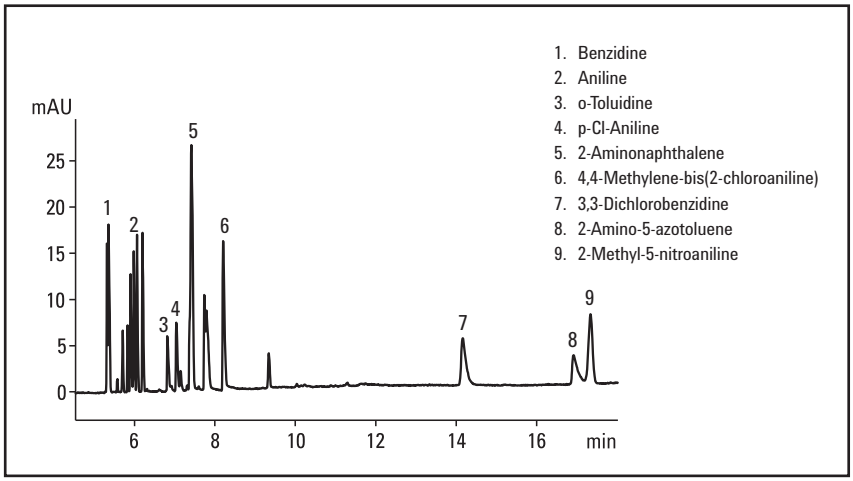
PVA coated capillaries can be used for a variety of applications, including protein analysis at physiological pH, isoelectric focusing, and small anion analysis without the need for flow-reversal agents in the buffer.

PVA coating is available in standard capillaries, or in Agilent Extended Light Path Capillaries ("bubble" cell capillaries) for high sensitivity applications. Both capillary types are available in longer lengths for use in non-Agilent systems.

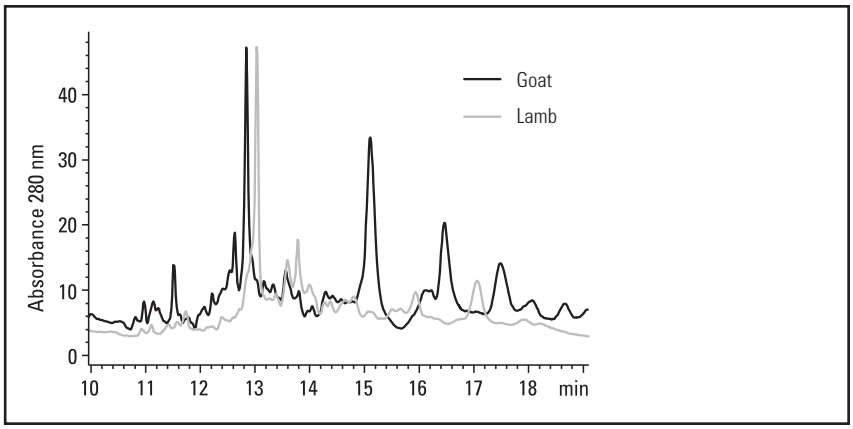
PVA is also available for use with the High Sensitivity Detection Cell for even further improved HPLC-like sensitivity. In addition, PVA coated capillaries are offered for CE-MS applications. The capillaries are provided with a normally positioned detection window to allow tandem UV-Vis and MS detection for improved sample identification.



Use of PVA coated capillaries to reduce protein adsorption



CZE analysis of basic amines using PVA coated capillaries (decomposition products of azo dyes)



Analysis of meat proteins by c-IEF using PVA capillaries

PVA Coated Capillaries for Agilent CE Systems*

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Color Code	Part No.
50	64.5	56	0	50	Green	G1600-61219
	64.5	56	3	150	Red	G1600-61239
	125	21.5	0	50	Green	G1600-67219
75	64.5	56	0	1200		G1600-68319
	125	21.5	0	75	Blue	G1600-67319
100	48.5	40	0	100	Gray	G1600-60419
	64.5	56	0	100	Gray	G1600-61419

*Not compatible with borate buffers

Note: PVA coated capillaries for CE/MS have a blue alignment stopper matching the blue color code of the alignment interface for MS-UV detection. The alignment stopper of the 50 µm ID PVA capillary for CE/MS has a black dot for easy identification.

PVA Coated Capillaries for Non-Agilent CE Systems*

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Part No.
50	71	60	0	50	G160U-61219
	71	60	3	150	G160U-61239
100	56	45	0	100	G160U-60419
	71	60	0	100	G160U-61419

*Not compatible with borate buffers

Note: When extended pathlength capillaries are used in non-Agilent systems, loss of resolution may be found if the axial slit width is not reduced. In Agilent systems, the alignment interface contains properly matched slits to maintain resolution.

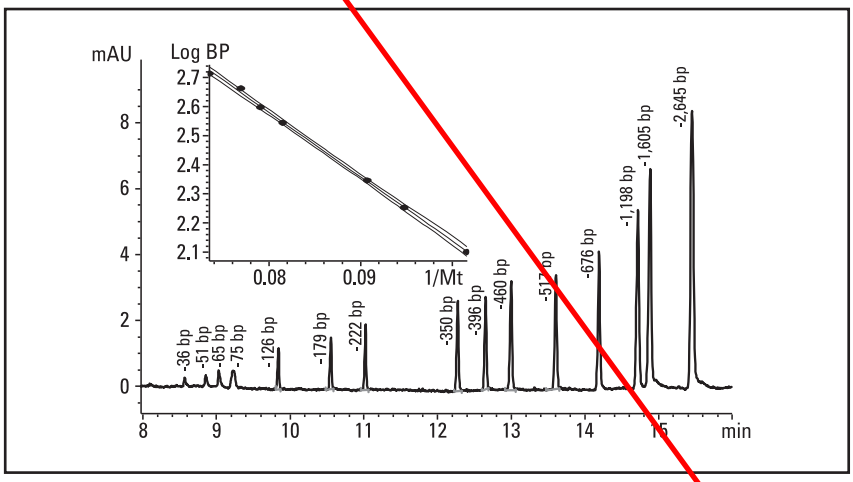
CEP kapiláry - produkt zastaralý, nedostupný

