



The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at ***wvOASIS.gov***. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at ***WVPurchasing.gov*** with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.

## Header 1

List View

General Information [Contact](#) [Default Values](#) [Discount](#) [Document Information](#) [Clarification Request](#)

Procurement Folder: 957915

SO Doc Code: CRFQ

Procurement Type: Central Contract - Fixed Amt

SO Dept: 0506

Vendor ID: 

SO Doc ID: CME2200000004

Legal Name: SHIMADZU SCIENTIFIC INSTRUMENT

Published Date: 3/23/22

Alias/DBA:

Close Date: 4/12/22

Total Bid: \$388,735.15

Close Time: 13:30

Response Date: 

Status: Closed

Response Time: 

Solicitation Description:  

Responded By User ID: 

Total of Header Attachments: 1

First Name: 

Total of All Attachments: 1

Last Name: 

Email: 

Phone:



Department of Administration  
Purchasing Division  
2019 Washington Street East  
Post Office Box 50130  
Charleston, WV 25305-0130

State of West Virginia  
Solicitation Response

**Proc Folder:** 957915  
**Solicitation Description:** LCMS/MS TRIPLE QUAD SYSTEM  
**Proc Type:** Central Contract - Fixed Amt

| Solicitation Closes | Solicitation Response        | Version |
|---------------------|------------------------------|---------|
| 2022-04-12 13:30    | SR 0506 ESR04112200000006233 | 1       |

**VENDOR**  
000000193062  
SHIMADZU SCIENTIFIC INSTRUMENT

**Solicitation Number:** CRFQ 0506 CME2200000004  
**Total Bid:** 388735.1500000000232830643653 **Response Date:** 2022-04-11 **Response Time:** 20:10:06  
**Comments:** There is not a place to enter the shipping charges for the order. The shipping for this instrument is \$1200.00.

**FOR INFORMATION CONTACT THE BUYER**  
Crystal G Hustead  
(304) 558-2402  
crystal.g.hustead@wv.gov

**Vendor**  
**Signature X** **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

| Line | Comm Ln Desc                | Qty     | Unit Issue | Unit Price    | Ln Total Or Contract Amount |
|------|-----------------------------|---------|------------|---------------|-----------------------------|
| 1    | LC/MS/MS Triple Quad System | 1.00000 | EA         | 283066.550000 | 283066.55                   |

| Comm Code | Manufacturer | Specification | Model # |
|-----------|--------------|---------------|---------|
| 42000000  |              |               |         |

Commodity Line Comments:

Extended Description:

SECTION 3.1 LC/MS/MS TRIPLE QUAD SYSTEM  
UHPLC  
PUMPING SYSTEM

| Line | Comm Ln Desc       | Qty     | Unit Issue | Unit Price   | Ln Total Or Contract Amount |
|------|--------------------|---------|------------|--------------|-----------------------------|
| 2    | Nitrogen Generator | 1.00000 | EA         | 24689.100000 | 24689.10                    |

| Comm Code | Manufacturer | Specification | Model # |
|-----------|--------------|---------------|---------|
| 42000000  |              |               |         |

Commodity Line Comments:

Extended Description:

Nitrogen Generator  
The supplied generator must meet the requirements of the LC/MS/MS system.

| Line | Comm Ln Desc  | Qty     | Unit Issue | Unit Price   | Ln Total Or Contract Amount |
|------|---------------|---------|------------|--------------|-----------------------------|
| 3    | Plate Changer | 1.00000 | EA         | 12347.400000 | 12347.40                    |

| Comm Code | Manufacturer | Specification | Model # |
|-----------|--------------|---------------|---------|
| 42000000  |              |               |         |

Commodity Line Comments:

Extended Description:

Plate changer  
The system must include a plate changer to allow for expansion of up to 16 additional deep well microtiter plates.



| Line | Comm Ln Desc                 | Qty     | Unit Issue | Unit Price   | Ln Total Or Contract Amount |
|------|------------------------------|---------|------------|--------------|-----------------------------|
| 4    | Customer Support and Service | 1.00000 | EA         | 53698.900000 | 53698.90                    |

| Comm Code | Manufacturer | Specification | Model # |
|-----------|--------------|---------------|---------|
| 81112201  |              |               |         |

**Commodity Line Comments:**

**Extended Description:**

Customer Support and Service 3.9.1 through 3.9.8

| Line | Comm Ln Desc                 | Qty     | Unit Issue | Unit Price  | Ln Total Or Contract Amount |
|------|------------------------------|---------|------------|-------------|-----------------------------|
| 5    | Uninterruptible Power Supply | 1.00000 | EA         | 8238.200000 | 8238.20                     |

| Comm Code | Manufacturer | Specification | Model # |
|-----------|--------------|---------------|---------|
| 42000000  |              |               |         |

**Commodity Line Comments:**

**Extended Description:**

Uninterruptible Power Supply

The package must include an Uninterruptible Power Supply (UPS) to power the system during a power outage or fluctuations until the generator is available.

| Line | Comm Ln Desc                  | Qty     | Unit Issue | Unit Price  | Ln Total Or Contract Amount |
|------|-------------------------------|---------|------------|-------------|-----------------------------|
| 6    | Toxicology Spectral Libraries | 1.00000 | EA         | 6695.000000 | 6695.00                     |

| Comm Code | Manufacturer | Specification | Model # |
|-----------|--------------|---------------|---------|
| 42000000  |              |               |         |

**Commodity Line Comments:**

**Extended Description:**

Toxicology Spectral Libraries

The package must include applicable toxicology spectral libraries for comparison of detected compounds.

**SEALED BID**  
**BUYER: Crystal Hustead**  
**SOLICITATION NO: CRFQ CME2200000004**  
**BID OPENING DATE: APRIL 12, 2022**  
**BID OPENING TIME: 1:30PM ET**  
**FAX NUMBER: 304-558-3970**

## LCMS/MS Triple Quad System SOLICITATION NO: CRFQ CME2200000004



### Shimadzu LCMS-8050 with Nexera X3 UHPLC Front End

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Department of Administration  
Purchasing Division  
2019 Washington Street East  
Post Office Box 50130  
Charleston, WV 25305-0130


State of West Virginia  
Centralized Request for Quote  
Laboratory

|  |                            |                         |                                 |
|--|----------------------------|-------------------------|---------------------------------|
| <b>Proc Folder:</b> 957915                         |                            |                         | <b>Reason for Modification:</b> |
| <b>Doc Description:</b> LCMS/MS TRIPLE QUAD SYSTEM |                            |                         |                                 |
| <b>Proc Type:</b> Central Contract - Fixed Amt     |                            |                         |                                 |
| <b>Date Issued</b>                                 | <b>Solicitation Closes</b> | <b>Solicitation No</b>  | <b>Version</b>                  |
| 2022-03-23   | 2022-04-12 13:30           | CRFQ 0506 CME2200000004 | 1                               |

|   |
|---|
| <b>BID RECEIVING LOCATION</b>   |
| BID CLERK<br>DEPARTMENT OF ADMINISTRATION<br>PURCHASING DIVISION<br>2019 WASHINGTON ST E<br>CHARLESTON WV 25305<br>US |

|  |                       |                    |
|--|-----------------------|--------------------|
| <b>VENDOR</b>  |                       |                    |
| <b>Vendor Customer Code:</b> 000000193062                  |                       |                    |
| <b>Vendor Name :</b> Shimadzu Scientific Instruments, Inc. |                       |                    |
| <b>Address :</b>   |                       |                    |
| <b>Street :</b> 7102 Riverwood Dr                          |                       |                    |
| <b>City :</b> Columbia                                     |                       |                    |
| <b>State :</b> MD  | <b>Country :</b> USA  | <b>Zip :</b> 21046 |
| <b>Principal Contact :</b> Faith Hays, Ph.D.               |                       |                    |
| <b>Vendor Contact Phone:</b> 919-425-2534                  | <b>Extension:</b> N/A |                    |

|   |
|---|
| <b>FOR INFORMATION CONTACT THE BUYER</b>                        |
| Crystal G Hustead<br>(304) 558-2402<br>crystal.g.hustead@wv.gov |

|                           |   |                         |                    |
|---------------------------|---|-------------------------|--------------------|
| <b>Vendor Signature X</b> |  | <b>FEIN#</b> 52-1035956 | <b>DATE</b> 4/5/22 |
|---------------------------|---|-------------------------|--------------------|

All offers subject to all terms and conditions contained in this solicitation

**ADDITIONAL INFORMATION**

THE STATE OF WEST VIRGINIA PURCHASING DIVISION FOR THE AGENCY, WEST VIRGINIA DEPARTMENT OF HEALTH AND HUMAN RESOURCES, OFFICE OF CHIEF MEDICAL EXAMINER, IS SOLICITING BIDS TO ESTABLISH A CONTRACT FOR A LC/MS/MS TRIPLE QUAD SYSTEM PER THE ATTACHED DOCUMENTS.

\*\*\*QUESTIONS REGARDING THE SOLICITATION MUST BE SUBMITTED IN WRITING TO CRYSTAL.G.HUSTEAD@WV.GOV PRIOR TO THE QUESTION PERIOD DEADLINE CONTAINED IN THE INSTRUCTIONS TO VENDORS SUBMITTING BIDS\*\*\*

**INVOICE TO**

HEALTH AND HUMAN  
RESOURCES  
BUREAU FOR PUBLIC  
HEALTH OFFICE CHIEF  
MEDICAL EXAMINER  
619 VIRGINIA ST WEST  
CHARLESTON WV  
US

**SHIP TO**

HEALTH AND HUMAN  
RESOURCES  
BUREAU FOR PUBLIC  
HEALTH OFFICE CHIEF  
MEDICAL EXAMINER  
619 VIRGINIA ST W  
CHARLESTON WV  
US

| Line | Comm Ln Desc                | Qty     | Unit Issue | Unit Price   | Total Price  |
|------|-----------------------------|---------|------------|--------------|--------------|
| 1    | LC/MS/MS Triple Quad System | 1.00000 | EA         | \$466,064.00 | \$283,066.55 |

| Comm Code | Manufacturer                          | Specification   | Model # |
|-----------|---------------------------------------|---|---------|
| 42000000  | Shimadzu Scientific Instruments, Inc. | LCMS-8050 with Nexera X3 UHPLC as per enclosed quote<br>SSI 179472-B3Q9 Rev. 3 and bid letter |         |

**Extended Description:**

SECTION 3.1 LC/MS/MS TRIPLE QUAD SYSTEM  
UHPLC  
PUMPING SYSTEM  
AUTOSAMPLER  
COLUMN OVEN  
TRIPLE QUADRUPOLE MASS SPECTROMETER

| INVOICE TO   |  |  | SHIP TO   |  |  |
|--|--|--|---|--|--|
| HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST WEST<br>CHARLESTON WV<br>US |  |  | HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST W<br>CHARLESTON WV<br>US |  |  |

| Line | Comm Ln Desc       | Qty     | Unit Issue | Unit Price  | Total Price |
|------|--------------------|---------|------------|-------------|-------------|
| 2    | Nitrogen Generator | 1.00000 | EA         | \$29,046.00 | \$24,689.10 |

| Comm Code | Manufacturer | Specification   | Model # |
|-----------|--------------|---|---------|
| 42000000  | LNI          | LNI Swissgas Nitrogen and Air Generator-NGA Castore XL iQ 20.40<br>Shimadzu part number #220-91491-65 |         |

**Extended Description:**

Nitrogen Generator

The supplied generator must meet the requirements of the LC/MS/MS system.

| INVOICE TO   |  |  | SHIP TO   |  |  |
|--|--|--|---|--|--|
| HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST WEST<br>CHARLESTON WV<br>US |  |  | HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST W<br>CHARLESTON WV<br>US |  |  |

| Line | Comm Ln Desc  | Qty     | Unit Issue | Unit Price  | Total Price |
|------|---------------|---------|------------|-------------|-------------|
| 3    | Plate Changer | 1.00000 | EA         | \$18,996.00 | \$12,347.40 |

| Comm Code | Manufacturer                          | Specification   | Model # |
|-----------|---------------------------------------|---|---------|
| 42000000  | Shimadzu Scientific Instruments, Inc. | Plate Changer +Plate Changer Coupling Kit Second<br>228-65110-58+228-71766-41 |         |

**Extended Description:**

Plate changer

The system must include a plate changer to allow for expansion of up to 16 additional deep well microtiter plates.

| INVOICE TO   |  |  | SHIP TO   |  |  |
|--|--|--|---|--|--|
| HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST WEST<br>CHARLESTON WV<br>US |  |  | HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST W<br>CHARLESTON WV<br>US |  |  |

| Line | Comm Ln Desc                 | Qty     | Unit Issue | Unit Price  | Total Price |
|------|------------------------------|---------|------------|-------------|-------------|
| 4    | Customer Support and Service | 1.00000 | EA         | \$72,331.00 | \$53,698.90 |

| Comm Code | Manufacturer                          | Specification  | Model # |
|-----------|---------------------------------------|--|---------|
| 81112201  | Shimadzu Scientific Instruments, Inc, | Three Year(36 month) Value Plan Service Agreement<br>-3 years of Extended Warranty + 2 Premium PM Visits |         |

**Extended Description:**  
Customer Support and Service 3.9.1 through 3.9.8  
3YVP + 220-99999-C4  
+220-91491-69

| INVOICE TO   |  |  | SHIP TO   |  |  |
|--|--|--|---|--|--|
| HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST WEST<br>CHARLESTON WV<br>US |  |  | HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST W<br>CHARLESTON WV<br>US |  |  |

| Line | Comm Ln Desc                 | Qty     | Unit Issue | Unit Price | Total Price |
|------|------------------------------|---------|------------|------------|-------------|
| 5    | Uninterruptible Power Supply | 1.00000 | EA         | \$9,692.00 | \$8,238.20  |

| Comm Code | Manufacturer    | Specification                       | Model # |
|-----------|-----------------|-------------------------------------|---------|
| 42000000  | Ametek PowerVar | UPS 5.2kVa, for LCMS, ABCDEF5202-22 |         |

**Extended Description:**  
Uninterruptible Power Supply  
The package must include an Uninterruptible Power Supply (UPS) to power the system during a power outage or fluctuations until the generator is available.



| INVOICE TO   |  |  | SHIP TO   |  |  |
|--|--|--|---|--|--|
| HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST WEST<br>CHARLESTON WV<br>US |  |  | HEALTH AND HUMAN<br>RESOURCES<br>BUREAU FOR PUBLIC<br>HEALTH OFFICE CHIEF<br>MEDICAL EXAMINER<br>619 VIRGINIA ST W<br>CHARLESTON WV<br>US |  |  |

| Line | Comm Ln Desc                  | Qty     | Unit Issue | Unit Price  | Total Price |
|------|-------------------------------|---------|------------|-------------|-------------|
| 6    | Toxicology Spectral Libraries | 1.00000 | EA         | \$10,300.00 | \$6,695.00  |

| Comm Code | Manufacturer                          | Specification  | Model #      |
|-----------|---------------------------------------|--|--------------|
| 42000000  | Shimadzu Scientific Instruments, Inc. | LCMS Method Package - Rapid<br>Toxicology Screening System Ver 3 | 225-32489-91 |

**Extended Description:**

Toxicology Spectral Libraries

The package must include applicable toxicology spectral libraries for comparison of detected compounds.

**SCHEDULE OF EVENTS**

| <u>Line</u> | <u>Event</u>             | <u>Event Date</u> |
|-------------|--------------------------|-------------------|
| 1           | VENDOR QUESTION DEADLINE | 2022-03-30        |

## **INSTRUCTIONS TO VENDORS SUBMITTING BIDS**

**1. REVIEW DOCUMENTS THOROUGHLY:** The attached documents contain a solicitation for bids. Please read these instructions and all documents attached in their entirety. These instructions provide critical information about requirements that if overlooked could lead to disqualification of a Vendor's bid. All bids must be submitted in accordance with the provisions contained in these instructions and the Solicitation. Failure to do so may result in disqualification of Vendor's bid.

**2. MANDATORY TERMS:** The Solicitation may contain mandatory provisions identified by the use of the words "must," "will," and "shall." Failure to comply with a mandatory term in the Solicitation will result in bid disqualification.

**3. PREBID MEETING:** The item identified below shall apply to this Solicitation.

☒ A pre-bid meeting will not be held prior to bid opening

☐ A **MANDATORY PRE-BID** meeting will be held at the following place and time:

All Vendors submitting a bid must attend the mandatory pre-bid meeting. Failure to attend the mandatory pre-bid meeting shall result in disqualification of the Vendor's bid. No one individual is permitted to represent more than one vendor at the pre-bid meeting. Any individual that does attempt to represent two or more vendors will be required to select one vendor to which the individual's attendance will be attributed. The vendors not selected will be deemed to have not attended the pre-bid meeting unless another individual attended on their behalf.

An attendance sheet provided at the pre-bid meeting shall serve as the official document verifying attendance. Any person attending the pre-bid meeting on behalf of a Vendor must list on the attendance sheet his or her name and the name of the Vendor he or she is representing.

Additionally, the person attending the pre-bid meeting should include the Vendor's E-Mail address, phone number, and Fax number on the attendance sheet. It is the Vendor's responsibility to locate the attendance sheet and provide the required information. Failure to complete the attendance sheet as required may result in disqualification of Vendor's bid.

All Vendors should arrive prior to the starting time for the pre-bid. Vendors who arrive after the starting time but prior to the end of the pre-bid will be permitted to sign in but are charged with knowing all matters discussed at the pre-bid.

Questions submitted at least five business days prior to a scheduled pre-bid will be discussed at the pre-bid meeting if possible. Any discussions or answers to questions at the pre-bid meeting  
Revised 02/08/2022

are preliminary in nature and are non-binding. Official and binding answers to questions will be published in a written addendum to the Solicitation prior to bid opening.

**4. VENDOR QUESTION DEADLINE:** Vendors may submit questions relating to this Solicitation to the Purchasing Division. Questions must be submitted in writing. All questions must be submitted on or before the date listed below and to the address listed below to be considered. A written response will be published in a Solicitation addendum if a response is possible and appropriate. Non-written discussions, conversations, or questions and answers regarding this Solicitation are preliminary in nature and are nonbinding.

Submitted e-mails should have solicitation number in the subject line.

Question Submission Deadline: March 30, 2022 at 10:00 AM ET

Submit Questions to: Crystal Hustead  
2019 Washington Street, East  
Charleston, WV 25305  
Fax: (304) 558-3970  
Email: Crystal.G.Hustead@wv.gov

**5. VERBAL COMMUNICATION:** Any verbal communication between the Vendor and any State personnel is not binding, including verbal communication at the mandatory pre-bid conference. Only information issued in writing and added to the Solicitation by an official written addendum by the Purchasing Division is binding.

**6. BID SUBMISSION:** All bids must be submitted electronically through wvOASIS or signed and delivered by the Vendor to the Purchasing Division at the address listed below on or before the date and time of the bid opening. Any bid received by the Purchasing Division staff is considered to be in the possession of the Purchasing Division and will not be returned for any reason. The Purchasing Division will not accept bids, modification of bids, or addendum acknowledgment forms via e-mail. Acceptable delivery methods include electronic submission via wvOASIS, hand delivery, delivery by courier, or facsimile.

The bid delivery address is:  
Department of Administration, Purchasing Division  
2019 Washington Street East  
Charleston, WV 25305-0130

A bid that is not submitted electronically through wvOASIS should contain the information listed below on the face of the envelope or the bid may be rejected by the Purchasing Division.:

**SEALED BID:**  
**BUYER:** Crystal Hustead  
**SOLICITATION NO.:** CRFQ CME2200000004  
**BID OPENING DATE:** April 12, 2022  
**BID OPENING TIME:** 1:30 PM ET  
**FAX NUMBER:** 304-558-3970

Revised 02/08/2022

The Purchasing Division may prohibit the submission of bids electronically through wvOASIS at its sole discretion. Such a prohibition will be contained and communicated in the wvOASIS system resulting in the Vendor's inability to submit bids through wvOASIS. Submission of a response to a Request for Proposal is not permitted in wvOASIS.

**For Request For Proposal ("RFP") Responses Only:** In the event that Vendor is responding to a request for proposal, the Vendor shall submit one original technical and one original cost proposal prior to the bid opening date and time identified in Section 7 below, plus n/a convenience copies of each to the Purchasing Division at the address shown above. Additionally, the Vendor should clearly identify and segregate the cost proposal from the technical proposal in a separately sealed envelope.

**7. BID OPENING:** Bids submitted in response to this Solicitation will be opened at the location identified below on the date and time listed below. Delivery of a bid after the bid opening date and time will result in bid disqualification. For purposes of this Solicitation, a bid is considered delivered when confirmation of delivery is provided by wvOASIS (in the case of electronic submission) or when the bid is time stamped by the official Purchasing Division time clock (in the case of hand delivery).

**Bid Opening Date and Time:** April 12, 2022 at 1:30 PM ET

**Bid Opening Location:** Department of Administration, Purchasing Division  
2019 Washington Street East  
Charleston, WV 25305-0130

**8. ADDENDUM ACKNOWLEDGEMENT:** Changes or revisions to this Solicitation will be made by an official written addendum issued by the Purchasing Division. Vendor should acknowledge receipt of all addenda issued with this Solicitation by completing an Addendum Acknowledgment Form, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

**9. BID FORMATTING:** Vendor should type or electronically enter the information onto its bid to prevent errors in the evaluation. Failure to type or electronically enter the information may result in bid disqualification.

**10. ALTERNATE MODEL OR BRAND:** Unless the box below is checked, any model, brand, or specification listed in this Solicitation establishes the acceptable level of quality only and is not intended to reflect a preference for, or in any way favor, a particular brand or vendor. Vendors may bid alternates to a listed model or brand provided that the alternate is at least equal to the model or brand and complies with the required specifications. The equality of any alternate being bid shall be determined by the State at its sole discretion. Any Vendor bidding an alternate model or brand should clearly identify the alternate items in its bid and should include manufacturer's specifications, industry literature, and/or any other relevant documentation demonstrating the equality of the alternate items. Failure to provide information for alternate items may be grounds for rejection of a Vendor's bid.

☐ This Solicitation is based upon a standardized commodity established under W. Va. Code § 5A-3-61. Vendors are expected to bid the standardized commodity identified. Failure to bid the standardized commodity will result in your firm's bid being rejected.

**11. EXCEPTIONS AND CLARIFICATIONS:** The Solicitation contains the specifications that shall form the basis of a contractual agreement. Vendor shall clearly mark any exceptions, clarifications, or other proposed modifications in its bid. Exceptions to, clarifications of, or modifications of a requirement or term and condition of the Solicitation may result in bid disqualification.

**12. COMMUNICATION LIMITATIONS:** In accordance with West Virginia Code of State Rules §148-1-6.6, communication with the State of West Virginia or any of its employees regarding this Solicitation during the solicitation, bid, evaluation or award periods, except through the Purchasing Division, is strictly prohibited without prior Purchasing Division approval. Purchasing Division approval for such communication is implied for all agency delegated and exempt purchases.

**13. REGISTRATION:** Prior to Contract award, the apparent successful Vendor must be properly registered with the West Virginia Purchasing Division and must have paid the \$125 fee, if applicable.

**14. UNIT PRICE:** Unit prices shall prevail in cases of a discrepancy in the Vendor's bid.

**15. PREFERENCE:** Vendor Preference may be requested in purchases of motor vehicles or construction and maintenance equipment and machinery used in highway and other infrastructure projects. Any request for preference must be submitted in writing with the bid, must specifically identify the preference requested with reference to the applicable subsection of West Virginia Code § 5A-3-37, and must include with the bid any information necessary to evaluate and confirm the applicability of the requested preference. A request form to help facilitate the request can be found at:

<http://www.state.wv.us/admin/purchase/vrc/Venpref.pdf>.

**15A. RECIPROCAL PREFERENCE:** The State of West Virginia applies a reciprocal preference to all solicitations for commodities and printing in accordance with W. Va. Code § 5A-3-37(b). In effect, non-resident vendors receiving a preference in their home states, will see that same preference granted to West Virginia resident vendors bidding against them in West Virginia. Any request for reciprocal preference must include with the bid any information necessary to evaluate and confirm the applicability of the preference. A request form to help facilitate the request can be found at: <http://www.state.wv.us/admin/purchase/vrc/Venpref.pdf>.

**16. SMALL, WOMEN-OWNED, OR MINORITY-OWNED BUSINESSES:** For any solicitations publicly advertised for bid, in accordance with West Virginia Code §5A-3-37(a)(7) and W. Va. CSR § 148-22-9, any non-resident vendor certified as a small, women-owned, or minority-owned business under W. Va. CSR § 148-22-9 shall be provided the same preference made available to any resident vendor. Any non-resident small, women-owned, or minority-owned business must identify itself as such in writing, must submit that writing to the Purchasing Division with its bid, and must be properly certified under W. Va. CSR § 148-22-9 prior to contract award to receive the preferences made available to resident vendors. Preference

for a non-resident small, women-owned, or minority owned business shall be applied in accordance with W. Va. CSR § 148-22-9.

**17. WAIVER OF MINOR IRREGULARITIES:** The Director reserves the right to waive minor irregularities in bids or specifications in accordance with West Virginia Code of State Rules § 148-1-4.6.

**18. ELECTRONIC FILE ACCESS RESTRICTIONS:** Vendor must ensure that its submission in wvOASIS can be accessed and viewed by the Purchasing Division staff immediately upon bid opening. The Purchasing Division will consider any file that cannot be immediately accessed and viewed at the time of the bid opening (such as, encrypted files, password protected files, or incompatible files) to be blank or incomplete as context requires and are therefore unacceptable. A vendor will not be permitted to unencrypt files, remove password protections, or resubmit documents after bid opening to make a file viewable if those documents are required with the bid. A Vendor may be required to provide document passwords or remove access restrictions to allow the Purchasing Division to print or electronically save documents provided that those documents are viewable by the Purchasing Division prior to obtaining the password or removing the access restriction.

**19. NON-RESPONSIBLE:** The Purchasing Division Director reserves the right to reject the bid of any vendor as Non-Responsible in accordance with W. Va. Code of State Rules § 148-1-5.3, when the Director determines that the vendor submitting the bid does not have the capability to fully perform or lacks the integrity and reliability to assure good-faith performance.”

**20. ACCEPTANCE/REJECTION:** The State may accept or reject any bid in whole, or in part in accordance with W. Va. Code of State Rules § 148-1-4.5. and § 148-1-6.4.b.”

**21. YOUR SUBMISSION IS A PUBLIC DOCUMENT:** Vendor’s entire response to the Solicitation and the resulting Contract are public documents. As public documents, they will be disclosed to the public following the bid/proposal opening or award of the contract, as required by the competitive bidding laws of West Virginia Code §§ 5A-3-1 et seq., 5-22-1 et seq., and 5G-1-1 et seq. and the Freedom of Information Act West Virginia Code §§ 29B-1-1 et seq.

**DO NOT SUBMIT MATERIAL YOU CONSIDER TO BE CONFIDENTIAL, A TRADE SECRET, OR OTHERWISE NOT SUBJECT TO PUBLIC DISCLOSURE.**

Submission of any bid, proposal, or other document to the Purchasing Division constitutes your explicit consent to the subsequent public disclosure of the bid, proposal, or document. The Purchasing Division will disclose any document labeled “confidential,” “proprietary,” “trade secret,” “private,” or labeled with any other claim against public disclosure of the documents, to include any “trade secrets” as defined by West Virginia Code § 47-22-1 et seq. All submissions are subject to public disclosure without notice.

**22. INTERESTED PARTY DISCLOSURE:** West Virginia Code § 6D-1-2 requires that the vendor submit to the Purchasing Division a disclosure of interested parties to the contract for all contracts with an actual or estimated value of at least \$1 million. That disclosure must occur on the form prescribed and approved by the WV Ethics Commission prior to contract award.

A copy of that form is included with this solicitation or can be obtained from the WV Ethics Commission. This requirement does not apply to publicly traded companies listed on a national or international stock exchange. A more detailed definition of interested parties can be obtained from the form referenced above.

**23. WITH THE BID REQUIREMENTS:** In instances where these specifications require documentation or other information with the bid, and a vendor fails to provide it with the bid, the Director of the Purchasing Division reserves the right to request those items after bid opening and prior to contract award pursuant to the authority to waive minor irregularities in bids or specifications under W. Va. CSR § 148-1-4.6. This authority does not apply to instances where state law mandates receipt with the bid.

**24. EMAIL NOTIFICATION OF AWARD:** The Purchasing Division will attempt to provide bidders with e-mail notification of contract award when a solicitation that the bidder participated in has been awarded. For notification purposes, bidders must provide the Purchasing Division with a valid email address in the bid response. Bidders may also monitor wvOASIS or the Purchasing Division's website to determine when a contract has been awarded.

## **GENERAL TERMS AND CONDITIONS:**

**1. CONTRACTUAL AGREEMENT:** Issuance of an Award Document signed by the Purchasing Division Director, or his designee, and approved as to form by the Attorney General's office constitutes acceptance by the State of this Contract made by and between the State of West Virginia and the Vendor. Vendor's signature on its bid, or on the Contract if the Contract is not the result of a bid solicitation, signifies Vendor's agreement to be bound by and accept the terms and conditions contained in this Contract.

**2. DEFINITIONS:** As used in this Solicitation/Contract, the following terms shall have the meanings attributed to them below. Additional definitions may be found in the specifications included with this Solicitation/Contract.

**2.1. "Agency" or "Agencies"** means the agency, board, commission, or other entity of the State of West Virginia that is identified on the first page of the Solicitation or any other public entity seeking to procure goods or services under this Contract.

**2.2. "Bid" or "Proposal"** means the vendors submitted response to this solicitation.

**2.3. "Contract"** means the binding agreement that is entered into between the State and the Vendor to provide the goods or services requested in the Solicitation.

**2.4. "Director"** means the Director of the West Virginia Department of Administration, Purchasing Division.

**2.5. "Purchasing Division"** means the West Virginia Department of Administration, Purchasing Division.

**2.6. "Award Document"** means the document signed by the Agency and the Purchasing Division, and approved as to form by the Attorney General, that identifies the Vendor as the contract holder.

**2.7. "Solicitation"** means the official notice of an opportunity to supply the State with goods or services that is published by the Purchasing Division.

**2.8. "State"** means the State of West Virginia and/or any of its agencies, commissions, boards, etc. as context requires.

**2.9. "Vendor" or "Vendors"** means any entity submitting a bid in response to the Solicitation, the entity that has been selected as the lowest responsible bidder, or the entity that has been awarded the Contract as context requires.



**3. CONTRACT TERM; RENEWAL; EXTENSION:** The term of this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below:

☒ **Term Contract**

**Initial Contract Term:** The Initial Contract Term will be for a period of one (1) year. The Initial Contract Term becomes effective on the effective start date listed on the first page of this Contract and the Initial Contract Term ends on the effective end date also shown on the first page of this Contract.

**Renewal Term:** This Contract may be renewed upon the mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any request for renewal should be delivered to the Agency and then submitted to the Purchasing Division thirty (30) days prior to the expiration date of the initial contract term or appropriate renewal term. A Contract renewal shall be in accordance with the terms and conditions of the original contract. Unless otherwise specified below, renewal of this Contract is limited to three (3) successive one (1) year periods or multiple renewal periods of less than one year, provided that the multiple renewal periods do not exceed the total number of months available in all renewal years combined. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's office (Attorney General approval is as to form only)

☐ **Alternate Renewal Term** – This contract may be renewed for \_\_\_\_\_ successive \_\_\_\_\_ year periods or shorter periods provided that they do not exceed the total number of months contained in all available renewals. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's office (Attorney General approval is as to form only)

**Delivery Order Limitations:** In the event that this contract permits delivery orders, a delivery order may only be issued during the time this Contract is in effect. Any delivery order issued within one year of the expiration of this Contract shall be effective for one year from the date the delivery order is issued. No delivery order may be extended beyond one year after this Contract has expired.

☐ **Fixed Period Contract:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within \_\_\_\_\_ days.

☐ **Fixed Period Contract with Renewals:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and part of the Contract more fully described in the attached specifications must be completed within \_\_\_\_\_ days. Upon completion of the work covered by the preceding sentence, the vendor agrees that maintenance, monitoring, or warranty services will be provided for \_\_\_\_\_ year(s) thereafter.

☐ **One-Time Purchase:** The term of this Contract shall run from the issuance of the Award Document until all of the goods contracted for have been delivered, but in no event will this Contract extend for more than one fiscal year.

☐ **Other:** Contract Term specified in \_\_\_\_\_

**4. AUTHORITY TO PROCEED:** Vendor is authorized to begin performance of this contract on the date of encumbrance listed on the front page of the Award Document unless either the box for "Fixed Period Contract" or "Fixed Period Contract with Renewals" has been checked in Section 3 above. If either "Fixed Period Contract" or "Fixed Period Contract with Renewals" has been checked, Vendor must not begin work until it receives a separate notice to proceed from the State. The notice to proceed will then be incorporated into the Contract via change order to memorialize the official date that work commenced.

**5. QUANTITIES:** The quantities required under this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below.

☐ **Open End Contract:** Quantities listed in this Solicitation/Award Document are approximations only, based on estimates supplied by the Agency. It is understood and agreed that the Contract shall cover the quantities actually ordered for delivery during the term of the Contract, whether more or less than the quantities shown.

☐ **Service:** The scope of the service to be provided will be more clearly defined in the specifications included herewith.

☒ **Combined Service and Goods:** The scope of the service and deliverable goods to be provided will be more clearly defined in the specifications included herewith.

☐ **One Time Purchase:** This Contract is for the purchase of a set quantity of goods that are identified in the specifications included herewith. Once those items have been delivered, no additional goods may be procured under this Contract without an appropriate change order approved by the Vendor, Agency, Purchasing Division, and Attorney General's office.

**6. EMERGENCY PURCHASES:** The Purchasing Division Director may authorize the Agency to purchase goods or services in the open market that Vendor would otherwise provide under this Contract if those goods or services are for immediate or expedited delivery in an emergency. Emergencies shall include, but are not limited to, delays in transportation or an unanticipated increase in the volume of work. An emergency purchase in the open market, approved by the Purchasing Division Director, shall not constitute of breach of this Contract and shall not entitle the Vendor to any form of compensation or damages. This provision does not excuse the State from fulfilling its obligations under a One Time Purchase contract.

**7. REQUIRED DOCUMENTS:** All of the items checked in this section must be provided to the Purchasing Division by the Vendor as specified:

☐ **BID BOND (Construction Only):** Pursuant to the requirements contained in W. Va. Code § 5-22-1(c), All Vendors submitting a bid on a construction project shall furnish a valid bid bond in the amount of five percent (5%) of the total amount of the bid protecting the State of West Virginia. The bid bond must be submitted with the bid.

☐ **PERFORMANCE BOND:** The apparent successful Vendor shall provide a performance bond in the amount of 100% of the contract. The performance bond must be received by the Purchasing Division prior to Contract award.

☐ **LABOR/MATERIAL PAYMENT BOND:** The apparent successful Vendor shall provide a labor/material payment bond in the amount of 100% of the Contract value. The labor/material payment bond must be delivered to the Purchasing Division prior to Contract award.

In lieu of the Bid Bond, Performance Bond, and Labor/Material Payment Bond, the Vendor may provide certified checks, cashier's checks, or irrevocable letters of credit. Any certified check, cashier's check, or irrevocable letter of credit provided in lieu of a bond must be of the same amount and delivered on the same schedule as the bond it replaces. A letter of credit submitted in lieu of a performance and labor/material payment bond will only be allowed for projects under \$100,000. Personal or business checks are not acceptable. Notwithstanding the foregoing, West Virginia Code § 5-22-1 (d) mandates that a vendor provide a performance and labor/material payment bond for construction projects. Accordingly, substitutions for the performance and labor/material payment bonds for construction projects is not permitted.

☐ **MAINTENANCE BOND:** The apparent successful Vendor shall provide a two (2) year maintenance bond covering the roofing system. The maintenance bond must be issued and delivered to the Purchasing Division prior to Contract award.

☐ **LICENSE(S) / CERTIFICATIONS / PERMITS:** In addition to anything required under the Section of the General Terms and Conditions entitled Licensing, the apparent successful Vendor shall furnish proof of the following licenses, certifications, and/or permits upon request and in a form acceptable to the State. The request may be prior to or after contract award at the State's sole discretion.

☐☐☐☐

The apparent successful Vendor shall also furnish proof of any additional licenses or certifications contained in the specifications regardless of whether or not that requirement is listed above.

**8. INSURANCE:** The apparent successful Vendor shall furnish proof of the insurance identified by a checkmark below and must include the State as an additional insured on each policy prior to Contract award. The insurance coverages identified below must be maintained throughout the life of this contract. Thirty (30) days prior to the expiration of the insurance policies, Vendor shall provide the Agency with proof that the insurance mandated herein has been continued. Vendor must also provide Agency with immediate notice of any changes in its insurance policies, including but not limited to, policy cancelation, policy reduction, or change in insurers. The apparent successful Vendor shall also furnish proof of any additional insurance requirements contained in the specifications prior to Contract award regardless of whether that insurance requirement is listed in this section.

Vendor must maintain:

☒ **Commercial General Liability Insurance** in at least an amount of: \$1,000,000.00 per occurrence.

☒ **Automobile Liability Insurance** in at least an amount of: \$1,000,000.00 per occurrence.

☐ **Professional/Malpractice/Errors and Omission Insurance** in at least an amount of: \_\_\_\_\_ per occurrence. Notwithstanding the forgoing, Vendor's are not required to list the State as an additional insured for this type of policy.

☐ **Commercial Crime and Third Party Fidelity Insurance** in an amount of: \_\_\_\_\_ per occurrence.

☐ **Cyber Liability Insurance** in an amount of: \_\_\_\_\_ per occurrence.

☐ **Builders Risk Insurance** in an amount equal to 100% of the amount of the Contract.

☐ **Pollution Insurance** in an amount of: \_\_\_\_\_ per occurrence.

☐ **Aircraft Liability** in an amount of: \_\_\_\_\_ per occurrence.

☒ **\*\*\*STATE OF WEST VIRGINIA MUST BE INCLUDED AS ADDITIONAL INSURED ON INSURANCE CERTIFICATE**

☒ **\*\*\*CERTIFICATE HOLDER SHOULD READ AS FOLLOWS:**  
WV DHHR  
619 VIRGINIA ST W, CHARLESTON, WV 25302

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☐

Notwithstanding anything contained in this section to the contrary, the Director of the Purchasing Division reserves the right to waive the requirement that the State be named as an additional insured on one or more of the Vendor's insurance policies if the Director finds that doing so is in the State's best interest.

