CESI 8000 Plus High Performance Separation-ESI Module

- Increased coverage from limited samples
- High-resolution separation of polar analytes and critical PTMs
- In-depth characterization of proteoforms and protein complexes





Expand the reach of your mass spectrometer The CESI 8000 Plus High Performance Separation ESI Module

The CESI 8000 Plus is a valuable accessory for your mass spectrometer when analyzing charged and polar compounds in every analytical laboratory. The CESI 8000 Plus:

- Consumes minute samples with extraordinary sensitivity
- Excels at charged and polar metabolites, peptides and more
- Enables high-resolution separation of proteins and protein complexes
- Eliminates ion suppression bias so you can see what you've been missing
- Is robust and easy-to-use

CESI-MS "showed better separation efficiency and resolution with 100-fold less sample consumption compared to an LC-based intact protein separation."

John Yates III The Scripps Research Institute, La Jolla, CA, USA

CESI-MS "shows a separation efficiency for high-molecular-mass compounds like larger peptides and proteins that is remarkably higher than that seen with any LC method"

Herbert Lindner Innsbruck Medical University, Austria "CESI-MS is a high-end tool for metabolomics work in my lab"

Dr. Rawi Ramautar Leiden Academic Center for Drug Research, The Netherlands

"...high resolution CZE separation of intact glycoprotein species coupled to MS has significant potential for the in-depth characterization and quantitative analysis of biopharmaceutical proteoforms."

Barry Karger Barnett Institute, Northeastern University, Boston, MA, USA "With only a 200 fmol injection, CESI-MS/ MS enables high quality mass spectra while completely characterizing the primary structure of biotherapeutic proteins in terms of amino acid sequence, glycosylation and post-translational modifications. This allows you to see more with less, and strengthens the power of the methodology in the context of biosimilarity assessment."

Yannis-Nicolas Francois University of Strasbourg, France "With monoclonal antibodies having become such a significant class of drugs, not just in the biopharma space but the entire pharma, capillary electrophoresis has become an indispensable tool for monitoring product related impurities and product variants of these blockbuster drugs. Advances like the CESI 8000 now allow for the coupling of CE and MS and provide a solution for the desperately needed identification of peaks separated by capillary electrophoresis."

Timothy Blanc Eli Lilly



Connecting the CESI 8000 Plus to your MS is as easy as plug and spray.

Simply click the OptiMS cartridge tip into the source adapter.



More data from less sample

The CESI 8000 Plus High Performance Separation ESI Module

CESI-MS is particularly valuable for precious samples such as subcellular fractions, microdialysates, CSF, murine samples, CTCs, needle biopsies and FFPE archives, or highly toxic samples such as ADCs and venoms.

- Consumes minute samples with extraordinary sensitivity
- Unique multi-segment injection increases throughput 10X
- Extraordinary sensitivity and high resolution enable maximum information with minimal sample consumption (~50 nL per injection)



Using only 100 ng of yeast mitochondrial extract, CESI-MS significantly increased peptide identification, resulting in a substantial increase in the number and variety of proteins identified.



Kindly provided by Yannis-Nicolas Francois, University of Strasbourg, France.

Multiple experiments in the time of one, with <1 µL sample injected.

The unique multi-segment injection (MSI) feature significantly increases throughput. Multiple injections are separated by 60 seconds of background electrolyte injections for sequential MS analysis. This technique is commonly used with MRM targeted analyte detection.



Data from multiple samples in single MS detection run.

Example of high sensitivity from a limited sample







Each dot is related to a single MS/MS fragmentation spectrum.

Separate charged / polar molecules and proteins in high resolution

Measurements of highly charged analytes pose considerable challenges to current technologies. CESI is the method of choice for highresolution separation of polar metabolites, peptides and proteins rich in particular post-translational modifications (such as glycosylation, citrullination, methylation, and phosphorylation).

Electrophoretic separation combined with highly efficient ESI supports a variety of applications, from investigating the anionic and cationic metabolome, to the study of proteoforms, glycoforms, and multimeric protein complexes.

The separation of sugar phosphates in central metabolism and baseline separation of isobaric positional isomers such as citrate and isocitrate demonstrates CESI-MS' high resolving power. CESI is also the preferred technology for chiral compound separations in a cost-effective manner compared to chiral LC columns.





Kindly provided by Dr. Rawi Ramautar, Leiden Academic Center for Drug Research, The Netherlands.



Kindly provided by Herbert Lindner, Innsbruck Medical University, Austria.

For complex peptide mixture analysis, CESI excels at various posttranslational modifications (PTMs) revealing important biological functional variations.

For deep characterization of proteoforms, glycoforms, charge states and PTMs, CESI front-end technology enables liquid phase high resolution separation of proteins, metal binding and protein complexes. CESI-MS is an invaluable tool to drive biopharmaceutical development and biochemical mechanistic studies.