CEP Coated Capillaries

CEP coated capillaries contain a permanently bonded polymer coating. This CEP coating shields the silanol functionality of the capillary surface and helps prevent sample adsorption. Additionally, EOF is nearly eliminated, making the capillary ideal for applications such as DNA separations with sieving polymer buffers.

Elimination of EOF also simplifies analysis of anions and organic acids by direct UV detection. Without EOF reduction, highly mobile ions such as nitrate can migrate in the opposite direction to the slower, longer chain acids.

The CEP coated capillary is stable from pH 2 to 8. It can be used with borate buffers, offering a different surface functionality to help alleviate sample adsorption. Each batch of CEP coated capillaries is rigidly tested by Agilent Technologies and each capillary includes a representative electropherogram to assure quality.



Restriction fragment separation (36–2645 bp)

CEP Coated Capillaries, 2/pk

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Part No.
75	80.5	72	0	75	G1600-62312

Cross-linked and Bonded µSIL Capillaries

µSIL-FC and µSIL-DNA Capillaries with Windows

A series of coated capillaries specifically designed for CE, which are prepared by cross-linking and bonding a novel, proprietary fluorocarbon (FC) polymer. µSIL-FC capillaries are chemically inert, hydrophobic, and stable from pH 2.5-10.

These capillaries are a must-have for cIEF, protein, peptide and carbohydrate separations, as well as replaceable gel CE applications such as oligonucleotides, DNA fragments, and PCR product separations.

µSIL-DNA capillaries are also coated with an FC polymer but have a 75 µm ID to accommodate the viscosity of entangled polymer solutions. All µSIL capillaries are batch tested to ensure the highest performance and reproducibility.

µSIL-WAX Capillaries with Windows

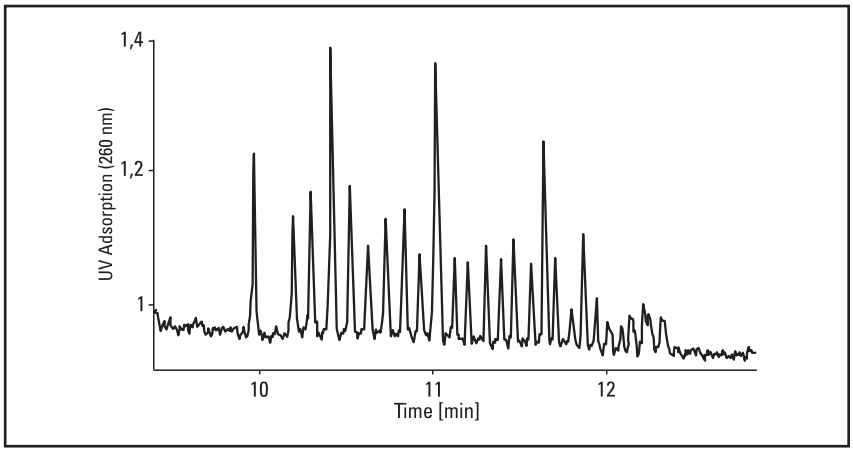
µSIL-WAX features a modified, polyethylene oxide, hydrophilic coating made through a special cross-linking and bonding process. The coating effectively masks active silanol sites, offering exceptional efficiency, resolution, peak shape and reproducibility. The highly stable coating and near-zero EOF of µSIL-WAX makes the capillary ideal for CE-MS, and protein and peptide separations from pH 2-5.

Capillary	ID (µm)	Total Length (cm)	Effective Length (cm)	Film Thickness (µm)	Unit	Part No.
µSIL-FC	50	80	50	0.075	3/pk	194-8111
µSIL-DNA	75	65	50	0.075	2/pk	199-2602
µSIL-WAX	50	100	75	0.1	2/pk	196-7203
µSIL-WAX	100	100	75	0.1	2/pk	197-7202

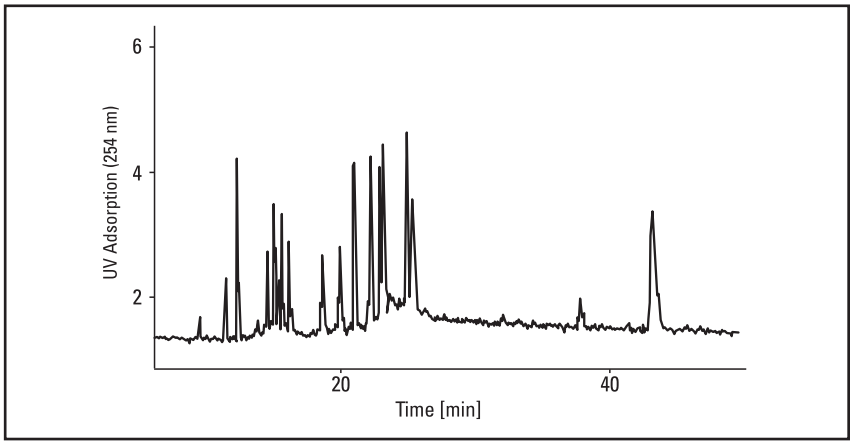
Bulk µSIL-DB Capillaries

µSIL-DB coated capillaries are available as µSIL-DB-1 and µSIL-DB-17. In combination with a cellulose based buffer system, µSIL-DB coated capillaries have been widely used in cIEF applications, PCR product and DNA fragment separation, and many other CE applications which require reduced EOF.