**9. WORKERS' COMPENSATION INSURANCE:** Vendor shall comply with laws relating to workers compensation, shall maintain workers' compensation insurance when required, and shall furnish proof of workers' compensation insurance upon request.

**10. [Reserved]**

**11. LIQUIDATED DAMAGES:** This clause shall in no way be considered exclusive and shall not limit the State or Agency's right to pursue any other available remedy. Vendor shall pay liquidated damages in the amount specified below or as described in the specifications:

☐ \_\_\_\_\_ for \_\_\_\_\_.

☐ Liquidated Damages Contained in the Specifications.

☐ Liquidated Damages Are Not Included in this Contract.

**12. ACCEPTANCE:** Vendor's signature on its bid, or on the certification and signature page, constitutes an offer to the State that cannot be unilaterally withdrawn, signifies that the product or service proposed by vendor meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise indicated, and signifies acceptance of the terms and conditions contained in the Solicitation unless otherwise indicated.

**13. PRICING:** The pricing set forth herein is firm for the life of the Contract, unless specified elsewhere within this Solicitation/Contract by the State. A Vendor's inclusion of price adjustment provisions in its bid, without an express authorization from the State in the Solicitation to do so, may result in bid disqualification. Notwithstanding the foregoing, Vendor must extend any publicly advertised sale price to the State and invoice at the lower of the contract price or the publicly advertised sale price.

**14. PAYMENT IN ARREARS:** Payments for goods/services will be made in arrears only upon receipt of a proper invoice, detailing the goods/services provided or receipt of the goods/services, whichever is later. Notwithstanding the foregoing, payments for software maintenance, licenses, or subscriptions may be paid annually in advance.

**15. PAYMENT METHODS:** Vendor must accept payment by electronic funds transfer and P-Card. (The State of West Virginia's Purchasing Card program, administered under contract by a banking institution, processes payment for goods and services through state designated credit cards.)

**16. TAXES:** The Vendor shall pay any applicable sales, use, personal property or any other taxes arising out of this Contract and the transactions contemplated thereby. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

**17. ADDITIONAL FEES:** Vendor is not permitted to charge additional fees or assess additional charges that were not either expressly provided for in the solicitation published by the State of West Virginia, included in the Contract, or included in the unit price or lump sum bid amount that Vendor is required by the solicitation to provide. Including such fees or charges as notes to the solicitation may result in rejection of vendor's bid. Requesting such fees or charges be paid after the contract has been awarded may result in cancellation of the contract.

**18. FUNDING:** This Contract shall continue for the term stated herein, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise made available, this Contract becomes void and of no effect beginning on July 1 of the fiscal year for which funding has not been appropriated or otherwise made available. If that occurs, the State may notify the Vendor that an alternative source of funding has been obtained and thereby avoid the automatic termination. Non-appropriation or non-funding shall not be considered an event of default.

**19. CANCELLATION:** The Purchasing Division Director reserves the right to cancel this Contract immediately upon written notice to the vendor if the materials or workmanship supplied do not conform to the specifications contained in the Contract. The Purchasing Division Director may also cancel any purchase or Contract upon 30 days written notice to the Vendor in accordance with West Virginia Code of State Rules § 148-1-5.2.b.

**20. TIME:** Time is of the essence regarding all matters of time and performance in this Contract.

**21. APPLICABLE LAW:** This Contract is governed by and interpreted under West Virginia law without giving effect to its choice of law principles. Any information provided in specification manuals, or any other source, verbal or written, which contradicts or violates the West Virginia Constitution, West Virginia Code, or West Virginia Code of State Rules is void and of no effect.

**22. COMPLIANCE WITH LAWS:** Vendor shall comply with all applicable federal, state, and local laws, regulations and ordinances. By submitting a bid, Vendor acknowledges that it has reviewed, understands, and will comply with all applicable laws, regulations, and ordinances.

**SUBCONTRACTOR COMPLIANCE:** Vendor shall notify all subcontractors providing commodities or services related to this Contract that as subcontractors, they too are required to comply with all applicable laws, regulations, and ordinances. Notification under this provision must occur prior to the performance of any work under the contract by the subcontractor.

**23. ARBITRATION:** Any references made to arbitration contained in this Contract, Vendor's bid, or in any American Institute of Architects documents pertaining to this Contract are hereby deleted, void, and of no effect.

**24. MODIFICATIONS:** This writing is the parties' final expression of intent. Notwithstanding anything contained in this Contract to the contrary no modification of this Contract shall be binding without mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any change to existing contracts that adds work or changes contract cost, and were not included in the original contract, must be approved by the Purchasing Division and the Attorney General's Office (as to form) prior to the implementation of the change or commencement of work affected by the change.

**25. WAIVER:** The failure of either party to insist upon a strict performance of any of the terms or provision of this Contract, or to exercise any option, right, or remedy herein contained, shall not be construed as a waiver or a relinquishment for the future of such term, provision, option, right, or remedy, but the same shall continue in full force and effect. Any waiver must be expressly stated in writing and signed by the waiving party.

**26. SUBSEQUENT FORMS:** The terms and conditions contained in this Contract shall supersede any and all subsequent terms and conditions which may appear on any form documents submitted by Vendor to the Agency or Purchasing Division such as price lists, order forms, invoices, sales agreements, or maintenance agreements, and includes internet websites or other electronic documents. Acceptance or use of Vendor's forms does not constitute acceptance of the terms and conditions contained thereon.

**27. ASSIGNMENT:** Neither this Contract nor any monies due, or to become due hereunder, may be assigned by the Vendor without the express written consent of the Agency, the Purchasing Division, the Attorney General's office (as to form only), and any other government agency or office that may be required to approve such assignments.

**28. WARRANTY:** The Vendor expressly warrants that the goods and/or services covered by this Contract will: (a) conform to the specifications, drawings, samples, or other description furnished or specified by the Agency; (b) be merchantable and fit for the purpose intended; and (c) be free from defect in material and workmanship.

**29. STATE EMPLOYEES:** State employees are not permitted to utilize this Contract for personal use and the Vendor is prohibited from permitting or facilitating the same.

**30. PRIVACY, SECURITY, AND CONFIDENTIALITY:** The Vendor agrees that it will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the Agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the Agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in <http://www.state.wv.us/admin/purchase/privacy/default.html>.

**31. YOUR SUBMISSION IS A PUBLIC DOCUMENT:** Vendor's entire response to the Solicitation and the resulting Contract are public documents. As public documents, they will be disclosed to the public following the bid/proposal opening or award of the contract, as required by the competitive bidding laws of West Virginia Code §§ 5A-3-1 et seq., 5-22-1 et seq., and 5G-1-1 et seq. and the Freedom of Information Act West Virginia Code §§ 29B-1-1 et seq.

**DO NOT SUBMIT MATERIAL YOU CONSIDER TO BE CONFIDENTIAL, A TRADE SECRET, OR OTHERWISE NOT SUBJECT TO PUBLIC DISCLOSURE.**

Submission of any bid, proposal, or other document to the Purchasing Division constitutes your explicit consent to the subsequent public disclosure of the bid, proposal, or document. The Purchasing Division will disclose any document labeled "confidential," "proprietary," "trade secret," "private," or labeled with any other claim against public disclosure of the documents, to include any "trade secrets" as defined by West Virginia Code § 47-22-1 et seq. All submissions are subject to public disclosure without notice.

**32. LICENSING:** In accordance with West Virginia Code of State Rules § 148-1-6.1.e, Vendor must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agency or political subdivision. Obligations related to political subdivisions may include, but are not limited to, business licensing, business and occupation taxes, inspection compliance, permitting, etc. Upon request, the Vendor must provide all necessary releases to obtain information to enable the Purchasing Division Director or the Agency to verify that the Vendor is licensed and in good standing with the above entities.

**SUBCONTRACTOR COMPLIANCE:** Vendor shall notify all subcontractors providing commodities or services related to this Contract that as subcontractors, they too are required to be licensed, in good standing, and up-to-date on all state and local obligations as described in this section. Obligations related to political subdivisions may include, but are not limited to, business licensing, business and occupation taxes, inspection compliance, permitting, etc. Notification under this provision must occur prior to the performance of any work under the contract by the subcontractor.

**33. ANTITRUST:** In submitting a bid to, signing a contract with, or accepting a Award Document from any agency of the State of West Virginia, the Vendor agrees to convey, sell, assign, or transfer to the State of West Virginia all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to Vendor.



**34. VENDOR CERTIFICATIONS:** By signing its bid or entering into this Contract, Vendor certifies (1) that its bid or offer was made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, person or entity submitting a bid or offer for the same material, supplies, equipment or services; (2) that its bid or offer is in all respects fair and without collusion or fraud; (3) that this Contract is accepted or entered into without any prior understanding, agreement, or connection to any other entity that could be considered a violation of law; and (4) that it has reviewed this Solicitation in its entirety; understands the requirements, terms and conditions, and other information contained herein.

Vendor's signature on its bid or offer also affirms that neither it nor its representatives have any interest, nor shall acquire any interest, direct or indirect, which would compromise the performance of its services hereunder. Any such interests shall be promptly presented in detail to the Agency. The individual signing this bid or offer on behalf of Vendor certifies that he or she is authorized by the Vendor to execute this bid or offer or any documents related thereto on Vendor's behalf; that he or she is authorized to bind the Vendor in a contractual relationship; and that, to the best of his or her knowledge, the Vendor has properly registered with any State agency that may require registration.

**35. VENDOR RELATIONSHIP:** The relationship of the Vendor to the State shall be that of an independent contractor and no principal-agent relationship or employer-employee relationship is contemplated or created by this Contract. The Vendor as an independent contractor is solely liable for the acts and omissions of its employees and agents. Vendor shall be responsible for selecting, supervising, and compensating any and all individuals employed pursuant to the terms of this Solicitation and resulting contract. Neither the Vendor, nor any employees or subcontractors of the Vendor, shall be deemed to be employees of the State for any purpose whatsoever. Vendor shall be exclusively responsible for payment of employees and contractors for all wages and salaries, taxes, withholding payments, penalties, fees, fringe benefits, professional liability insurance premiums, contributions to insurance and pension, or other deferred compensation plans, including but not limited to, Workers' Compensation and Social Security obligations, licensing fees, etc. and the filing of all necessary documents, forms, and returns pertinent to all of the foregoing.

Vendor shall hold harmless the State, and shall provide the State and Agency with a defense against any and all claims including, but not limited to, the foregoing payments, withholdings, contributions, taxes, Social Security taxes, and employer income tax returns.

**36. INDEMNIFICATION:** The Vendor agrees to indemnify, defend, and hold harmless the State and the Agency, their officers, and employees from and against: (1) Any claims or losses for services rendered by any subcontractor, person, or firm performing or supplying services, materials, or supplies in connection with the performance of the Contract; (2) Any claims or losses resulting to any person or entity injured or damaged by the Vendor, its officers, employees, or subcontractors by the publication, translation, reproduction, delivery, performance, use, or disposition of any data used under the Contract in a manner not authorized by the Contract, or by Federal or State statutes or regulations; and (3) Any failure of the Vendor, its officers, employees, or subcontractors to observe State and Federal laws including, but not limited to, labor and wage and hour laws.

**37. PURCHASING AFFIDAVIT:** In accordance with West Virginia Code §§ 5A-3-10a and 5-22-1(i), the State is prohibited from awarding a contract to any bidder that owes a debt to the State or a political subdivision of the State, Vendors are required to sign, notarize, and submit the Purchasing Affidavit to the Purchasing Division affirming under oath that it is not in default on any monetary obligation owed to the state or a political subdivision of the state.

**38. CONFLICT OF INTEREST:** Vendor, its officers or members or employees, shall not presently have or acquire an interest, direct or indirect, which would conflict with or compromise the performance of its obligations hereunder. Vendor shall periodically inquire of its officers, members and employees to ensure that a conflict of interest does not arise. Any conflict of interest discovered shall be promptly presented in detail to the Agency.

**39. REPORTS:** Vendor shall provide the Agency and/or the Purchasing Division with the following reports identified by a checked box below:

☒ Such reports as the Agency and/or the Purchasing Division may request. Requested reports may include, but are not limited to, quantities purchased, agencies utilizing the contract, total contract expenditures by agency, etc.

☐ Quarterly reports detailing the total quantity of purchases in units and dollars, along with a listing of purchases by agency. Quarterly reports should be delivered to the Purchasing Division via email at [purchasing.division@wv.gov](mailto:purchasing.division@wv.gov).

**40. BACKGROUND CHECK:** In accordance with W. Va. Code § 15-2D-3, the State reserves the right to prohibit a service provider's employees from accessing sensitive or critical information or to be present at the Capitol complex based upon results addressed from a criminal background check. Service providers should contact the West Virginia Division of Protective Services by phone at (304) 558-9911 for more information.

**41. PREFERENCE FOR USE OF DOMESTIC STEEL PRODUCTS:** Except when authorized by the Director of the Purchasing Division pursuant to W. Va. Code § 5A-3-56, no contractor may use or supply steel products for a State Contract Project other than those steel products made in the United States. A contractor who uses steel products in violation of this section may be subject to civil penalties pursuant to W. Va. Code § 5A-3-56. As used in this section:

- a. "State Contract Project" means any erection or construction of, or any addition to, alteration of or other improvement to any building or structure, including, but not limited to, roads or highways, or the installation of any heating or cooling or ventilating plants or other equipment, or the supply of and materials for such projects, pursuant to a contract with the State of West Virginia for which bids were solicited on or after June 6, 2001.
- b. "Steel Products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more or such operations, from steel made by the open hearth, basic oxygen, electric furnace, Bessemer or other steel making process.
- c. The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:

1. The cost for each contract item used does not exceed one tenth of one percent (.1%) of the total contract cost or two thousand five hundred dollars (\$2,500.00), whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project; or
2. The Director of the Purchasing Division determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

**42. PREFERENCE FOR USE OF DOMESTIC ALUMINUM, GLASS, AND STEEL:** In Accordance with W. Va. Code § 5-19-1 et seq., and W. Va. CSR § 148-10-1 et seq., for every contract or subcontract, subject to the limitations contained herein, for the construction, reconstruction, alteration, repair, improvement or maintenance of public works or for the purchase of any item of machinery or equipment to be used at sites of public works, only domestic aluminum, glass or steel products shall be supplied unless the spending officer determines, in writing, after the receipt of offers or bids, (1) that the cost of domestic aluminum, glass or steel products is unreasonable or inconsistent with the public interest of the State of West Virginia, (2) that domestic aluminum, glass or steel products are not produced in sufficient quantities to meet the contract requirements, or (3) the available domestic aluminum, glass, or steel do not meet the contract specifications. This provision only applies to public works contracts awarded in an amount more than fifty thousand dollars (\$50,000) or public works contracts that require more than ten thousand pounds of steel products.

The cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than twenty percent (20%) of the bid or offered price for foreign made aluminum, glass, or steel products. If the domestic aluminum, glass or steel products to be supplied or produced in a “substantial labor surplus area”, as defined by the United States Department of Labor, the cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than thirty percent (30%) of the bid or offered price for foreign made aluminum, glass, or steel products. This preference shall be applied to an item of machinery or equipment, as indicated above, when the item is a single unit of equipment or machinery manufactured primarily of aluminum, glass or steel, is part of a public works contract and has the sole purpose or of being a permanent part of a single public works project. This provision does not apply to equipment or machinery purchased by a spending unit for use by that spending unit and not as part of a single public works project.

All bids and offers including domestic aluminum, glass or steel products that exceed bid or offer prices including foreign aluminum, glass or steel products after application of the preferences provided in this provision may be reduced to a price equal to or lower than the lowest bid or offer price for foreign aluminum, glass or steel products plus the applicable preference. If the reduced bid or offer prices are made in writing and supersede the prior bid or offer prices, all bids or offers, including the reduced bid or offer prices, will be reevaluated in accordance with this rule.

**43. INTERESTED PARTY SUPPLEMENTAL DISCLOSURE:** W. Va. Code § 6D-1-2 requires that for contracts with an actual or estimated value of at least \$1 million, the vendor must submit to the Agency a supplemental disclosure of interested parties reflecting any new or differing interested parties to the contract, which were not included in the original pre-award interested party disclosure, within 30 days following the completion or termination of the contract. A copy of that form is included with this solicitation or can be obtained from the WV Ethics Commission. This requirement does not apply to publicly traded companies listed on a national or international stock exchange. A more detailed definition of interested parties can be obtained from the form referenced above.

**44. PROHIBITION AGAINST USED OR REFURBISHED:** Unless expressly permitted in the solicitation published by the State, Vendor must provide new, unused commodities, and is prohibited from supplying used or refurbished commodities, in fulfilling its responsibilities under this Contract.

**45. VOID CONTRACT CLAUSES –** This Contract is subject to the provisions of West Virginia Code § 5A-3-62, which automatically voids certain contract clauses that violate State law.

**DESIGNATED CONTACT:** Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

\_\_\_\_\_  
(Name, Title) Christopher Greco, Contracts and Legal Affairs Specialist

\_\_\_\_\_  
(Printed Name and Title) Christopher Greco, Contracts and Legal Affairs Specialist

\_\_\_\_\_  
(Address) 7102 Riverwood Dr Columbia, MD 21046

\_\_\_\_\_  
(Phone Number) / (Fax Number) 410-910-0812

\_\_\_\_\_  
(email address) cjgreco@shimadzu.com

**CERTIFICATION AND SIGNATURE:** By signing below, or submitting documentation through wvOASIS, I certify that: I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

By signing below, I further certify that I understand this Contract is subject to the provisions of West Virginia Code § 5A-3-62, which automatically voids certain contract clauses that violate State law.

\_\_\_\_\_  
(Company) Shimadzu Scientific Instruments, Inc.

\_\_\_\_\_  
(Authorized Signature) (Representative Name, Title) Senior Regional Manager- SouthEast

\_\_\_\_\_  
(Printed Name and Title of Authorized Representative) Jeffrey Ratliff, Senior Regional Manager,-SouthEast

\_\_\_\_\_  
(Date)

: 919-425-1003 Fax: 919-544-3497

\_\_\_\_\_  
(Phone Number) (Fax Number)

**ADDENDUM ACKNOWLEDGEMENT FORM**  
**SOLICITATION NO.: CRFQ CME2200000004**

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

*(Check the box next to each addendum received)*

- |   |  |
|---|--|
| <input type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6  |
| <input type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7  |
| <input type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8  |
| <input type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9  |
| <input type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

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Company

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Authorized Signature

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Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

**REQUEST FOR QUOTATION**  
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**LC/MS/MS Triple Quadrupole Mass Spectrometer System**

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**SPECIFICATIONS**

1. **PURPOSE AND SCOPE:** The West Virginia Purchasing Division is soliciting bids on behalf of WV Office of Chief Medical Examiner to establish a contract for a LC/MS/MS Triple Quad System.

**NOTE:** The WVDHHR has developed an EEOP Utilization Report and it is available at: [HTTP://WWW.WVDHHR.ORG/PDFS/H1.5%20UTILIZATION%20REPORT%20AND%20EEO%20POLICY.PDF](http://www.wvdhhr.org/pdfs/H1.5%20UTILIZATION%20REPORT%20AND%20EEO%20POLICY.PDF)

2. **DEFINITIONS:** The terms listed below shall have the meanings assigned to them below. Additional definitions can be found in section 2 of the General Terms and Conditions.

2.1 **“Contract Services”** means the warranty and preventative maintenance services for the contract items as more fully described in these specifications.

2.2 **“Contract Item”** means the purchase of one LC/MS/MS triple quadrupole mass spectrometer as more fully described by these specifications.

2.3 **“Pricing Page”** means the pages, contained in wvOASIS on which Vendor should list its proposed price for the Contract Items and Services.

2.4 **“Solicitation”** means the official notice of an opportunity to supply the State with goods or services that is published by the Purchasing Division.

2.5 **“LC/MS/MS Triple Quad System”** means a Liquid Chromatography with Tandem Mass Spectroscopy instrument system.

3. **MANDATORY REQUIREMENTS: Mandatory Contract Services Requirements and Deliverables:** Contract Services must meet or exceed the mandatory requirements listed below.

3.1 **LC/MS/MS Triple Quad System** The LC/MS/MS Triple Quad System must include the following minimum specifications, features and accessories for an atmospheric pressure ionization tandem quadrupole mass spectrometer system coupled with an Ultra-High-Performance Liquid Chromatograph (UHPLC) for integrated LC/MS/MS analysis.

3.1.1 The preferred system for the liquid chromatograph and the mass spectrometer must have all items manufactured and serviced by the same company.

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- 3.1.2** The fully integrated software package must be able to operate and control both the mass spectrometer and liquid chromatograph instruments from a single unified operating platform.
- 3.1.3** The UHPLC components and LC/MS instrument must be manufactured in the United States of America to allow for quick access and shipping times.
- 3.1.4** The fully integrated software package must be able to operate and control both the mass spectrometer and liquid chromatograph instruments from a single unified operating platform.
- 3.1.5** Quantitative results, threshold levels or synchronized survey scans must have the ability to initiate qualitative data scans to generate additional data from a single injection that may be programed into the analytical methods.
- 3.1.6** The system must be capable of performing both qualitative and quantitative analysis on a sample in a single run.
- 3.1.7** The system must include the ability to perform solvent selection of up to 4 solvents per pump, as well as automatic column selection capability for up to 6 columns.
- 3.1.8** There must also be a flow diversion valve to assist in keeping the LC/MS interface clean.
- 3.1.9** The system must come with a second reservoir tray to hold all the mobile phase bottles from the pumping system.

**3.2 UHPLC Front End: System Controller**

- 3.2.1** UHPLC system must have a cooled autosampler with a capacity of a minimum of 2 deep well micro-titre plates (MTP); as well as a column oven that can cool and heat.
- 3.2.2** The system controller must have an integrated touch screen and show the system and each module status from across the room.



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- 3.2.3** The system controller must have a built-in reservoir tray to hold the mobile phase bottles and directly interface with a monitor to gravimetrically measure the amount of mobile phase remaining and alert users if additional mobile phase must be added to complete the loaded batch.
- 3.2.4** The system controller must allow users to monitor system status through a smart device and via the internet.
- 3.2.5** The controller must display error messages on the front panel for easy recognition.

### **3.3 Pumping System**

- 3.3.1** Pumping system must have a binary high-pressure pumping system with 2 pumps.
- 3.3.2** Each pump must be able to flow up to 10 mL/min.
- 3.3.3** Each pump must have a 4-solvent selector on it to help change assays easily, rapidly and efficiently develop new methods, and rinse between methods.
- 3.3.4** During a batch, the pumping system must recognize it has a flow anomaly like a bubble and attempt to recover and continue the batch in an automated and unassisted fashion.
- 3.3.5** The pumping system must automatically startup the system and ramp the mobile phase once the column oven is ready.

### **3.4 Autosampler**

- 3.4.1** The autosampler must have a cooler to keep samples from degrading during batches.
- 3.4.2** The autosampler must hold at least 2 Deep Well microtiter plates.

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- 3.4.3** The autosampler must accept different plate types such as 2 mL and Deep Well microtiter plates simultaneously to allow flexibility for different assays.
- 3.4.4** The autosampler must have a means to reduce condensation and to come to temperature quickly when opening to exchange plates.
- 3.4.5** Autosampler must have no more than a 7 second cycle time.
- 3.4.6** The autosampler must be a needle in the flow path design to maintain low carry over.
- 3.4.7** The autosampler must achieve the following carryover performance: 0.0015% without needle rinsing and 0.0003% with needle rinsing.
- 3.4.8** The autosampler must be able to do a total injection or variable volume injection to protect sample loss from happening.
- 3.4.9** The autosampler must be able to reproducibly inject as low as 0.1  $\mu$ L and as much as 50  $\mu$ L depending on assays.
- 3.4.10** The RSD for 0.1  $\mu$ L injections must be more than 0.5%.
- 3.4.11** The autosampler must be capable of performing sample pretreatment including dilution, reagent addition, co-injection of samples, stacked injection, and overlapped injection.
- 3.4.12** The autosampler must be able to do an automatic purge cycle.
- 3.4.13** The autosampler must have both front panel and software control to allow us to do routine tasks such as purge from the front panel.
- 3.4.14** The autosampler must have the ability to display the total operating time, needle and rotor seal usage and any error logs to help users establish SOP's and maintenance schedules based on samples.

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**3.4.15** The plate or rack changer must be cooled to keep samples from degrading.

**3.4.16** The plate or rack changer must accept different plate types such as 2 mL and Deep Well microtiter plates simultaneously to allow flexibility for different assays.

**3.4.17** The plate or rack changer must also automatically recognize the plate type in each position and in the software.

**3.5 Column Oven**

**3.5.1** The oven must be forced air to quickly get to its set temperature.

**3.5.2** The column oven must have the ability to cool to at least 10 degrees below lab temperature and heat up to at least 70 degrees.

**3.5.3** The column oven must have both front panel and software control to allow us to do routine tasks such as changing columns.

**3.5.4** The column oven must be large enough to hold at least 6 columns of 25 cm length or 3 columns of 300 mm length.

**3.5.5** The column oven must have the ability to display the total operating time, parts replacement and any error logs to help users establish SOP's (Standard Operating Procedures) and maintenance schedules based on lab samples.

**3.6 Triple Quadrupole Mass Spectrometer**

**3.6.1** Must be capable of detecting a wide variety of analytes including toxins, drugs of abuse, prescription drugs and a variety of other compounds in human fluids and tissues.

**3.6.2** The minimum sensitivity requirement for positive ion mode: S/N > 500,000:1 (RMS) for 1pg of reserpine on column.

**3.6.3** The minimum sensitivity requirement for negative ion mode: S/N >500,000:1 (RMS) 1 pg chloramphenicol on column.

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- 3.6.4** To facilitate the analysis of a wide variety of analytes in a short chromatography window, the system must have the ability to perform fast polarity switching of 5msec.
- 3.6.5** The system must be capable of performing the following acquisition modes: Q1 Scan, Q3 Scan, Multiple Reaction Monitoring (MRM), Selected Ion Monitoring (SIM), Product Ion Scan, Precursor Ion Scan, Neutral Loss Scan, Data Dependent Scan (where the Product ion scans can be automatically initiated by precursor scans, neutral loss scans, Q1 scans, Q3 scans, or MRM results)
- 3.6.6** The LC/MS/MS must have a minimum mass range of 2-2000 m/z.
- 3.6.7** The mass assignment must be stable within 0.05 Da over a 24-hour time period to ensure data accuracy.
- 3.6.8** The minimum acceptable mass accuracy is: 0.1 Da.
- 3.6.9** The scan speed must be 30,000 amu/sec. This scan speed must be applicable to all scan functions: precursor, neutral loss, and product ion scans and must be able to be applied across the whole mass range.
- 3.6.10** The dynamic range must be 7 orders of magnitude.
- 3.6.11** The dwell time must be 0.8 msec.
- 3.6.12** The pause time must be 1msec.
- 3.6.13** The system must include a dual binary ultra-high pressure Liquid Chromatograph with integrated degassing.
- 3.6.14** The LC/MS/MS must come with both an electrospray ionization source as well as a dual ionization source which operates both ESI and APCI simultaneously and without splitting flow so that a wide variety of analytes in one injection can be analyzed.

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- 3.6.15** The dual ionization source must not reduce sensitivity (signal to noise) relative to the ESI source operation.
- 3.6.16** The ionization sources must be easy to remove without the use of tools. Must have the ability to remove and replace the inlet to the vacuum region of the LC/MS/MS without breaking vacuum, which means that all source maintenance can be performed without breaking vacuum.
- 3.6.17** The system must be capable of autotuning where both positive ion mode and negative ion mode are optimized automatically.
- 3.6.18** A single tuning standard must be available for use on the LC/MS/MS that is able to produce both positive and negative ions for both ESI and APCI sources.
- 3.6.19** The system must be capable of automatically restarting the vacuum system when the power resumes after a power failure.
- 3.6.20** The package must include software for multiple analyte quantitation and should include 5 additional seat licenses for that quantitation software so that data can be processed remotely.
- 3.6.21** The software must include a page layout function for *fast* generation of customized reports.
- 3.6.22** The software must include a method creation tool for automated, batch-type optimization of new compounds.

### **3.7 Nitrogen Generator**

- 3.7.1** The supplied generator must meet the requirements of the LC/MS/MS system.

### **3.8 Plate changer**

- 3.8.1** The system must include a plate changer to allow for expansion of up to 16 additional deep well microtiter plates.

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**3.9 Customer Support and Service**

- 3.9.1** To supplement the routine familiarization training done onsite, the vendor must supply at least 40 hours on-site training for the UHPLC front end and the LC/MS detector.
- 3.9.2** If the customer is unavailable to take advantage of the training during the first year, the expiration should be extended automatically and without penalty.
- 3.9.3** The system must include installation and familiarization training.
- 3.9.4** The system must include both phone and onsite technical support for the life of the instrument.
- 3.9.5** Field personnel must be made available for re-familiarizations.
- 3.9.6** The package must be protected by a service contract for 3 years past the date of installation.
- 3.9.7** This coverage must include emergency service as well as 2 full Premium Preventative Maintenance Visits.
- 3.9.8** The Nitrogen Generator must also have 3 years of warranty coverage.

**3.10 Uninterruptable Power Supply**

- 3.10.1** The package must include an Uninterruptable Power Supply (UPS) to power the system during a power outage or fluctuations until the generator is available.

**3.11 Toxicology Spectral Libraries**

- 3.11.1** The package must include applicable toxicology spectral libraries for comparison of detected compounds.

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**4. CONTRACT AWARD:**

**4.1 Contract Award:** The Contract is intended to provide Agency with a purchase price for the Contract Items and Services. The Contract shall be awarded to the Vendor that provides the Contract Item and Services meeting the required specifications for the lowest overall total cost as shown on the Pricing Pages.

**4.2 Pricing Page:** Vendor should complete the Pricing Page by entering the unit price for each Commodity Line. Vendor should complete the Pricing Page in full as failure to complete the Pricing Page in its entirety may result in Vendor's bid being disqualified.

**5. PERFORMANCE:** Vendor and Agency shall agree upon a schedule for performance of Contract Services and Contract Services Deliverables, unless such a schedule is already included herein by Agency. In the event that this Contract is designated as an open-end contract, Vendor shall perform in accordance with the release orders that may be issued against this Contract.

**6. DELIVERY AND RETURN:**

**6.1 Shipment and Delivery:** Vendor shall ship the Contract Items immediately after being awarded this Contract and receiving a purchase order. Vendor shall deliver the Contract Items within 120 working days (twenty four weeks) after receiving a purchase order. Contract Items must be delivered to Agency at WV OCME, 619 Virginia St. West, Charleston, WV 25302.

**6.2 Late Delivery:** The Agency placing the order under this Contract must be notified in writing if the shipment of the Contract Items will be delayed for any reason. Any delay in delivery that could cause harm to an Agency will be grounds for cancellation of the Contract, and/or obtaining the Contract Items from a third party.

Any Agency seeking to obtain the Contract Items from a third party under this provision must first obtain approval of the Purchasing Division.

**6.3 Delivery Payment/Risk of Loss:** Vendor shall deliver the Contract Items F.O.B. destination to the Agency's location.

**6.4 Return of Unacceptable Items:** If the Agency deems the Contract Items to be unacceptable, the Contract Items shall be returned to Vendor at Vendor's expense and with no restocking charge. Vendor shall make arrangements for the return within

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five (5) days of being notified that items are unacceptable or permit the Agency to arrange for the return and reimburse Agency for delivery expenses. If the original packaging cannot be utilized for the return, Vendor will supply the Agency with appropriate return packaging upon request. All returns of unacceptable items shall be F.O.B. the Agency's location. The returned product shall either be replaced, or the Agency shall receive a full credit or refund for the purchase price, at the Agency's discretion.

- 6.5 Return Due to Agency Error:** Items ordered in error by the Agency will be returned for credit within 30 days of receipt, F.O.B. Vendor's location. Vendor shall not charge a restocking fee if returned products are in a resalable condition. Items shall be deemed to be in a resalable condition if they are unused and in the original packaging. Any restocking fee for items not in a resalable condition shall be the lower of the Vendor's customary restocking fee or 5% of the total invoiced value of the returned items.
- 7. PAYMENT:** Agency shall pay the amount, as shown on the Pricing Pages, for all Contract Services and deliverables performed and accepted under this Contract. Vendor shall accept payment in accordance with the payment procedures of the State of West Virginia.
- 8. TRAVEL:** Vendor shall be responsible for all mileage and travel costs, including travel time, associated with performance of this Contract. Any anticipated mileage or travel costs may be included in the flat fee or hourly rate listed on Vendor's bid, but such costs will not be paid by the Agency separately.
- 9. FACILITIES ACCESS:** Performance of Contract Services may require access cards and/or keys to gain entrance to Agency's facilities. In the event that access cards and/or keys are required:
- 9.1.** Vendor must identify principal service personnel which will be issued access cards and/or keys to perform service.
  - 9.2.** Vendor will be responsible for controlling cards and keys and will pay replacement fee, if the cards or keys become lost or stolen.
  - 9.3.** Vendor shall notify Agency immediately of any lost, stolen, or missing card or key.
  - 9.4.** Anyone performing under this Contract will be subject to Agency's security protocol and procedures.



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9.5. Vendor shall inform all staff of Agency's security protocol and procedures.

**10. VENDOR DEFAULT:**

10.1. The following shall be considered a vendor default under this Contract.

10.1.1. Failure to perform Contract Services in accordance with the requirements contained herein.

10.1.2. Failure to comply with other specifications and requirements contained herein.

10.1.3. Failure to comply with any laws, rules, and ordinances applicable to the Contract Services provided under this Contract.

10.1.4. Failure to remedy deficient performance upon request.

10.2. The following remedies shall be available to Agency upon default.

10.2.1. Immediate cancellation of the Contract.

10.2.2. Immediate cancellation of one or more release orders issued under this Contract.

10.2.3. Any other remedies available in law or equity.

**11. MISCELLANEOUS:**

11.1. **Contract Manager:** During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

**Contract Manager:** Christopher Greco  
**Telephone Number:** 410-910-0812  
**Fax Number:** \_\_\_\_\_  
**Email Address:** cjgreco@shimadzu.com

## West Virginia Ethics Commission



### Disclosure of Interested Parties to Contracts

Pursuant to *W. Va. Code* § 6D-1-2, a state agency may not enter into a contract, or a series of related contracts, that has/have an actual or estimated value of \$1 million or more until the business entity submits to the contracting state agency a Disclosure of Interested Parties to the applicable contract. In addition, the business entity awarded a contract is obligated to submit a supplemental Disclosure of Interested Parties reflecting any new or differing interested parties to the contract within 30 days following the completion or termination of the applicable contract.

For purposes of complying with these requirements, the following definitions apply:

*"Business entity"* means any entity recognized by law through which business is conducted, including a sole proprietorship, partnership or corporation, but does not include publicly traded companies listed on a national or international stock exchange.

*"Interested party" or "Interested parties"* means:

- (1) A business entity performing work or service pursuant to, or in furtherance of, the applicable contract, including specifically sub-contractors;
- (2) the person(s) who have an ownership interest equal to or greater than 25% in the business entity performing work or service pursuant to, or in furtherance of, the applicable contract. (This subdivision does not apply to a publicly traded company); and
- (3) the person or business entity, if any, that served as a compensated broker or intermediary to actively facilitate the applicable contract or negotiated the terms of the applicable contract with the state agency. (This subdivision does not apply to persons or business entities performing legal services related to the negotiation or drafting of the applicable contract.)

*"State agency"* means a board, commission, office, department or other agency in the executive, judicial or legislative branch of state government, including publicly funded institutions of higher education: Provided, that for purposes of *W. Va. Code* § 6D-1-2, the West Virginia Investment Management Board shall not be deemed a state agency nor subject to the requirements of that provision.

The contracting business entity must complete this form and submit it to the contracting state agency prior to contract award and to complete another form within 30 days of contract completion or termination.

*This form was created by the State of West Virginia Ethics Commission, 210 Brooks Street, Suite 300, Charleston, WV 25301-1804. Telephone: (304)558-0664; fax: (304)558-2169; e-mail: [ethics@wv.gov](mailto:ethics@wv.gov); website: [www.ethics.wv.gov](http://www.ethics.wv.gov).*

West Virginia Ethics Commission  
**Disclosure of Interested Parties to Contracts**

(Required by W. Va. Code § 6D-1-2)

Name of Contracting Business Entity: \_\_\_\_\_ Address: 7102 Riverwood Dr  
Shimadzu Scientific Instruments, Inc. Columbia, MD 21046

Name of Authorized Agent: \_\_\_\_\_ Address: \_\_\_\_\_

Contract Number: \_\_\_\_\_ Contract Description: \_\_\_\_\_

Governmental agency awarding contract: \_\_\_\_\_

☐ Check here if this is a Supplemental Disclosure

List the Names of Interested Parties to the contract which are known or reasonably anticipated by the contracting business entity for each category below (*attach additional pages if necessary*):

**1. Subcontractors or other entities performing work or service under the Contract**

☐ Check here if none, otherwise list entity/individual names below.

**2. Any person or entity who owns 25% or more of contracting entity (not applicable to publicly traded entities)**

☐ Check here if none, otherwise list entity/individual names below.

**3. Any person or entity that facilitated, or negotiated the terms of, the applicable contract (excluding legal services related to the negotiation or drafting of the applicable contract)**

☐ Check here if none, otherwise list entity/individual names below.

Signature: \_\_\_\_\_ Date Signed: \_\_\_\_\_

***Notary Verification***

State of \_\_\_\_\_, County of \_\_\_\_\_:

I, \_\_\_\_\_, the authorized agent of the contracting business entity listed above, being duly sworn, acknowledge that the Disclosure herein is being made under oath and under the penalty of perjury.

Taken, sworn to and subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
Notary Public's Signature

**To be completed by State Agency:**

Date Received by State Agency: \_\_\_\_\_

Date submitted to Ethics Commission: \_\_\_\_\_

Governmental agency submitting Disclosure: \_\_\_\_\_

*Revised June 8, 2018*

STATE OF WEST VIRGINIA  
Purchasing Division

## PURCHASING AFFIDAVIT

**CONSTRUCTION CONTRACTS:** Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

**ALL CONTRACTS:** Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

**EXCEPTION:** The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

**DEFINITIONS:**

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

**AFFIRMATION:** By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

**WITNESS THE FOLLOWING SIGNATURE:**

Vendor's Name: Shimadzu Scientific Instruments, Inc.