For more information, visit: **sciex.com/CESI800plus**

Intact MAb Separation of IgG1 by CESI-MS



Principles and design of **CESI**

CESI technology integrates capillary electrophoresis (CE) with electrospray ionization (ESI) into a single dynamic process within the same device.

CESI was developed as a new front-end separation and ionization technique, combining the high efficiency and ultra-low flow of CE with ESI. This ESI optimization has shown to greatly improve assay sensitivity while reducing ion suppression bias.^{1,2}

Schematic of CESI sprayer





^{1.} Kelly RT, Page JS, Zhao R, Qian W, Mottaz HM, Tang K, Smith RD, Anal.Chem. 2008, 80, 143-149 2. Schmidt A, Karas M, Dulks T, J., Am. Soc. Mass Spectrom. 2003, 14, 492-500

The CESI 8000 Plus was developed in collaboration with mass spectrometry researchers covering a number of applications. They sought to expand their range of detection and increase sensitivity. In order to achieve this, ultra-low flow separation was integrated with mass spectrometry using proprietary CESI-MS technology.

The sprayer, located within a protective housing of the OptiMS cartridge, combines an intrinsically low-flow CE separation with electrospray ionization (ESI) within a single device.

- The CESI OptiMS capillary inlet and outlet are of the same inner diameter
- The electrical contact for CE separation as well as for ESI generation is achieved through the ESI metal needle filled with conductive fluid
- Ultra low flow at the porous capillary tip instantly generates a fine ESI spray when a low voltage ~ 1.25 KV is applied
- The low voltage of CESI-MS reduces oxidation artifacts

Zero dead-volume design

A single continuous separation capillary is contained within the **OptiMS cartridge**, with the same internal diameter from sample to spray. This design:

- Eliminates sample carry-over
- Increases robustness



Sample inlet

- Does not require lengthy column equilibration
- Reduces sample-to-sample injection time

Multiple experiments / sample analyses from as little as 5 µL

The **nanoVials** have been validated for use with 5 μL of sample. With careful pipetting, injections from as little as 1 µL are possible. CESI-MS has ultra-low sample consumption, leaving most of the material available for analysis by orthogonal techniques.

Service, support and consumables

Our customer support organization has access to the latest product updates, software revisions, methods and repair procedures. The following is available to further optimize your use of CESI-MS:

- Application training
- Operation gualification (OQ)
- Chemistries for MS as well as optical detection

CESI 8000 Plus mobile design

The CESI 8000 Plus comes equipped with an electric height adjustable mobile lab bench.

• Switching between nanoLC and CESI is swift and simple

Workflows-assays and method development



Multi-MS connectivity and multi-detection capability

In CESI-MS mode, the CESI 8000 Plus can be connected to a variety of MS brands and models. In stand-alone CE mode, UV/VIS, PDA, or LIF detection can be selected. This allows for the analysis of biologics using our CE-SDS, cIEF and glycan chemistries.

MS analysis



CESI 8000 Plus easy-to-use software



1. Appli	Application 2. Gemples/Visis 3 Accustion										Buer nume: cesi Application: CE.MS Saquance temptate: CEMS Bac							
Number	-	e (16);				Colocad 1	agente pr	en Seg	panico Report								Depter	Cente
Owtput	day path	CUICAN	Pacijes	CHART NEWS	da		Bronne D	int Hel	hod Report		-	ofe ince	et biter			and in the set		
		IN CUSton					Brance				1.1.1			111	1		and the second second	
Owner	sequence	Post C.Co.Cards	(HID	CRINCEL MEND	alaisequence		Brance					10	60	53	λ.			
Ba	of B	in Type Re		Inject Intel	Songle ID		Hellod		Data File *	il	1 (1)	(10)		e (at	i.			
	1 1945			SEAT	20110411_B		C-122Karafipre			1		6	Q.	16				
	2 Unio			SRA2	20110411_8					-	10	-	20					
	2. UNIO			SEA)			CARRANTIPO		2010411_8864	-1	0.0	100	90	9.6				
	4 Links			SEAL SEAL			CSI2Karafipre				M (H	(10)	B)(1 (H)				
	5 Links			244			C VICE and pro		20110411_Base 20110411_Base		10 10	(m)		a (n	8			
	7 Unio			(II A)			C:32Earafipre				10	3	20	5.8				
	E Unit			CAN IN CONTRACT					20110411_Dasic	10.5	20	10		9.6				
	e Links			SLAI	20110411 B		C\32Earaflare			181	M (8)	(a)	30	10				
	12 Links			SA ST			CARLaration						-			Diefer Get	(CRE IN	
	E UNIC	and the second		SEAT			CARLANATION			110	310	151		110	1.10	2 8	1.10	ų,
	2 UNK	own		MR	20110411 8	ant D	C-SIZE and pro	enchia.	20110411 Basic	-0	9.6	19	80	빈명	19	66	1010	2
	13 UND	-	1	SE AS	20110411_B	88. D	CUREwallpre	pets.	20110411_Basic		58	1	6		10	(8)(8)	00 4	87
	4 Links	une:	-	MIC	20110411_8	mic D	C132Eaudipre	(ectal.	20110411_flask		10 (H	10		8) (B)	4 (4)			
- 1	IS UNU	ever .		TAR			C.\32Karafipre				10 (B)	(8)	606	a) (a)	3 40	(10)(11)	(44) (4	a)
	IS Unic			GR.AL					20110411_Dasic	1	10 10	(0)	1		14		6	1
1	17 Uwlo	ener.	1	SILA1	20110411_8	lank -	C:\32Karafipre	inche.	20110411_Dasie			9	Ξ.	. 92	1	66	22	2