Capillary	ID (mm)	Length (m)	Film Thickness (µm)	Part No.
DB-1	0.05	10	0.05	126-1012
DB-1	0.20	10	0.05	126-1013
DB-1	0.10	10	0.10	127-100A
DB-17	0.10	10	0.05	126-1713
DB-17	0.10	10	0.10	127-1712
DB-17	0.20	10	0.10	127-1713



Analysis of Allelic ladder with µSIL-DNA



Analysis of Myoglobin tryptic digest using µSIL-WAX

Capillary Electrochromatography (CEC) Capillaries

Capillary electrochromatography is a hybrid of CE and LC and can be performed in the Agilent CE system. Using CE capillaries packed with LC stationary phases, CEC offers the loadability and selectivity of LC and the high efficiency of CE.

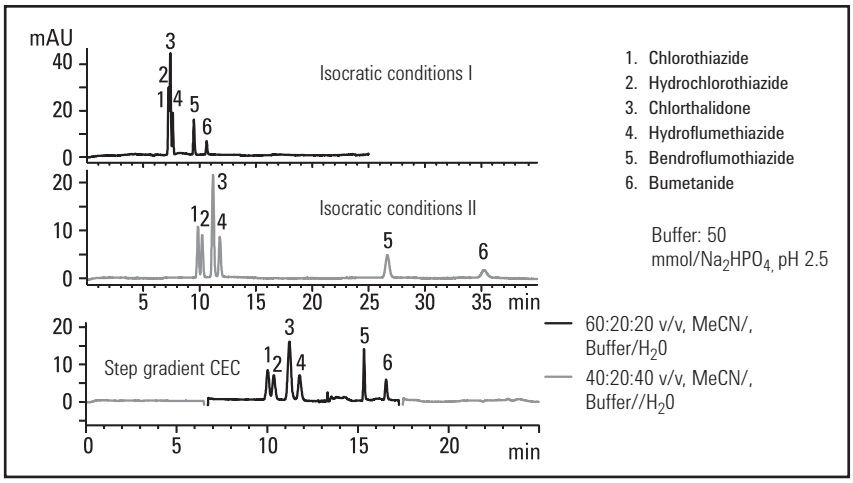
Using the high pressure capabilities of the Agilent CE system, both ends of the CEC capillary can be pressurized. This process prevents outgassing upon application of high voltage and significantly extends capillary lifetime.

Use CEC to improve resolution of solutes, which are difficult to resolve by HPLC, for hydrophobic solutes which cannot be solubilized in MEKC buffers, or for reduced sample and solvent consumption compared to HPLC.

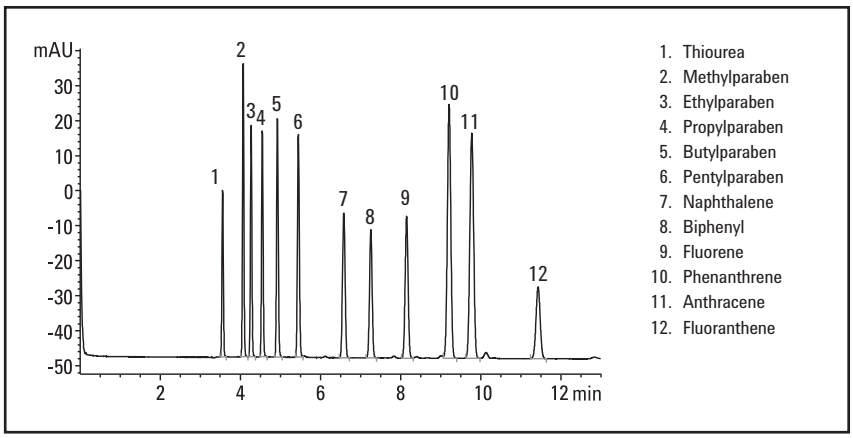
Standard Packed CEC Capillaries, 2/pk

Description	ID (µm)	Total Length (cm)	Effective Length (cm)	Color Code*	Part No.
C18, 3 µm	100	33.5	25	Gray	5063-6512
	100	48.5	40	Gray	5063-6513
C8, 3 µm	100	33.5	25	Gray	5063-6535
	100	48.5	40	Gray	5063-6540
Phenyl, 3 µm	100	33.5	25	Gray	5063-6536
	100	48.5	40	Gray	5063-6541

*The color coding of the capillary (alignment stopper) and the interface allows you to easily combine the correct alignment interface with the capillary.



Capillary Electrochromatography of diuretic test mixture
(courtesy of Dr. Melvin Euerby, Astra Charnwood, UK)



Capillary Electrochromatography of parabenes and aromatics

Tips & Tools

CEC capillaries require an Agilent CE system with external gas supply capabilities.

Alignment Interfaces and Capillary Cassette

Agilent Technologies alignment interfaces are an integral part of the Agilent diode-array detection (DAD) system. These interfaces contain optical slits which are precisely matched to the capillary inner diameter for optimized sensitivity and linear detection range.

In combination with the capillary cassette, alignment interfaces simplify capillary exchange, protect the fragile detection window and ensure exact alignment of the window in the detector. Quick-change cassette allows capillary exchange in less than one minute.