Authorized Signature:  Date: 4/5/22

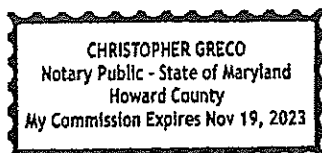
State of Maryland

County of Howard, to-wit:


Taken, subscribed, and sworn to before me this 8th day of April, 2022.

My Commission expires November 19, 2023.

**AFFIX SEAL HERE**



**NOTARY PUBLIC**

  
Purchasing Affidavit (Revised 01/19/2018)



# CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)  
01/05/2022

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

**IMPORTANT:** If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

|  |  |                                     |
|--|--|-------------------------------------|
| <b>PRODUCER</b><br>Aon Risk Services Northeast, Inc.<br>New York NY Office<br>One Liberty Plaza<br>165 Broadway, Suite 3201<br>New York NY 10006 USA | <b>CONTACT NAME:</b>                                       |                                     |
|  | <b>PHONE (A/C. No. Ext):</b> (866) 283-7122                | <b>FAX (A/C. No.):</b> 800-363-0105 |
| <b>INSURED</b><br>Shimadzu Scientific Instruments, Inc.<br>7102 Riverwood Drive<br>Columbia MD 21046 USA   | <b>E-MAIL ADDRESS:</b>                                     |                                     |
|  | <b>INSURER(S) AFFORDING COVERAGE</b>                       |                                     |
|  | <b>NAIC #</b>  |                                     |
|  | <b>INSURER A:</b> Associated Industries Insurance Co., Inc | 23140                               |
|  | <b>INSURER B:</b> Tokio Marine America Insurance Company   | 10945                               |
|  | <b>INSURER C:</b> Trans Pacific Ins Co                     | 41238                               |
| <b>INSURER D:</b>  |  |                                     |
| <b>INSURER E:</b>  |  |                                     |
| <b>INSURER F:</b>  |  |                                     |

Holder Identifier :

**COVERAGES****CERTIFICATE NUMBER:** 570091123357**REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

Limits shown are as requested

| INSR LTR | TYPE OF INSURANCE  | ADDL INSD  | SUBR WVD   | POLICY NUMBER  | POLICY EFF (MM/DD/YYYY) | POLICY EXP (MM/DD/YYYY) | LIMITS  |              |
|----------|--|--|------------|--|-------------------------|-------------------------|---|--------------|
| C        | <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY   |  |            | CPP640073112   | 01/01/2022              | 01/01/2023              | EACH OCCURRENCE   | \$1,000,000  |
|          | <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR   |  |            |  |                         |                         | DAMAGE TO RENTED PREMISES (Ea occurrence)                                       | \$100,000    |
|          |  |  |            |  |                         |                         | MED EXP (Any one person)  | \$5,000      |
|          |  |  |            |  |                         |                         | PERSONAL & ADV INJURY   | \$1,000,000  |
|          | GEN'L AGGREGATE LIMIT APPLIES PER:   |  |            |  |                         |                         | GENERAL AGGREGATE   | \$2,000,000  |
|          | <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input checked="" type="checkbox"/> LOC  |  |            |  |                         |                         | PRODUCTS - COMP/OP AGG  | \$1,000,000  |
|          | OTHER:   |  |            |  |                         |                         |   |              |
| B        | <b>AUTOMOBILE LIABILITY</b>  |  |            | CA6400730-12   | 01/01/2022              | 01/01/2023              | COMBINED SINGLE LIMIT (Ea accident)   | \$1,000,000  |
|          | <input checked="" type="checkbox"/> ANY AUTO   |  |            |  |                         |                         | BODILY INJURY (Per person)  |              |
|          | <input type="checkbox"/> OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> NON-OWNED AUTOS ONLY |  |            |  |                         |                         | BODILY INJURY (Per accident)  |              |
|          | <input checked="" type="checkbox"/> \$1,000 Comp. Ded. <input checked="" type="checkbox"/> \$1,000 Collision Ded   |  |            |  |                         |                         | PROPERTY DAMAGE (Per accident)  |              |
|          |  |  |            |  |                         |                         | Medical Payments Lia  | \$5,000      |
| B        | <input checked="" type="checkbox"/> UMBRELLA LIAB  | <input checked="" type="checkbox"/> OCCUR                        |            | CU640073212<br>SIR applies per policy terms & conditions                 | 01/01/2022              | 01/01/2023              | EACH OCCURRENCE   | \$10,000,000 |
|          | <input type="checkbox"/> EXCESS LIAB   | <input type="checkbox"/> CLAIMS-MADE                             |            |  |                         |                         | AGGREGATE   | \$10,000,000 |
|          | <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION   |  |            |  |                         |                         |   |              |
| B        | <b>WORKERS COMPENSATION AND EMPLOYERS' LIABILITY</b>   |  |            | WC640073412  | 01/01/2022              | 01/01/2023              | <input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER |              |
|          | ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)  | <input type="checkbox"/> Y <input checked="" type="checkbox"/> N | N/A        |  |                         |                         | E.L. EACH ACCIDENT  | \$1,000,000  |
|          | If yes, describe under DESCRIPTION OF OPERATIONS below   |  |            |  |                         |                         | E.L. DISEASE-EA EMPLOYEE  | \$1,000,000  |
|          |  |  |            |  |                         |                         | E.L. DISEASE-POLICY LIMIT   | \$1,000,000  |
| A        | <b>E&amp;O-MPL-Primary</b>   |  |            | AES120676200<br>Claims Made<br>SIR applies per policy terms & conditions | 01/31/2021              | 01/31/2022              | Each Claim  | \$2,000,000  |
|          |  |  | Deductible |  |                         |                         | \$50,000  |              |
|          |  |  |            |  |                         |                         | Aggregate   | \$2,000,000  |


DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

**CERTIFICATE HOLDER****CANCELLATION**

|  |  |
|--|--|
| State of West Virginia<br>Attn: Dept. of Administration<br>2019 Washington Street East<br>Charleston WV 25305-0130 USA | SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. |
|  | AUTHORIZED REPRESENTATIVE<br><br><i>Aon Risk Services Northeast, Inc.</i>  |

Certificate No : 570091123357

**EXECUTIVE SUMMARY:** Shimadzu has advanced triple quadrupole mass spectrometry further than any manufacturer to date. Adoption of our ultra-fast technologies in markets like forensics, food safety, environmental and clinical testing have fueled growth and development. In March of 2018 (last publication date of this feature), C&E News placed Shimadzu as the world's second largest instrument company. We have surpassed our closest LCMS competitors and remain the fastest growing LCMS company in the world.



| RANK |      | COMPANY                           | INSTRUMENT<br>SALES 2018<br>(\$ MILLIONS) | %<br>CHANGE<br>FROM<br>2017 | % OF TOTAL<br>SALES | HEADQUARTERS |
|------|------|-----------------------------------|---|-----------------------------|---------------------|--------------|
| 2018 | 2017 |                                   |   |                             |                     |              |
| 1    | 1    | Thermo Fisher Scientific          | \$6,333                                   | 12.1%                       | 26.0%               | US           |
| 2    | 3    | Shimadzu <sup>a</sup>             | 2,183                                     | 5.2                         | 61.8                | Japan        |
| 3    | 4    | Roche Diagnostics <sup>b</sup>    | 2,064                                     | 5.2                         | 15.6                | Switzerland  |
| 4    | 5    | Agilent Technologies <sup>c</sup> | 2,015                                     | 3.8                         | 41.0                | US           |
| 5    | 2    | Danaher                           | 1,941                                     | -15.0                       | 9.8                 | US           |
| 6    | 6    | Zeiss Group <sup>d</sup>          | 1,831                                     | 0.7                         | 26.6                | Germany      |
| 7    | 8    | Bruker                            | 1,516                                     | 14.4                        | 80.0                | US           |
| 8    | 7    | Mettler-Toledo International      | 1,497                                     | 9.8                         | 51.0                | Switzerland  |
| 9    | 9    | Waters Corp.                      | 1,205                                     | 2.1                         | 49.8                | US           |
| 10   | 12   | PerkinElmer                       | 889                                       | 27.0                        | 32.0                | US           |

Since 2010, Shimadzu has sold thousands of ultra-fast LCMS systems, with the fastest growing presence in the clinical and forensic market.

Shimadzu LCMS/MS instruments are engineered with no-compromise industry leading specifications. The strength of the Shimadzu hardware is based in the ultra-modern electronics-starting with the ability to collect data very fast to the fastest polarity switching on the market and, by far, the fastest scanning rates on the market. Whereas other instruments based on older electronics can require multiple injections to complete a comprehensive analysis, Shimadzu is known for fast one-injection analyses. Multiple injections and longer methods per sample reduces throughput, increases overhead cost, and adds complexity to data analysis.

Shimadzu is proposing a modern, fast and efficient solution to West Virginia Office of Chief Medical Examiner's requirement for a highly sensitive triple quadrupole mass spectrometer instrument. Ultra-Fast technologies, patented by Shimadzu, provide a significant improvement in sample throughput and data quality.

**MANUFACTURED IN AMERICA:** Shimadzu is the only major LCMS manufacturer with production in the United States. Our HPLC, LCMS and GCMS instruments are proudly built in an ISO-accredited facility in Canby, OR.

## **MANDATORY REQUIREMENTS: Mandatory Contract Services Requirements and Deliverables:**

Contract Services must meet or exceed the mandatory requirements listed below:

### **3.1 LC/MS/MS Triple Quad System**

- 3.1.1** The preferred system for the liquid chromatograph and the mass spectrometer must have all items manufactured and serviced by the same company.

**MEETS**

- 3.1.2** The fully integrated software package must be able to operate and control both the mass spectrometer and liquid chromatograph instruments from a single unified operating platform.

**MEETS**

- 3.1.3** The UHPLC components and LCMS instrument must be manufactured in the United States of America to allow for quick access and shipping times.

**MEETS**

- 3.1.4** The fully integrated software package must be able to operate and control both the mass spectrometer and the liquid chromatograph instruments from a single, unified operating platform.

**MEETS**

- 3.1.5** Quantitative results, threshold levels or synchronized survey scans must have the ability to initiate qualitative data scans to generate additional data from a single injection that may be programmed into the analytical methods.

**MEETS**

- 3.1.6** The system must be capable of performing both qualitative and quantitative analysis on a sample in a single run.

**MEETS**

- 3.1.7** The system must include the ability to perform solvent selection of up to 4 solvents per pump, as well as automatic column selection capability for up to 6 columns.

**MEETS**

- 3.1.8** There must also be a flow diversion valve to assist in keeping the LC/MS interface clean.

**MEETS**

- 3.1.9** The system must come with a second reservoir tray to hold all the mobile phase bottles from the pumping system.

**MEETS**

### **3.2 UHPLC Front End: System Controller**

- 3.2.1** UHPLC system must have a cooled autosampler with a capacity of a minimum of 2 deep well micro-titer plates (MTP); as well as a column oven that can cool and heat.

**EXCEEDS: The Shimadzu SIL-40CX3 has a capacity of 3 deep well MTP's. The column oven can cool to a temperature of 10°C below ambient and will heat to 100°C.**

- 3.2.2** The system controller must have an integrated touch screen and show the system and each module status from across the room.

**MEETS**

- 3.2.3** The system controller must have a built-in reservoir tray to hold the mobile phase bottles and directly interface with a monitor to gravimetrically measure the amount of mobile phase remaining and alert users if additional mobile phase must be added to complete the loaded batch.

**MEETS**

- 3.2.4** The system controller must allow users to monitor system status through a smart device and via the internet.

**MEETS**

- 3.2.5** The controller must display error messages on the front panel for easy recognition.

**MEETS**

### **3.3 Pumping System**

- 3.3.1** Pumping system must have a binary high-pressure pumping system with 2 pumps.

**MEETS**

- 3.3.2** Each pump must be able to flow up to 10 mL/min.

**MEETS**

- 3.3.3** Each pump must have a 4-solvent selector on it to help change assays easily, rapidly and efficiently develop new methods, and rinse between methods.

**MEETS**

- 3.3.4** During a batch, the pumping system must recognize it has a flow anomaly like a bubble and attempt to recover and continue the batch in an automated and unassisted fashion.

**MEETS**

- 3.3.5** The pumping system must automatically startup the system and ramp the mobile phase once the column oven is ready.

**MEETS**

### **3.4 Autosampler**

- 3.4.1** The autosampler must have a cooler to keep samples from degrading during batches.

**MEETS**

- 3.4.2** The autosampler must hold at least 2 Deep Well microtiter plates.

**EXCEEDS. The autosampler holds 3 Deep Well microtiter plates.**

- 3.4.3** The autosampler must accept different plate types such as 2 mL and Deep Well microtiter plates simultaneously to allow flexibility for different assays.

**MEETS**

- 3.4.4** The autosampler must have a means to reduce condensation and to come to temperature quickly when opening to exchange plates.

**MEETS**

- 3.4.5** Autosampler must have no more than a 7 second cycle time.

**MEETS**

- 3.4.6** The autosampler must be a needle in the flow path design to maintain low carry over.

**MEETS**

- 3.4.7** The autosampler must achieve the following carryover performance: 0.0015% without needle rinsing and 0.0003% with needle rinsing.

**MEETS**



**3.4.8** The autosampler must be able to do a total injection or variable volume injection to protect sample loss from happening.

**MEETS**

**3.4.9** The autosampler must be able to reproducibly inject as low as 0.1 µL and as much as 50 µL depending on assays.

**MEETS**

**3.4.10** The RSD for 0.1 µL injections must be more than 0.5%.

**MEETS**

**3.4.11** The autosampler must be capable of performing sample pretreatment including dilution, reagent addition, co-injection of samples, stacked injection, and overlapped injection.

**MEETS**

**3.4.12** The autosampler must be able to do an automatic purge cycle.

**MEETS**

**3.4.13** The autosampler must have both front panel and software control to allow us to do routine tasks such as purge from the front panel.

**MEETS**

**3.4.14** The autosampler must have the ability to display the total operating time, needle and rotor seal usage and any error logs to help users establish SOP's and maintenance schedules based on samples.

**MEETS**

**3.4.15** The plate or rack changer must be cooled to keep samples from degrading.

**MEETS**

**3.4.16** The plate or rack changer must accept different plate types such as 2mL and Deep Well microtiter plates simultaneously to allow flexibility for different assays.

**MEETS**

**3.4.17** The plate or rack changer must also automatically recognize the plate type in each position and in the software.

**MEETS**

### **3.5 Column Oven**

**3.5.1** The oven must be forced air to quickly get to its set temperature.

**MEETS**

**3.5.2** The column oven must have the ability to cool to at least 10 degrees below lab temperature and heat up to at least 70 degrees.

**EXCEEDS. The column oven can cool to 10 degrees below lab temperature, and will heat up to 100 degrees C.**

**3.5.3** The column oven must have both front panel and software control to allow us to do routine tasks such as changing columns.

**MEETS**

**3.5.4** The column oven must be large enough to hold at least 6 columns of 25 cm length or 3 columns of 300 mm length.

**MEETS**

- 3.5.5** The column oven must have the ability to display the total operating time, parts replacement and any error logs to help users establish SOP's (Standard Operating Procedures) and maintenance schedules based on lab samples.

**MEETS**

### **3.6 Triple Quadrupole Mass Spectrometer**

- 3.6.1** Must be capable of detecting a wide variety of analytes including toxins, drugs of abuse, prescription drugs and a variety of other compounds in human fluids and tissues.

**MEETS**

- 3.6.2** The minimum sensitivity requirement for positive ion mode: S/N >500,000:1 (RMS) for 1 pg of reserpine on column.

**MEETS**

- 3.6.3** The minimum sensitivity requirement for negative ion mode: S/N >500,000:1 (RMS) 1 pg chloramphenicol on column.

**MEETS**

- 3.6.4** To facilitate the analysis of a wide variety of analytes in a short chromatography window, the system must have the ability to perform fast polarity switching of 5msec.

**MEETS**

- 3.6.5** The system must be capable of performing the following acquisition modes: Q1 Scan, Q3 Scan, Multiple Reaction Monitoring (MRM), Selected Ion Monitoring (SIM), Product Ion Scan, Precursor Ion Scan, Neutral Loss Scan, Data Dependent Scan (where the Production scans can be automatically initiated by precursor scans, neutral loss scans, Q1 scans, Q3 scans, or MRM results)

**MEETS**

- 3.6.6** The LC/MS/MS must have a minimum mass range of 2-2000 m/z.

**MEETS**

- 3.6.7** The mass assignment must be stable within 0.05 Da over a 24-hour time period to ensure data accuracy.

**MEETS**

- 3.6.8** The minimum acceptable mass accuracy is: 0.1 Da.

**MEETS**

- 3.6.9** The scan speed must be 30,000 amu/sec. This scan speed must be applicable to all scan functions: precursor, neutral loss, and product ion scans and must be able to be applied across the whole mass range.

**MEETS**

- 3.6.10** The dynamic range must be 7 orders of magnitude.

**MEETS**

- 3.6.11** The dwell time must be 0.8 msec.

**MEETS**

- 3.6.12** The pause time must be 1 msec.

**MEETS**

- 3.6.13** The system must include a dual binary ultra-high-pressure Liquid Chromatograph with integrated degassing.

**MEETS**

- 3.6.14** The LC/MS/MS must come with both an electrospray ionization source as well as a dual ionization source which operates both ESI and APCI simultaneously and without splitting flow so that a wide variety of analytes in one injection can be analyzed.

**MEETS**

- 3.6.15** The dual ionization source must not reduce sensitivity (signal to noise) relative to the ESI source operation.

**MEETS**

- 3.6.16** The ionization sources must be easy to remove without the use of tools. Must have the ability to remove and replace the inlet to the vacuum region of the LC/MS/MS without breaking vacuum, which means that all source maintenance can be performed without breaking vacuum.

**MEETS**

- 3.6.17** The system must be capable of autotuning where both positive ion mode and negative ion mode are optimized automatically.

**MEETS**

- 3.6.18** A single tuning standard must be available for use on the LC/MS/MS that is able to produce both positive and negative ions for both ESI and APCI sources.

**MEETS**

- 3.6.19** The system must be capable of automatically restarting the vacuum system when the power resumes after a power failure.

**MEETS**

- 3.6.20** The package must include software for multiple analyte quantitation and should include 5 additional seat licenses for that quantitation software so that data can be processed remotely.

**MEETS**

- 3.6.21** The software must include a page layout function for *fast* generation of customized reports.

**MEETS**

- 3.6.22** The software must include a method creation tool for automated, batch-type optimization of new compounds.

**MEETS**

### **3.7 Nitrogen Generator**

- 3.7.1** The supplied generator must meet the requirements of the LC/MS/MS system.

**MEETS**

### **3.8 Plate Changer**

- 3.8.1** The system must include a plate changer to allow for expansion of up to 16 additional deep well microtiter plates.

**MEETS**

### 3.9 Customer Service and Support

- 3.9.1** To supplement the routine familiarization training done onsite, the vendor must supply at least 40 hours on-site training for the UHPLC front end and the LC/MS detector.

**MEETS**

- 3.9.2** If the customer is unavailable to take advantage of the training during the first year, the expiration should be extended automatically and without penalty.

**MEETS**

- 3.9.3** The system must include installation and familiarization training.

**MEETS**

- 3.9.4** The system must include both phone and onsite technical support for the life of the instrument.

**MEETS**

- 3.9.5** Field personnel must be made available for re-familiarizations.

**MEETS**

- 3.9.6** The package must be protected by a service contract for 3 years past the date of installation.

**MEETS**

- 3.9.7** This coverage must include emergency service as well as 2 full Premium Preventative Maintenance Visits.

**MEETS**

- 3.9.8** The Nitrogen Generator must also have 3 years of warranty coverage.

**MEETS**

### 3.10 Uninterruptable Power Supply

- 3.10.1** The package must include an Uninterruptable Power Supply (UPS) to power the system during a power outage or fluctuations until the generator is available.

**MEETS**

### 3.11 Toxicology Spectral Libraries

- 3.11.1** The package must include applicable toxicology spectral libraries for comparison of detected compounds

**MEETS**

**DELIVERY AND INSTALLATION:** That proposed timeline for instrument Delivery, Installation, Introductory Training at the Office of the West Virginia Chief Medical Officer, and Continued Training at Shimadzu is:

- Delivery of the LCMS/MS within 45 days of Receipt of Award
- If the site is properly ready, installation usually occurs within about a week of delivery
- Completion of installation, performance testing and immediate introductory training: 1-2 weeks
- Ongoing training and support: included in price and available as needed
- Formal training at the Shimadzu Institute of Learning in Columbia, MD: tuition certificates included for HPLC class and for LCMS Class.

**IMPLEMENTATION & TRAINING PLAN:** Shimadzu has two local LCMS Technical Support Scientists based in the Southeast Region with over twenty years of combined experience in mass spectrometric applications such as clinical, forensic, agricultural, environmental and -omics LCMS applications. The local LCMS Technical Support Scientists are the primary resource for training, retraining and application support. There are over 10 Field LCMS Technical Support Scientists across the US. In addition, there is a staff of specially trained LCMS Scientists based in our corporate office in Columbia, MD that are available for remote technical and application support.

Shimadzu provides ongoing training and technical support at no additional charge. This creates a low stress environment for the West Virginia Chief Medical Examiners staff to learn LCMS software and methodology. Please note that other vendors may include support during the warranty period, but Shimadzu is the only major vendor that provides on-going technical support, at no additional charge, for the life of the instrument.

Shimadzu customizes the training plan to the needs of lab staff. We believe that this allows lab staff to learn at their own pace without the concern of additional charges for follow up visits. To that end, Shimadzu will start by scheduling and providing one (1) basic user training session for up to four (4) users at WVME. The training will provide a basic demonstration of all equipment functions, maintenance, data administration, data acquisition, and troubleshooting. The training will be completed at WVME immediately after installation/set-up and on-site performance testing demonstrating that no damage or misalignment issues arose during transportation and installation (but shall be completed no later than 30 days after delivery).

In addition, classes to be held at Shimadzu's Institute of Learning in Columbia, MD, were included on the quote, free of charge. WVME would be able to send their scientists for continuing education on the topics of HPLC and LCMS, including software and hardware.

We are the fastest growing LCMS company in the world for two reasons:

1. We make the fastest, most efficient and cost-effective instruments.
2. We treat our customers like family.

As you go through this evaluation process you will undoubtedly find suppliers who will provide a lower price, but you will not find another company who can provide a better value.

We sincerely appreciate the opportunity to earn your business and treat the West Virginia Chief Medical Examiner like part of the Shimadzu family. Thank you for your consideration.

Sincerely,



Faith Hays, Ph.D.  
Senior LCMS Sales Specialist, SOE Region

**Customer:**

Tonya Mitchell  
State of West Virginia-Office of the Chief Medical Examiner  
619 Virginia Street, West  
Charleston, WV 24302  
Phone: (304) 352-4370  
Fax:  
E-mail: [tonya.h.mitchell@wv.gov](mailto:tonya.h.mitchell@wv.gov)

**Sales Engineer:**

Faith Hays  
Shimadzu Scientific Instruments  
1 TW Alexander Drive, Suite 100  
Durham, NC 27703  
Regional Office: (800) 951-9167 Ext. 1034  
Direct Dial: (800) 388-6996  
E-mail: [fahays@SHIMADZU.com](mailto:fahays@SHIMADZU.com)

**Sales Proposal**

**Quotation:** SSI-179472-B3Q9 Rev. 3

**Expiration:** 9/30/2022

**Quote Description:**

Solicitation #: CRFQ CME2200000004  
LCMS-8050 Package with Oil Free Rough Pump and Dual Ionization Source  
Package Includes Nitrogen Generator and UPS Power Conditioner  
5 Seat Software Post-Run Analysis License and Installation Kits Included  
Nexera X3 UHPLC with 4-Solvent Selection for each pump, and 6 Column Selection and flow diversion valves  
Column oven, mobile phase monitor, and plate changer included  
A total of 8 classes at the CTEC Center included  
3YVP Service Contract covers the instrument for 3 years past the date of installation and includes 2 Premium PM visits and a PM lite during the first year  
Also, 2 years of contract coverage for the Nitrogen Generator included in price

**Proposed Ship Date:** 90 Days/ARO **FOB:** DESTINATION **Ship Method:** BEST WAY

**Shipping Terms:** PREPAID & ADD **Incoterms:**

**Additional Information:**

**For proposal questions or modifications, please contact your sales representative.**

Thank you for your interest in Shimadzu Scientific Instruments.

**Authorization Signature\***



Willard Bankert

**Date: 3/25/2022**

\*Sales Proposal is not valid without Authorized Signature.

**For Order Placement:**

Reference Quotation Number on Purchase Order

Please note that state and local taxes, if applicable,  
will be added at invoicing.

Forward official tax exempt documentation if applicable.

Shimadzu Scientific Instruments  
7102 Riverwood Drive, Columbia, MD 21046  
Toll Free: 800-477-1227  
Local: 410-381-1227 Fax: 410-381-6781  
E-mail: [customer.service@shimadzu.com](mailto:customer.service@shimadzu.com)

International:  
Fax: 410-309-6130  
E-mail: [jcsc@shimadzu.com](mailto:jcsc@shimadzu.com)

Sales Quotation - please reference the quotation when submitting purchase order.

**LCMS-8050 with Oil-Free Rough Pump**

|    | Product #    | Qty | Description   | Price Per Unit | Ext'd Price  |
|----|--------------|-----|---|----------------|--------------|
| 1  | 220-91597-51 | 1   | LCMS-8050 Package with Dry Pump Option                            | \$309,024.00   | \$200,865.60 |
| 2  | 225-19605-58 | 1   | DUIS Dual Probe Set for LCMS-8045/8050/8060                       | \$4,053.00     | \$2,634.45   |
| 3  | 220-97823-12 | 1   | UPS 5.2kVa, for LCMS, ABCDEF5202-22                               | \$9,692.00     | \$8,238.20   |
| 4  | 225-15718-42 | 2   | LCMS-8050 Desolvation Line Assembly, DL ASSY2.                    | \$536.00       | \$696.80     |
| 5  | 225-14948-91 | 2   | ESI CAPILLARY PIPE ASSEMBLY, LCMS-2020, LCMS-8030/8040/8045/8050. | \$160.00       | \$208.00     |
| 6  | 225-32702-92 | 1   | LabSolutions Insight, 5 User License (electronic, network)        | \$1,697.00     | \$1,103.05   |
| 7  | 220-91600-52 | 1   | LCMS-8045/8050/8060/9030 Installation Kit                         | \$2,296.00     | \$1,492.40   |
| 8  | TIER 4 I&F   | 1   | Tier 4 Installation and Customer Familiarization                  | \$7,334.00     | \$0.00       |
| 9  | 220-99215-01 | 4   | LCMS-101: INTRODUCTION TO LCMS TRIPLE QUAD INSTRUMENTATION        | \$2,268.00     | \$0.00       |
| 10 | 225-32489-91 | 1   | LCMS Method Package - Rapid Toxicology Screening System Ver 3     | \$10,300.00    | \$6,695.00   |

**Nitrogen Generator and Generator Service**

|    | Product #    | Qty | Description   | Price Per Unit | Ext'd Price |
|----|--------------|-----|---|----------------|-------------|
| 11 | 220-91491-65 | 1   | LNI Swisssgas Nitrogen and Air Generator- NGA Castore XL iQ 20.40   | \$29,046.00    | \$24,689.10 |
| 12 | 220-91491-69 | 1   | LNI Swisssgas Onsite Installation, startup, and commissioning   | \$2,060.00     | \$1,751.00  |
| 13 | 220-99999-C4 | 1   | Extended Warranty Service Plan (Nitrogen Generator)<br>Comprehensive service plan that extends the product warranty from 15 months to 36 months and includes all PMs performed by a factory certified engineer and any repairs (parts, labor and travel included) during the same period. | \$9,194.00     | \$9,194.00  |

**UHPLC with Mobile Phase Monitor, Solvent Selection and Column Selection**

|    | Product #    | Qty | Description                               | Price Per Unit | Ext'd Price |
|----|--------------|-----|---|----------------|-------------|
| 14 | 228-65076-58 | 2   | LC-40D X3 UHPLC Pump                      | \$16,529.00    | \$21,487.70 |
| 15 | 228-65019-58 | 2   | DGU-405 5-channel Degasser                | \$4,061.00     | \$5,279.30  |
| 16 | 228-70254-42 | 1   | Piping Kit B, for High Pressure GE, ID0.1 | \$1,397.00     | \$908.05    |
| 17 | 228-70247-41 | 1   | Nexera Series Wiring Kit, A               | \$181.00       | \$117.65    |



|    |              |   |  |             |             |
|----|--------------|---|--|-------------|-------------|
| 18 | 228-57647-43 | 1 | Tool Kit, Common LC-40   | \$1,089.00  | \$707.85    |
| 19 | 220-91656-06 | 1 | SIL-40CX3 with Installation Kit                                      | \$37,965.00 | \$24,677.25 |
| 20 | 228-65500-58 | 1 | SCL-40 System Controller   | \$3,772.00  | \$2,451.80  |
| 21 | 228-65202-58 | 1 | CTO-40C Column Oven  | \$5,556.00  | \$3,611.40  |
| 22 | 228-65525-58 | 1 | Mobile Phase Monitor, Controller                                     | \$967.00    | \$628.55    |
| 23 | 228-65526-58 | 3 | Mobile Phase Monitor, Bottle Holder                                  | \$685.00    | \$1,335.75  |
| 24 | 228-65549-58 | 2 | Mobile Phase Monitor, Large Bottle Holder                            | \$1,167.00  | \$1,517.10  |
| 25 | 228-45209-41 | 1 | MiRC Mixer MR20 for pH 1-14  | \$1,258.00  | \$817.70    |
| 26 | 228-65016-58 | 2 | Low Pressure Gradient Kit, LC-40                                     | \$1,977.00  | \$2,570.10  |
| 27 | 228-65625-58 | 1 | FCV-0607H3 6-position 7-port UHPLC Valve                             | \$4,973.00  | \$3,232.45  |
| 28 | 228-65603-58 | 1 | FCV-0206 2-position 6-port HPLC Valve                                | \$3,666.00  | \$2,382.90  |
| 29 | 220-91057-00 | 1 | VALCO 7-PORT MANIFOLD, ANALYTICAL                                    | \$376.00    | \$244.40    |
| 30 | 220-91522-79 | 1 | IDEX 2/6 15k or 18k Tubing/Fittings Kit                              | \$998.00    | \$648.70    |
| 31 | 228-72589-41 | 1 | FCV Attachment Kit (CTO-40C)   | \$621.00    | \$403.65    |
| 32 | 228-65110-58 | 1 | Plate Changer  | \$16,936.00 | \$11,008.40 |
| 33 | 228-71840-41 | 3 | Recognition Labels for 96 Well Microplates (100 pc. set)             | \$349.00    | \$680.55    |
| 34 | 228-71840-42 | 3 | Recognition Labels for 96 Well Deep Well Plates (100 pc. set)        | \$349.00    | \$680.55    |
| 35 | 228-71766-41 | 1 | Plate Changer Coupling Kit Second Expansion Kit                      | \$2,060.00  | \$1,339.00  |
| 36 | 220-91530-32 | 1 | Vials, LC, 96-pos Deep Well MTP. 2 mL, Square Well, V Bottom, 12/pk. | \$84.00     | \$54.60     |
| 37 | 220-91530-94 | 1 | Vials, LC, Teflon/Silicone Mat for Square Well MTP, Pre-slit, 12/pk  | \$261.00    | \$169.65    |
| 38 | 220-91494-06 | 1 | HPLC Startup Kit w/o Res Tray #2 5-GAL Poly                          | \$1,565.00  | \$1,017.25  |
| 39 | 228-65508-58 | 1 | Reservoir Tray, Nexera series  | \$515.00    | \$334.75    |
| 40 | 220-91412-00 | 4 | 4L Bottle Cap Assembly   | \$41.00     | \$106.60    |
| 41 | TIER 2 I&F   | 1 | Tier 2 Installation and Customer Familiarization                     | \$2,307.00  | \$0.00      |
| 42 | 220-99213-70 | 4 | HPLC-101: INTRODUCTION TO HPLC MODULAR INSTRUMENTATION - LC-40       | \$2,966.00  | \$0.00      |

## Service

| Product #              | Qty | Description                                       | Plan Price  | Ext'd Price |
|------------------------|-----|---|-------------|-------------|
| 43 3YVP-3YR VALUE PLAN | 1   | Three Year(36 month) Value Plan Service Agreement | \$61,077.00 | \$42,753.90 |

**Total List Price:** \$606,429.00  
**Total Line Item Discount:** \$217,693.85  
**Quote Sub-Total:** \$388,735.15  
**Estimated Freight:** \$1,200.00  
**Total Amount:** \$389,935.15

Company Name: State of West Virginia-Office of the  
Chief Medical Examiner  
Quote Number: SSI-179472-B3Q9 Rev.3  
Activation Date: 3/24/2022  
Expiration Date: 9/30/2022

By placing an Order for any Products related to this Sales Proposal and Quotation, Customer agrees to the terms and conditions at <https://www.ssi.shimadzu.com/terms/General-Terms-Conditions-of-Sale.html>, which are incorporated herein and applicable hereto. SSI reserves the right to update its Terms and Conditions at any time, however the terms and conditions in effect at the date of delivery of Products related to this Sales Proposal and Quotation shall apply to that purchase.

## Service Agreement Plans Available

### As Quoted

| Quantity | Plan Name | Plan Price | Disc't % | Ext'd Price | Products Covered |
|----------|-----------|------------|----------|-------------|------------------|
|----------|-----------|------------|----------|-------------|------------------|

### Descriptions of Service Coverage

#### Preventative Maintenance

Preventative Maintenance (PM) visits will be scheduled by SSI at the mutual convenience of the buyer and SSI, or performed during any other service visit. PM visits, when provided under this Agreement, may include necessary cleaning, adjustments, verification, lubrication and parts replacement according to the PM checklist. Labor, travel expenses, and selected consumable parts will be included during the PM visit at no additional cost to the buyer.

#### Premium Preventative Maintenance

Premium Preventative Maintenance visits will be scheduled by SSI at the mutual convenience of the customer and SSI, or performed during any other service visit. This Premium PM will be performed by SSI according to established SSI procedures. Premium PM visits, when performed under this Agreement, will include necessary cleaning, adjustments, verification, lubrication and parts replacement. Labor, travel expenses and selected consumables parts\* (list of parts available upon customer request) will be included during the Premium PM visit at no additional cost to the customer. A travel zone fee is added to the agreement to cover travel costs. Purchase of the Premium PM option does not excuse Customer from performing normal daily, weekly or monthly maintenance that may be required.

#### Extended Warranty

Extended Warranty coverage includes all labor and parts (excluding consumables) necessary to restore the products to operating specifications.

This coverage level is not available for MS products and the associated turbo and roughing pumps. The MS products require a coverage level which includes a Premium PM.

#### Extended Warranty Plus

A combination of one scheduled Premium PM visit and Extended Warranty Coverage. Premium Preventative Maintenance visits will be scheduled by SSI at the mutual convenience of the customer and SSI, or performed during any other service visit. Premium PM visits, when performed under this Agreement, will include necessary cleaning, adjustments, verification, lubrication and parts replacement. Labor, travel expenses and selected consumables parts\* (list of parts available upon customer request) will be included during the Premium PM visit at no additional cost to the customer. The extended Warranty Includes all labor and parts (excluding consumables outside of PM) necessary to restore the products to operating specifications. A travel zone charge is added to the contract to cover travel costs. In the event of a covered product failure, SSI will use its best effort to provide on-demand service.

#### Premium Total Coverage

This level of agreement provides the customer with a level of coverage includes all labor and non-consumable parts, a Premium PM visit, and in addition provides for the replacement of consumable parts outside of a PM visit at no additional cost to the buyer. Use of this level of Service will be monitored by SSI and in the event that the buyer's use does not exceed two visits during the effective dates of the agreement, the buyer will be entitled to an agreed upon rebate at the end of the agreement term. This rebate must be applied to the purchase of future service agreements or other services offered by SSI.

#### Three Year Value Plan

Three Year Value Plan Service Agreement:

Following system installation, provides 3 consecutive years of FULL warranty coverage, Customer Care follow-up Year1, and Scheduled Premium Preventative Maintenance (PPM) on-site service during Year2 and Year3.

Sales Quotation - please reference the quotation when submitting purchase order.

### Line Item Descriptions

#### Product # Description

#### 3YVP-3YR VALUE PLAN

Three Year Value Plan Service Agreement:

Following system installation, provides 3 consecutive years of FULL warranty coverage, Customer Care follow-up Year1, and Scheduled Premium Preventative Maintenance (PPM) on-site service during Year2 and Year3.

#### LCMS-8050 with Oil-Free Rough Pump

#### 220-91597-51 LCMS-8050 Package with Dry Pump Option

LCMS-8050 triple quadrupole mass spectrometer with Electrospray Ionization (ESI) interface for high speed mass spectral scanning and high sensitivity Multiple Reaction Monitoring (MRM) applications. Optional Atmospheric Pressure Chemical Ionization (APCI) or Dual Ion Source (DUIS) available. The LCMS-8050 features ultra-fast multiple reaction monitoring (MRM) transitions, enabling data acquisition with up to 555 different channels per second and scan speeds of 30,000 u/sec without sacrificing sensitivity or resolution, and ultra-fast polarity switching (5msec) for the most information without signal deterioration. LabSolutions LCMS software provides an easy to use graphical interface for seamless operation of the entire LCMS system, unmatched qualitative and quantitative analysis, increased productivity, and accelerated workflows for high throughput data analysis. LabSolutions Insight offers rapid data processing capable of peak identification, quantitative results, and statistical calculations of large data sets for further optimization of high throughput data analysis. Package includes LCMS-8050 Triple Quadrupole Detector, Advanced Data Station, 24" LCD Monitor, LabSolutions Software Package and License, LabSolutions Insight Software Package and License, Startup Kit, Maintenance Free Dry Pump, and Accessories.

#### 225-19605-58 DUIS Dual Probe Set for LCMS-8045/8050/8060

Shimadzu's DUIS Dual Ion Source adds APCI capability to the standard ESI configuration. By adding APCI capability for non-polar molecules, the user benefits from faster method development and the ability to analyze more compounds in a single method.

#### 220-97823-12 UPS 5.2kVa, for LCMS, ABCDEF5202-22

AMETEK Powervar uninterruptible power managers (UPM) combine surge diversion and noise filtering with a highly efficient low-impedance isolation transformer for power protection and reliability for your mission-critical application. Security Plus Series II products are warranted to be free from defects in material and workmanship for three (3) years from date of shipment from AMETEK Powervar on the chassis and electronic components, and two (2) years from date of shipment from AMETEK Powervar on the batteries.