Ready for use within minutes

Simply select one of the pre-loaded methods, follow visuals to place samples and reagents and hit START.



Flexible yet expandable

Select programmed control or direct control to maximize throughput and optimize separation performance.

Visual and intuitive

The layout of the user interface mimics the instrument to enable direct tracking of sample contents.

Dimensions

Height: 29.2 in (74.2 cm) Door Open: 38.8 in (98.6 cm) Width: 25 in (63.5 cm) Depth: 28.4 in (72.1 cm)

with memory settings

(69 - 112 cm)

Weight (uncrated)

188 lbs (85.3 kg) Electrical requirements:

Voltage range

1 to 30 kV programmable at 0.1 kV increments

Current range

3 to 300 μA programmable at 0.1 µA increments

15 - 30° C 20 - 60% relative humidity (non-condensing)

Module specifications

Height adjustable portable lab bench

36 in x 30 in (91.4 cm x 76.2 cm) Height adjustable from 27 in to 44 in

Voltage: 100 - 240 V; 50/60 Hz

Operating environment range

Sample trays 2 x 48 CESI vials/0.3 mL microvials

Buffer tray 2 x 36 CESI vials

Sample temperature adjustment sange 4 - 60° C

Capillary temperature adjustment range

15 - 30° C

Stand-alone capillary temperature adjustment range

15 - 60° C

Pressure delivery range -5 to +100 psi

Minimum required sample Volume

50 μL when using microvials 5 μL when using nanoVials



A98089: CESI 8000 Plus High Performance Separation -**ESI Module**

Includes CE separation module, OptiMS Sprayer technology and UV detector ready for stand-alone or CESI-MS analysis. Also includes computer, monitor and system controller pre-loaded with the CESI 8000 Plus software. An electric height adjustable mobile lab bench makes switching between CESI-MS and other front-end separation instruments swift and simple.

30 μm ID, 150 μm OD x 90 cm Contains bare fused silica capillary for high-resolution separation of peptides, glycans, amino acids and nucleotides/nucleosides.

PDA detector



Ordering information

B07367: Silica Surface OptiMS Cartridge

B07368: Neutral OptiMS Cartridge

30 μm ID, 150 μm OD x 90 cm

Contains covalently attached neutral hydrophilic capillary surface enabling high resolution separation of intact proteins and protein/ peptide/small molecule/metal complexes.

5043467: nanoVial

5 μL starting volume validated, 1 μL starting volume demonstrated

A59494: LIF Detector Upgrade (optional)

Solid state laser and detector

B68372: PDA Detector Upgrade (optional)

Biologic Characterization Kits

390953: SDS-MW Assay Kit/Purity/Sizing 477600: Carbohydrate Labeling and Analysis Assay A58481: cIEF Peptide Marker Kit (pl Marker Kit) A80976: Advancied cIEF Starter Kit

CESI OptiMS Adapter Kits

B07363: Adapter for Sciex NanoSpray III Ion Source B07366: Adapter for Thermo Scientific Nanospray II Ion Source B83386: Adapter for Thermo Scientific Nanospray Flex and Nanospray Flex NG Ion Sources

B85397: Adapter for Waters NanoLockSpray and Waters NanoFlow Ion Sources

B86099: Adapter for Bruker Mass Spectrometers

For more product information on our capillary electrophoresis systems visit **sciex.com/ceproducts**

For information on CESI 8000 Plus and supported MS models/ sources, contact your SCIEX representative.

The SCIEX clinical diagnostic portfolio is For In Vitro Diagnostic Use. Rx Only. Product(s) not available in all countries. For information on availability, please contact your local sales representative or refer to https://sciex.com/diagnostics. All other products are For Research Use Only. Not for use in Diagnostic Procedures. Trademarks and/or registered trademarks mentioned herein are the property of AB Sciex Pte. Ltd. or their respective owners in the United States and/or certain other countries. © 2020 DH Tech. Dev. Pte. Ltd. RUO-MKT-03-2678-H 02/2020. AB SCIEX™ is being used under license.

Headquarters

500 Old Connecticut Path Framingham, MA 01701 USA Phone 508-383-7700 sciex.com

International Sales

For our office locations please call the division headquarters or refer to our website at sciex.com/offices