Note: The color code of the alignment interface must match the color code of the capillary's built-in alignment stopper.

Alignment interface for standard capillary, G1600-60310

Capillary cassette, G7100-60002

Alignment Interfaces

Description	ID (µm)	Color Code	Corresponding Capillary	G7100 CE Part No.	G1600 CE Part No.
Alignment interface for standard capillary	50	Green	Green	G7100-60210	G1600-60210
	75	Blue	Blue	G7100-60310	G1600-60310
	100	Gray	Gray		
	150	Brown	Brown		
Alignment interface for Agilent Extended Light Path capillaries	25	Black	Black	G7100-60150	G1600-60150
	50	Red	Red	G7100-60230	G1600-60230
	75	Yellow	Yellow	G7100-60330	G1600-60330
CE/MS alignment interface for 360 µm OD capillaries, nonmetallic		Blue	Blue Gray	G7100-60400	

Note: 75, 100 and 150 µm ID standard capillaries use the same interface (color blue).
PVA coated 50 and 75 µm ID capillary for CE/MS use the same nonmetallic interface with color code blue for use with standard and extended light path capillaries, and the high sensitivity detector cell.

Capillary cassette

Description	G7100 CE Part No.	G1600 CE Part No.
Capillary cassette	G7100-60002	G1600-60002

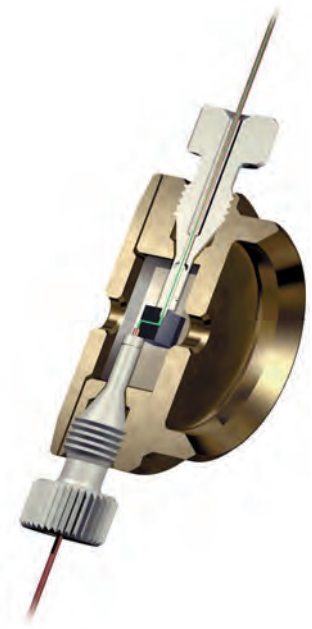
Note: Only use G7100-60002 cassette in G7100 and G1600-60002 cassette in G1600. Never mix cassettes.

Optical filter for DAD

Description	G7100 CE Part No.	G1600 CE Part No.
Optical filter for DAD 260 nm, for DNA analysis with polyacrylamide filled capillaries and oligonucleotide analysis	G7100-62700	G1600-62700

Tips & Tools

Cassette and interfaces accept all commercially available capillaries (~365 µm OD).



High Sensitivity Detection Cell

Instrument Parts and Supplies

High Sensitivity Detection Cell

The Agilent high sensitivity detection cell – a technological leap which extends sensitivity by an order of magnitude – provides a solution to sensitivity limitations often encountered in CE. This improvement will substantially increase the utility of CE for impurity analysis of chiral drugs, biologicals, and compounds of environmental interest, among others.

The high linear range allows quantification of both <0.1% impurities and the main component in one run. This is useful for all impurity determinations and is especially useful for determining chiral excess.

The high sensitivity detection cell for the Agilent CE system not only improves detection sensitivity more than 10-fold over standard capillaries, but also extends linearity beyond 2000 mAU and provides unsurpassed spectral fidelity. These improvements are a result of a proprietary micromachined design which increases the detection pathlength from 75 µm to 1200 µm while dramatically reducing stray light.

The high sensitivity detection cell has a design comprised of a fused-silica cell body and removable capillaries. The light path through the cell is made from black fused-silica which significantly minimizes stray light and defines the aperture for the diode-array spectrometer. In addition, the reflective interior functions as a "lightpipe," ensuring almost 100% transmission of light which entered the cell. These properties result in enhanced linearity and unsurpassed spectral fidelity with the diode-array detector.

Characteristics of the Agilent High Sensitivity Detection Cell

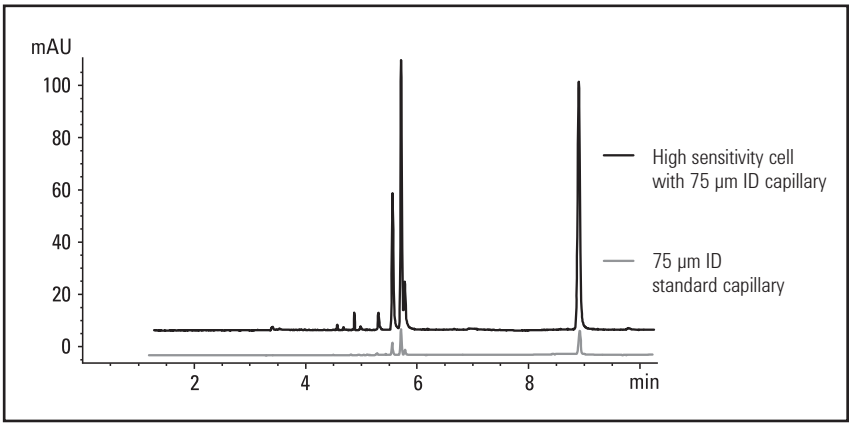
- Up to 10-fold increase in signal-to-noise
- Detector linearity beyond 2000 mAU for accurate quantitative analysis
- Decoupled design allows replaceable capillaries and reduced cost operation
- Special capillary geometry ensures maintenance of peak symmetry
- Full diode-array spectral capabilities
- Design fits all Agilent CE instruments