#### 225-15718-42 LCMS-8050 Desolvation Line Assembly, DL ASSY2.

LCMS-8050 Desolvation Line Assembly, DL ASSY2.

#### 225-14948-91 ESI CAPILLARY PIPE ASSEMBLY, LCMS-2020, LCMS-8030/8040/8045/8050.

ESI CAPILLARY PIPE ASSEMBLY, LCMS-2020, LCMS-8030/8040/8045/8050/8060/8060NX, LCMS-9030 and LCMS-9030 Calibrant delivery system

#### 225-32702-92 LabSolutions Insight, 5 User License (electronic, network)

LabSolutions Insight, 5 User License (electronic, network) offers high throughput data review for five users via a network server. A single serial number and security code is provided for activation.

Can be used for both LabSolutions Insight and LabSolutions Insight DB/CS

#### 220-91600-52 LCMS-8045/8050/8060/9030 Installation Kit

LCMS-8045/8050/8060/8060NX/9030 Installation Kit. This kit contains 100' of 6mm OD PTFE nitrogen gas tubing, 50' of 1/8" cleaned copper argon gas tubing, 1 Nitrogen regulator, 1 Argon regulator, and fittings allowing connection of the LCMS unit to the gas system.

#### TIER 4 I&F Tier 4 Installation and Customer Familiarization

#### 220-99215-01 LCMS-101: INTRODUCTION TO LCMS TRIPLE QUAD INSTRUMENTATION

This course is designed for those analysts who will be performing routine quantitative analysis and are a novice with triple quad LCMS. Students will learn to operate the LCMS hardware, optimize quantitative methods, and acquire data using LabSolutions software. Data will be processed using LabSolutions software and Insight software. Routine maintenance and troubleshooting will also be discussed.

#### **225-32489-91 LCMS Method Package - Rapid Toxicology Screening System Ver 3**

Compatible with LCMS-8040/8045/8050/8060.

Analyzes 235 analytes in one injection.

This system improves the efficiency of simultaneous LC/MS/MS analysis methods by allowing the user to start analysis without time-consuming steps such as consideration of separation conditions and MS parameter optimization. Rapid simultaneous analysis methods with analysis times under 15 mins are included for 235 compounds including drugs of abuse, psychoneurotic drugs and sedatives. The system also provides optimized conditions for synchronized survey scans used in screening measurements (conditions adopted for the product ion spectrum as a threshold value for the intensity in MRM).

Consumables NOT INCLUDED:

Column: 00D-4496-AN Phenomenex Kinetex XB-C18 2.1x100mm, 2,6 um

AJO-8782 Phenomenex Security Guard Ultra C18 for 2.1mm ID 3-pack

AJO-9000 Guard cartridge holder

#### **Nitrogen Generator and Generator Service**

##### **220-91491-65 LNI Swissgas Nitrogen and Air Generator- NGA Castore XL iQ 20.40**

LNI Swissgas Nitrogen and Air Generator- NGA Castore XL iQ 20.40, Nitrogen and air gas generator with integrated compressor capable of producing 20L/min of LCMS grade Nitrogen at 115psi and 40 L/min of purified air. Configuration includes installation kit and 1st year annual filter kit.

##### **220-91491-69 LNI Swissgas Onsite Installation, startup, and commissioning**

LNI Swissgas Onsite Installation, Startup, and Commissioning. Onsite installation covers all parts included in the installation kit and is performed by a LNI Swissgas service engineer. Installation kit includes 2 quick fittings (Male 1/4" BSPP for 6mm tube), 2 quick fittings (Male 1/4" BSPP for 10mm tube), 2 quick fittings (Male 1/4" BSPP for 1/4" tube), 2 swagelock fitting (Male 1.4" BSPP for 1/4" tube), 2 Conversion fittings (Female 1/4" BSPP to quick fitting for 10mm tube), 5m 1/4" PTFE Tube, 5m PTFE 6mm tube, and 5m PTFE 10mm tube

##### **220-99999-C4 Extended Warranty Service Plan (Nitrogen Generator) Comprehensive service plan that extends the product warranty from 15 months to 36 months and includes all PMs performed by a factory certified engineer and any repairs (parts, labor and travel included) during the same period.**

#### **UHPLC with Mobile Phase Monitor, Solvent Selection and Column Selection**

##### **228-65076-58 LC-40D X3 UHPLC Pump**

The LC-40DX3 pump provides the highest tier of reliable and robust UHPLC performance up to 130 MPa (~19,000 psi). This pumping system incorporates a dual plunger, reciprocating pump for stable solvent delivery across a wide analytical flow rate range. The -40DX3 pump can be configured for HPGE, LPGE, and blending functions for solvent delivery. The -X3 pump is ideal for semi-micro LCMS applications and for analysis using <2 um particle columns.

##### **228-65019-58 DGU-405 5-channel Degasser**

A 5-channel degassing unit for the Nexera Series (U)HPLC. Degassing reduces the occurrence of bubbles in the HPLC which can lead to poor chromatographic outcomes. This degasser provides efficient vacuum degassing for four pump lines plus the rinse line for the autosampler.

##### **228-70254-42 Piping Kit B, for High Pressure GE, ID0.1**

Kit with stainless steel tubing for connecting two UHPLC pumps to mixer (0.3x600 mm), mixer to injector (0.3x300 mm), and injector to column (0.1x600 mm).

##### **228-70247-41 Nexera Series Wiring Kit, A**

Includes one 600 mm FO cable, one 800 mm FO cable and a wiring cover.

##### **228-57647-43 Tool Kit, Common LC-40**

Shared tool kit for the i-Series and LC-40. Includes wrenches, seal installer tool, syringes and adapters, rotor replacement tool, and other items for routine maintenance on i-Series and LC-40 Series units.

**220-91656-06 SIL-40CX3 with Installation Kit**

The SIL-40C X3 provides high speed injections with ultra-low carryover achieved through advanced material technology and rinse chemistries with up to 4 solvents. The standard configuration uses the needle in the flow path design for 0.1 to 50 µL injection volumes; an optional fixed-loop configuration (5, 10, or 20 µL) is user-changeable to reduce delay volume. The sample compartment provides temperature control from 4-40 C. An external rinse pump is standard, and provides additional rinsing to the outer surface of the needle. Sample capacity is three racks, for 1.5 (2mL) vials, 1 mL vials, 4 mL vials, 10 mL vials, 1.5 mL microcentrifuge tubes, or 96/384 well plates. Sample capacity is 252 x 1 mL vials, 162 x 1.5 mL vials, 84 x 4 mL vials, or 3 x MTP (MTP 96, DWP 96, or MTP 384). Maximum pressure is 130 MPa (19000 psi).

**228-65500-58 SCL-40 System Controller**

The SCL-40 system controller is the central communication and control module for the Nexera series. Advanced pressure-sensitive color touchscreen allows system control and monitoring. System components connect via fiber optic cables for easy configuration. Internal web server offers convenient control and monitoring of the HPLC system through a web browser.

**228-65202-58 CTO-40C Column Oven**

Full-sized forced air column oven that provides temperature control from (ambient - 10 C) to 100 C. Can accommodate a manual injector, mixer, and 2 switching valves. For columns up to 300 mm length.

**228-65525-58 Mobile Phase Monitor, Controller**

Controller for Mobile Phase Monitor function. Allows for the amount of mobile phase remaining on the instrument to be determined gravimetrically and will stop the instrument before mobile phase runs out. Compatible with 3rd party instruments via contact closure. One controller can be used with up to 6 bottle holders (12 1L bottles total).

**228-65526-58 Mobile Phase Monitor, Bottle Holder**

Bottle Holder for the Mobile Phase Monitor function. Requires a MPM Controller to function. Each Bottle Holder can accommodate 2x1L bottles. 6 Bottle Holders can be used with a single controller (12 bottles total).

**228-65549-58 Mobile Phase Monitor, Large Bottle Holder**

Large Bottle Holder for the Mobile Phase Monitor function. Requires a MPM Controller to function. Each Large Bottle Holder can accommodate 1x 2-5 L bottle bottles. 4 Large Bottle Holders can be used in total.

**228-45209-41 MiRC Mixer MR20 for pH 1-14**

High efficiency 20 µL mixer using micro reactor technology to thoroughly blend solvents in a small volume. This mixer is recommended for UHPLC systems requiring minimal system dispersion without an optical detector, operating at analytical flow rates (~1 mL/min) and LCMS flow rates with solvents from pH 1-14.

**228-65016-58 Low Pressure Gradient Kit, LC-40**

Low Pressure Gradient Elution (LPGE) valve for the Nexera LC-40 Series (U)HPLC pump. This quaternary valve provides 4-solvent selection and blending for any model of LC-40 pump for accurate and reproducible gradient formation.

**228-65625-58 FCV-0607H3 6-position 7-port UHPLC Valve**

Quick-exchange UHPLC valve for use with Nexera series. Max pressure = 19000 psi.

**228-65603-58 FCV-0206 2-position 6-port HPLC Valve**

Quick-exchange HPLC valve for use with Nexera series. Max pressure = 6300 psi.

**220-91057-00 VALCO 7-PORT MANIFOLD, ANALYTICAL**

7-port, 6-position manifold for HPLC column switching. Serves as an alternative to a second FCV-14AH or FCV-20AH6 for multi-column applications. Does not include mounting bracket. Manifold is meant to be held up by the connected tubing.

**220-91522-79 IDEX 2/6 15k or 18k Tubing/Fittings Kit**

Tubing and fittings kit for a typical 2 position 6 port valve configuration in a CTO20/30 oven.

**228-72589-41 FCV Attachment Kit (CTO-40C)**

Attachment kit for the CTO-40C that allow the attachment of up to 2 valves in the oven.

**228-65110-58 Plate Changer**

Temperature Controlled robotic unit for loading microtiter plates into the SIL-40C, -40CXR, -40XS, -40CX3. 14 MTP capacity (96 position, shallow or deep well). Up to 3 plate changers may be multiplexed.

**228-71840-41 Recognition Labels for 96 Well Microplates (100 pc. set)**

Identification labels for 96 well MTPs. Pack of 100. Used for automatic rack detection in the SIL-40 and Plate Changer.

**228-71840-42 Recognition Labels for 96 Well Deep Well Plates (100 pc. set)**

Identification labels for 96 deep well MTPs. Pack of 100. Used for automatic rack detection in the SIL-40 and Plate Changer.

**228-71766-41 Plate Changer Coupling Kit Second Expansion Kit**

Optional kit to add second Plate Changer to SIL-40 system. Requires additional Plate Changer, max. capacity = 30 plates.

**220-91494-06 HPLC Startup Kit w/o Res Tray #2 5-GAL Poly**

Complete installation kit for HPLC that includes a set of 5 1-L bottles with 3-hole caps, PEEK tubing and fittings kit, and a 5-gallon (20 L) PE waste can with polypropylene quick-disconnect manifold fittings.

**228-65508-58 Reservoir Tray, Nexera series**

This reservoir tray is used to hold and organize mobile phase bottles for the Nexera Series (U)HPLC. It has convenient slots that can accommodate the Mobile Phase Monitor Controller and up to 3 standard Bottle Holders (or 2 Large Bottle Holders) securely.

**220-91412-00 4L Bottle Cap Assembly**

For standard 4L solvent bottles and 1L HDPE plastic bottles (220-91413-03) with GL-38 threads. Includes 1 solid plug and 1 filter plug with stainless steel frit.

**TIER 2 I&F Tier 2 Installation and Customer Familiarization**

Tier 2 Installation and Customer Familiarization.

**220-99213-70 HPLC-101: INTRODUCTION TO HPLC MODULAR INSTRUMENTATION - LC-40**

This course consists of classroom and laboratory activities.  
 Duration: 4 days

Items needed: Everything needed is provided in the class. A personal laptop is recommended.

This course covers the skills required by an analyst to successfully analyze unknown samples using a modular Shimadzu LC-40 system with LabSolutions software. Participants will learn to operate the HPLC hardware, create methods, acquire and process data, and calibrate methods for quantitative analysis. Instrument maintenance and troubleshooting is also covered.

To register: create an account at <https://shimadzu.geniussis.com/PublicStudentSignUp.aspx>. Once logged in, choose "Register for Course" from the left navigation > click "Register" on your desired course > click "Proceed to Checkout" and follow the checkout instructions to "Submit". You will be instantly enrolled and Customer Service may contact you as follow-up based on the payment method chosen.

## HPLC

**220-91530-32 Vials, LC, 96-pos Deep Well MTP. 2 mL, Square Well, V Bottom, 12/pk.**

Polypropylene 96-well MTP. Deep well, conical bottom, approx. 2mL volume. Pre-slit Teflon/silicone mat 220-91530-98 is available to reseal wells and protect labile samples.

**220-91530-94 Vials, LC, Teflon/Silicone Mat for Square Well MTP, Pre-slit, 12/pk**

Silicone mat with sprayed on Teflon barrier coating. Pre-slit wells allow easy needle penetration and will reseal to protect labile samples.

Liquid Chromatograph Mass Spectrometer

# LCMS-8050

**UFMS**  
ULTRA FAST MASS SPECTROMETRY





# Speed and



# Sensitivity Beyond Comparison

---

Continuing the evolution of Shimadzu's UF technology,  
Shimadzu introduces the LCMS-8050 triple quadrupole mass spectrometer,  
offering unparalleled measurement speeds and high-sensitivity performance.

High-sensitivity quantitation delivered at high speed

Multi-component analysis performed more rapidly

Simultaneous qualitative and quantitative analyses

The high performance of the LCMS-8050 defies expectations,  
redefining high-sensitivity, high-speed analysis.



# Experience a New Realm of High-Sensitivity & High-Speed Performance

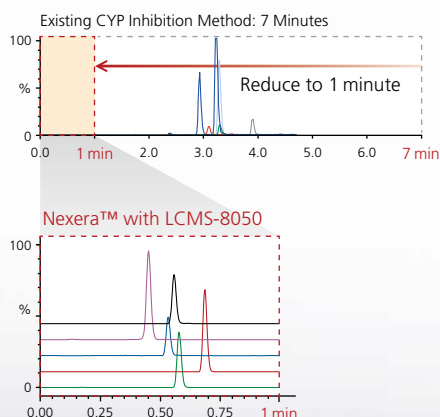


UFsensitivity™  
Combining Speed and High Sensitivity

UFswitching™ ■ High-Sensitivity & High-Speed Positive/Negative Ionization Switching in 5 msec

## A Case Study Using High-Speed Positive/Negative Ionization Switching

High-speed polarity switching has a high impact on LC-MS/MS method design and capability by optimizing the signal response for each target compound resulting in a single injection analysis cycle, faster rates of sample throughput and a greater number of target compounds in a single method.



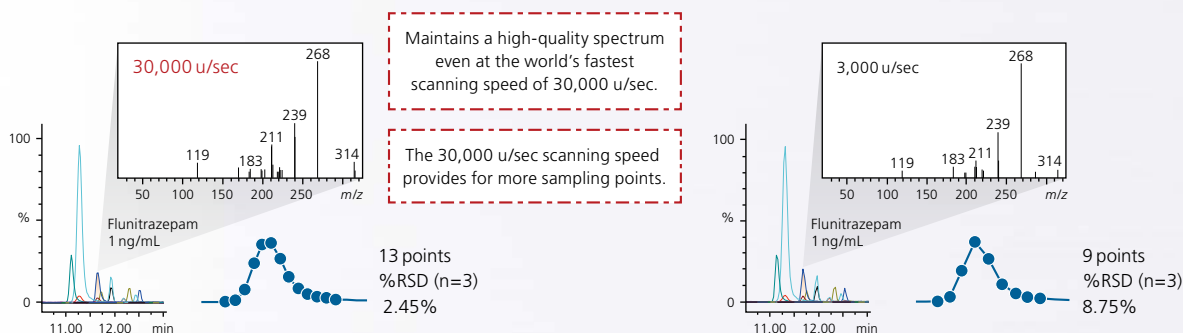
High-speed polarity switching pushes the boundaries further;

- Supports high data sampling rates delivering over 20 points across a UHPLC peak
- Improves reproducibility even at the lowest calibration level
- Enhanced dynamic range compared to other triple quadrupoles

| Compound                     | Polarity | Legacy HPLC Method<br>7 min  |                 |                             | Nexera with LCMS-8050<br>1 min |                 |                             |
|------------------------------|----------|------------------------------|-----------------|-----------------------------|--------------------------------|-----------------|-----------------------------|
|                              |          | Dynamic<br>range<br>(nmol/L) | Points/<br>peak | %RSD<br>0.6 nmol/L<br>(n=4) | Dynamic<br>range<br>(nmol/L)   | Points/<br>peak | %RSD<br>0.6 nmol/L<br>(n=4) |
| Resorufin                    | +        | 0.6–300                      | 19              | 4.66                        | 0.6–1000                       | 21              | 4.30                        |
| 1'-Hydroxy Bufuralol         | +        | 0.6–300                      | 21              | 2.39                        | 0.6–1000                       | 24              | 1.82                        |
| (+/-)-4'-Hydroxy Mephenytoin | +        | 0.6–300                      | 20              | 2.75                        | 0.6–1000                       | 23              | 2.18                        |
| Oxidized Nifedipine          | +        | 0.6–300                      | 19              | 5.58                        | 0.6–1000                       | 23              | 5.07                        |
| Hydroxy Tolbutamide          | —        | 0.6–300                      | 20              | 5.68                        | 0.6–1000                       | 23              | 2.96                        |

## Simultaneous Quantitative and Qualitative Analysis Simultaneous High-Speed Screening of 12 Toxicological Drugs

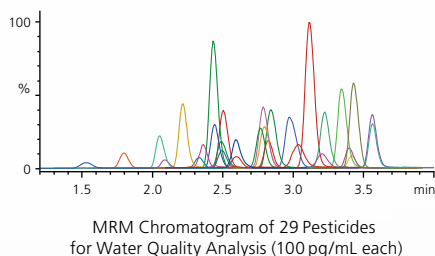
The LCMS-8050 is capable of simultaneously obtaining both qualitative and quantitative information in a single analysis. Acquisition occurs so rapidly that MS/MS scans and MRM measurements can be performed concurrently while maintaining quantitative accuracy. MS/MS scans are usable and reliable because even at 30,000 u/sec, Shimadzu uses a 0.1 u scan step.



MRM Triggered Product Ion Scanning of a Mixture of 12 Benzodiazepines (1 ng/mL each)

## Detect Target Compounds at Trace-Level Concentrations Simultaneous Analysis of 29 Pesticides for Water Quality Analysis

The LCMS-8050 is capable of simultaneously acquiring 555 MRM transitions per second without sacrificing accuracy and precision. A high sampling rate delivers precise and accurate quantitation for quantitation ions, reference ions, and internal standard ions even in chromatographic regions with unresolved peaks. The high sensitivity of the LCMS-8050 allows for trace-level analysis, such as pesticides in drinking water, without the need for sample pre-concentration. This high sensitivity is maintained even when monitoring large panels of target compounds.



LCMS-8050 has achieved LOQs that fulfill the 1/100 target value without sample pre-concentration.

| No. | Compound       | LOQ<br>pg/mL | 1/100 of<br>target<br>pg/mL* | No. | Compound            | LOQ<br>pg/mL | 1/100 of<br>target<br>pg/mL* |
|-----|----------------|--------------|------------------------------|-----|---------------------|--------------|------------------------------|
| 1   | Thiuram        | 2.0          | 200                          | 16  | MPP oxon sulfoxide  | 4.2          | 10                           |
| 2   | Bentazone      | 3.9          | 2000                         | 17  | MPP oxon sulfone    | 5.7          | 10                           |
| 3   | Carbofuran     | 1.6          | 50                           | 18  | Dymron              | 0.65         | 8000                         |
| 4   | 2,4-D          | 46.7         | 300                          | 19  | Methomyl            | 2.3          | 300                          |
| 5   | Triclopyr      | 45.3         | 60                           | 20  | Probenazole         | 5.2          | 500                          |
| 6   | Iprodione      | 1.7          | 3000                         | 21  | Diuron (DCMU)       | 0.7          | 200                          |
| 7   | Asulam         | 2.3          | 2000                         | 22  | Bensulfuron-methyl  | 4.4          | 4000                         |
| 8   | Bensulide      | 4.8          | 1000                         | 23  | Tricyclazole        | 2.7          | 800                          |
| 9   | Mecoprop (MCP) | 6.1          | 50                           | 24  | Azoxystrobin        | 2.7          | 5000                         |
| 10  | Carbaryl (NAC) | 2.3          | 500                          | 25  | Halosulfuron-methyl | 0.52         | 3000                         |
| 11  | Carpropamid    | 1.3          | 400                          | 26  | Flazasulfuron       | 0.47         | 300                          |
| 12  | Fenthion (MPP) | 3.1          | 10                           | 27  | Thiodicarb          | 3.4          | 800                          |
| 13  | MPP sulfoxide  | 1.7          | 10                           | 28  | Siduron             | 0.82         | 3000                         |
| 14  | MPP sulfone    | 5.1          | 10                           | 29  | Fipronil            | 4.7          | 5                            |
| 15  | MPP oxon       | 4.9          | 10                           |     |                     |              |                              |

\*Note: Official analytical methods require detection to 1/100th of regulatory targets.



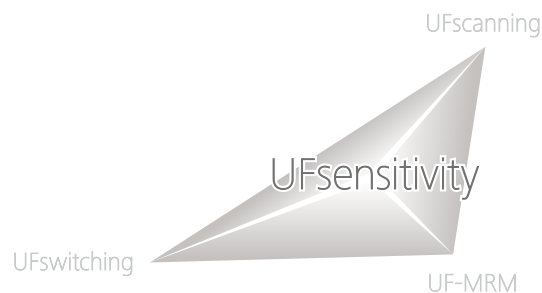
## UFsensitivity

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### High Sensitivity for Trace Quantitative Analysis

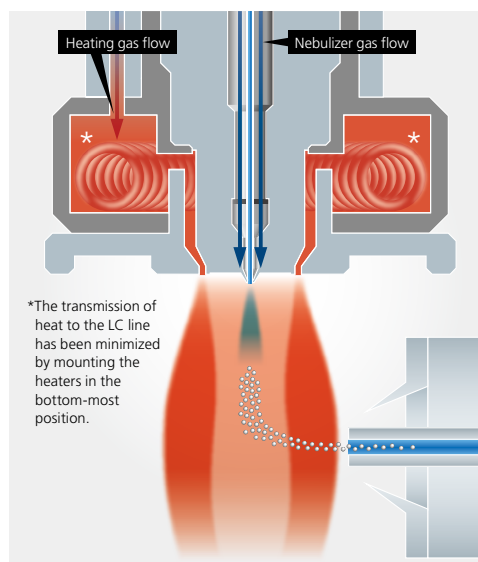
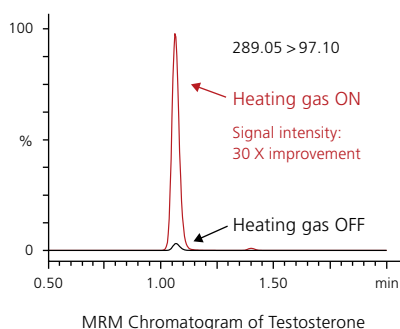
Scientists who demand trace-level quantitation will benefit from a newly designed heated ESI probe and a new high-efficiency CID cell, the UFsweeper™ III.

These technological improvements combined with Shimadzu's patented ion optics system deliver robust high-sensitivity performance.



## ■ Heated ESI Probe

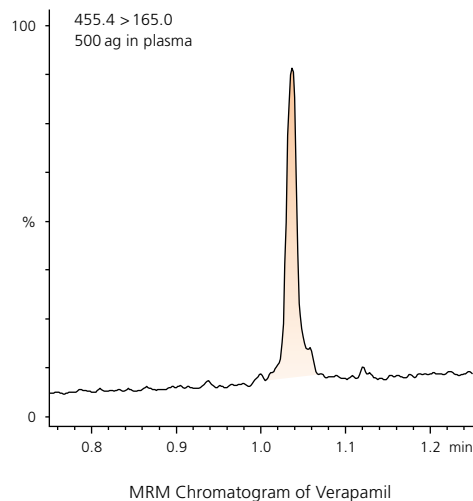
In order to improve desolvation efficiency, the newly developed heated ESI probe combines a high-temperature gas with the nebulizer spray, assisting in the desolvation of large droplets and facilitating ionization. This development allows for high-sensitivity analysis of a wide range of target compounds.



## ■ Excellent Reproducibility Even at Attogram (ag) Levels

Both sensitivity and reproducibility are essential when establishing low limits of quantitation. High-precision quantitative results obtained with the LCMS-8050 in the analysis of Verapamil in blood plasma at levels between 500 ag and 50 pg are shown below. Excellent reproducibility with a % RSD of 2.77 % was obtained when analyzing just 500 ag of Verapamil. The LCMS-8050 demonstrates optimal performance for quantitative analysis of even trace components of a complex matrix.

| Concentration actual ng/mL | Calculated concentration ng/mL | % RSD (n = 6) | Accuracy (%) (n = 6) |
|----------------------------|--------------------------------|---------------|----------------------|
| 0.000500                   | 0.000501                       | 2.77          | 100.2                |
| 0.00500                    | 0.00496                        | 3.98          | 99.2                 |
| 0.0500                     | 0.0506                         | 1.21          | 101.2                |
| 0.500                      | 0.493                          | 1.31          | 98.6                 |
| 5.00                       | 4.89                           | 1.81          | 97.8                 |
| 50.0                       | 51.6                           | 0.65          | 103.2                |







# UFswitching

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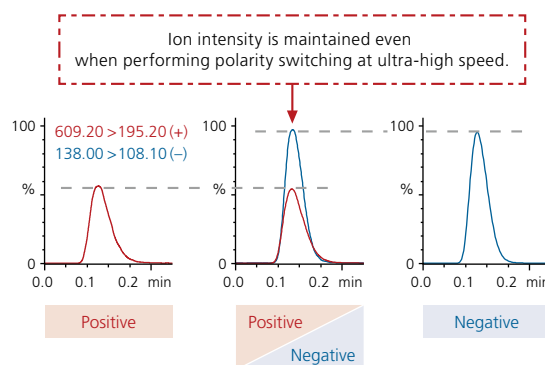
## Polarity Switching Technology with No Compromise in Quality or Sensitivity

Ultra-high speed positive/negative ionization switching technology [ UFswitching ] maintains constant data quality and sensitivity with no loss of quantitative accuracy. Laboratories can now use a single method for both positive and negative ions, increasing sample throughput and saving method development time.



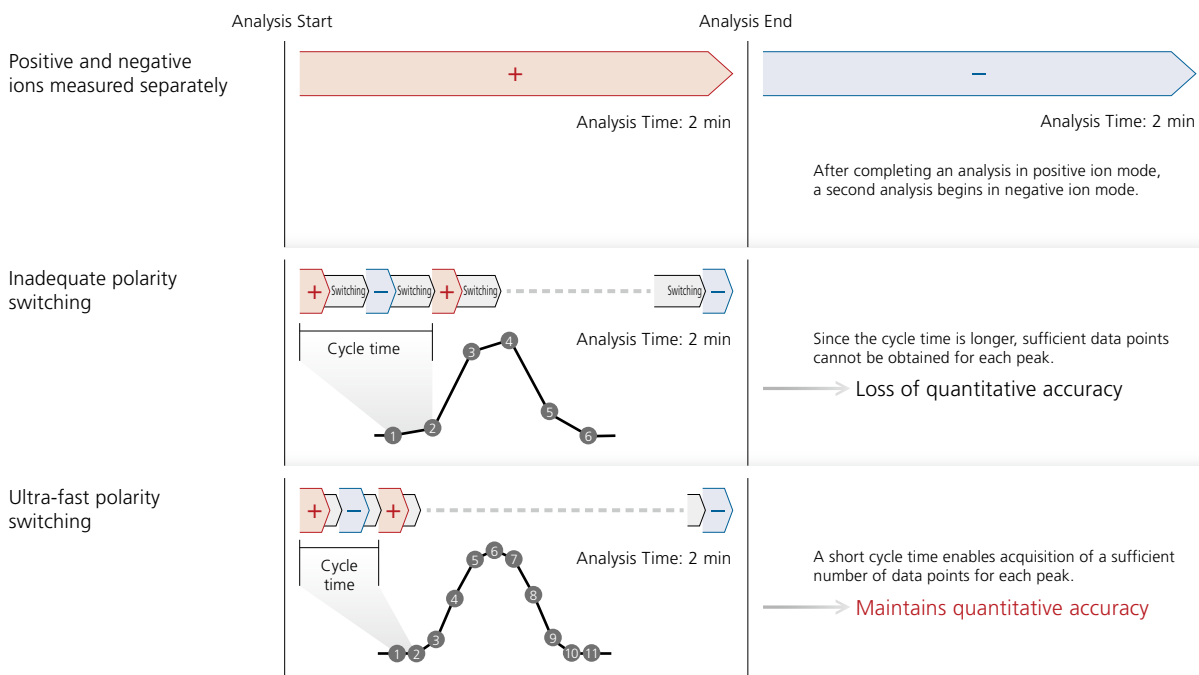
## ■ Only 5 msec to Achieve Stable Quantitative Accuracy with Positive/Negative Ionization Switching

The LCMS-8050 uses unique high-voltage power supply technology to achieve an ultra-high-speed positive/negative ionization switching time of just 5 msec. The LCMS-8050 is also the only instrument of its type to maintain ion intensity even when performing polarity switching at ultra-high speed, yielding consistent, reproducible data. Excellent quantitative results can be obtained from UHPLC peaks no more than 2-3 seconds wide, even when multiple components are eluted simultaneously.

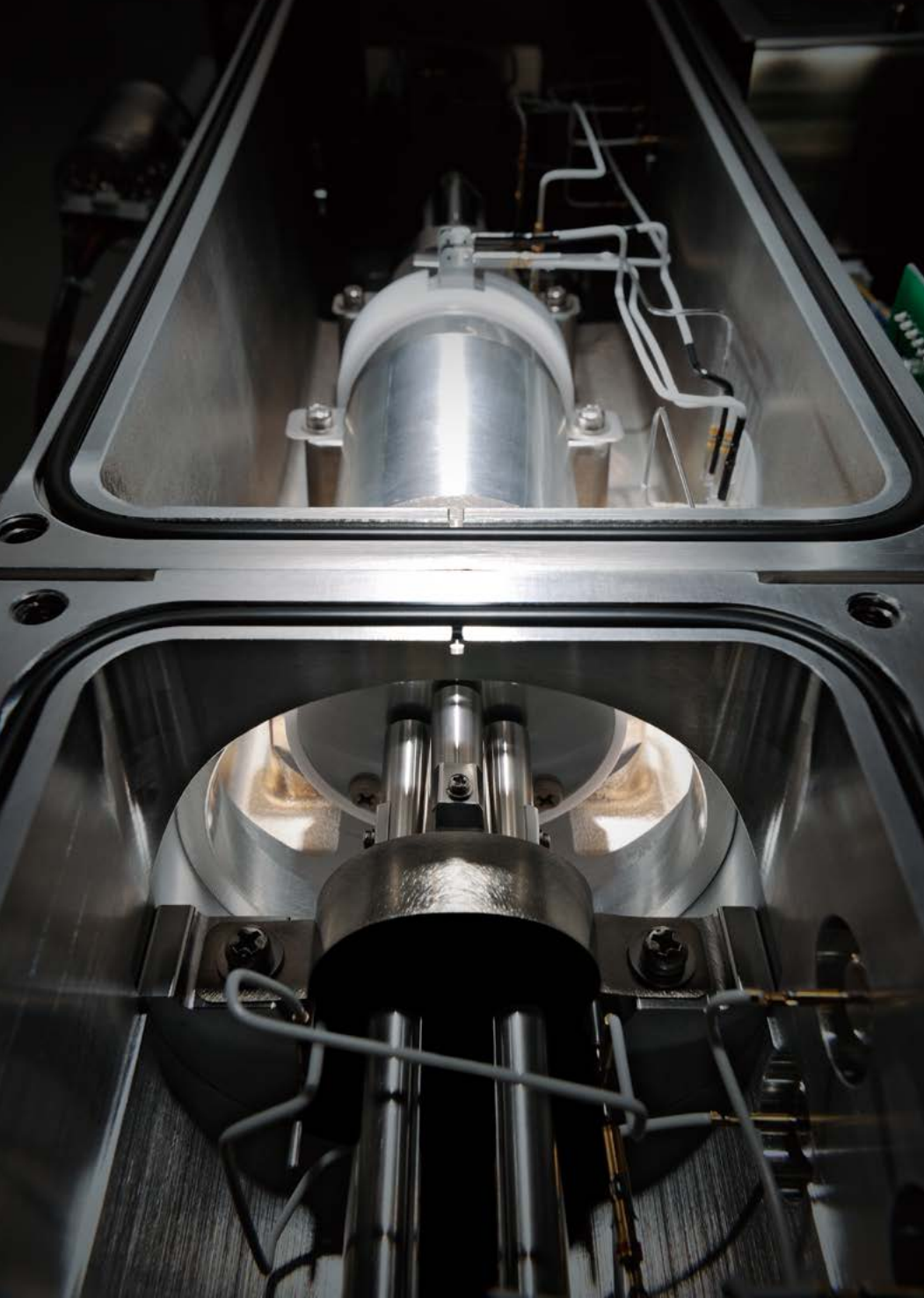


Comparison of measurement using the ultra-fast polarity switching (5 msec) and individual measurement of positive and negative ions.

## ■ Outstanding Throughput and Quantitative Accuracy





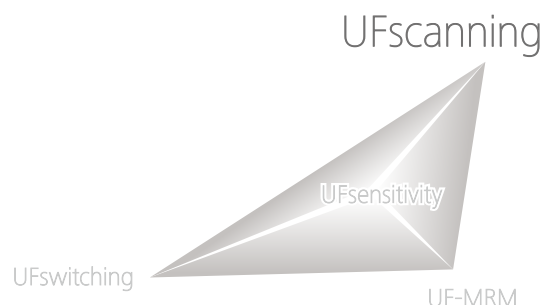


# UFscanning

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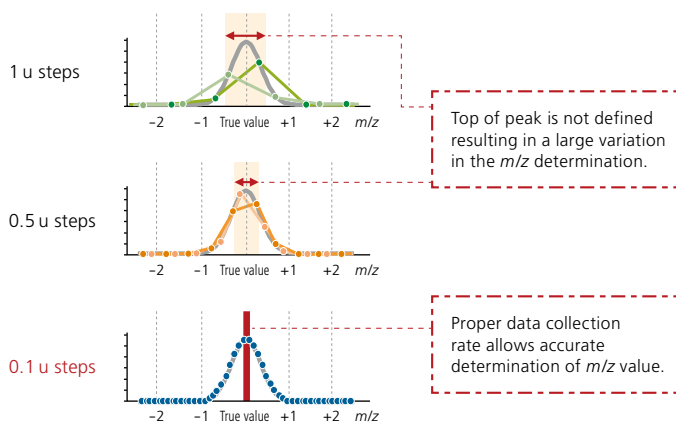
## Simultaneous, Highly Reliable Quantitative and Qualitative Analysis

With the development of a unique approach to ultra-high-speed scan technology [UFscanning], the LCMS-8050 maintains spectrum quality and ion intensity at any scan speed. Perform quantitative and qualitative analysis simultaneously with a maximum high-speed scan rate of 30,000 u/sec.

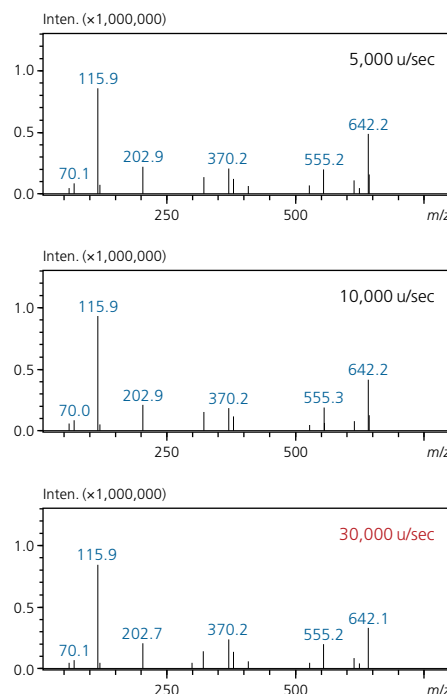


## ■ Maintain Sensitivity and Mass Accuracy Even at 30,000 u/sec

Greater ion transmission at any scan speed has been achieved by precisely controlling the voltage applied to the quadrupoles across the mass scale. As Shimadzu quadrupole technology using a data collection interval of 0.1 u high quality mass spectra are acquired without loss of sensitivity or mass accuracy.



Variation in  $m/z$  Caused by Different Sampling Intervals for Spectral Data



Bradykinin (MW 756.4) Product Ion Scan Spectrum  
Precursor Ion  $m/z$  379.4

## ■ Efficient Qualitative Analysis Using Synchronized Survey Scan™

The Synchronized Survey Scan (SSS) function allows MRM acquisition to be combined with other scan modes including library searchable spectra using a MRM triggered product ion scan.