High Sensitivity Detection Cell

Description	G7100 CE Part No.	G1600 CE Part No.
High sensitivity cell kit Includes detection cell, 75 µm ID inlet capillary (72 cm) and outlet capillary (8.5 cm) pair, capillary cassette, fittings (3 fitting screws with seals, 2 fitting caps), cleaning solution, CE Partner CD-ROM	G7100-68723	G1600-68723
CE cell fitting kit Includes 3 fitting screws, 2 fitting caps		G1600-63200
Replacement detection cell		G1600-60027
Cell cleaning fluid, 1 L		5062-8529

Capillary Kits for High Sensitivity Detection Cell

Description	Effective Length (cm)	G1600 CE Part No.
75 µm capillary kit with 8.5 cm outlet	56	G1600-68716
	72	G1600-68715
	88	G1600-68714
PVA coated 75 µm capillary kit with 8.5 cm outlet	56	G1600-68319



Agilent high sensitivity detection cell vs. 75 µm standard capillary for the CZE separation of naphthalene sulfonic acids

CE/MS Accessories

The CE/MS Adapter Kit simplifies coupling the Agilent CE system with MS systems equipped with an electrospray ionization (ESI) source. Integral to this kit is the CE/MS cassette, which completely thermostats the capillary until it exits the CE system. The cassette offers multiple capillary paths that vary the capillary length. A method development configuration uses online diode array detection and MS. For rapid or routine MS analysis, the detector can be bypassed to decrease the total capillary length and reduce analysis time. The CE/MS adapter kit can be used with the complete Agilent 6000 Series mass spectrometers, or virtually any electospray-MS platform.

The CE-MS cassette completely thermostats the capillary until it exits the CE system. Methods development configuration uses online diode array detection (DAD) and MS. For rapid or routine MS analysis the DAD can be by-passed to decrease the total capillary length and reduce analysis time.

The CE-ESI-MS Nebulizer Kit includes the electrospray needle and splitter assembly, which allows the direct connection of the CE instrument with Agilent and other electrospray MS systems. The CE-ESI-MS Nebulizer Kit needs the CE-MS Adapter Kit to fully support CE/MS coupling.

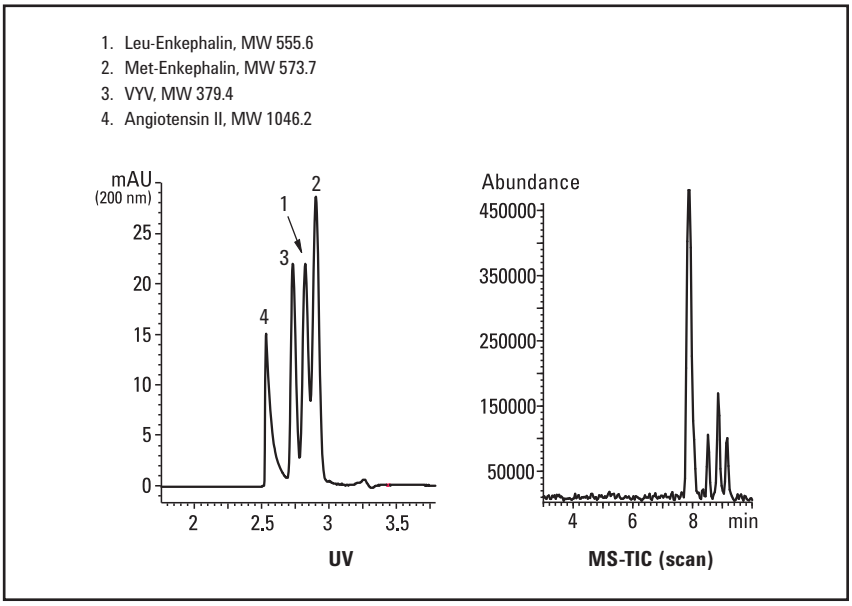
CE with tandem UV-Vis and MS detection allows the analysis of complex mixtures. Analyte mixtures are separated and the components detected via UV-Vis absorption, allowing preliminary identification based on peak elution time and UV-Vis spectra, or both, when compared to a standard. Online coupling to electrospray-ionization mass spectrometry (ESI-MS) then reveals unambiguous information on the solute's molecular weight, and possibly structure.

Interfacing the capillary requires an electospray needle which is not included in this kit but in the CE-ESI-MS Nebulizer Kit. For coupling with non-Agilent MS please contact the MS vendor.

CE/MS Adapter Kit

Description	Part No.
CE/MS Adapter Kit For interfacing the Agilent CE system with a mass spectrometer Includes parts below, which can be ordered separately*	G1603A
CE/MS interface cassette, metallic, for G1600 and G7100 CE	G1600-60013
CE/MS alignment interface for 360 µm OD capillaries, nonmetallic, for G1600 CE	G1600-60400
CE/MS alignment interface for 360 µm OD capillaries, nonmetallic, for G7100 CE	G7100-60400
Bare fused-silica, 50 µm ID, 125 cm long, 2/pk	G1600-67311

*Interfacing the capillary requires an electrospray needle which is not included in this kit



CE/MS of 4-component peptide mixture (210 fmol)

CE/MS Sprayer Kit

Description	Unit	Part No.
CE/MS Sprayer Kit Includes CE/MS test sample (5 g quinine sulfate dihydrate) and the parts listed below		G1607A
ES needle assembly		G1607-60041
CE-ESI sprayer		G1607-60001
Splitter assembly		G1607-60000
PEEK ferrule, 360 µm for CE/MS Sprayer		5022-2141
Nut, fingertight fitting and ferrule	2/pk	0100-1543
Flex loc element	2/pk	1520-0401
Gasket	1/pk	G1607-20030
Ion kit (ammonium acetate)	5 x 5 mL	8500-4410