One thousand events can be registered within a single method supporting the analysis of large panels of target compounds with high data quality and greater information.

| Type                | Event# | +/- | Compound Name                              | $m/z$ | Time (6.647 min - 14.137 min) |
|---------------------|--------|-----|--|-------|-------------------------------|
| MRM                 | 1      | +   | zolpidem M-1 33815/26510                   |       |                               |
| [- Product Ion Scan | 2      | +   | zolpidem M-1 100.00 > 60.00/340.00         |       |                               |
| MRM                 | 3      | +   | 7-aminoflunitrazepam 25210/12105           |       |                               |
| [- Product Ion Scan | 4      | +   | 7-aminoflunitrazepam 100.00 > 50.00/260.00 |       |                               |
| MRM                 | 5      | +   | 7-aminoflunitrazepam 286.05/121.20         |       |                               |
| [- Product Ion Scan | 6      | +   | 7-aminoflunitrazepam 100.00 > 50.00/290.00 |       |                               |
| MRM                 | 7      | +   | N-desmethyltopirone 325.20/245.10          |       |                               |
| [- Product Ion Scan | 8      | +   | N-desmethyltopirone 100.00 > 50.00/380.00  |       |                               |
| MRM                 | 9      | +   | 7-aminoflunitrazepam 264.10/136.10         |       |                               |
| [- Product Ion Scan | 10     | +   | 7-aminoflunitrazepam 100.00 > 50.00/290.00 |       |                               |

An Example Method for Performing an MRM-Triggered Product Ion Scan

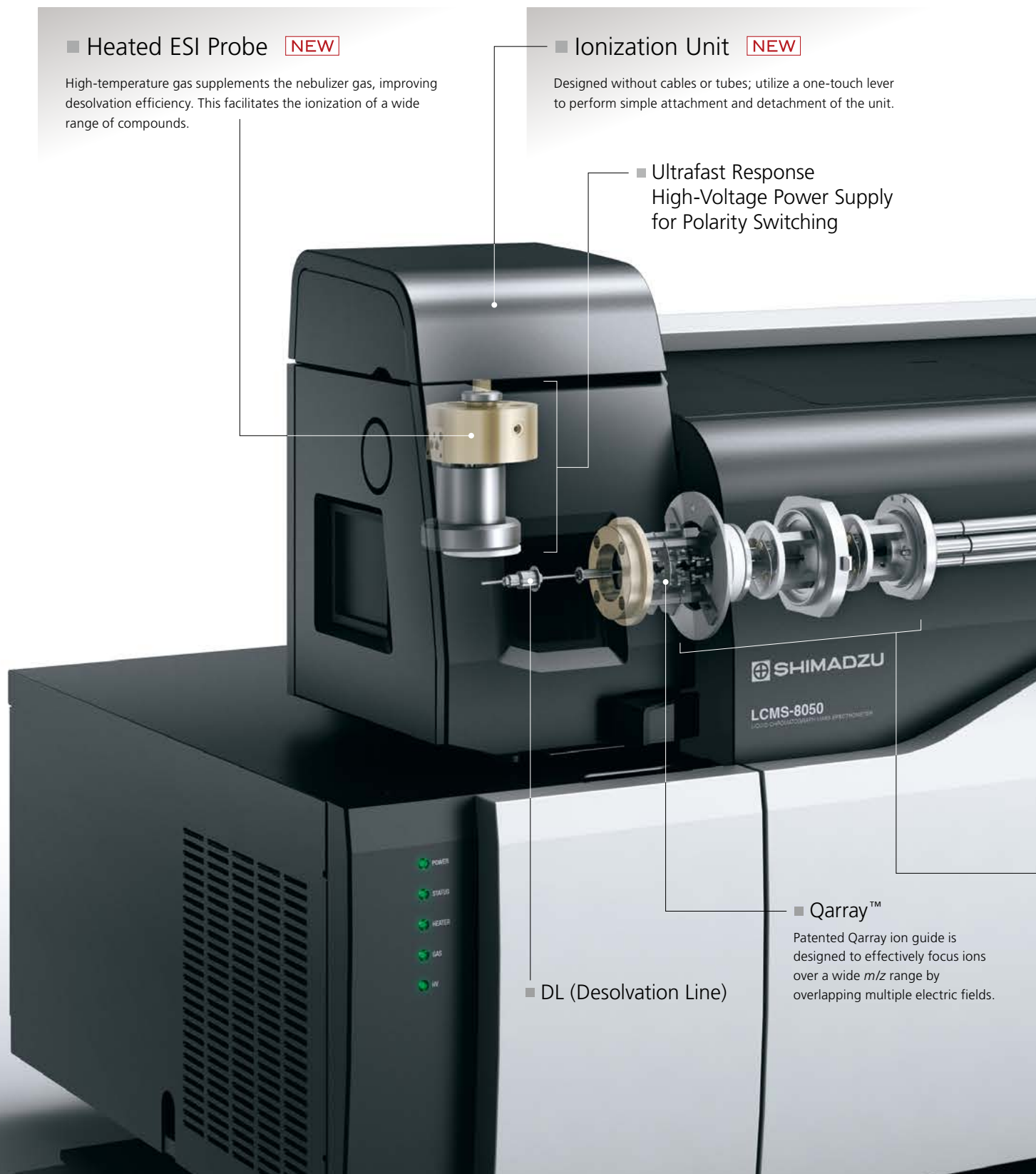
## UF Technologies Combine Sensitivity and High Speed

The LCMS-8050 combines the following technologies to ensure highly sensitive, high-speed performance:

[ UFSensitivity ] achieves high-sensitivity performance utilizing a new heated ESI probe and new UFSweeper III collision cell.

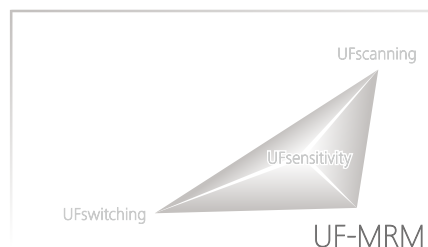
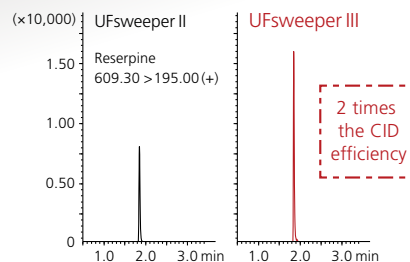
[ UFSwitching ] high-speed positive/negative ionization switching and high-speed MRM [ UF-MRM ] maintain data quality and sensitivity.

[ UFscanning ] high-speed scan rate obtains high-quality mass spectra, even during high-speed analysis.



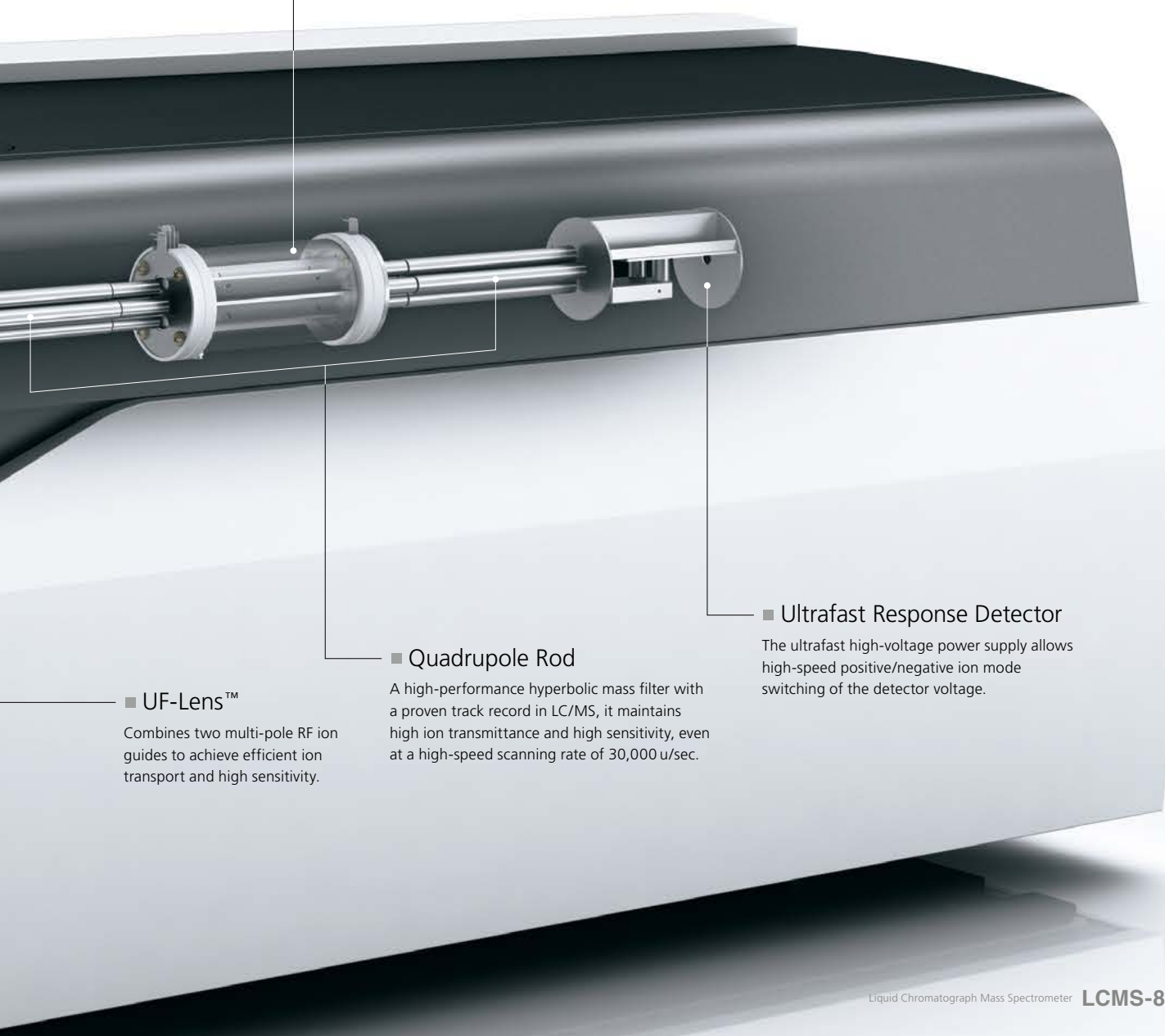
## ■ UFsweeper III Collision Cell NEW

A high-sensitivity, high-speed collision cell, the proprietary UFsweeper III accelerates ions out of the collision cell without loss of momentum. Achieving fast sweeping on successive scans, it offers twice the CID efficiency of UFsweeper II, maintains signal intensity, and suppresses crosstalk, even for high-speed or simultaneous multi-component analysis.



## UF-MRM

UFsweeper III high-speed ion transport technology minimizes ion loss even at a dwell time of 0.8 msec. High-speed MRM transitions up to 555 MRMs/sec accelerate laboratory throughput for simultaneous multi-component analyses.



### ■ UF-Lens™

Combines two multi-pole RF ion guides to achieve efficient ion transport and high sensitivity.

### ■ Quadrupole Rod

A high-performance hyperbolic mass filter with a proven track record in LC/MS, it maintains high ion transmittance and high sensitivity, even at a high-speed scanning rate of 30,000 u/sec.

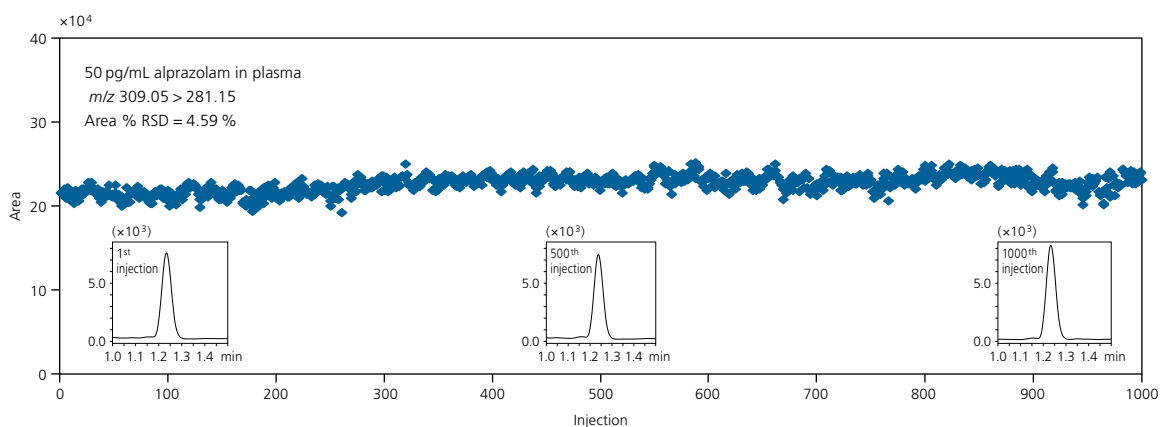
### ■ Ultrafast Response Detector

The ultrafast high-voltage power supply allows high-speed positive/negative ion mode switching of the detector voltage.

# Engineered for Robustness and Easy Operation/Maintenance

## ■ Maintains High Sensitivity Even During Successive Demanding Analyses

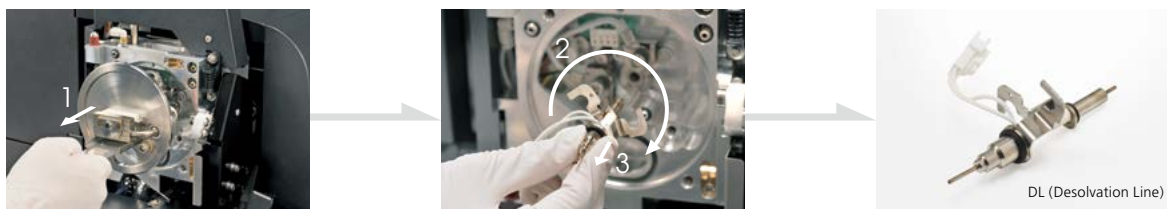
In addition to speed and sensitivity, Shimadzu designed the LCMS-8050 for robustness to meet the most demanding laboratory requirements and most difficult matrices. The figure below plots the area results from 1000 consecutive analyses of a deproteinized blood plasma sample spiked with alprazolam. The LCMS-8050 achieves excellent reproducibility with a 4.59 % RSD for the area results over the 1000 analyses.



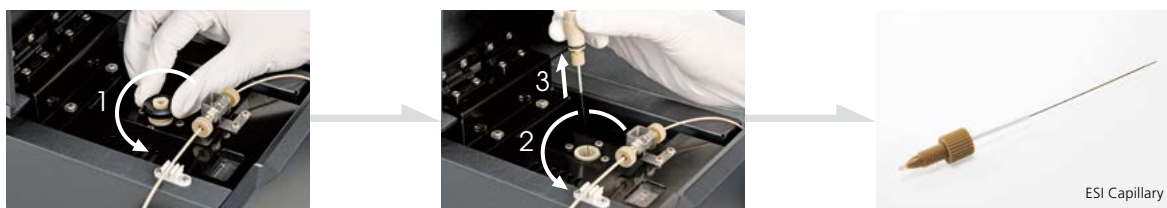
## ■ Easy System Maintenance Reduces Downtime

As with Shimadzu's other triple quad systems, maintaining the LCMS-8050 is simple. Replacing the desolvation line (DL) and ESI capillary is quick and easy. Additionally, the design allows users to replace the DL without breaking vacuum, providing greater uptime and usability.

### ● Steps for DL Replacement



### ● Steps for ESI Capillary Replacement





## ■ Newly Designed Ionization Unit

Designed without cables or tubes, removing the new ionization unit is simple: release a one-touch lever to open the unit and lift it out. In addition, no tools are needed to detach the needles fitted in APCI and DUIS units, allowing for easy maintenance.



ESI-8050 (standard)



APCI-8050 (optional)



DUIS™-8050 (optional)



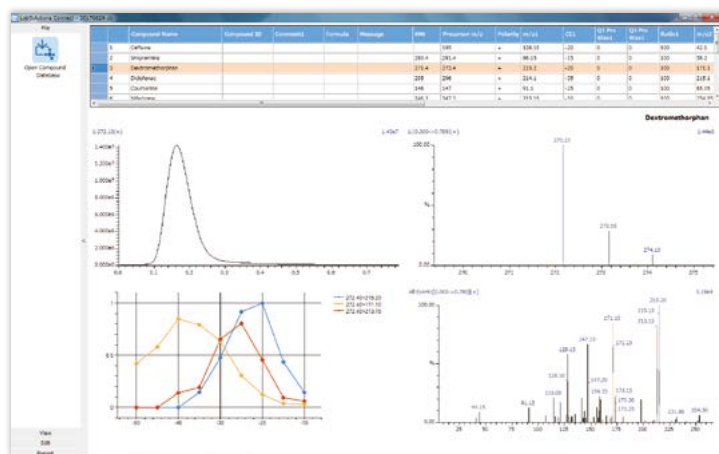
# Smart Software for Anyone Doing LC-MS/MS

## LabSolutions Connect™

LabSolutions Connect is the smart way to work for all routine laboratories. Simplifying workflows to run samples on the LC-MS/MS with tools to help MRM optimization.

### ■ Get Better Results

Laboratories with the need for expanding target compound panels or building up new methods also need to consider how to get the highest sensitivity without manual compound optimization. The automated MRM optimization tool, which is part of the LabSolutions Connect platform, delivers MRM transitions for quantitation and for MRM Spectrum for library searchable identification.



### MRM Data Review

A simple graphical interface showing the collision energy profiles for multiple product ions

### ■ Tablet-like UI for Sample Analysis

In routine laboratories, the sample to result cycle time defines efficiency and productivity. To help reduce the sample to result cycle time and open LC-MS/MS technology to everyone the user experience has been redefined making running samples easy. LabSolutions Connect is designed with an intuitive layout to show the sample list as a simple table and the position of the sample in the autosampler tray.



### Designed for Everyone in The Lab

By redesigning the user experience, analytical scientists across multiple disciplines can run sample lists, check the sample vials are in the right position and see the status of the instrument in one smart layout.

Its simple, intuitive and streamlines workflows in any laboratory environment.

# LabSolutions Insight™

## Rethinking Quantitative Data Review

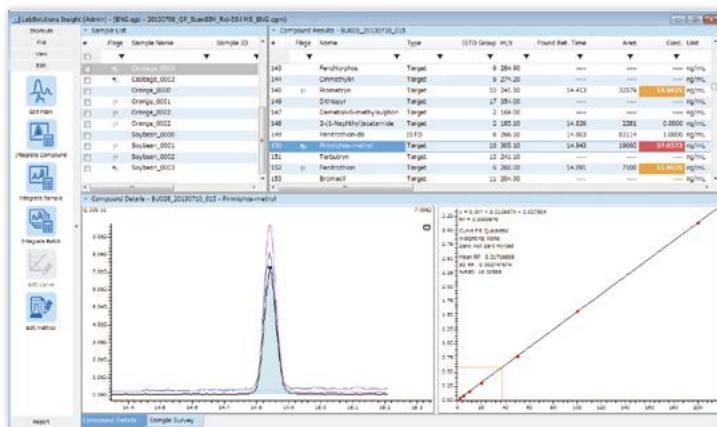
LabSolutions Insight has powerful data mining and analytics capabilities for reviewing LC-MS/MS results. It is designed to support review-by-exception enabling quality rules to identify exceptions quickly. LabSolutions Insight now has the added capability to work seamlessly with the LabSolutions DB/CS environment and audited regulatory

requirements, it also has the flexibility to adapt to different reporting workflows with multiple results files.

The new Insight software also supports library identification by either full scan or MRM spectrum mode helping to provide tools for both quantitation and identification in one workspace.

### ■ Brings A New Way to Review Actionable Data

LabSolutions Insight enables quantitative data to be reviewed in different ways, each connected workspace environment helps to check peak integration, find outliers, show chart trends and calibration curve data. Visualizing data, finding specific information, sorting actionable data is made easy by applying filters to each field in the table.



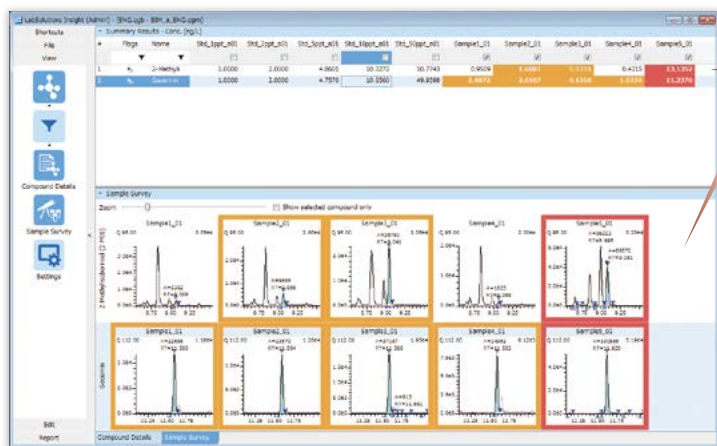
#### LabSolutions Insight

Finds actionable data faster.

LabSolutions Insight has a panel of quality rules that can be set-up to find outliers at the touch of a single click. Outliers are color coded and can be easily visualized, sorted and reported.

### ■ Survey Panel View to Quickly Review Actionable Data

Checking and reviewing individual data files can have a marked impact on laboratory productivity. Survey mode helps to change productivity by simply visualizing positive samples, outliers or simply to check data quality. As Insight uses dock-able pane technology, the survey mode screen can be shared on multiple monitors helping to improve productivity and data quality review for large panels of target compounds.



Sample Survey View

#### Color Coded Review

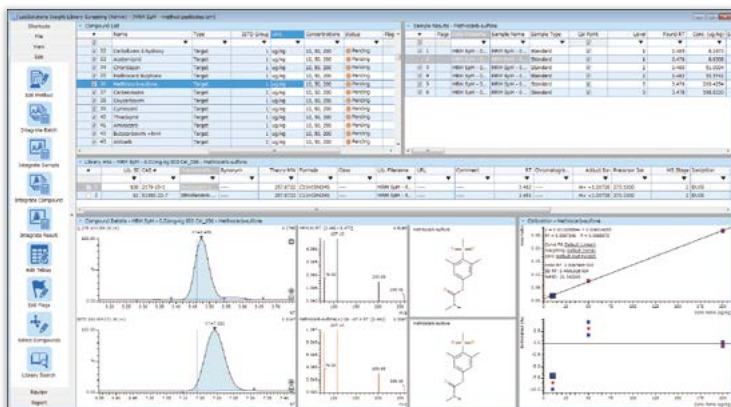
By supporting a range of quality rules, samples can be flagged if the concentration is considered cautionary or as a warning. But the possibilities can be focused to specific needs highlighting retention time variation, ion ratio tolerance outside a set range, calibration curve regression outside an expected range. The list of quality rules helps to find actionable data quickly.



# Compound Identification LabSolutions Insight Library Screening

LabSolutions Insight offers MS/MS library search capabilities. Instrument parameters and MS/MS library spectra are available to deliver faster data acquisition, higher data quality, and enhanced identification. Shimadzu's LabSolutions Insight software offers easy viewing of the compounds of interest, including structural information, retention time and library similarity score. LabSolutions also

enables you to produce high-quality results without the need to define a threshold value to trigger a spectrum, decreasing the chance of false negative reporting. This feature, MRM Spectrum Mode, acquires all compound fragments of interest in MRM mode and can be used to create accurate spectra from even trace concentrations.



## Example of the screening of veterinary drugs using MRM spectrum mode

In MRM Spectrum Mode, known compound fragments are selectively acquired using multiple MRM channels, enhancing signal for low abundance analytes. Shimadzu's ultra-fast quadrupole technology makes this a practical approach for large panels of analytes.

## ■ LC/MS/MS Method Packages and MRM Libraries

Shimadzu offers a wide variety of method packages containing LC separation conditions and a number of predetermined MRM conditions. Laboratories can bypass time-consuming method development steps and realize results sooner.



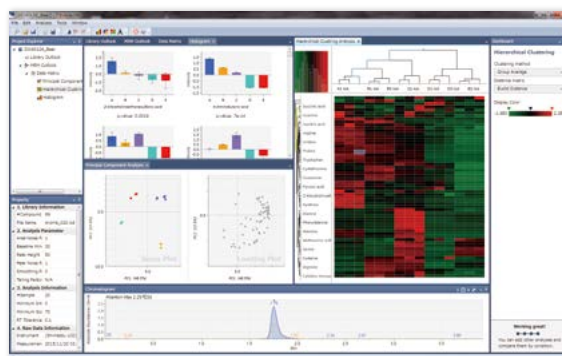
|                 | Description                | Flyer code | Description                      | Flyer code |
|-----------------|----------------------------|------------|----------------------------------|------------|
| Method Packages | Residual Pesticides        | C146-E348  | Cell Culture Profiling           | C146-E279  |
|                 | Veterinary Drugs           | C146-E161  | D/L Amino Acids                  | C146-E336  |
|                 | Water Quality Analysis     | C146-E180  | Short Chain Fatty Acids          | C146-E355  |
|                 | Rapid Toxicology Screening | C146-E224  | Mycotoxins                       | C146-E351  |
|                 | Primary Metabolites        | C146-E227  | Aminoglycoside Antibiotics       | C146-E352  |
|                 | Lipid Mediators            | C146-E381  | Restricted Chemicals in Textiles | C146-E382  |
| MRM Libraries   | Metabolic Enzymes in Yeast | C146-E275  | Phospholipid Profiling           | C146-E314  |

Note: Check your local sales office to learn which packages are compatible with each LCMS model.

## ■ Traverse MS™

### Multivariate Analysis Software

Traverse MS data analysis software enables multivariate analysis of high complexity data in the field of metabolomics. Both Shimadzu GCMS and LCMS MRM data can be analyzed to align, identify, and quantitate component peaks. Large sample sets can be displayed graphically, statistical analysis can be performed, and metabolite pathways can be mapped.



\* Traverse MS is provided by Reifync Inc.

## Nexera UHPLC

Our unique approach to delivering high-quality, high-speed LC/MS/MS analysis is combining the Nexera UHPLC and LCMS-8050 as a seamlessly integrated system.



### Key elements of Nexera and LCMS-8050 performance to maximize your productivity

#### Nexera

- The fastest gradient cycle and sample injection time
- Eliminates carryover even with high-sensitivity LC/MS/MS
- Solvent blending, and sample handling are possible

#### LCMS-8050

- 0.8 msec dwell time and 1 msec pause time
- 5 msec polarity switching speed
- No signal loss even at lower dwell time by UFSweeper technology

#### ■ Nexera X2



Brochure: C196-E079

#### ■ Nexera XR



Brochure: C196-E082

#### ■ Nexera MP



Brochure: C193-E030

#### ■ Nexera-i



Brochure: C196-E084

#### ■ Nexera UC

#### On-line SFE-SFC-MS System

This revolutionary system combines on-line SFE and SFC in a single flow path. Target compounds are extracted from solid samples and then automatically transferred to SFC/MS so that no human intervention is required. The Nexera UC on-line SFE-SFC system reduces the time for pretreatment of samples and acquires highly accurate data.



Brochure: C190-E185

UFSensitivity, UFswitching, UFscanning, UF-MRM, UFSweeper, Synchronized Survey Scan, Qarray, UF-Lens,  
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# Specification Sheet

Liquid Chromatograph Mass Spectrometer

## LCMS-8050

Triple Quadrupole Mass Spectrometry is the method of choice for definitive identification and reproducible quantification of trace-level analytes in complex samples for a variety of applications including clinical research, forensic toxicology, pharmacokinetics, environmental analysis, and food and beverage testing. Combined with the chromatographic resolving power of our world-leading UHPLC systems, and maintaining Shimadzu's proprietary ultrafast technologies (UF Technologies), which include high-speed MRM transitions, MS/MS acquisition, and ultra-high speed polarity switching, the LCMS-8050 can dramatically improve analytical throughput with ultra-high-speed performance. In addition, the newly designed ion source and collision cell, Heated-ESI and UFsweeper™ III collision cell technology, yield higher sensitivity and expand the potential range of LC/MS/MS applications.



### Instrument

|                              |  |
|------------------------------|--|
| Model                        | LCMS-8050  |
| Mass range                   | $m/z$ 2 to 2,000   |
| Sensitivity                  | ESI positive:<br>1 pg reserpine, S/N > 500,000:1 (RMS)<br>ESI negative:<br>1 pg chloramphenicol, S/N > 500,000:1 (RMS) |
| Resolution                   | $R < 0.7$ $\mu$ FWHM and adjustable to 0.5 $\mu$   |
| Mass stability               | 0.05 $\mu$ / 24 hr   |
| Mass accuracy                | 0.1 $\mu$  |
| Cross-talk                   | < 0.0005 %   |
| Minimum pause time           | 1 msec   |
| Minimum dwell time           | 0.8 msec   |
| Scan speed                   | Max 30,000 $\mu$ /sec (in all modes of scanning)<br>(0.1 $\mu$ step: 300,000 data points/sec)                          |
| Polarity switching time      | 5 msec   |
| Interface                    | ESI (Standard), Micro-ESI (Optional),<br>APCI (Optional), DUIS™ (Optional)   |
| Applicable LC flow rate      | ESI 1 $\mu$ L/min to 2 mL/min  |
| MRM transition speed         | Max 555 channels/sec   |
| ESI desolvation temperature  | More than 650 °C   |
| APCI desolvation temperature | More than 500 °C   |

|               |   |
|---------------|---|
| Analysis mode | Q1 Scan/SIM<br>Q3 Scan/SIM<br>MRM<br>Precursor ion scan<br>Product ion scan<br>Neutral loss scan<br>Synchronized Survey Scan™ |
|---------------|---|

### Mass Analyzers and Detector

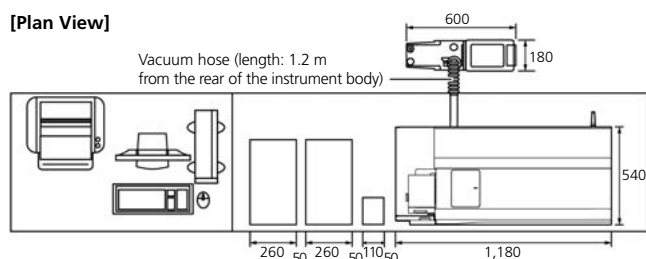
|                          |   |
|--------------------------|---|
| Mass analyzers           | Q1 & Q3 are molybdenum hyperbolic mass filters with pre-rods; Q1 includes post-rods   |
| Collision cell           | Tapered multipole type ultra-high-speed collision cell (UFsweeper III collision cell)   |
| Detector                 | Secondary electron multiplier with off-axis conversion dynode   |
| Ion optics               | Q-array focus optics operating in Field-Flow mode, multipole transfer optics  |
| Digital detection system | Operates in pulse counting mode for fastest operation   |
| Detection mode           | Ultra-fast positive/negative ion switching  |
| Dynamic range            | 7 orders  |
| Vacuum system            | Rotary pump: 1 unit<br>Vacuum pumping speed: 28 m <sup>3</sup> /hr<br>Triple-inlet turbo molecular pump: 1 unit<br>40 L/sec, 260 L/sec, 210 L/sec |

## Software

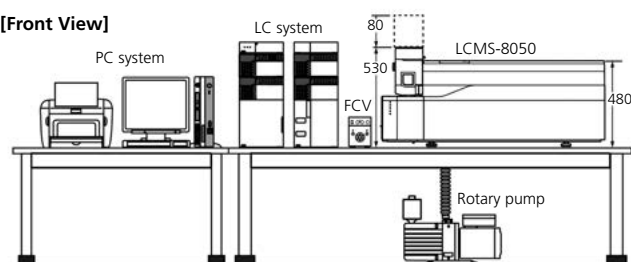
|                        |  |
|------------------------|--|
| Workstation            | LabSolutions™ LCMS, LabSolutions Insight™ (Optional)   |
| Instrument control     | Prominence™ and Nexera™ series   |
| MS acquisition mode    | Scan (Max. 1,000 events), SIM (Max. 1,000 events × 32 channels)  |
| MS/MS acquisition mode | MRM (Max. 1,000 events × 32 channels)<br>Product ion scan<br>Precursor ion scan<br>Neutral loss scan<br>Synchronized Survey Scan |
| Auto-tuning            | Possible to optimize sensitivity, resolution, and mass calibration in both positive and negative ionization mode                 |

## Installation Example

[Plan View]



[Front View]



Units: mm

## Installation Conditions

|                  |  |
|------------------|--|
| Temperature      | 18 to 28 °C  |
| Humidity         | 20 to 70 % (Non-condensing)  |
| Size             | 1,180 mm (W) × 540 mm (D) × 610 mm (H)   |
| Weight           | 140 kg   |
| Power supply     | MS unit: AC 230 V 15 A (50/60 Hz)<br>Single-phase  |
| Gas requirements | Nitrogen gas:<br>Maximum 24.4 L/min,<br>Purity greater than 97 %<br><br>Argon: Purity greater than 99.99% as CID gas<br><br>Dry air: Maximum 20 L/min, oil/water-free<br><br>Total nitrogen plus air:<br>25L/min maximum |

The above are not standard installation specification. All LCMS-8050 instruments will be installed and tested in accordance with standard performance tests as detailed in the Shimadzu document ZEAH-0467, Shimadzu High-Performance Liquid Chromatograph Mass Spectrometer LCMS-8050 Installation Standard.

LCMS, UFSweeper, DUIs, Synchronized Survey Scan, LabSolutions, LabSolutions Insight, Prominence and Nexera are trademarks of Shimadzu Corporation.



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Multi-analyte Quantitation Software

# LabSolutions Insight

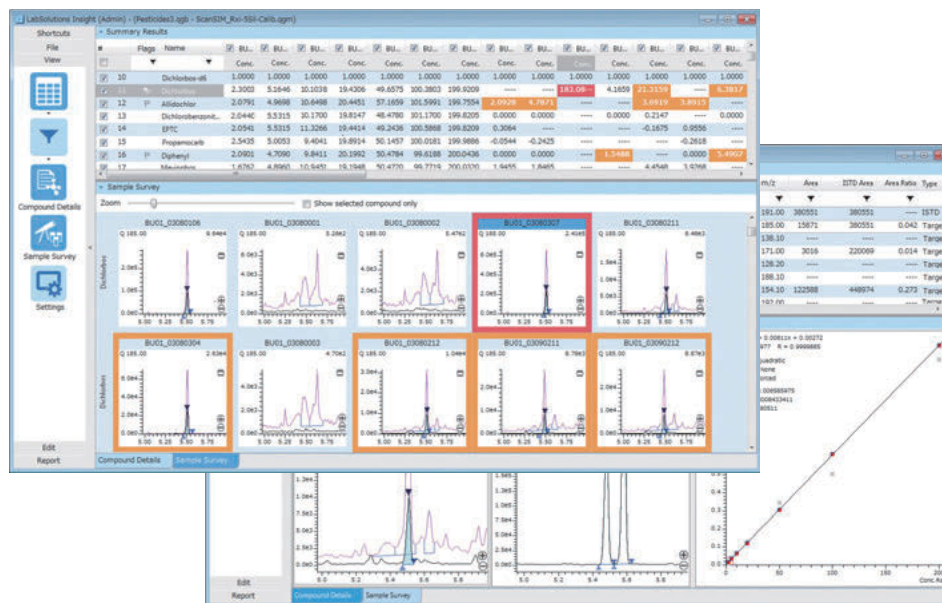




# LabSolutions Insight for Efficient Multi-analyte Data Confirmation and Review

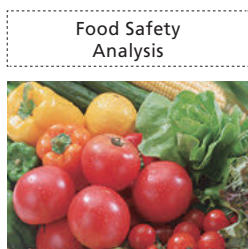
## ■ Multi-analyte Data Review

With LabSolutions Insight software, quantitative results for a complete series of data files can be displayed side-by-side for comparison and QC review. All of the chromatograms for a selected target compound can be displayed simultaneously, making it easy to review the detected peaks and confirm the quantitative results. Color-coded QA/QC flags quickly identify any outliers that require further examination. Results can be displayed in a variety of ways, allowing users to select the view that is best suited for their workflow, and when necessary, peaks can be re-integrated and re-quantified directly from LabSolutions Insight.



## • Using the LabSolutions Insight with a GC/MS Database and LC/MS/MS Method Package

When used in conjunction with one of Shimadzu's application-specific GC/MS Databases and LC/MS/MS Method Packages, LabSolutions Insight allows users to process data files, and perform QA/QC data review for all samples in one easy, seamless workflow.



### Food Safety Analysis

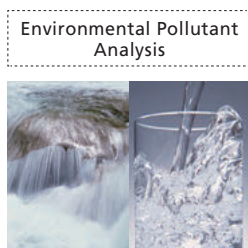
- [GC/MS]
  - Pesticide Quick-DB
  - Smart Pesticides Database

- [LC/MS]
  - Method Package Residual Agrochemicals
  - Method Package Veterinary Drugs



### Metabolic Component Analysis

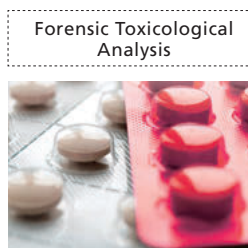
- [GC/MS]
  - Smart Metabolites Database
- [LC/MS]
  - Method Package Primary Metabolites
  - Method Package Lipid Mediators
  - MRM Library Metabolic enzymes in yeast



### Environmental Pollutant Analysis

- [GC/MS]
  - Environmental Quick-DB
  - Smart Environmental Database

- [LC/MS]
  - Method Package Water Safety



### Forensic Toxicological Analysis

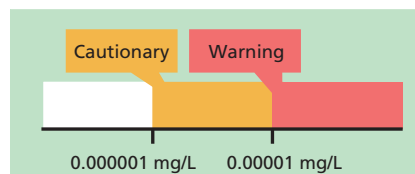
- [GC/MS]
  - Smart Forensic Database
- [LC/MS]
  - Method Package rapid Toxicology Screening
  - Method Package Forensic Toxicology

## ■ Color-coded QA/QC Flags

In LabSolutions Insight, quantitative results can be compared to established criteria, and any outliers are color-coded for easy identification and further review. Five color-coded criteria levels can be defined, making it easy to determine which data points are outliers, and which specific QC criteria were not met. Any changes made to calibration curves or manual peak integration are immediately reflected in the color-coded flags.

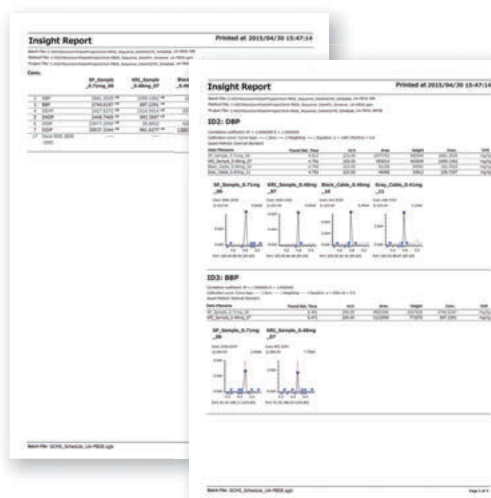
### • Example of Using Flags for Quantitative Review

The example below illustrates how an orange flag was set to identify moldy odor compound concentrations that exceeded a defined cautionary limit of 1.0 ppt (part-per-trillion), and a red flag was used as a warning to identify those which had exceeded 10 ppt. In the figure below, quantitative results are tabulated at the top of the screen, while the bottom of the screen simultaneously displays peak identification and integration. Both views include the color-coded flags.



## ■ Refined Report Output

Data reports can be customized for specific user requirements. All compounds can be included, or a summary report can be created of just the compound that failed to pass the defined QA/QC parameters. The tabulated report can include calculated concentrations, ion ratios, and chromatograms for all sample data files. Quantitative information (such as peak areas or area ratios) can also be output as CSV files for use in multivariate analysis.

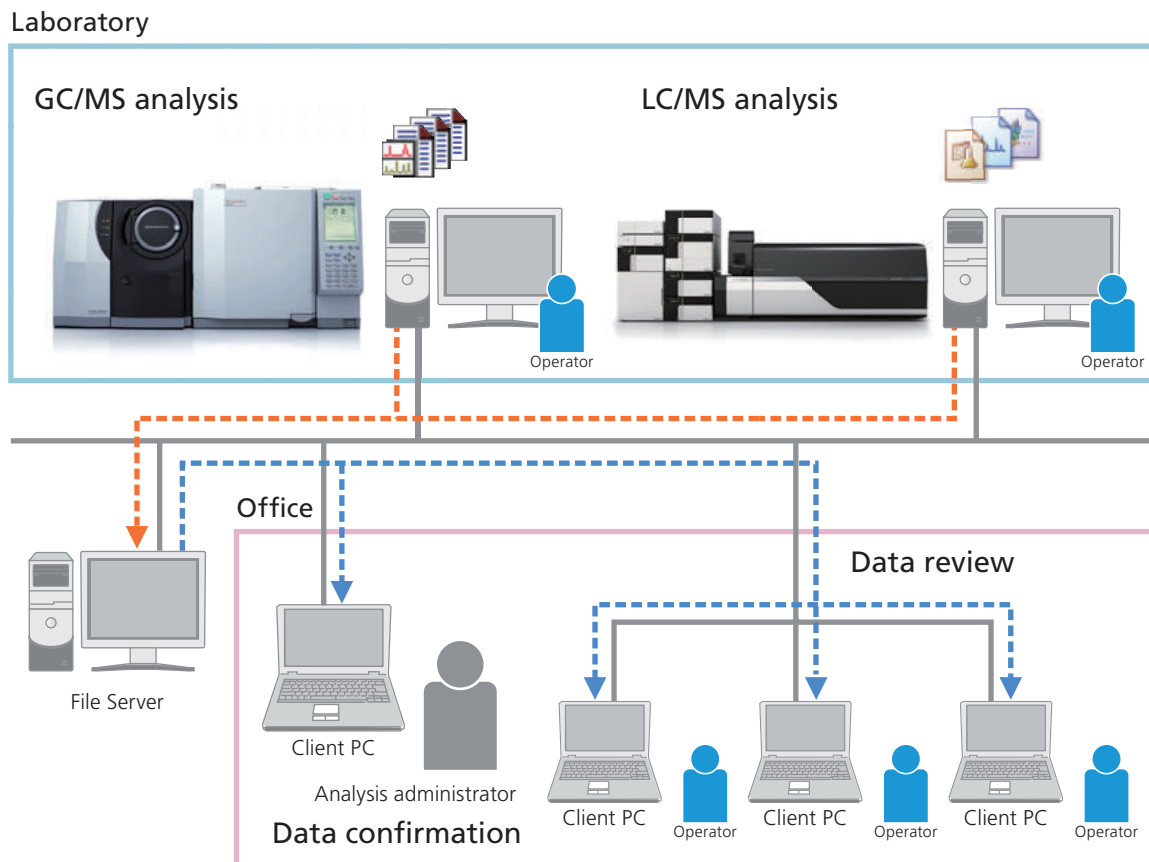


Data reports of phthalate ester analysis in electric instruments



## ■ System Configurations Using Multiple Client Computers

Additional licenses of LabSolutions Insight allow review and confirmation of multiple analytes on client computers via a LAN. Even when multiple instruments are used, analysis administrator can review data obtained from each instrument on a client computer. It can relieve instrument computers from analysis by running post-acquisition analysis in office and improve operation efficiency. Additional licenses are installed as needed so the system can be easily expanded at low cost in the future.



File management on a file server is recommended for systems with more than 5 users.

### Applicable Models

GCMS-QP series and GCMS-TQ series models  
LCMS-8030, LCMS-8040, LCMS-8050, LCMS-8060

### Operating Environment

OS: Microsoft® Windows® 7 Professional  
Workstation software: GCMSolution Ver. 4.30 or later  
LabSolutions LCMS Ver. 5.80 or later



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Ultra High Performance Liquid Chromatograph

# Nexera series



Mobile Phase Monitoring

Auto-Diagnostics

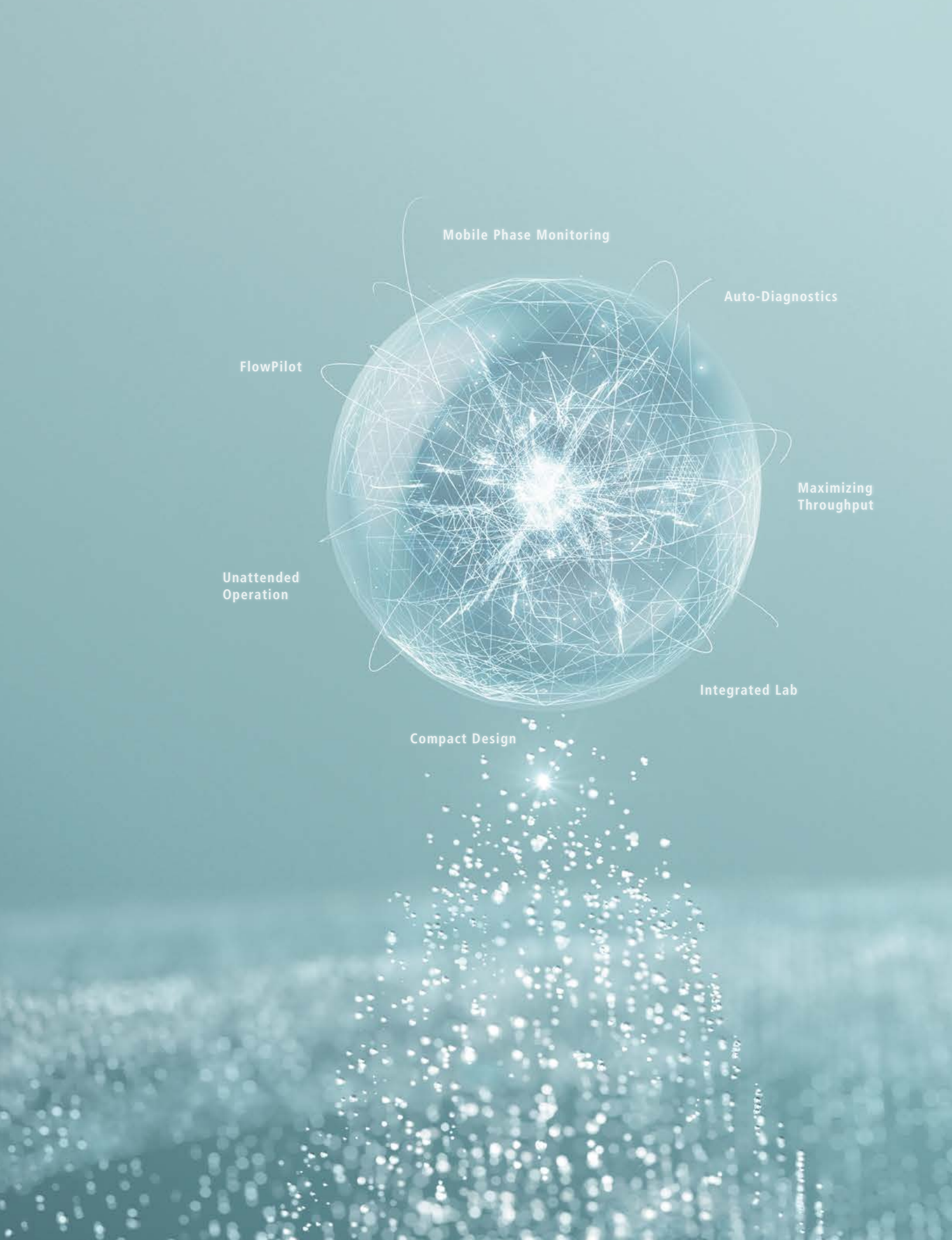
FlowPilot

Maximizing  
Throughput

Unattended  
Operation

Integrated Lab

Compact Design



# EXPERIENCE NEW BENCHMARKS

- A New Benchmark of Intelligence
- A New Benchmark of Efficiency
- A New Benchmark of Design

Shimadzu has long been advancing the analytical performance of HPLC systems. At the same time, we recognize that overall efficiency depends not only on the performance of one instrument, but on the management of all devices within a lab. This realization leads us to now, a time in which AI capabilities have been incorporated to allow devices to detect and resolve issues automatically. In addition, lab management has been integrated using the Internet of Things (IoT) and device networking, making it simple to review the status of instruments and optimize resource allocation.

Building upon 40 years of experience in LC technology, the Nexera series is a family of UHPLC systems that marries these AI and IoT enhancements to set new industry standards in terms of intelligence, efficiency, and design.



# Nexera™ series

## Key Features

### Analytical Intelligence ANALYTICAL INTELLIGENCE

- Automated support functions utilizing digital technology, such as M2M, IoT, and Artificial Intelligence (AI), that enable higher productivity and maximum reliability.
- Allows a system to monitor and diagnose itself, handle any issues during data acquisition without user input, and automatically behave as if it were operated by an expert.
- Supports the acquisition of high quality, reproducible data regardless of an operator's skill level for both routine and demanding applications.





## Mobile Phase Monitor MPM-40

- Reservoir tray weight sensors monitor the remaining mobile phase in real time. [P. 7](#)

## System Controller SCL-40, CBM-40

- Supports remote monitoring via a smart device.
- Mobile phases can be purged and baselines checked easily via the touch panel.

## UV-VIS Absorbance Detector SPD-40 / SPD-40V Photodiode Array Detector SPD-M40

- Temperature control improves performance stability. [P. 13](#)
- Analytical data is linked to information about consumables to ensure traceability.

## Solvent Delivery Unit LC-40 Series

- Auto-diagnostics to detect problems during analysis, and an auto-recovery function. [P. 6](#)
- Reduces space requirements with a dual solvent delivery system. [P. 12](#)

## Autosampler SIL-40 Series PLATE CHANGER

- The injection speed is twice as fast as previous models, shortening multi-analyte processing times. [P. 10](#)
- Can perform continuous analysis on up to 44 microtiter plates. [P. 11](#)
- High reproducibility and ultra-low carryover for micro-volume injections. [P. 13](#)
- Automated sample preparation functions such as diluting samples, adding internal standards, and performing derivatization reactions, reduce labor.

## Column Oven CTO-40 Series

- Slim-type column oven with half the width of the previous model. [P. 12](#)
- Easy column attach/detach mechanism prevents peak broadening. (Nexlock™)
- Automatic management of column information such as number of injections and pressure during analysis.
- Monitoring of column degradation through usage history (when used with LabSolutions™).



# A New Benchmark of Intelligence

## Maximizing Reliability, Minimizing Down Time

### Fully Unattended Operation from Startup to Shutdown

The Nexera can be set to start up at a specified time, so that it can complete auto-purge, equilibration and baseline checks in advance, and be ready for analysis as soon as you arrive at the lab. Moreover, the system can be set up in advance to run without user intervention all the way from startup through analysis to shutdown.

You can view the status and predicted analysis completion time for multiple systems from any location via a smart device. None of these features requires any special software.

### Auto-Diagnostics and Recovery

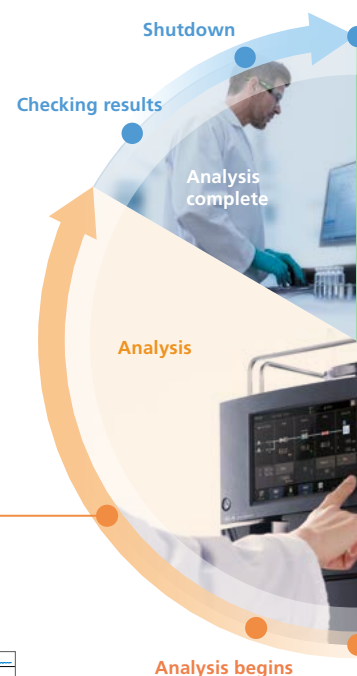
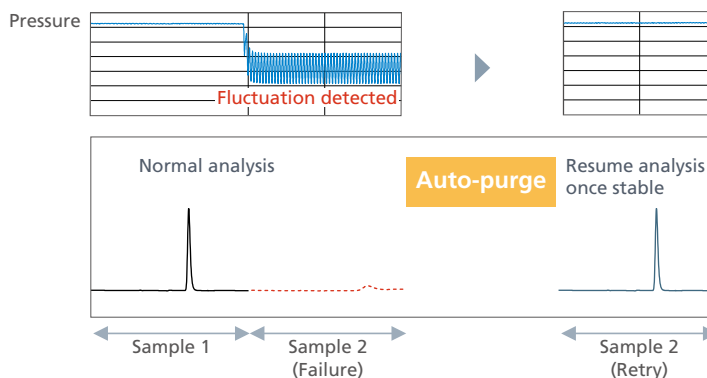


In rare cases, air bubbles can form in the mobile phase and cause problems if inhaled into the pump. The Nexera has the ability to monitor baseline changes and pressure fluctuations to check for abnormalities.

When it detects an unusual fluctuation, it can automatically pause the analysis, purge the flow path, and restart analysis once it has confirmed recovery to normal pressure.

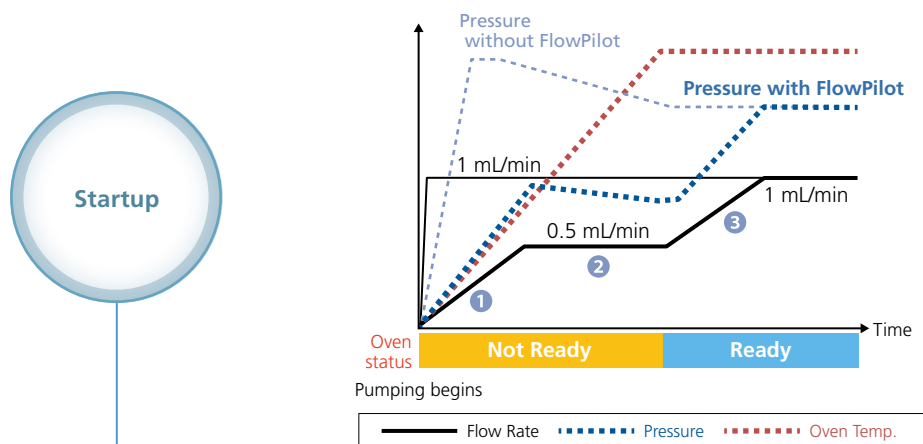
#### Auto-Diagnostics for Trapped Bubbles (Patent Pending)

If an air bubble becomes trapped in the pump head, it causes an abrupt drop in pressure, after which periodic pressure changes (pulsations) will occur. This can be detected using Shimadzu's proprietary bubble detection algorithm which assesses these distinctive pressure fluctuations caused by trapped bubbles to distinguish them from any expected changes in pressure.



## FlowPilot Protects Columns ANALYTICAL INTELLIGENCE

HPLC columns can be damaged by sudden pump starts and stops or extreme gradient changes. The Nexera automatically uses FlowPilot (Smart Flow Control) to increase the flow rate gradually to the set point. There is no need to create startup protocols for each analysis.



### FlowPilot (Patent Pending)

The pump controls the flow rate according to oven temperature. The flow rate is gradually increased up to half of the set value. (①) The flow rate is kept constant until the oven is ready. (②) The flow rate is gradually increased up to the set value. (③)

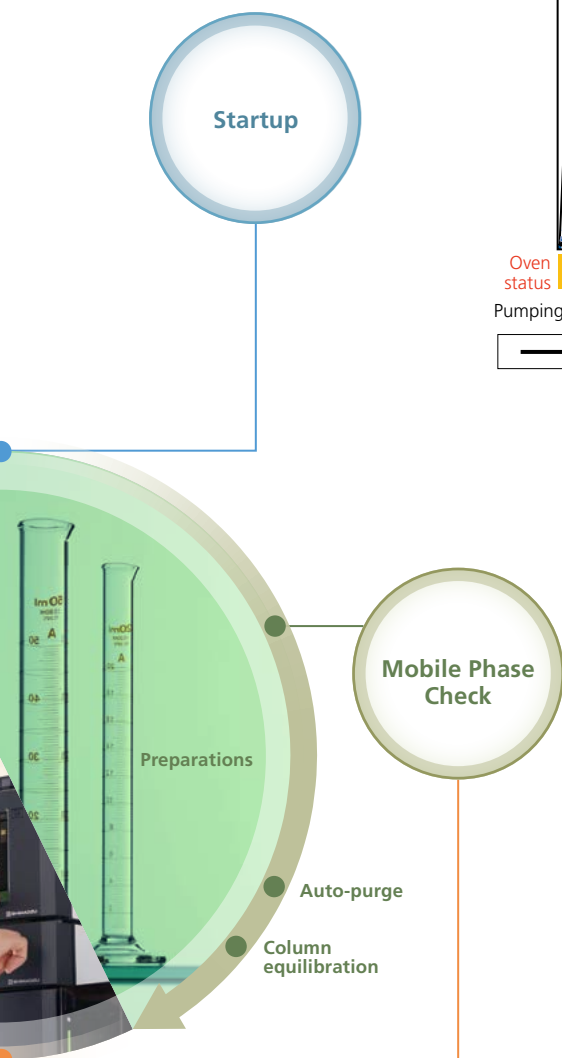
## Mobile Phase Levels Measured in Real Time ANALYTICAL INTELLIGENCE

Reservoir tray weight sensors (optional) can be used to monitor the volume of mobile phase or autosampler rinse solution in up to twelve containers. The containers can also be checked remotely from a smart device.

You will no longer need to worry about running out of mobile phase mid-analysis, because the device will notify you before starting the run if the volume remaining is too low.

### Comparing Solvent Volume Measurements with Predicted Consumption (Patent Pending)

The required mobile phase volume is predicted at the start of analysis from the weight sensor's measurement data, the instrument configuration information (the mobile phase used and the rinsing liquid configuration), and the analysis method. If a shortage occurs, the user is notified.





# A New Benchmark of Intelligence

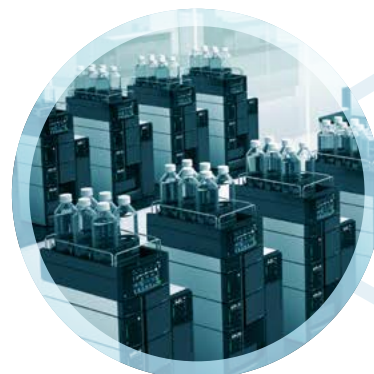
## Remote Monitoring and Integrated Lab Management

### Reliably Track Column Usage\* ANALYTICAL INTELLIGENCE

Columns used in analysis need to be traceable to investigate any influence they may have on results. With the Column Management Device (optional), each column is recognized by an individual ID, and stats such as pressure and injection number are automatically recorded in the database and linked to each measurement data file. The device can be linked to all columns regardless of their brand or type.

The condition of a column can be checked directly with the column management software, so that you can start analysis without having to test column performance in advance.

\*To make use of this feature, a CMD compatible with the Nexera series and LabSolutions DB/CS are required.



#### Column Management Device (CMD) (Patent Pending)

The CMD (optional) compares the column information with the requirements of the analysis method and only begins analysis if they match. This device prevents mistakes in the choice of columns while at the same time storing the usage history of each column.



#### Step 1

Manage all your columns from the database, which can display usage status, injection count, etc. on one screen. Information about the column used is automatically linked to the analytical results.

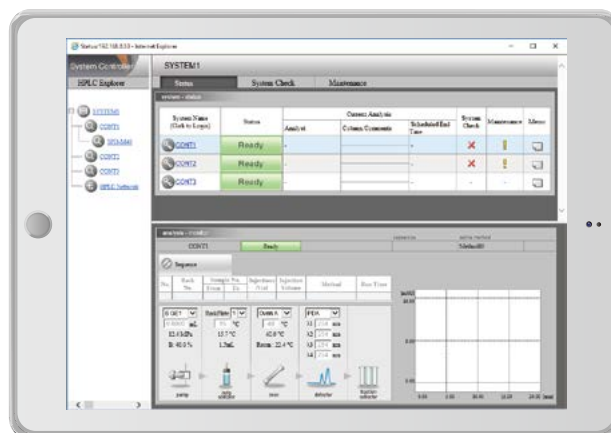
#### Step 2

Deterioration of columns can be checked visually by examining peak shapes. Each compound listed in the compound table can be directly overlaid on the chromatogram.

## Check Chromatograms Online

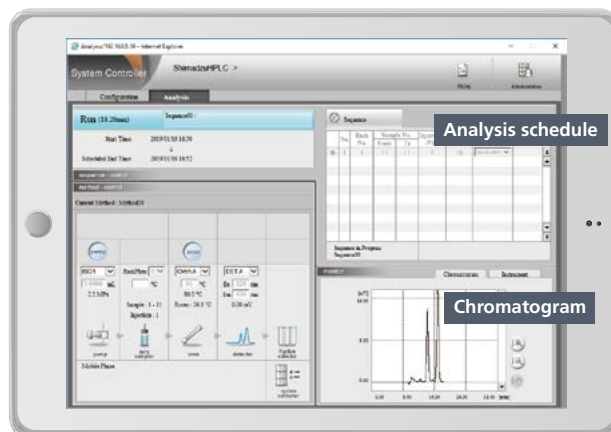
View the operating status of instruments from a web browser using a smart device. This allows you to confirm parameters such as oven temperature and pump status directly from the web, and to monitor chromatograms in real time without returning to the lab.

In addition, SHIMADZU LabTotal™ Smart Service Net (optional) saves operating data from your instruments in a cloud server. Error information, including the date and time the errors occurred, can be sent via email.



Check the operating status of your LC systems

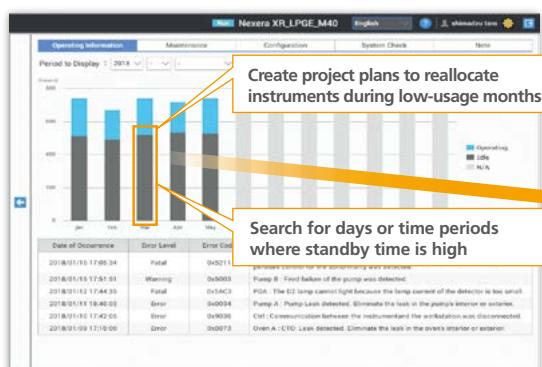
Select  
one system



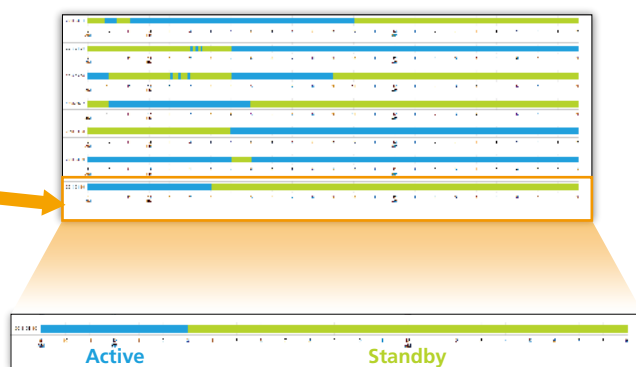
Monitor chromatograms currently being taken

## Allocate Resources Efficiently

Manage the overall operation of your lab with SHIMADZU LabTotal Smart Service Net (optional). Review and compare instrument usage to maximize available analysis time, and manage shared consumables through a common system. (Patent Pending)



View graphs of monthly operation status



Zoom in further to view the daily operation status of each instrument

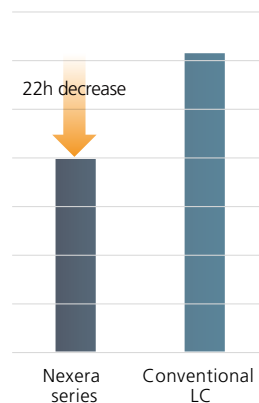
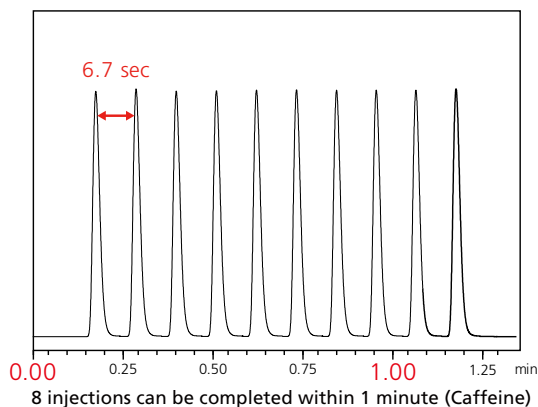
# A New Benchmark of Efficiency

## Automating Workflow, Maximizing Throughput

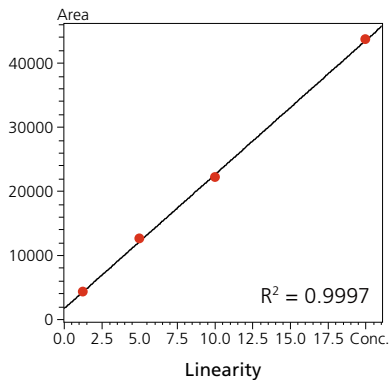
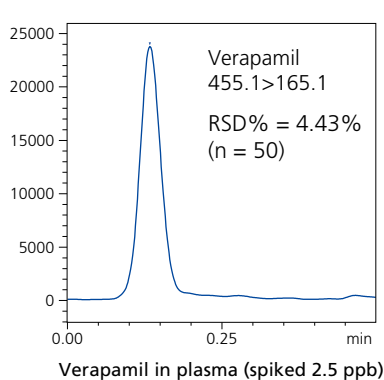


### Analysis Cycle Time Less Than 10 Seconds

The SIL-40 autosampler can process the entire injection cycle time in as little as seven seconds, twice as fast as the previous model. In addition, continuous analysis can be carried out on up to 44 MTPs (using 3 PLATE CHANGERS). Together these features dramatically increase analysis throughput.

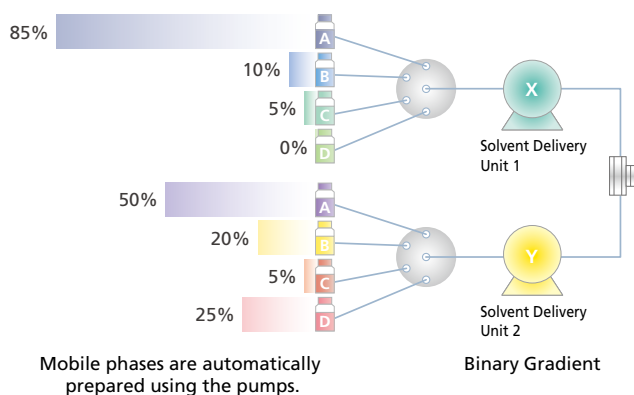


Pharmacokinetic analysis requires not only speed but also high reliability at low concentrations. With its ultra-fast injection and ultra-low carryover, the SIL-40 autosampler delivers high reproducibility and reliability, even during an ultra-fast 30-second analysis.



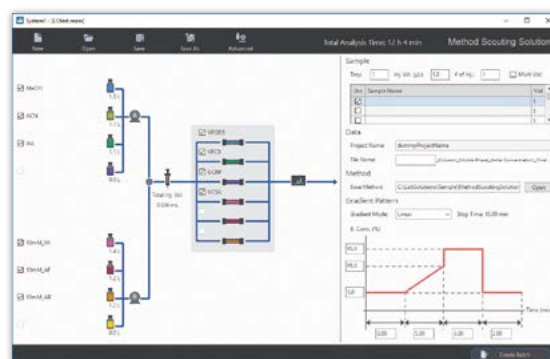
## Quick and Reliable Mobile Phase Blending

The Nexera can automatically blend mobile phases at any set ratio. This speeds up the preparation of buffer solutions and the dilution of solvents, and can be used to easily prepare the exact amounts required for analysis, reducing waste as well as labor.



## Simplified Method Development

The Nexera Method Scouting System is capable of automatically switching between combinations of up to 6 columns and 8 mobile phases. It can run unattended, maximizing available uptime. In addition, Method Scouting Solution Software can automatically create methods with different columns, mobile phases, and gradient conditions from a single base method.

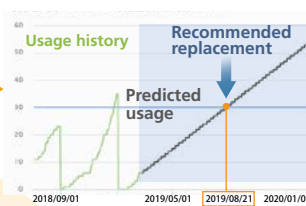
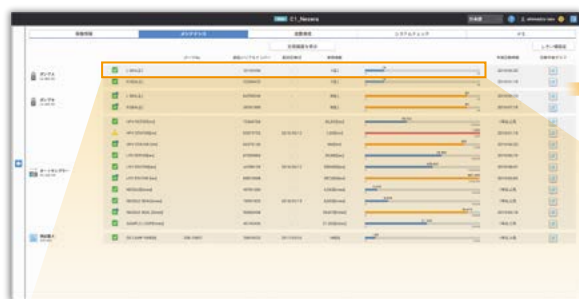


## Remote Instrument Maintenance Ensures Stable Operation



Each Nexera component automatically transfers the status of consumable parts, the traceability information of consumable parts after shipment from the factory, and various logs and error information to the SHIMADZU LabTotal Smart Service Net cloud system. Using this information, the system recommends the timing for consumable part replacement. Problems can be diagnosed remotely by Shimadzu service engineers. This means the system can be maintained in optimal condition and equipment management costs can also be reduced.

View the usage information for consumable parts in every device at a glance

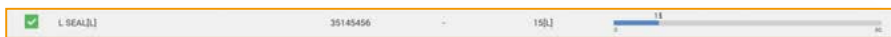


Receive notifications before the replacement date

- Easy to replace consumables at the appropriate time
- Improved lab efficiency



- Balance maintenance schedule remotely
- Easy to determine appropriate maintenance



Usage display for consumable pump parts

Start of use    Current status    Replacement



# A New Benchmark of Design

## Compact and Inventive



### Space-Saving Design

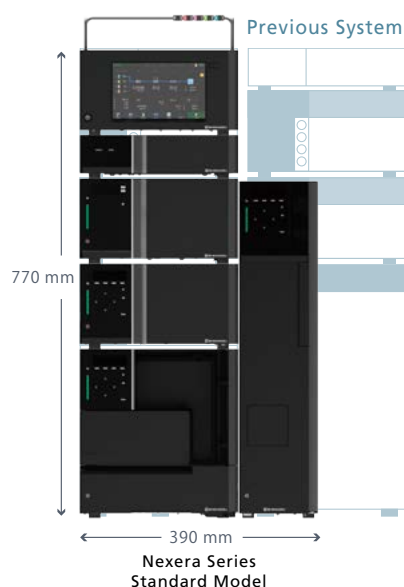
The Nexera frees up bench space with a compact design two thirds the size of Shimadzu's previous model.

### Energy-Saving Standby Mode

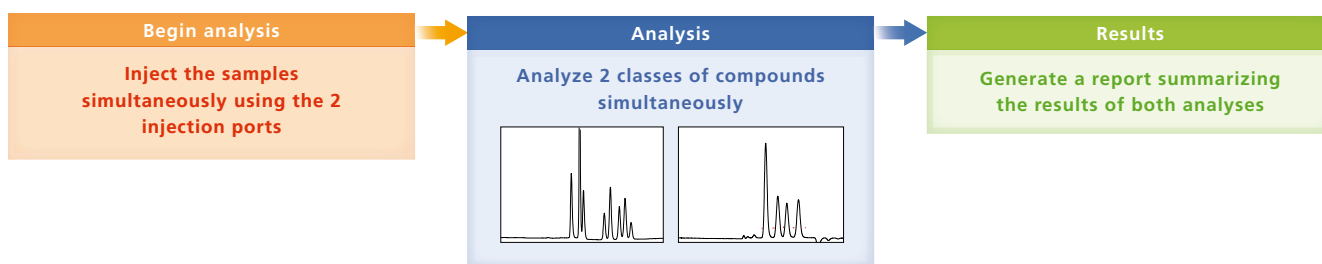
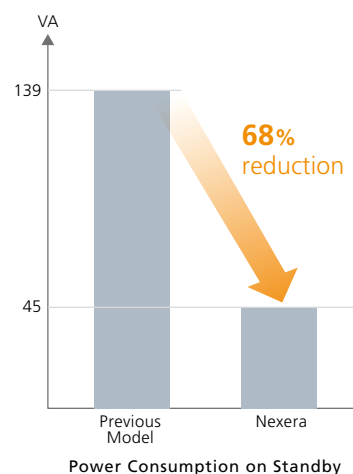
The Nexera uses over 80% less electricity when in standby mode, significantly reducing running costs and supporting an environmentally-friendly lab.

### Dual Injection Enables Simultaneous Analysis

Injection ports for two separate flow paths can be installed, allowing two different types of analysis (such as analysis of amino acids, organic acids or vitamins) to be performed using one system.



reddot award 2019  
winner

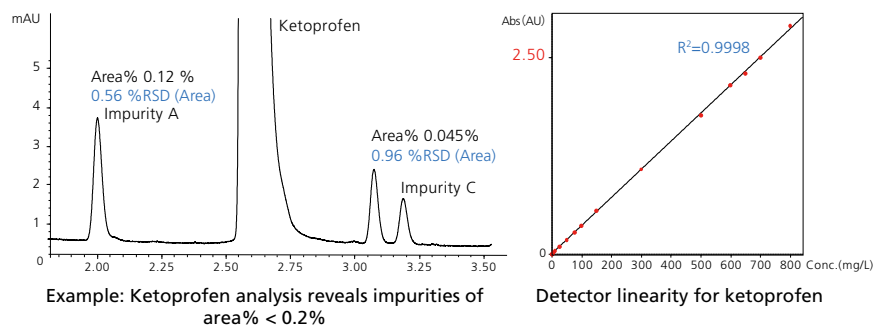


#### Dual Injection (Patent Pending)

A second injection port and injection valve have been added. As a result, the sample can be injected independently into two analysis flow lines with a single needle, enabling the consolidation of a two-system analysis within a single system.

## High-Sensitivity Impurity Analysis

The SPD-M40 detector achieves an extremely high level of sensitivity and linearity (up to 2.5 AU). This allows quantitation of very low concentration impurities even in high-concentration samples. The UV cut-off filter installed in the detector prevents sample degradation due to UV light, helping to maintain good linearity at low concentrations.



### Reduced Stray Light and Improved Measurement Circuits (Patent Pending)

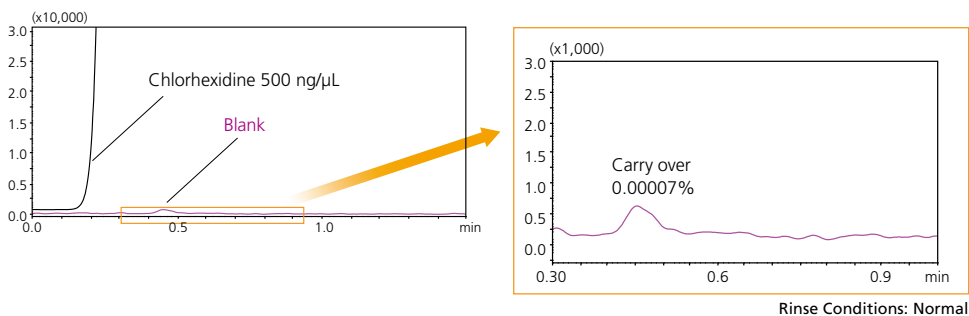
With the SPD-M40, the measurement circuits have been improved, and the amount of stray light in the optical system, a cause for linearity errors, has been reduced (to less than 1/3 of the usual amount). As a result, the absorbance linearity has been improved to at least 2.5 AU.

## Ultra-low Carryover

The Nexera boasts ultra-low carryover, even on a high-sensitivity LC/MS/MS. This reduces time spent on rinsing, resulting in a shorter overall analysis time.

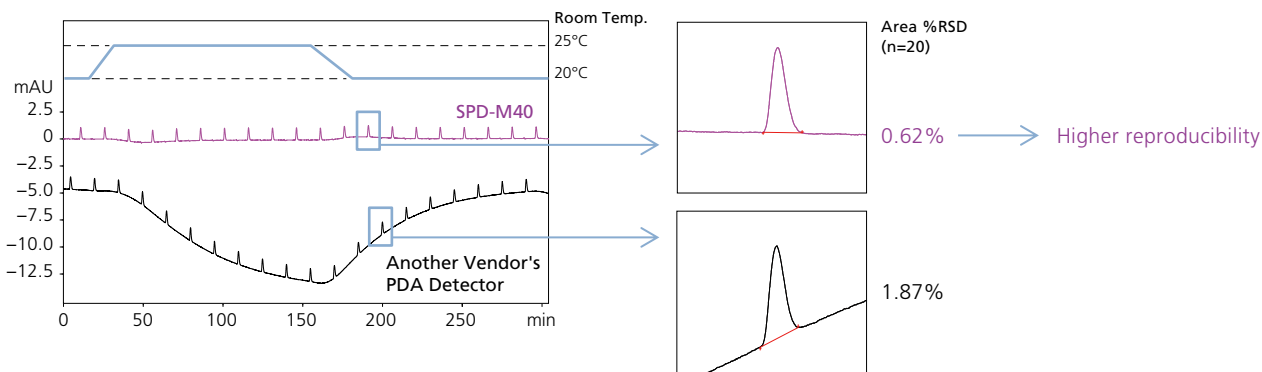
### Elimination of Dead Volume (Patent Pending)

Dead volume in the flow line will lead to carryover from sample residue. In the SIL-40 series, the sample loop and needle are connected linearly, eliminating dead volume, and reducing carryover.



## Stable Baseline

Baseline fluctuations can affect peak area calculation, reducing the accuracy of quantitative results. The SPD-M40 photodiode array detector's "Advanced TC-Optics" function adjusts the temperature of the flow cell, lamp, and optical system to lessen the impact of external temperature changes. Noise and drift have also been reduced by 40% compared to the previous model.



### Advanced TC-Optics (SPD-M40) (Patent Pending)

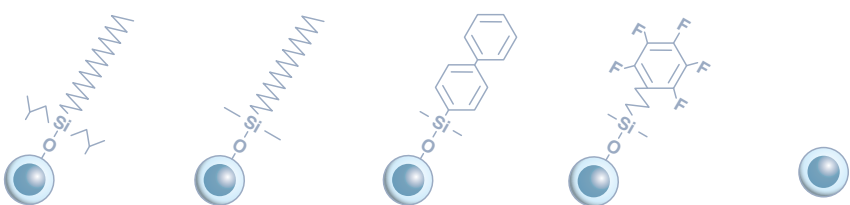
With the SPD-M40, in addition to conventional cell temperature regulation, the lamp and spectrometer, which are responsible for thermal effects on absorbance, are also thermally regulated, further reducing baseline fluctuations caused by the light source.