CE/MS Capillaries

Description	Color Code	Unit	Part No.
Bare fused-silica, 50 µm ID, 125 cm long	Green	2/pk	G1600-67311
PVA coated capillary, 50 µm ID, 125 cm long	Green	1/pk	G1600-67219
PVA coated capillary, 75 µm ID, 125 cm long	Blue	1/pk	G1600-67319

CE Standards & Reagents

Premade buffers help eliminate the time-consuming buffer preparation process. All Agilent buffers and reagents are designed to meet the stringent demands of CE. Manufactured under GLP/GMP conditions in ISO9001 facilities, each is shipped with assay information and verification of purity. Chemicals are all electrophoresis grade, with nearly all ionic and organic impurities removed. Solutions are prepared under Class 10 clean room conditions and prefiltered through 0.2 µm filters to ensure removal of particulates. Superior quality control ensures reproducible results bottle-to-bottle and batch-to-batch.

In addition to a set of kit buffers, which are specially designed for dedicated applications, Agilent offers a series of basic CZE buffers covering a broad pH range. The product portfolio also includes special buffers for protein analysis and for Micellar Electrokinetic Chromatography (MEKC). Cleaning and conditioning solutions complete the offering.

Ultra pure CE water, 5062-8578

50 mM sodium phosphate buffer, pH 2.5, 5062-8571

Ultra Pure CE Water

Description	Volume (mL)	Part No.
Ultra pure CE water	500	5062-8578

Capillary Conditioning Solutions

Description	Volume (mL)	Part No.
0.1 N sodium hydroxide	250	5062-8575
1.0 N sodium hydroxide	250	5062-8576
0.1 N phosphoric acid	250	5062-8577

CZE Buffers for Charged Analytes

Description	Volume (mL)	Part No.
50 mM sodium phosphate buffer, pH 2.5	250	5062-8571
50 mM sodium phosphate buffer, pH 7.0	250	5062-8572
50 mM sodium tetraborate buffer, pH 9.3	250	5062-8573
20 mM sodium tetraborate buffer, pH 9.3	100	8500-6782

CZE Buffers for Proteins

Description	Volume (mL)	Part No.
50 mM phosphate, 0.05% hydroxyethyl cellulose buffer, pH 2.5	250	8500-6786
150 mM phosphate, 200 mM ammonium sulfate buffer, pH 7.0	250	8500-6787

MEKC Buffers for Neutral and Charged Analytes

Description	Volume (mL)	Part No.
50 mM sodium tetraborate, 100 mM sodium dodecyl sulfate buffer, pH 9.3*	250	5062-8574

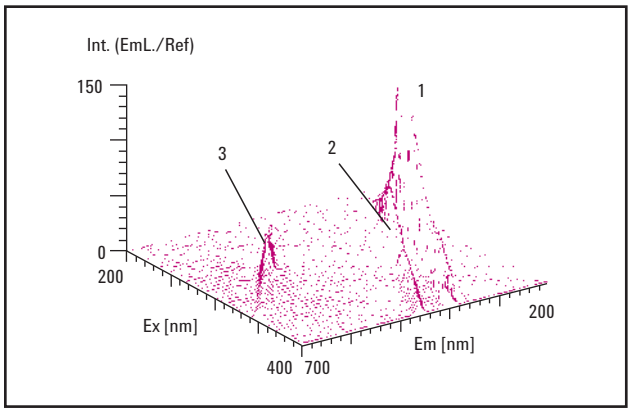
*Dilute with 50 mM sodium tetraborate, pH 9.3 (P/N 5062-8573) to reduce SDS concentration without affecting the tetraborate composition or pH

Plating Bath Analysis Buffer

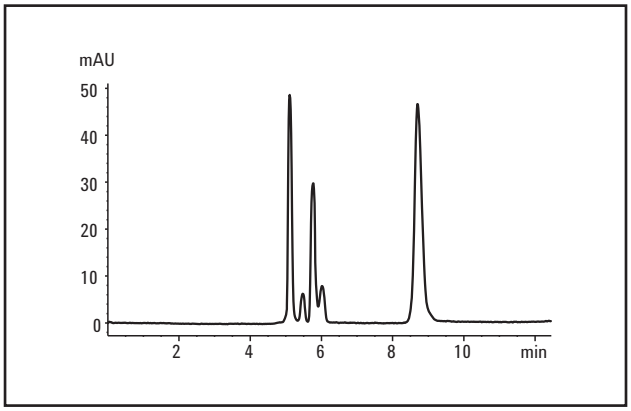
Description	Volume (mL)	Part No.
Plating bath analysis buffer	250	5064-8236

µPAGE Buffer Solutions and Oligo Standards

Description	Part No.
µPAGE tris-borate and urea buffer for µPAGE-10, 4 x 237 mL	590-4005
µPAGE tris-borate and urea buffer for µPAGE-3 and µPAGE-5, 4 x 237 mL	590-4001
µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5, 3 x 50 µL	590-4000



The total fluorimetry spectrum of the 50 mM borate buffer pH 9.2 verifies that the solution is free of fluorescence-active impurities (1 and 2 = Rayleigh stray light of zero and first order, 3 = Raman stray light).



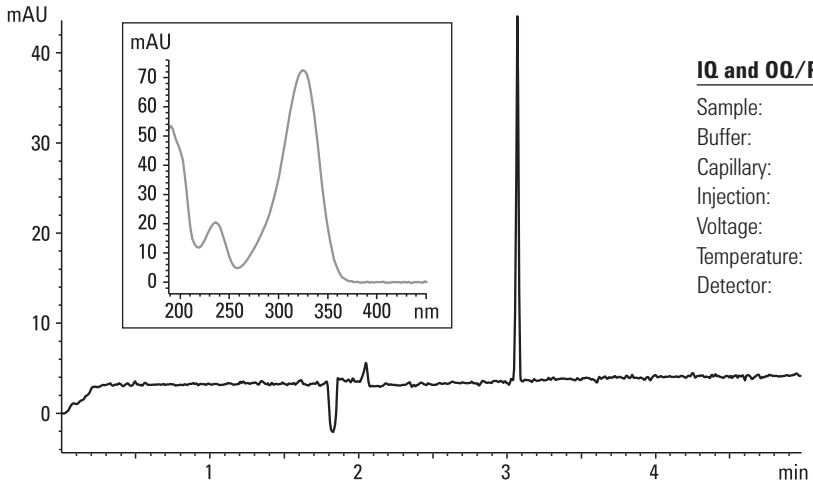
CZE analysis of a peptide mixture using pre-made 50 mM sodium phosphate buffer, pH 2.5

CE System Start-up and Test Kits

Chemical test kits and validation packages are available to help comply with regulatory and quality standards. The Installation Qualification (IQ) Chemical Kit and Hardware Start-Up Kits, which are shipped with new instruments, are useful for rapidly verifying system functionality. For rigorous testing, the Operational Qualification (OQ)/Performance Verification (PV) Kit can be used to verify DAD noise, drift, linearity, wavelength accuracy and replenishment functionality. The OQ/PV kit is only part of the validation services available from Agilent Technologies. When implemented by qualified Agilent personnel, our service packages can be used to help validate your Agilent CE system.

CE System Start-up and Test Kits

Description	Part No.
CE Installation Qualification (IQ) Kit Includes buffer (20 mM borate, pH 9.3, 100 mL), test sample (4-(hydroxy)-acetophenone, 2 mL), capillary conditioning solution (0.1 N sodium hydroxide, 100 mL)	5063-6514
CE Operational Qualification Performance Verification (OQ/PV) Chemical Kit Includes buffer (20 mM borate, pH 9.3, 100 mL), test samples (0.1, 0.5, 1.0, and 5.0 mM 4-(hydroxy)-acetophenone, 2 mL ea.), capillary conditioning solution (0.1 N sodium hydroxide, 100 mL), test capillary (L 48.5 cm, I 40 cm, ID 50 µm), diskette with methods, sequence, spectral library. Note: Method is supported for G1600 only.	5063-6515
CE OQ/PV Chemicals Only Kit Includes buffer (20 mM borate, pH 9.3, 100 mL), test samples (0.1, 0.5, 1.0, and 5.0 mM 4-(hydroxy)-acetophenone, 2 mL)	5063-6520



IQ and OQ/PV test method

Sample:	p-Hydroxyacetophenone
Buffer:	20 mM Borate pH 9.2
Capillary:	I = 40 cm, L = 48.5 cm, 50 µm ID
Injection:	250 mbar*s
Voltage:	30 kV
Temperature:	20°C
Detector:	192/4 nm

Snap caps, polyurethane, 5181-1512, 5042-6491

Electrode assembly, standard (for G1600 only), G1600-60007

Electrode O-ring, silicone, 5062-8544

Electrolyte bottle, 500 mL, 9300-1748

Filter frit adapters, 5062-8517

Air filter, 5 µm, 3150-0619

Pre-puncher, G1600-67201

Screws for pre-puncher/insulation plate holding, G1600-62402

Instrument Parts and Supplies

Vials and Caps for CE

Description	Unit	Part No.
Crimp/snap top vial, 1 mL, Polypropylene, crimp/snap top	100/pk	5182-0567
Clear, wide opening crimp/snap top vial, 2 mL	100/pk	5182-9697
Clear, wide opening crimp/snap top glass vial, 2 mL	500/pk	5183-4623
Amber, wide opening crimp/snap top vial, write-on spot, 2 mL	100/pk	5183-4619
Crimp/snap top vial, 250 µL	1000/pk	9301-0978
Snap caps PEO (polyethylene olefin for chemical resistance)	100/pk	5181-1507
Snap caps PEO (polyethylene olefin for chemical resistance)	500/pk	5181-1513
Snap caps PUR (polyurethane for resealing)*	100/pk	5181-1512
Snap caps PUR (polyurethane for resealing)*	500/pk	5042-6491

*PUR caps are recommended to help prevent sample or buffer evaporation even after multiple injections

Instrument Supplies

Description	Unit	Part No.
Long life HiS Deuterium lamp (8-pin) with RFID tag		5190-0917
Deuterium lamp		2140-0585
Electrode assembly, standard (for G1600 only)		G1600-60007
Electrode assembly, short (for G1600 only)		G1600-60033
Electrode assembly, standard (for G7100 only)		G7100-60007
Electrode assembly, short (for G7100 only)		G7100-60033
Electrode O-ring, silicone	5/pk	5062-8544
Electrolyte bottle, 500 mL		9300-1748
Electrolyte bottle, 100 mL		5042-6478
Electrolyte bottle cap		9300-1747
Bottle sealing O-ring		0905-1163
Glass filter, solvent inlet, 20 µm		5041-2168
Filter frit adapter, 3 mm	4/pk	5062-8517
Bottle cap plug		G1600-23223
Air filter, 5 µm		3150-0619
Pre-puncher		G1600-67201
Screws for pre-puncher/insulation plate holding	10/pk	G1600-62402