## Faster Analysis Without Sacrificing Precision

It is important to use the most appropriate column in your LC system to achieve the highest efficiency and most accurate chromatograms. The Shim-pack series consists of a range of columns designed with the increased capabilities of the Nexera in mind. The superior ruggedness of Shim-pack columns ensures a long lifetime even with demanding sample matrices.

### Shim-pack Velox™

The superficially porous particle (SPP) technology allows for optimum separation and analysis times. The range of column types available enables you to choose the most appropriate column for each application.



|                    | SP-C18                   | C18         | Biphenyl    | PFPP                     | HILIC |
|--------------------|--------------------------|-------------|-------------|--------------------------|-------|
| USP classification | L1                       | L1          | L11         | L43                      | L3    |
| Stationary phase   | Sterically protected C18 | C18         | Biphenyl    | Pentafluorophenyl propyl | None  |
| Particle size (µm) | 1.8, 2.7, 5              | 1.8, 2.7, 5 | 1.8, 2.7, 5 | 1.8, 2.7, 5              | 2.7   |

\*To maximize column lifetime, columns with 1.8 µm particle size are recommended for use with a pressure under 80 MPa.

### Shim-pack™ XR-ODS II & III

Although the Shim-pack XR-ODS II has a particle size of 2.2 µm, it can be used up to a pressure of 60 MPa, making it appropriate for a wide range of analyses. The particle size of the XR-ODS III column has been reduced to 1.6 µm. With a maximum pressure of 100 MPa, it achieves high separation even with a short column length.

These columns are suitable for shortening analysis times while taking full advantage of the high separation power of UHPLC.

|                    | XR-ODS II | XR-ODS III |
|--------------------|-----------|------------|
| USP classification | L1        | L1         |
| Stationary phase   | C18       | C18        |
| Particle size (µm) | 2.2       | 1.6        |

### Shim-pack™ GIS/GIST/GISS

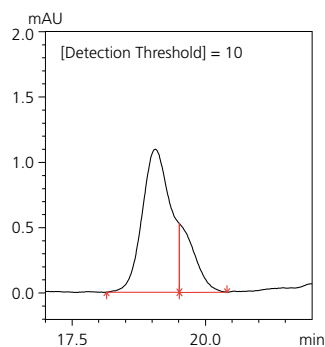
The Shim-pack GIS/GIST/GISS series lineup includes columns with particle sizes ranging from 5 µm, appropriate for HPLCs, to 2 µm, appropriate for UHPLCs. With a variety of substrates available, they are ideal for method development.

- GIS Series: HPLC columns packed with a high-purity silica gel material as a base. With high particle uniformity to secure the mobile phase path, these columns are ideal for low-pressure analysis.
- GIST Series: An increase in the inertness of the silica results in improved peak shapes and ruggedness. Can be used in pH 1–10 environments. Easy to use for a wide range of chemicals and environments.
- GISS Series: Adding to the advantages of the GIST series, a faster elution time has been achieved to provide even sharper peaks.

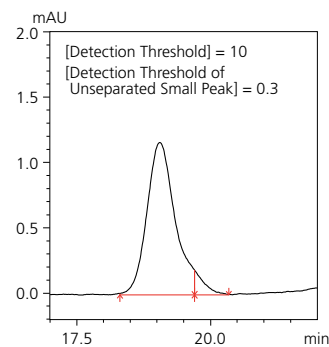
## Extract the Smallest of Shoulder Peaks

The i-PeakFinder tool can automatically recognize peaks even in complex chromatograms with high noise, and accounts for baseline drift for higher integration accuracy. Adjustable parameters in i-PeakFinder, such as peak detection threshold, allow the user to detect smaller peaks.

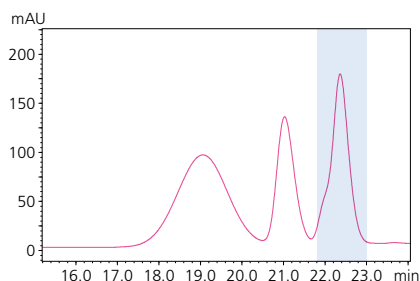
In addition, the i-PDeA II function can quantify peaks that cannot be completely separated by a column. Separate peaks by simply specifying the time and wavelength in LabSolutions.



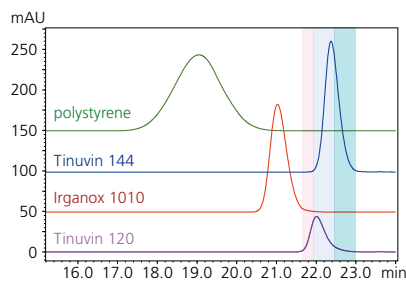
Shoulder peak detected automatically



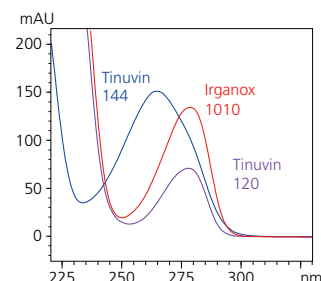
Smaller peak detected with parameter adjustment



The smaller peak is normally impossible to extract



i-PDeA II chromatogram identifies the two separate peaks



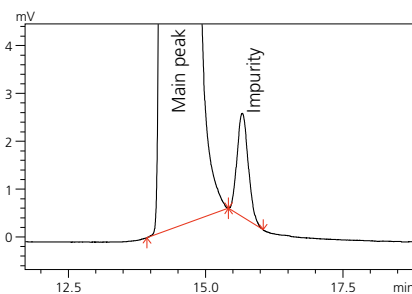
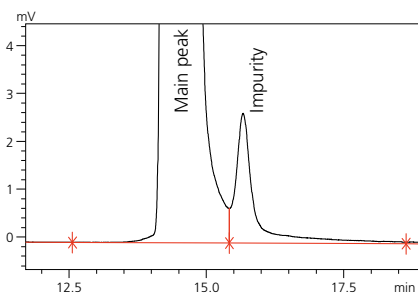
Spectrum analysis with i-PDeA II



## Consistent Peak Splitting

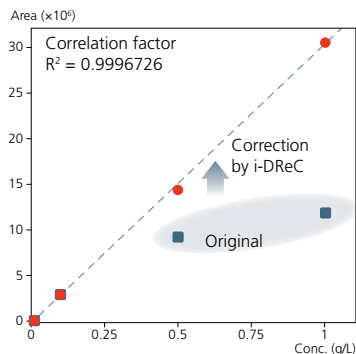


Manually setting the baseline for fused peaks is time-consuming, and the peaks may be split differently depending on the user. The i-PeakFinder has adjustable parameters for different analyses, allowing the consistent application of the best baseline in each situation.



## Dynamic Range Extension Function for Accurate Calibration

i-DReC is a new analytical method that significantly extends the dynamic range. It enables the analysis of high-concentration compounds without diluting them, and ensures a correct calibration curve.





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Ultra High Performance Liquid Chromatograph

# Nexera series

## Specifications



# System Configuration

## UV-VIS Detector SPD-40/40V

### Photodiode Array (PDA) Detector SPD-M40

Baseline stability and linearity have been improved, and stability remains even under fluctuating temperatures. The PDA detector is equipped with a UV cut-off filter to improve the quantitation accuracy of photodegradable compounds. The cell and lamp are traceable via individual IDs.

## Solvent Delivery Pump LC-40 series

In addition to the four parallel double plunger models based on the maximum pressure limit, the XR and X3 models have a dual pump that reduces gradient delay volume and enables an ultra-fast high-pressure gradient. Other pumping environments (low-pressure gradient, mobile phase blending) can also be provided.

## Autosampler SIL-40 series

The autosampler boosts ultra-low carryover, less than 0.0003% (under specified conditions). Its ultra-fast injection cycle and auto pretreatment functions also contribute to more efficient analysis. The optional dual-injection system consists of two separate injection ports and flow lines, enabling different analyses to be carried out simultaneously.



## Mobile Phase Monitor MPM-40 (Optional)

The monitoring device can be placed in the reservoir tray. The volume of liquid remaining in each mobile phase bottle is measured in real time and can be checked from a PC or mobile device. Before a batch analysis is started, the amount of mobile phase required is calculated and a warning is displayed if the amount remaining is insufficient.

## System Controller SCL-40, CBM-40/40lite

The SCL-40 system controller features a touch panel and allows the user to control the instrument and carry out analysis preparation directly without the need for a PC. A graphical UI makes the controller easy to use.

## Degassing Unit DGU-403/405

3-channel and 5-channel types available. Since the degassing unit is built into the LC-40B X3 pump, a separate unit is not required.

## Plate Changer

The installation area has been greatly reduced to 170 mm. It is possible to load up to 7 racks of 1.5 mL vials or 14 microtiter plates. Up to 3 plate changers can be connected, allowing up to 44 MTPs with up to 16896 samples to be loaded at once (using 384-well MTPs).

## Column Oven CTO-40 series

The circulation oven has a slim 130 mm model (maximum temperature: 85°C) and a standard 260 mm model (maximum temperature: 100°C). Both are able to accommodate a 300 mm column and have connection ports for CMD or mixer ID recognition. Active preheater tubing is available as an option.

# Specifications



SCL-40

## System Controller

|                             | SCL-40  | CBM-40                      | CBM-40lite                                   |
|-----------------------------|---|-----------------------------|--|
| Monitor                     | Touch panel<br>LabSolutions™<br>Web monitor   | LabSolutions<br>Web monitor | LabSolutions<br>Web monitor                  |
| Connectable unit            | Solvent delivery unit: max. 4, Autosampler: 1, Column oven: max. 4, Detector: max 2, etc. |                             |  |
| Number of connectable units | 8 (Using option: 12)  |                             | 4 (Excluding built-in solvent delivery unit) |
| Event input/output          | Input: 1, output: 2   |                             |  |
| Analog board                | Up to two channels (option)   | Up to one channel (option)  | —  |
| Communication               | Ethernet  |                             |  |
| Reservoir tray              | Built-in  | —                           |  |
| Dimensions [mm], weight     | W 260 × D 500 × H 140, 6 kg   | W 260 × D 500 × H 72, 5 kg  | —  |
| Operating temperature range | 4 to 35°C   |                             |  |
| Power supply                | AC 100–240 V, 50 VA, 50/60 Hz   |                             | Supplied from solvent delivery unit          |



LC-40B XR

## Solvent Delivery Pump

|   | LC-40D   | LC-40D XR<br>LC-40B XR  | LC-40D XS  | LC-40D X3<br>LC-40B X3  |
|---|--|---|--|---|
| Pumping method                          | Parallel-type double plunger (approx. 10 µL/1 stroke)                                  |   |  |   |
| Allowable maximum pressure              | 44 MPa   | 70 MPa  | 105 MPa  | 130 MPa   |
| Flow rate settings range                | 0.0001 – 5.0000 mL/min<br>(1.0 – 44 MPa)<br>5.0001 – 10.0000 mL/min<br>(1.0 – 22 MPa)  | 0.0001 – 3.0000 mL/min<br>(1.0 – 70 MPa)<br>3.0001 – 5.0000 mL/min<br>(1.0 – 44 MPa)<br>5.0001 – 10.0000 mL/min<br>(1.0 – 22 MPa)                         | 0.0001 – 3.0000 mL/min<br>(1.0 – 105 MPa)<br>3.0001 – 5.0000 mL/min<br>(1.0 – 80 MPa)<br>5.0001 – 10.0000 mL/min<br>(1.0 – 22 MPa) | 0.0001 – 3.0000 mL/min<br>(1.0 – 130 MPa)<br>3.0001 – 5.0000 mL/min<br>(1.0 – 80 MPa)<br>5.0001 – 10.0000 mL/min<br>(1.0 – 22 MPa)                        |
| Flow rate accuracy                      | ± 1% or ± 2 µL/min, whichever greater<br>(under specified conditions)                  |   | ± 1% (under specified conditions)  |   |
| Flow rate precision                     | ≤ 0.06% RSD or 0.02 minSD, whichever greater   |   |  |   |
| Gradient mode                           | High-pressure gradient<br>(2 or 3 solvents)<br><br>Quaternary low-pressure<br>gradient | High-pressure gradient<br>(2 solvents (LC-40B XR<br>standard) or 3 solvents)<br><br>Quaternary low-pressure<br>gradient (Only available<br>for LC-40D XR) | High-pressure gradient<br>(2 or 3 solvents)<br><br>Quaternary low-pressure<br>gradient   | High-pressure gradient<br>(2 solvents (LC-40B X3<br>standard) or 3 solvents)<br><br>Quaternary low-pressure<br>gradient (Only available<br>for LC-40D X3) |
| Gradient range of<br>set concentrations | 0 to 100% (0.1% step)  |   |  |   |
| Gradient concentration accuracy         | ± 0.5% (under specified conditions)  |   |  |   |
| Wetted materials                        | SUS316L, Hastelloy® C,<br>PEEK, PTFE, Sapphire, Ruby                                   | SUS316L, Hastelloy C, PEEK, PE, Sapphire, Ruby  |  |   |
| Available pH range                      | 1 to 14  |   |  |   |
| Automatic rinsing kit                   | Option   | Standard equipment  |  |   |
| Degassing unit                          | 1 unit connectable   | LC-40D XR:<br>1 unit connectable<br>LC-40B XR:<br>2 units connectable   | 1 unit connectable   | LC-40D X3:<br>1 unit connectable<br>LC-40B X3:<br>pre-installed (5 port built-in), 1 unit connectable   |
| Dimensions [mm]                         | W 260 × D 500 × H 140  |   |  | LC-40D X3:<br>W 260 × D 500 × H 140<br>LC-40B X3:<br>W 260 × D 500 × H 210  |
| Weight                                  | 10 kg  | LC-40D XR: 10 kg<br>LC-40B XR: 13 kg  | 12 kg  | LC-40D X3: 12 kg<br>LC-40B X3: 21 kg  |
| Operating temperature range             | 4 to 35°C  |   |  |   |
| Power supply                            | AC 100–240 V, 50/60 Hz   |   |  |   |
|   | 150 VA   | LC-40D XR: 150 VA<br>LC-40B XR: 180 VA  | 150 VA   | LC-40D X3: 150 VA<br>LC-40B X3: 180 VA  |



DGU-403

## Degassing Unit

|                             | DGU-403                             | DGU-405 |
|-----------------------------|-------------------------------------|---------|
| Number of degassed solvents | 3                                   | 5       |
| Degassed flow line capacity | 400 µL/1 line                       |         |
| Dimensions [mm], weight     | W 260 × D 500 × H 72, 4 kg          |         |
| Operating temperature range | 4 to 35°C                           |         |
| Power supply                | Supplied from solvent delivery unit |         |



SIL-40C XR

## Autosampler

|  | SIL-40<br>SIL-40C   | SIL-40 XR<br>SIL-40C XR   | SIL-40C XS   | SIL-40C X3         |
|--|---|---|--|--------------------|
| Injection method   | Total-volume Injection (standard), loop injection (optional)  |   |  |                    |
| Allowable maximum pressure                                   | 44 MPa  | 80 MPa  | 105 MPa  | 130 MPa            |
| Injection volume   | 0.1 to 100 µL   | 0.1 to 50 µL  |  |                    |
|  | 0.1 to 2000 µL (optional)   |   |  |                    |
| Injection volume accuracy                                    | ≤ ± 1% (5 µL injection, n = 20)   |   |  |                    |
| Linearity  | ≥ 0.9999  |   |  |                    |
| Injection cycle time   | ≤ 6.7 seconds (under specified conditions)  |   |  |                    |
| Samples for processing                                       | 288 (microtiter plate, 96 well × 3 plates), 1152 (microtiter plate, 384 well × 3 plates),<br>252 (1 mL sample vial, 84 × 3 plates), 162 (1.5 mL sample vial, 54 × 3 plates),<br>84 (4 mL sample vial, 28 × 3 plates), 36 (10 mL sample vial, 12 × 3 plates),<br>72 (1.5 mL micro tube, 24 × 3 plates) |   |  |                    |
| Injection volume reproducibility                             | RSD ≤ 1.0% (0.5 to 0.9 µL), RSD ≤ 0.5% (1.0 to 1.9 µL), RSD ≤ 0.25% (2.0 to 4.9 µL),<br>RSD ≤ 0.15% (More than 5.0 µL), RSD < 0.5% (typically, 0.5 µL), RSD < 0.25% (typically, 1.0 µL)   |   |  |                    |
| Carryover  | ≤ 0.0025% (without rinse)<br>≤ 0.0005%<br>(with rinse, typically)<br>(under specified conditions)   | ≤ 0.0015% (without rinse)<br>≤ 0.0003% (with rinse, typically)<br>(under specified conditions)          |  |                    |
| Dip rinsing outside the needle<br>and injection port rinsing | Standard equipment  |   |  |                    |
| Pumping rinse outside the needle                             | Option  | Standard equipment  |  |                    |
| Internal rinsing (3 dil)                                     |   | Option  |  | Standard equipment |
| Sample cooler  | SIL-40: None<br>SIL-40C:<br>Standard equipment<br>(Air-circulation tem-<br>perature control type)   | SIL-40 XR: None<br>SIL-40C XR:<br>Standard equipment<br>(Air-circulation tem-<br>perature control type) | Standard equipment<br>(Air-circulation temperature control type) |                    |
| Sample cooler<br>temperature setting range                   | 4 to 45°C<br>(Room temperature needs to be less than 30°C and humidity needs to be less than 70% to set 4°C)  |   |  |                    |
| Sample cooler<br>temperature accuracy                        | ± 2°C (sensor position ± 0.5°C)   |   |  |                    |
| Wetted material  | SUS316L, DLC, PEEK, GFP, PTFE, FEP, ETFE, sapphire, ceramics, PPS, FFKM   |   |  |                    |
| Available pH range   | 1 to 14   |   |  |                    |
| Dimensions [mm], weight                                      | W 260 × D 500 × H 280 (SIL-40C/40C XR/40C XS/40C X3: Protrusion adds 140 mm to the depth)   |   |  |                    |
|  | SIL-40: 17 kg<br>SIL-40C: 24 kg   | SIL-40 XR: 17 kg<br>SIL-40C XR: 24 kg   | 24 kg  |                    |
| Operating temperature range                                  | 4 to 35°C   |   |  |                    |
| Power supply   | Cooler model  | AC 100–240 V, 400 VA, 50/60 Hz  |  |                    |
|  | Non cooler model  | AC 100–240 V, 150 VA, 50/60 Hz  |  | —                  |

## Plate Changer

|   | PLATE CHANGER   |  |
|---|---|--|
| Samples for processing (includes two plates of autosampler) | 1 PLATE CHANGER   | 1536 (microtiter plate, 96 well × 16 plates), 864 (deep-well plate, 96 well × 9 plates)<br>6144 (microtiter plate, 384 well × 16 plates), 3456 (deep-well plate, 384 well × 9 plates)<br>756 (1 mL sample vial, 84 × 9 plates), 486 (1.5 mL sample vial, 54 × 9 plates)<br>252 (4 mL sample vial, 28 × 9 plates), 108 (10 mL sample vial, 12 × 9 plates)           |
|   | 3 PLATE CHANGERS  | 4224 (microtiter plate, 96 well × 44 plates), 2208 (deep-well plate, 96 well × 23 plates)<br>16896 (microtiter plate, 384 well × 44 plates), 8832 (deep-well plate, 384 well × 23 plates)<br>1932 (1 mL sample vial, 84 × 23 plates), 1242 (1.5 mL sample vial, 54 × 23 plates)<br>644 (4 mL sample vial, 28 × 23 plates), 276 (10 mL sample vial, 12 × 23 plates) |
| Sample cooler   | Air-circulation temperature control type, 4 to 45°C   |  |
| Sample cooler temperature setting range                     | (Room temperature needs to be less than 30°C and humidity needs to be less than 70% to set 4°C) |  |
| Dimensions [mm], weight                                     | W 170 × D 500 × H 560 (Protrusion adds 140 mm to the depth), 26 kg                              |  |
| Operating temperature range                                 | 4 to 35°C   |  |
| Power supply  | AC 100–240 V, 400 VA, 50/60 Hz  |  |

## Column Oven

|                                    | CTO-40C  | CTO-40S   |
|------------------------------------|--|---|
| Temperature control type           | Forced air circulation   |   |
| Temperature control range          | Room temperature –10°C to 100°C                                  | Room temperature –10°C to 85°C                        |
| Temperature accuracy               | ± 0.5°C  | ± 0.8°C   |
| Temperature precision              | ± 0.05°C   | ± 0.1°C   |
| Containable column size and number | Up to 250 mm L. column × 6<br>or 300 mm L. column × 3            | Up to 100 mm L. column × 6<br>or 300 mm L. column × 3 |
| Dimensions [mm], weight            | W 260 × D 500 × H 415, 21 kg                                     | W 130 × D 500 × H 553, 15 kg                          |
| Operating temperature range        | 4 to 35°C  |   |
| Power supply                       | AC 100–120 V / 220–240 V (Automatic switching), 400 VA, 50/60 Hz | AC 100–240 V, 300 VA, 50/60 Hz                        |



CTO-40S



SPD-40V

## UV-VIS Detector

|                                | SPD-40  | SPD-40V   |
|--------------------------------|---|---|
| Light source                   | Deuterium (D <sub>2</sub> ) lamp  | Deuterium (D <sub>2</sub> ) lamp, tungsten lamp |
| Wavelength range               | 190 to 700 nm   | 190 to 1000 nm                                  |
| Bandwidth                      | 8 nm  |   |
| Wavelength accuracy            | ± 1 nm  |   |
| Wavelength reproducibility     | ± 0.1 nm  |   |
| Drift                          | ≤ 0.1 × 10 <sup>-3</sup> of AU/h (under specified conditions)   |   |
| Noise                          | 1 Wavelength mode: ≤ 4.0 × 10 <sup>-6</sup> AU, 2 Wavelength mode: ≤ 10.0 × 10 <sup>-6</sup> AU (under specified conditions)  |   |
| Linearity                      | 2.5 AU (under specified conditions)   |   |
| Standard flow cell             | Optical path length: 10 mm, Cell volume: 12 μL, Pressure: 12 MPa<br>Material of wetted parts: SUS316L, PFA, quartz  |   |
| Cell temperature control range | 19 to 50°C, 1°C Step  |   |
| Optional flow cell             | UHPLC cell (optical path length: 10 mm, cell volume: 8 μL, equipped with temperature control function)<br>Semi-micro cell (optical path length: 5 mm, cell volume: 2.5 μL, equipped with temperature control function)<br>Conventional cell (optical path length: 10 mm, cell volume: 12 μL, equipped with temperature control function)<br>Inert cell (optical path length: 10 mm, cell volume: 12 μL, equipped with temperature control function)<br>Preparative cell (optical path length: 0.1/0.2/0.5 mm, cell volume: 0.8/1.6/4.0 μL)<br>Micro flow cell (optical path length: 3 mm, cell volume: 0.21 μL)<br>Maximum pressure cell (optical path length: 10 mm, cell volume: 12 μL) |   |
| Available pH range             | 1 to 13 (Cell quartz might be damaged by a mobile phase of pH >10.)   |   |
| Dimensions [mm], weight        | W 260 × D 500 × H 140, 11 kg  |   |
| Operating temperature range    | 4 to 35°C   |   |
| Power supply                   | AC 100–240 V, 150 VA, 50/60 Hz  |   |



SPD-M40

## Photodiode Array Detector

|                                | SPD-M40   |
|--------------------------------|---|
| Light source                   | Deuterium (D <sub>2</sub> ) lamp, Tungsten lamp   |
| Number of diode elements       | 1024  |
| Wavelength range               | 190 to 800 nm   |
| Wavelength accuracy            | ± 1 nm  |
| Wavelength reproducibility     | ± 0.1 nm  |
| Slit width                     | 1.2 nm, 8 nm  |
| Spectral resolution            | ≤ ± 1.4 nm  |
| Drift                          | ≤ 0.4 × 10 <sup>-3</sup> of AU/h (under specified conditions)   |
| Noise                          | ≤ 4.5 × 10 <sup>-6</sup> AU (under specified conditions)  |
| Linearity                      | 2.5 AU (under specified conditions)   |
| Standard flow cell             | Optical path length: 10 mm, Cell volume: 12 μL, Pressure: 12 MPa<br>Material of wetted parts: SUS316L, PFA, quartz  |
| Cell temperature control range | 19 to 50°C, 1°C Step  |
| Optional flow cell             | UHPLC cell (optical path length: 10 mm, cell volume: 8 μL, equipped with temperature control function)<br>Semi-micro cell (optical path length: 5 mm, cell volume: 2.5 μL, equipped with temperature control function)<br>Conventional cell (optical path length: 10 mm, cell volume: 12 μL, equipped with temperature control function)<br>Inert cell (optical path length: 10 mm, cell volume: 12 μL, equipped with temperature control function)<br>Preparative cell (optical path length: 0.1/0.2/0.5 mm, cell volume: 0.8/1.6/4.0 μL, equipped)<br>Micro flow cell (optical path length: 3 mm, cell volume: 0.21 μL)<br>Maximum pressure cell (optical path length: 10 mm, cell volume: 12 μL) |
| Available pH range             | 1 to 13 (Cell quartz might be damaged by a mobile phase pH >10.)  |
| Dimensions [mm], weight        | W 260 × D 500 × H 140, 10 kg  |
| Operating temperature range    | 4 to 35°C   |
| Power supply                   | AC 100–240 V, 180 VA, 50/60 Hz  |

## Capillary cell type Photodiode Array Detector

|                             | SPD-M30A  |
|-----------------------------|---|
| Light source                | Deuterium (D <sub>2</sub> ) lamp  |
| Number of diode elements    | 1024  |
| Wavelength range            | 190 to 700 nm   |
| Wavelength accuracy         | ± 1 nm  |
| Wavelength reproducibility  | ± 0.1 nm  |
| Slit width                  | 1 nm, 8 nm  |
| Spectral resolution         | ≤ 1.4 nm  |
| Drift                       | ≤ 0.5 × 10 <sup>-3</sup> AU/h (under specified conditions)  |
| Noise                       | ≤ 0.4 × 10 <sup>-6</sup> AU (under specified conditions)  |
| Linearity                   | 2.0 AU (under specified conditions)   |
| Cell                        | Standard cell: Optical path length: 10 mm, Capacity: 1 μL, Pressure: 8 MPa<br>Optional high-sensitivity cell: Optical path length: 85 mm, Capacity: 9 μL, Pressure: 8 MPa |
| Dimensions [mm], weight     | W 260 × D 500 × H 140, 12 kg  |
| Operating temperature range | 4 to 35°C   |
| Power supply                | AC 100–240 V, 150 VA, 50/60 Hz  |

## Spectrofluorometric Detector

|                                   | RF-20A  | RF-20Axs  |
|-----------------------------------|---|---|
| Light source                      | Xenon lamp  | Xenon lamp<br>Low-pressure mercury lamp<br>(to check wavelength accuracy)                 |
| Wavelength range                  | 200 to 650 nm   | 200 to 750 nm   |
| Spectral bandwidth                | 20 nm   |   |
| Wavelength accuracy               | $\pm 2$ nm  |   |
| Wavelength precision              | $\pm 0.2$ nm  |   |
| S/N                               | Water Raman peak S/N $\geq 1200$<br>Low background S/N $\geq 9000$  | Water Raman peak S/N $\geq 2000$<br>Low background S/N $\geq 12000$                       |
| Range of cell temperature control | —   | Room temperature $-10^{\circ}\text{C}$ to $40^{\circ}\text{C}$ , $1^{\circ}\text{C}$ step |
| Cell                              | Standard conventional cell: volume 12 $\mu\text{L}$ , maximum pressure 2 MPa<br>Optional semi-micro cell: volume 3 $\mu\text{L}$ , maximum pressure 2 MPa |   |
| Function                          | Simultaneous measurement of four wavelengths, Wavelength scanning   |   |
| Dimensions [mm], weight           | W 260 $\times$ D 500 $\times$ H 210, 16 kg  | W 260 $\times$ D 500 $\times$ H 210, 18 kg  |
| Operating temperature range       | 4 to $35^{\circ}\text{C}$   |   |
| Power supply                      | AC 100–240 V, 400 VA, 50/60 Hz  |   |

## Differential Refractive Index Detector

|                                   | RID-20A   |
|-----------------------------------|---|
| Measurement range                 | 1 to 1.75 RIU   |
| Noise                             | $\leq 2.5 \times 10^{-9}$ RIU   |
| Drift                             | $\leq 1 \times 10^{-7}$ RIU/h   |
| Range                             | A mode: $0.01 \times 10^{-6}$ to $500 \times 10^{-6}$ RIU<br>P, L-mode: $1 \times 10^{-6}$ to $5000 \times 10^{-6}$ RIU |
| Response                          | 0.05 to 10 sec, 10 steps  |
| Polarity – Change                 | Available   |
| Zero adjustment                   | Auto zero, Optical zero, Fine zero  |
| Maximum flow rate                 | 20 mL/min (150 mL/min in option)  |
| Range of cell temperature control | 30 to $60^{\circ}\text{C}$  |
| Cell                              | Volume 9 $\mu\text{L}$ , Maximum pressure 2 MPa   |
| Dimensions [mm], weight           | W 260 $\times$ D 420 $\times$ H 140, 12 kg  |
| Operating temperature range       | 4 to $35^{\circ}\text{C}$   |
| Power supply                      | AC 100–240 V, 150 VA, 50/60 Hz  |

## Conductivity Detector

|                             | CDD-10Avp                                      |
|-----------------------------|--|
| Cell volume                 | 0.25 $\mu\text{L}$                             |
| Cell constant               | 25 $\mu\text{S}\cdot\text{cm}^{-1}$            |
| Material of wetted parts    | PEEK, SUS316                                   |
| Maximum use pressure        | 2.9 MPa (30 kgf/cm <sup>2</sup> )              |
| Response                    | 0.05 to 10 s, 10 steps                         |
| Zero adjustment             | Auto-zero function, Baseline-shifting function |
| Dimensions [mm], weight     | W 260 $\times$ D 420 $\times$ H 140, 6 kg      |
| Operating temperature range | 4 to $35^{\circ}\text{C}$                      |
| Power supply                | AC 100–240 V, 250 VA, 50/60 Hz                 |

## Evaporative Light-Scattering Detector

|                                 | ELSD-LT II  |
|---------------------------------|---|
| Nebulizing method               | Siphon Splitting  |
| Light source                    | LED   |
| Detection                       | Photomultiplier   |
| Scope of set temperature        | Room temperature to $80^{\circ}\text{C}$  |
| Gas nebulizer                   | Nitrogen or air*  |
| Gas flow rate, gas pressure     | Up to 3.0 mL/min, up to 450 kPa   |
| Standard mobile phase flow rate | 0.2 to 2.5 mL/min   |
| Analog output                   | 0 to 1 V  |
| Dimensions [mm], weight         | W 260 $\times$ D 550 $\times$ H 450, 20 kg  |
| Operating temperature range     | 5 to $40^{\circ}\text{C}$   |
| Operation humidity range        | $\leq 80\%$ (Room temperature 5 to $31^{\circ}\text{C}$ ), $\leq 50\%$ (Room temperature 31 to $40^{\circ}\text{C}$ ) |
| Power supply                    | AC 100 V, 210 VA, 50/60 Hz  |

\*Requires a gas supply source, such as an air compressor, nitrogen generator and gas piping.

[Note] • Please use a regulator with filter (option) in order to remove small foreign matters in the gas.

- Please make sure that nitrogen or air doesn't contain oil, dust, or moisture when you use nitrogen generator and/or air compressor.
- Please use the instrument in a room with exhaust facilities.

# Optional accessories

## Solvent Delivery Unit

| Part Name                  |                | P/N          | Description  |
|----------------------------|----------------|--------------|--|
| Low-pressure gradient unit |                | 228-65016-58 | Low-pressure gradient unit for LC-40D/40D XR/40D XS/40D X3   |
| Reservoir selection valve  |                | 228-65017-58 | Two-solvent switching unit to be incorporated in solvent delivery unit                             |
| FCV-11AL                   |                | 228-65611-58 | The mobile phase switching valve of 3 flow lines that connects to solvent delivery unit (external) |
| FCV-11ALS                  |                | 228-65610-58 | The mobile phase switching valve of 1 flow line that connects to solvent delivery unit (external)  |
| Automatic rinsing kit      |                | 228-56201-41 | Automatic rinsing kit for plunger seal cleaning  |
| Mixer                      | MR 20 µL       | 228-72652-41 | High-efficiency mixer for high-pressure gradient system (volume 20 µL)                             |
|                            | MR 40 µL       | 228-72652-42 | High-efficiency mixer for high-pressure gradient system (volume 40 µL)                             |
|                            | MR 100 µL      | 228-72652-43 | High-efficiency mixer for high-pressure gradient system (volume 100 µL)                            |
|                            | MR 180 µL      | 228-72652-44 | High-efficiency mixer for high-pressure gradient system (volume 180 µL)                            |
|                            | MR 40 µL LPGE  | 228-65020-41 | High-efficiency mixer for low-pressure gradient system (volume 40 µL)                              |
|                            | MR 300 µL LPGE | 228-72653-42 | High-efficiency mixer for low-pressure gradient system (volume 300 µL)                             |

## Autosampler

| Part Name                      |                               | P/N               | Description   |
|--------------------------------|-------------------------------|-------------------|---|
| Sample loop                    | 50 µL                         | 228-63132-44      | Sample loop for 50 µL injection (standard configuration of SIL-40 XR/40C XR/40C XS/40C X3)            |
|                                | 100 µL                        | 228-63132-45      | Sample loop for 100 µL injection (standard configuration of SIL-40/40C)                               |
|                                | 500 µL                        | 228-45405-45      | Sample loop to increase the injection volume up to 500 µL (Connect sample loop 100 µL (228-63132-45)) |
|                                | 2000 µL                       | 228-45405-46      | Sample loop to increase the injection volume up to 2 mL (Connect sample loop 100 µL (228-63132-45))   |
| Dual-injection kit             |                               | 228-72568-41, -42 | Tubing kits for dual injection (228-72568-41 is for CTO-40S and 228-72568-42 is for CTO-40C)          |
| Sample loop for loop injection | 5 µL                          | 228-71759-42      | Sample loop for loop injection mode (volume 5 µL)   |
|                                | 20 µL                         | 228-71759-43      | Sample loop for loop injection mode (volume 20 µL)  |
|                                | 50 µL                         | 228-71759-44      | Sample loop for loop injection mode (volume 50 µL)  |
| Sample plate                   | 1.5 mL                        | 228-71762-46      | Plate for 1.5 mL sample vial (54)   |
|                                | 1 mL                          | 228-71762-42      | Plate for 1 mL sample vial (84)   |
|                                | 4 mL                          | 228-71762-43      | Plate for 4 mL sample vial (28)   |
|                                | 10 mL                         | 228-71762-44      | Plate for 10 mL sample vial (12)  |
| Identification labels          | For 96-well microplates       | 228-71840-41      | Identification label affixed to the 96-well microtiter plate (100 set)                                |
|                                | For 96-well deep-well plates  | 228-71840-42      | Identification label affixed to the 96-well deep-well plate (100 set)                                 |
|                                | For 384-well microplates      | 228-71840-43      | Identification label affixed to the 384-well microtiter plate (100 set)                               |
|                                | For 384-well deep-well plates | 228-71840-44      | Identification label affixed to the 384-well deep-well plate (100 set)                                |

## Column Oven

| Part Name                  |                    | P/N          | Description  |
|----------------------------|--------------------|--------------|--|
| Active pre-heater          |                    | 228-72084-41 | Pre-heater device for thermostating mobile phase before the column inlet |
| FCV kits                   | For CTO-40S        | 228-72438-41 | This is a kit for attaching a flow line switching valve to CTO-40S       |
|                            | For CTO-40C        | 228-72589-41 | This is a kit for attaching a flow line switching valve to CTO-40C       |
| Two FCV tubing kits        | ID 0.3             | 228-72437-41 | Tubing kit to connect the flow line switching valve and columns          |
|                            | ID 0.1             | 228-72437-42 |  |
| Six FCV tubing kits        | ID 0.3             | 228-72437-43 |  |
|                            | ID 0.1             | 228-72437-44 |  |
| Nexlock™ SS (with fitting) | ID 0.1 mm × 600 mm | 228-62544-11 | Finger-tight high-pressure fitting                                       |
|                            | ID 0.3 mm × 600 mm | 228-62544-22 |  |

## UV Detector / PDA Detector

| Part Name             | P/N                          | Description  |
|-----------------------|------------------------------|--|
| UHPLC cell            | 228-64724-41 (PDA), -42 (UV) | Flow cell for high-speed analysis (volume 8 µL)                                      |
| Semi-micro cell       | 228-64725-41 (PDA), -42 (UV) | Flow cell for semi-micro analysis (volume 2.5 µL)                                    |
| Conventional cell     | 228-68250-41 (PDA), -42 (UV) | Flow cell with the same cell volume (12 µL) as standard cell of SPD-20A and SPD-M20A |
| Inert cell            | 228-64728-41 (PDA), -42 (UV) | Inert-type flow cell with metal-less wetted parts                                    |
| Preparative cell      | 228-64727-41 (PDA), -42 (UV) | Preparative flow cell with variable optical path length                              |
| Micro flow cell       | 228-64737-41 (PDA), -42 (UV) | Flow cell for micro analysis (volume 0.21 µL)  |
| Maximum pressure cell | 228-64726-41 (PDA), -42 (UV) | High-pressure resisting flow cell for Nexera™ UC                                     |
| Solvent recycle valve | 228-56808-42 (UV)            | Valve to recycle mobile phase by attaching to SPD-40/40V                             |



## Others

| Part Name                                 | P/N  | Description  |
|---|--|--|
| Mobile phase monitor (controller)         | 228-65525-58   | MPM-40 controller to monitor remaining mobile phase in real-time<br>Up to six bottle holders can be connected (228-65526-58, set of two)                             |
| Power outlet unit 6P                      | 228-65523-42 (socket type B)<br>228-65523-43 (socket type D)<br>228-65523-46 (socket type I)<br>228-65523-58 (socket type F) | Power tap to turn off the main power of the instrument completely at one time.<br>Switches can be installed in front of the reservoir tray. It provides six outlets. |
| Power outlet unit 2PS                     | 228-65524-46 (for China)<br>228-65524-58 (for other than China)  | Outlet to supply power to main units that need to be connected to service outlets, such as SIL-10A and FRC-10A. It provides two outlets.                             |
| Tubing kit A, ID 0.3 for high-pressure GE | 228-70254-41   | Tubing kits for high-pressure gradient system. Column inlet tubing ID 0.3 mm   |
| Tubing kit B, ID 0.1 for high-pressure GE | 228-70254-42   | Tubing kits for high-pressure gradient system. Column inlet tubing ID 0.1 mm   |
| Tubing kit C, ID 0.3 for low-pressure GE  | 228-70254-43   | Tubing kits for low-pressure gradient system. Column inlet tubing ID 0.3 mm  |
| Tubing kit D, ID 0.1 for low-pressure GE  | 228-70254-44   | Tubing kits for low-pressure gradient system. Column inlet tubing ID 0.1 mm  |
| Cable kit A                               | 228-70247-41   | Optical link cable kit, 600 mm × 1 pc, 800 mm × 1 pc   |
| Cable kit B                               | 228-70247-42   | Optical link cable kit, 600 mm × 2 pcs, 800 mm × 1 pc  |
| Cable kit C                               | 228-70247-43   | Optical link cable kit, 600 mm × 3 pcs, 800 mm × 1 pc  |
| Cable kit D                               | 228-70247-44   | Optical link cable kit, 600 mm × 4 pcs, 800 mm × 1 pc  |
| Reservoir tray                            | 228-65508-58   | Reservoir tray for up to 8 bottles (1L)  |
| AD board                                  | 228-55519-41   | Board for analog-digital conversion. It takes in detector signals as analog signals.   |
| Optical cable connector expansion board   | 228-70481-41   | The board to expand the number of optical cable connector channels to 12ch from 8ch (standard) by attaching to SCL-40/CBM-40   |

## Valve

| Part Name  | P/N          | Description   |
|------------|--------------|---|
| FCV-DR     | 228-65602-58 | Drive unit and control board for incorporating valve into CTOs (1 FCV valve is required separately) |
| FCV-0206   | 228-65603-58 | 2-position 6-port valve (Maximum pressure: 44 MPa)  |
| FCV-0607   | 228-65604-58 | 6-position 7-port valve (Maximum pressure: 44 MPa)  |
| FCV-0206H  | 228-65607-58 | 2-position 6-port valve (Maximum pressure: 80 MPa)  |
| FCV-0607H  | 228-65608-58 | 6-position 7-port valve (Maximum pressure: 80 MPa)  |
| FCV-0206H3 | 228-65624-58 | 2-position 6-port valve (Maximum pressure: 130 MPa)   |
| FCV-0607H3 | 228-65625-58 | 6-position 7-port valve (Maximum pressure: 130 MPa)   |

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# MRM spectrum mode and Library Searching for Enhanced Reporting Confidence in Forensic Toxicology

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# MRM spectrum mode and Library Searching for Enhanced Reporting Confidence in Forensic Toxicology

## Introduction

The majority of clinical decisions are based on laboratory test results. For many laboratories, Triple quadrupole MRM methods are used to deliver highly sensitive, selective and robust for precise quantification and identification verification. To help transition towards a more effective data review and higher confidence in reporting results, we have been rethinking the capability of MRM in compound identification and verification. In this workflow, 6-10

fragment ion transitions were monitored for each target compound as opposed to a conventional approach using 2-3 fragment ions. By acquiring a high number of fragment ion transitions, each target compound had a corresponding fragmentation spectra which could be used in routine library searching and compound verification using reference library match to clinical and forensic toxicology.