CE column cutter, 5183-4669

Accessories

Description	Part No.
CE accessory kit Includes electrode tool, screwdriver, fuses, air filter, glass frit, vials and caps alignment interfaces (red and green) standard and 50 µm ID capillaries: L 64.5 cm, Standard: L 64.5 cm, Extended Light Path: L 48.5 cm	G7100-68705
Rack for 12 mm, 2 mL vials, holds 50 vials per rack, 5/pk	9301-0722
CE column cutter	5183-4669
Diamond blade replacement kit for CE column cutter	5183-4670
Capillary tubing cutter, 4/pk	5181-8836

Window etching tool, 590-3003

Window Etching Tool

The window etching tool is designed for fast, convenient and reproducible preparation of detection windows on fused-silica capillaries. The polyimide coating is removed without destroying the inner polymeric coating. The tool contains three glass blocks with fine grooves, precisely controlling the size of the windows.

Description	Part No.
Window etching tool, 3/pk	590-3003

Troubleshooting

Basic Capillary Electrophoresis Troubleshooting		
Symptom	**Possible Cause**	**Solution(s)**
Unstable Current		
Variable or no current	Air bubble formed in capillary	Flush capillary, ramp voltage to limit initial heating, and/or degas buffers.
	Clogged capillary	Flush capillary with absorbing solution (such as NaOH). A "step" on the baseline should be observed when viewing the online signal at 200 nm. If still plugged, flush manually with syringe or high pressure gas.
	Broken capillary	Replace capillary.
	No or incorrect solution in buffer vials	Fill/change buffer vials.
	Large volume injection	Normal situation. Current should stabilize during analysis.
Unstable Baseline		
Spikes in baseline	Precipitates in buffer	Filter buffer through 0.2 or 0.45 µm filter.
	Micro air bubbles in buffer	Degas buffer by ultrasonication or vacuum.
	Precipitation of sample	Verify that sample components are sufficiently soluble in buffer.
Noisy baseline	Optical slit in capillary interface is occluded	Clean slit with methanol or water. View under magnifier.
	Aging deuterium lamp	Use DAD test to measure lamp output and time-on. Replace if necessary.
	Data acquisition rate too high	Determine peak width and decrease acquisition rate if appropriate.
	Improper reference wavelength	Acquire UV spectrum during analysis. Use lowest wavelength possible without impinging where sample absorbs. Also use wide bandwidth.
	Buffer absorbs at detection wavelength	Use minimally UV-absorbing buffers such as phosphate and borate, especially below 210 nm.
Drifting baseline	Improper capillary alignment	Re-seat capillary cartridge in detector block.
	Unequilibrated temperature	Allow 10-20 minutes for equilibration after opening top cover.
	Lamp recently ignited	Allow 15-30 minutes for equilibration after igniting lamp.

(Continued)

Basic Capillary Electrophoresis Troubleshooting		
Symptom	**Possible Cause**	**Solution(s)**
Poor Peak Efficiency		
Broad peaks	Sample overloading	Decrease sample injection or concentration.
	Excessive Joule heating	Reduce voltage, buffer conductivity, or capillary ID.
Skewed peaks	Mismatched sample buffer ion mobilities	Match mobilities or increase difference between buffer and sample conductivity.
	Sample overloading	Decrease sample injection or concentration.
Tailing peaks	Adsorption to capillary wall	Use pH extremes, high buffer concentrations, polymer additives, or coated capillary.
Poor Migration Time Reproducibility		
Adsorption to capillary walls	Changes in EOF caused by buffer (especially phosphates and detergents) or sample adsorption	Condition capillary and allow sufficient equilibration time. Replace capillary.
Hysteresis of wall charge	Caused by conditioning capillary at high (or low) pH and employing a low (or high) pH runnning buffer	Avoid pH differences. Allow sufficient equilibration time.
Changes in buffer composition	pH changes due to electrolysis	Replenish buffer.
	Buffer evaporation	Tightly cap buffer vials and reduce carousel temperature.
	Conditioning solution waste flushed into outlet reservoir	Use separate vial to collect waste.
	Conditioning solution carried over into buffer vial	First dip capillary in separate buffer or water vial.
Buffer reservoirs not level	Generation of laminar flow	Level liquid in reservoirs. If not replenishing buffer, do not use inlet vial for flushing capillary.
Different silanol content of capillary batches	Different wall charge and variations in EOF	Measure EOF and normalize.
Temperature changes	Changes in viscosity and EOF	Use system with capillary thermostatting.

(Continued)

Basic Capillary Electrophoresis Troubleshooting		
Symptom	**Possible Cause**	**Solution(s)**
Poor Peak Area Reproducibility		
Sudden application of high voltage	Heating, thermal expansion of buffer, and expulsion of sample	Ramp separation voltage or inject buffer plug after sample.
Sample evaporation	Increasing sample concentration and peak area	Cap vials and/or reduce temperature of sample carousel.
Instrumental limitations	System rise time significant proportion of injection time	Increase injection time.
Sample carry-over	Extraneous injection	Use capillary with flat, smooth injection end. Remove polyimide from end of capillary.
Zero-injection caused by simply dipping the capillary in the sample	Extraneous injection	Cannot be totally eliminated. Increase injection amount to minimize effect.
Sample adsorption to capillary walls	Distorted peak shape (tailing) Non-eluting sample	Change buffer pH. Increase buffer concentration. Use additive such as cellulose or coated capillary.
Low signal-to-noise ratio	Integration errors	Optimize integration parameters. Increase sample concentration. Use peak height.
Temperature changes of capillary environment	Changes in viscosity and injection amount	Use system with capillary thermostatting.