## Methods and Pretreatment

Whole blood was spiked with 33 drugs (Hypnotics). Calibration samples were prepared by modified QuEChERS method. In this study, MRM spectrum mode acquired a library of typically 7 or more MRM's per compound using certified reference materials. The library included retention

time, CAS number, formula and MRM transitions for each target compound. As a comparison, MRM triggered product ion scan for three collision energies corresponding to CE: 15, 30, 45V as well as a fourth merged CE spectrum was performed for qualitative.

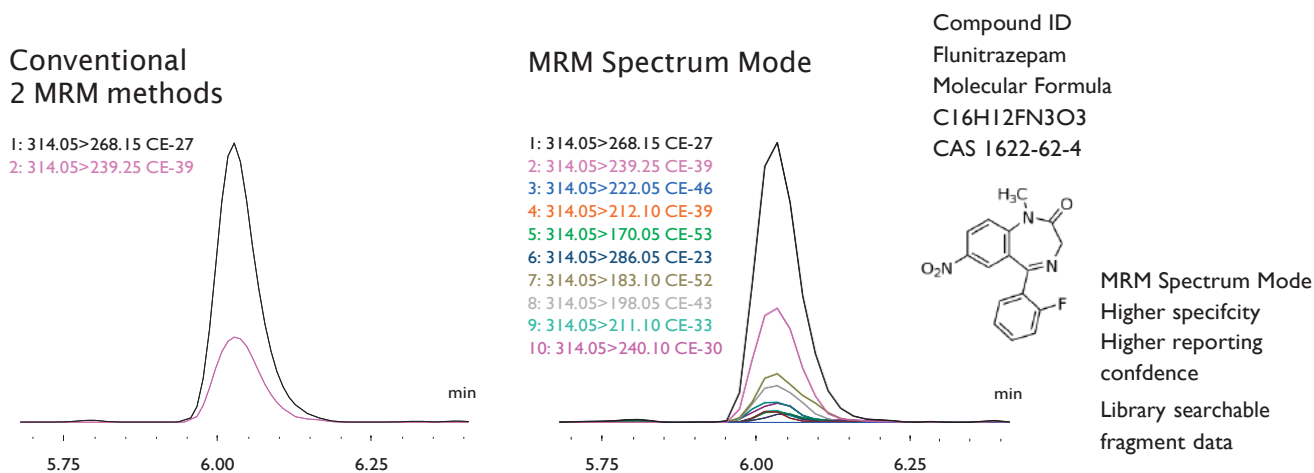


Fig.1 Comparison of conventional MRM and MRM spectrum mode with flunitrazepam

## MRM spectrum mode and Library Searching for Enhanced Reporting Confidence in Forensic Toxicology

Table 1. LC and MS conditions

| [LC] Nexera™ X2 System |  |            |    |   |   |     |    |    |    |       |   |    |      |
|------------------------|--|------------|----|---|---|-----|----|----|----|-------|---|----|------|
| Analytical Column      | : Phenomenex Kinetex® XB-C18 (2.1 mmI.D.×100 mmL, 2.6 µm)  |            |    |   |   |     |    |    |    |       |   |    |      |
| Guard Column           | : Phenomenex Security Guard Ultra C18 2.1 mmID   |            |    |   |   |     |    |    |    |       |   |    |      |
| Solvent A              | : Water + 10 mmol/L ammonium formate + 0.1% formic acid  |            |    |   |   |     |    |    |    |       |   |    |      |
| Solvent B              | : Methanol + 10 mmol/L ammonium formate + 0.1% formic acid   |            |    |   |   |     |    |    |    |       |   |    |      |
| Gradient Program       | : <table border="1"> <thead> <tr> <th>Time (min)</th><th>%B</th></tr> </thead> <tbody> <tr> <td>0</td><td>5</td></tr> <tr> <td>7.5</td><td>95</td></tr> <tr> <td>10</td><td>95</td></tr> <tr> <td>10.01</td><td>5</td></tr> <tr> <td>15</td><td>STOP</td></tr> </tbody> </table> | Time (min) | %B | 0 | 5 | 7.5 | 95 | 10 | 95 | 10.01 | 5 | 15 | STOP |
| Time (min)             | %B   |            |    |   |   |     |    |    |    |       |   |    |      |
| 0                      | 5  |            |    |   |   |     |    |    |    |       |   |    |      |
| 7.5                    | 95   |            |    |   |   |     |    |    |    |       |   |    |      |
| 10                     | 95   |            |    |   |   |     |    |    |    |       |   |    |      |
| 10.01                  | 5  |            |    |   |   |     |    |    |    |       |   |    |      |
| 15                     | STOP   |            |    |   |   |     |    |    |    |       |   |    |      |
| Flow Rate              | : 0.3 mL/min   |            |    |   |   |     |    |    |    |       |   |    |      |
| Column Temp            | : 40 °C  |            |    |   |   |     |    |    |    |       |   |    |      |
| [MS] LCMS-8060         |  |            |    |   |   |     |    |    |    |       |   |    |      |
| Ionization             | : ESI (Positive)   |            |    |   |   |     |    |    |    |       |   |    |      |
| Nebulizer Gas          | : 3 L/min  |            |    |   |   |     |    |    |    |       |   |    |      |
| Interface temperature  | : 300 °C   |            |    |   |   |     |    |    |    |       |   |    |      |
| Desolvation Line       | : 250 °C   |            |    |   |   |     |    |    |    |       |   |    |      |
| Heat Block temperature | : 400 °C   |            |    |   |   |     |    |    |    |       |   |    |      |
| Heating Gas            | : 15 L/min   |            |    |   |   |     |    |    |    |       |   |    |      |
| Drying Gas             | : 10 L/min   |            |    |   |   |     |    |    |    |       |   |    |      |



# MRM spectrum mode and Library Searching for Enhanced Reporting Confidence in Forensic Toxicology

## Results

### Quantitation

Conventional qualitative data acquisition by triple quadrupole LC-MS/MS which typically uses 2 MRM per compound. MRM product mode acquires a higher number of precursor-fragment ion transitions to generate a library searchable product ion spectrum. For quantitative analysis, these compounds and QuEChERS extraction were diluted

at 0.05, 0.1, 0.5, 1.0 ng/mL for calibration points. For accurate quantitative, internal standard was required. Low similarity score was obtained for some compounds, because some drugs have almost same mass which can't separate by nominal mass. Good LC separation was required for the good similarity score.

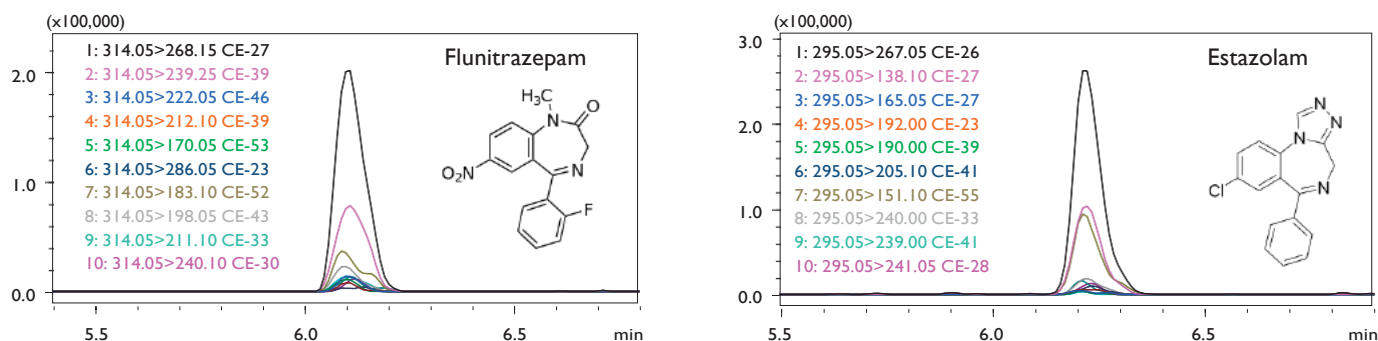


Fig.2 MS chromatogram of flunitrazepam and estazolam post-spiked in whole blood at 1 ng/mL

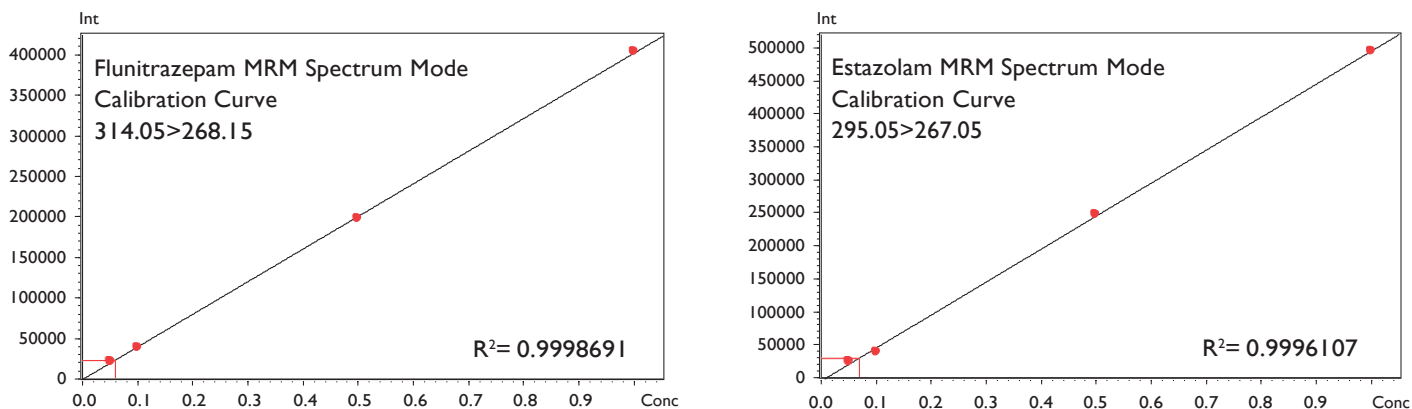


Fig.3 Calibration curve with MRM spectrum mode post-spiked sample (0.05, 0.1, 0.5, 1.0 ng/mL).

## MRM spectrum mode and Library Searching for Enhanced Reporting Confidence in Forensic Toxicology

Table 2 Similarity score, retention time, recovery rate, accuracy of typical compounds pre-spiked (2.0 ng/mL) and  $R^2$  for post-spiked calibration curve with MRM spectrum mode.

| Compound             | Similarity Score | RT (min) | Accuracy (%) | $R^2$  |
|----------------------|------------------|----------|--------------|--------|
| 7-aminoflunitrazepam | 97               | 4.67     | 107          | 0.9960 |
| 7-aminoclonazepam    | 88               | 4.25     | 106          | 0.9969 |
| Estazolam            | 93               | 6.18     | 85           | 0.9996 |
| Zolpidem             | 96               | 4.68     | 78           | 0.9998 |
| Flunitrazepam        | 98               | 6.16     | 77           | 0.9998 |
| Bromazepam           | 65               | 5.78     | 115          | 0.9960 |
| Clotiazepam          | 93               | 7.14     | 79           | 0.9913 |
| Midazolam            | 98               | 5.82     | 111          | 0.9950 |
| 4-hydroxymidazolam   | 87               | 5.51     | 92           | 0.9992 |
| Triazolam            | 76               | 6.32     | 87           | 0.9862 |
| Ethyl loflazepate    | 77               | 6.95     | 89           | 0.9931 |
| Flurazepam           | 100              | 5.46     | 89           | 0.9998 |
| Nordiazepam          | 90               | 6.71     | 82           | 0.9833 |

### Library Identification

To minimize the possibility of false reporting without compromising the accuracy, precision and limits of detection, methods were developed to combine the sensitivity of MRM detection with the identification power of a product ion spectrum. The methods have the capability of simultaneously using both precursor and product ion information enabling precise, accurate

quantification and library searchable compound identification. To assess the impact of methods designed to increase reporting confidence by library searching on quantification both product ion spectrum methods were compared to a data generated using conventional 2 MRM methods; MRM triggered product ion spectrum and MRM spectrum mode.

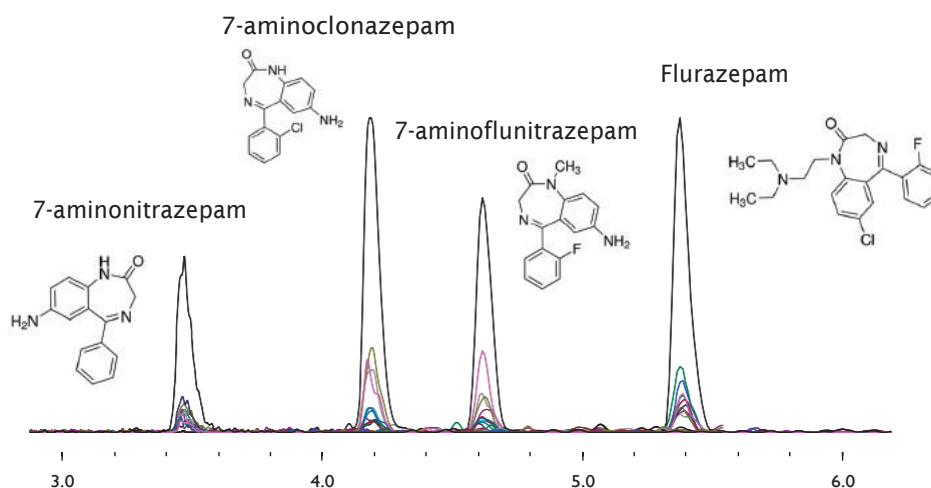


Fig.4 MS chromatogram of 7-aminonitrazepam, 7-aminoclonazepam, 7-aminoflunitrazepam, and flurazepam.

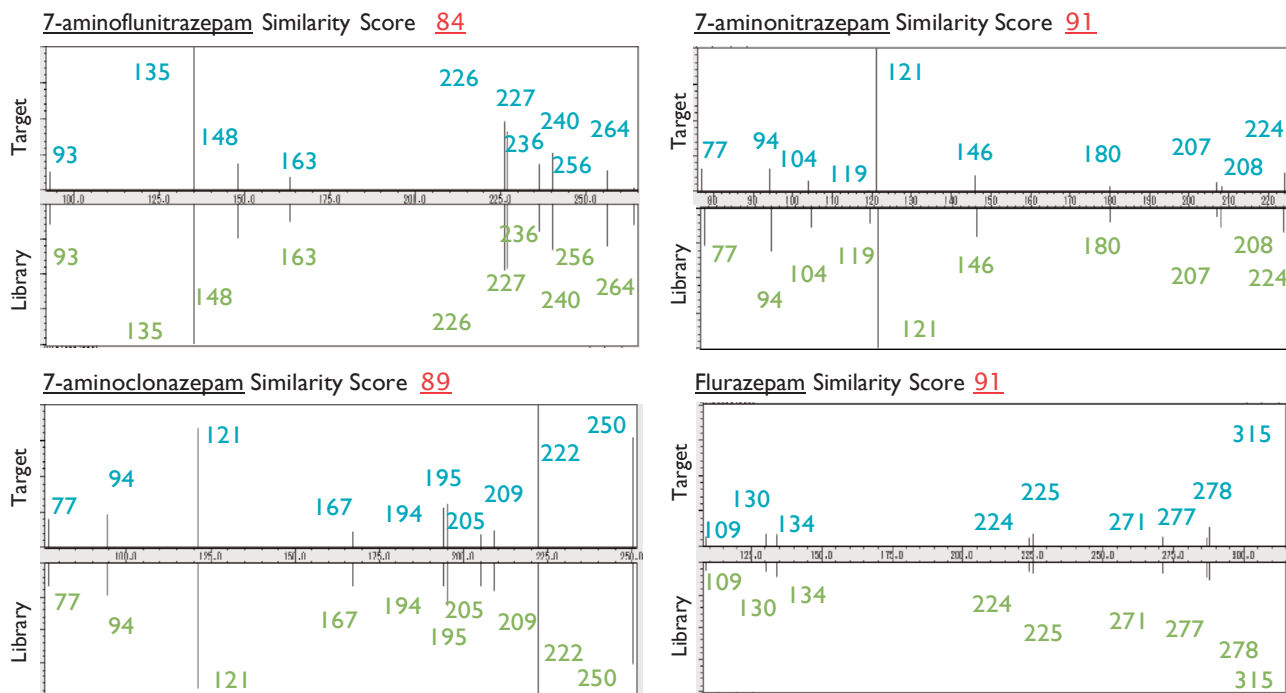
## MRM spectrum mode and Library Searching for Enhanced Reporting Confidence in Forensic Toxicology

Table 3 Acquisition parameters of MRM Spectrum Mode and MRM  
Triggered Product Ion Scan (Threshold was an intensity of 10,000 counts).

| Compound               | 7-amino<br>nitrazepam | 7-amino<br>clonazepam          | 7-amino<br>flunitrazepam | Flurazepam |
|------------------------|-----------------------|--------------------------------|--------------------------|------------|
| MS/MS acquisition mode |                       | MRM Spectrum Mode              |                          |            |
| Precursor              | 252.1                 | 286.1                          | 284.1                    | 388.2      |
| Product 1              | 121.1                 | 222.1                          | 135.1                    | 315.0      |
| Product 2              | 208.1                 | 194.1                          | 148.1                    | 225.0      |
| Product 3              | 119.1                 | 209.1                          | 236.2                    | 288.0      |
| Product 4              | 207.5                 | 205.1                          | 264.1                    | 134.1      |
| Product 5              | 180.1                 | 167.1                          | 163.2                    | 317.0      |
| Product 6              | 94.1                  | 121.1                          | 227.1                    | 287.0      |
| Product 7              | 77.1                  | 250.1                          | 226.1                    | 271.0      |
| Product 8              | 224.1                 | 94.1                           | 93.1                     | 109.0      |
| Product 9              | 146.1                 | 77.1                           | 240.1                    | 130.1      |
| Product 10             | 104.1                 | 195.1                          | 256.1                    | 224.0      |
| MS/MS acquisition mode |                       | MRM Triggered Product Ion Scan |                          |            |
| Precursor              | 252.1                 | 286.1                          | 284.1                    | 388.2      |
| Product 1              | 121.1                 | 222.1                          | 135.1                    | 315.0      |
| Product 2              | 94.1                  | 121.2                          | 226.2                    | 317.0      |
| CE: 15                 | 20 : 262.1            | 20 : 296.1                     | 20 : 294.1               | 20 : 398.2 |
| CE: 30                 | 20 : 262.1            | 20 : 296.1                     | 20 : 294.1               | 20 : 398.2 |
| CE: 45                 | 20 : 262.1            | 20 : 296.1                     | 20 : 294.1               | 20 : 398.2 |

## MRM spectrum mode and Library Searching for Enhanced Reporting Confidence in Forensic Toxicology

### MRM Spectrum Mode



### MRM Triggered Product Ion Spectrum (Merged Spectrum CE: 15/30/45)

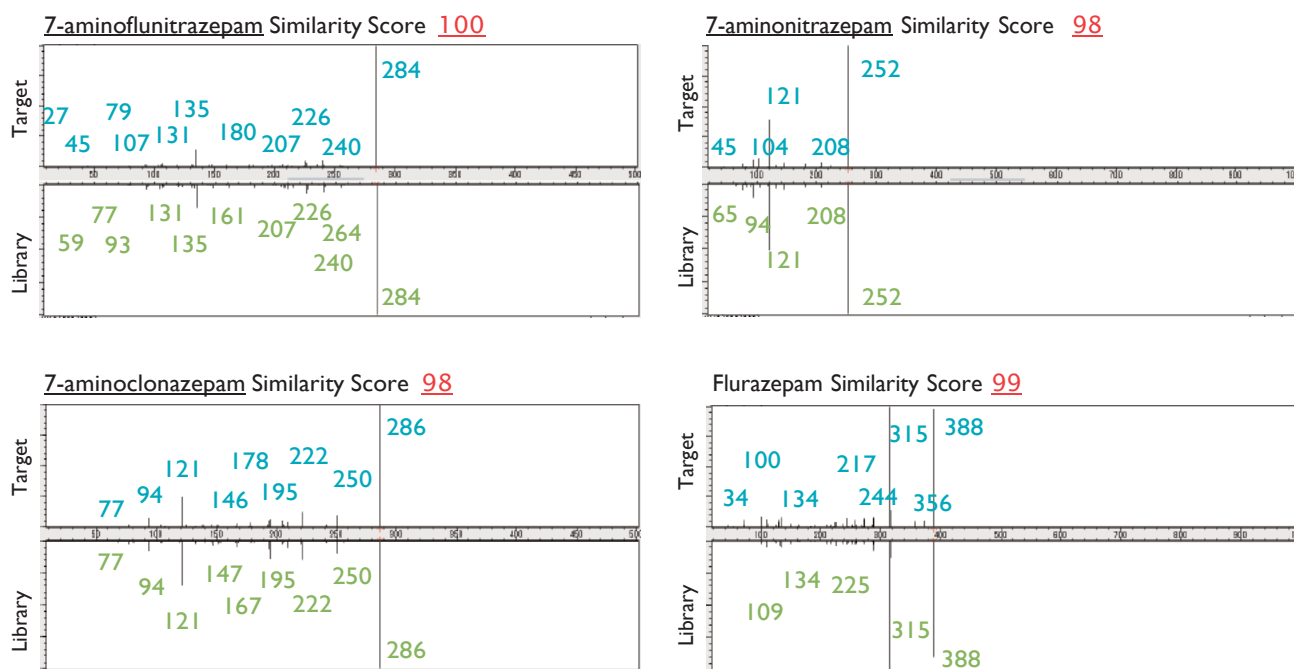


Fig.5 Compared to a conventional MRM triggered product ion scan and MRM spectrum mode, MRM spectrum mode has almost same qualitative ability for these compounds.



## MRM spectrum mode and Library Searching for Enhanced Reporting Confidence in Forensic Toxicology

### Conclusion

MRM spectrum mode results in high data densities and a high data sampling rate across a peak. This approach generates a consistent loop time and sampling rate producing reliable quantification and peak integration without threshold triggering and creates new opportunities in toxicological screening.

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# Rethink your MRM Limits

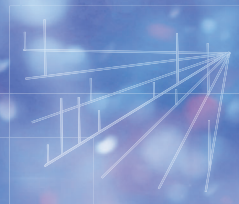
MRM Spectrum Mode

simultaneously

Achieve high-  
sensitivity  
quantitation



Attain high-  
confidence  
identification



## Rediscover the capabilities of MRM

# ONE concept

Library Screening MRM Spectrum Mode



**ONE  
Instrument**



**ONE  
Injection**



**ONE  
Workflow**

## to achieve two goals at once

quantitation and identification  
in **ONE** run

Accelerated  
Data Review



High-Confidence  
Identification



Streamlined

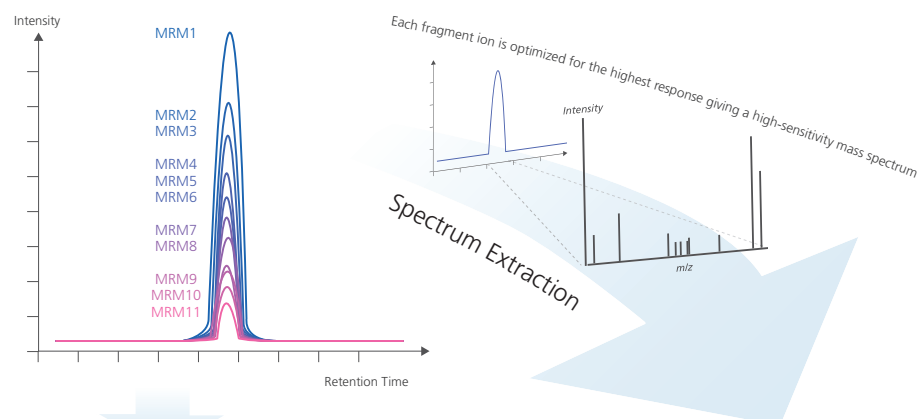


Cost-Effective

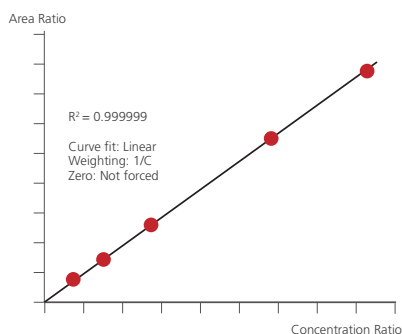


# The MRM Spectrum Concept

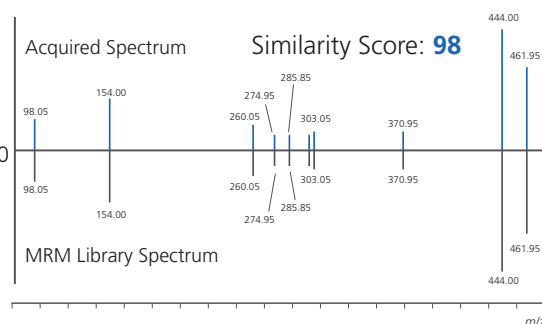
## A All Reaction Monitoring



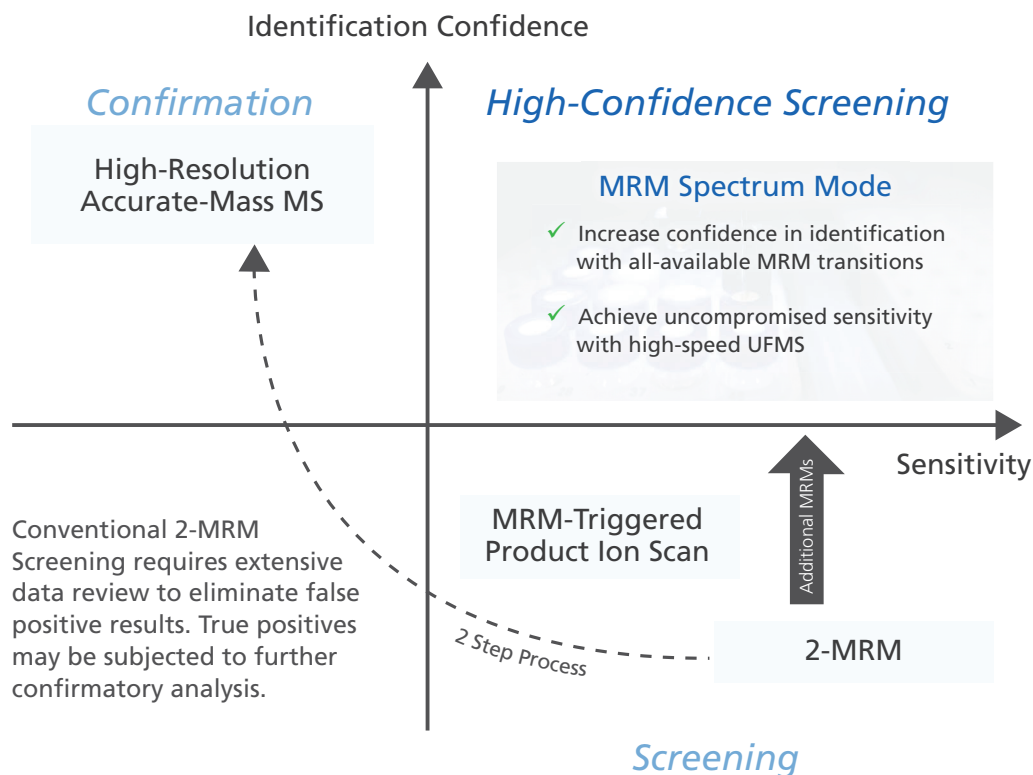
## B1 Quantitation



## B2 Library Match



## In Comparison to Existing Workflows





# Library Screening MRM Spectrum Mode

is featured in [LabSolutions Insight](#) which includes:



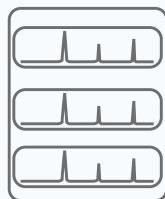
Centralized Data Management



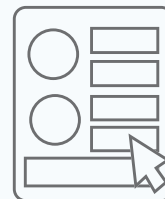
Powerful Peak Integration Algorithm



Compliant with Data Integrity Requirements



Extensive Data Review Tools



Intuitive User Interface

Download these application notes on MRM Spectrum Mode and get started with our LC-MS/MS method packages



**Veterinary Drugs**

[Fast Quantitative Analysis of Aminoglycoside Antibiotic Residues in Meat, Eggs and Milk](#)

[Analysis of >200 Compounds using MRM Spectrum Mode by LC-MS/MS](#)



**Pesticides**

[Library Searching for Enhanced Reporting Confidence in Pesticide Residue Analysis](#)



**Drugs of Abuse**

[Library Searching for Enhanced Reporting Confidence in Forensic Toxicology](#)

Visit our [LabSolutions Insight page](#) and [Library Screening page](#) for more information.

# LC/MS/MS Forensic Toxicology Database

The database includes information on drugs of abuse, hypnotics, psychotropics, pesticides, prescription drugs and natural toxins.



LCMS-8060

## Simplified Acquisition and Identification

The Forensic Toxicology Database includes optimized LC-MS/MS data acquisition parameters and a library database to help clinical and forensic researchers build screening and quantitation methods quickly, simplifying method development.

## MRM & Spectral Library database contains information on more than 2,500 compounds

The spectral library database is built using two separation conditions (ODS and Biphenyl). Both methods have information on clinical and forensic compounds of interest in routine analysis. The ODS method contains information on 1,250 compounds and the Biphenyl method contains 1,281 compounds. Compound datasheet includes: monoisotopic mass, RT, CAS number, formula and compound class. This package provides Synchronized Survey Scan parameters (MRM parameters, MRM intensity threshold and triggered product ion scan parameters) optimized for screening analysis.

### Analytical Conditions for ODS column

|                   |   |
|-------------------|---|
| Analytical column | : Phenomenex Kinetex XB-C18<br>(2.1 mmI.D. x 100 mmL., 2.6µm) |
| Guard column      | : Phenomenex SecurityGuard ULTRA C18 2.1mmID                  |
| Mobile phase A    | : 10 mmol/L ammonium formate + 0.1% formic acid – water       |
| Mobile phase B    | : 10 mmol/L ammonium formate +<br>0.1% formic acid – methanol |
| Flow rate         | : 0.3 mL / min  |
| Column temp.      | : 40 °C   |
| Analytical time   | : 15 min  |

## Enhanced identification by merged spectrum

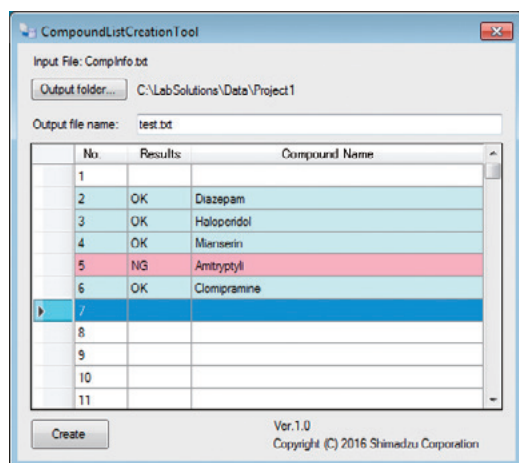
Each certified reference material was acquired with three different collision energies to generate an information-rich merged-CE spectrum which can be used in library matching and compound verification. Matching with a merged-CE spectrum library can be a powerful tool to identify compounds with a library score.

### Analytical Conditions for Biphenyl column

|                   |  |
|-------------------|--|
| Analytical column | : Restek Raptor Biphenyl (2.1 mmI.D. x 100 mmL., 2.7µm)        |
| Mobile phase A    | : 2 mmol/L ammonium formate +<br>0.002% formic acid – water    |
| Mobile phase B    | : 2 mmol/L ammonium formate +<br>0.002% formic acid – methanol |
| Flow rate         | : 0.3 mL/min (0.5 mL/min from 11 min to 14 min)                |
| Column temp.      | : 50 °C  |
| Analytical time   | : 17 min   |

# LC/MS/MS Forensic Toxicology Database

## Method Creation by "Compound List Creation Tool"



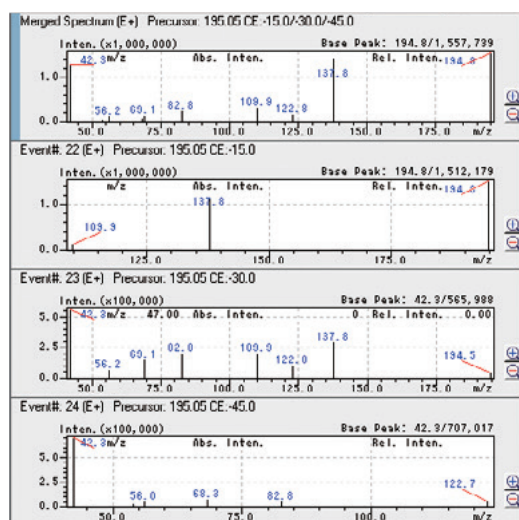
To accelerate customized method development, the 'Compound List Creation Tool' can be used to select specific panels of targets from the library for analysis by LC-MS/MS.



| Type             | Event# | +/- | Compound Name           | m/z                          | Time (0.000 min - 8.318 min) |
|------------------|--------|-----|-------------------------|------------------------------|------------------------------|
| MRM              | 5      | +   | Caffeine                | 195.10>138.05, 195.10>42.10  |                              |
| Product Ion Scan | 6      | +   | > CE-15.0, 20.00>205.10 |                              |                              |
| Product Ion Scan | 7      | +   | > CE-30.0, 20.00>205.10 |                              |                              |
| Product Ion Scan | 8      | +   | > CE-45.0, 20.00>205.10 |                              |                              |
| MRM              | 9      | +   | Atropine                | 290.15>124.15, 290.15>93.20  |                              |
| Product Ion Scan | 10     | +   | > CE-15.0, 20.00>300.15 |                              |                              |
| Product Ion Scan | 11     | +   | > CE-30.0, 20.00>300.15 |                              |                              |
| Product Ion Scan | 12     | +   | > CE-45.0, 20.00>300.15 |                              |                              |
| MRM              | 13     | +   | Fentanyl                | 337.20>105.10, 337.20>188.10 |                              |
| Product Ion Scan | 14     | +   | > CE-15.0, 20.00>347.20 |                              |                              |

Synchronized Survey Scan  
(Including three Product Ion Scan events with three different CE)

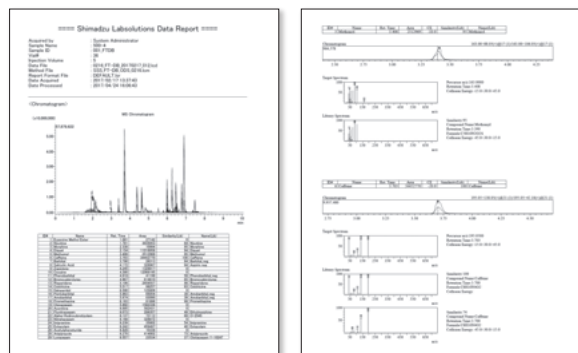
## Compound Identification by Merged Spectra



Merged Spectrum

MS/MS Spectra with three different CE

Merged Spectra using three MS/MS spectra with three different CE help to increase the confidence in reporting results by using library searchable spectra.



Report by Library Search Results with Merged Spectra

### Remarks and Precautions

1. Shimadzu makes no warranty regarding the accuracy of information included in the database or the usefulness of information obtained from using the database.
2. It is the user's responsibility to adopt appropriate quality control tests using standard samples to confirm qualitative and quantitative information obtained with the database.
3. LabSolutions LCMS Ver. 5.91 or later is required for this database.



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