



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 @ 5

List View

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

Procurement Folder: 265333

SO Doc Code: CRFQ

Procurement Type: Central Purchase Order

SO Dept: 1400

Vendor ID: 000000186851

SO Doc ID: AGR1700000005

Legal Name: THERMO ELECTRON NORTH AM LLC

Published Date: 11/9/16

Alias/DBA:

Close Date: 11/17/16

Total Bid: \$254,064.81

Close Time: 13:30

Response Date: 11/16/2016

Status: Closed

Response Time: 10:42

Solicitation Description: Addendum # 1 - Triple Quad LC/MS/MS

Total of Header Attachments: 5

Total of All Attachments: 5



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

State of West Virginia
Solicitation Response

Proc Folder : 265333

Solicitation Description : Addendum # 1 - Triple Quad LC/MS/MS

Proc Type : Central Purchase Order

Date issued	Solicitation Closes	Solicitation Response	Version
	2016-11-17 13:30:00	SR 1400 ESR11161600000002238	1

VENDOR

000000186851

THERMO ELECTRON NORTH AM LLC

Solicitation Number: CRFQ 1400 AGR17000000005

Total Bid : \$254,064.81

Response Date: 2016-11-16

Response Time: 10:42:18

Comments:

FOR INFORMATION CONTACT THE BUYER

Linda Harper
(304) 558-0468
linda.b.harper@wv.gov

Signature on File

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	LCMSMS, Workstation, software, printer	1.00000	EA	\$194,346.810000	\$194,346.81

Comm Code	Manufacturer	Specification	Model #
41100000			

Extended Description : LCMSMS, Workstation, software, printer per specification 3.1.1 & 3.1.2

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	Shipping Charges and inside delivery	1.00000	EA	\$900.000000	\$900.00

Comm Code	Manufacturer	Specification	Model #
78121603			

Extended Description : Shipping Charges and inside deliver per section 3.1.3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
3	Installation/validation	1.00000	EA	\$0.000000	\$0.00

Comm Code	Manufacturer	Specification	Model #
73171605			

Extended Description : Installation/validation per section 3.1.3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
4	Training/Warranty	1.00000	EA	\$17,406.000000	\$17,406.00

Comm Code	Manufacturer	Specification	Model #
73171605			

Extended Description : Training/Warranty per section 3.1.3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
5	Service	1.00000	EA	\$41,412.000000	\$41,412.00

Comm Code	Manufacturer	Specification	Model #
73171605			

Extended Description :	Service per section 3.1.3
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Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation
01 — Agricultural

Proc Folder: 265333

Doc Description: Triple Quad LC/MS/MS

Proc Type: Central Purchase Order

Date Issued	Solicitation Closes	Solicitation No	Version
2016-10-24	2016-11-17 13:30:00	CRFQ 1400 AGR1700000005	1

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number: Thermo Electron North America LLC
5225 Verona Road Bldg 4
Madison WI 53711
800-532-4752
usmadorderprocessing@thermofisher.com

FOR INFORMATION CONTACT THE BUYER

Linda Harper
(304) 558-0468
linda.b.harper@wv.gov

Signature X *Debbie D. Erickson*

FEIN # 43-1992201

DATE 11/15/16

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

ADDITIONAL INFORMATION:

The West Virginia Purchasing Division for the Agency, The West Virginia Department of Agriculture is soliciting bids from qualified vendors to establish a "One-Time" contract for the purchase of a Liquid Chromatography/Mass Spectrometer (LC/MS) Instrument per the Specifications, Terms & Conditions and bid requirements as attached.

INVOICE TO		SHIP TO	
PROCUREMENT OFFICER 304-558-2221 AGRICULTURE DEPARTMENT OF ADMINISTRATIVE SERVICES 1900 KANAWHA BLVD E CHARLESTON WV25305-0173 US		AUTHORIZED RECEIVER 304-558-2227 AGRICULTURE DEPARTMENT OF REGULATORY PROTECTION DIVISION 313 GUS R DOUGLAS LN, BLDG 11 CHARLESTON WV 25312 US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	LCMSMS, Workstation, software, printer	1.00000	EA		\$251,824.08

Comm Code	Manufacturer	Specification	Model #
41100000	Thermo Electron NA LLC	TSQ Endura	TSQ-50003

Extended Description :

LCMSMS, Workstation, software, printer per specification 3.1.1 & 3.1.2

INVOICE TO		SHIP TO	
PROCUREMENT OFFICER 304-558-2221 AGRICULTURE DEPARTMENT OF ADMINISTRATIVE SERVICES 1900 KANAWHA BLVD E CHARLESTON WV25305-0173 US		AUTHORIZED RECEIVER 304-558-2227 AGRICULTURE DEPARTMENT OF REGULATORY PROTECTION DIVISION 313 GUS R DOUGLAS LN, BLDG 11 CHARLESTON WV 25312 US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Shipping Charges and inside delivery	1.00000	EA		\$900.00

Comm Code	Manufacturer	Specification	Model #
78121603			

Extended Description :

Shipping Charges and inside deliver per section 3.1.3

INVOICE TO		SHIP TO	
PROCUREMENT OFFICER 304-558-2221 AGRICULTURE DEPARTMENT OF ADMINISTRATIVE SERVICES 1900 KANAWHA BLVD E CHARLESTON WV25305-0173 US		AUTHORIZED RECEIVER 304-558-2227 AGRICULTURE DEPARTMENT OF REGULATORY PROTECTION DIVISION 313 GUS R DOUGLAS LN, BLDG 11 CHARLESTON WV 25312 US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Installation/validation	1.00000	EA		

Comm Code	Manufacturer	Specification	Model #
73171605			

Extended Description :

Installation/validation per section 3.1.3

INVOICE TO		SHIP TO	
PROCUREMENT OFFICER 304-558-2221 AGRICULTURE DEPARTMENT OF ADMINISTRATIVE SERVICES 1900 KANAWHA BLVD E CHARLESTON WV25305-0173 US		AUTHORIZED RECEIVER 304-558-2227 AGRICULTURE DEPARTMENT OF REGULATORY PROTECTION DIVISION 313 GUS R DOUGLAS LN, BLDG 11 CHARLESTON WV 25312 US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Training/Warranty	1.00000	EA		

Comm Code	Manufacturer	Specification	Model #
73171605			

Extended Description :

Training/Warranty per section 3.1.3

INVOICE TO		SHIP TO	
PROCUREMENT OFFICER 304-558-2221 AGRICULTURE DEPARTMENT OF ADMINISTRATIVE SERVICES 1900 KANAWHA BLVD E CHARLESTON WV25305-0173 US		AUTHORIZED RECEIVER 304-558-2227 AGRICULTURE DEPARTMENT OF REGULATORY PROTECTION DIVISION 313 GUS R DOUGLAS LN, BLDG 11 CHARLESTON WV 25312 US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Service	1.00000	EA		

Comm Code	Manufacturer	Specification	Model #
73171605			

Extended Description :

Service per section 3.1.3

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Question Deadline 3:00 p.m.	2016-11-04

AGR1700000005	Document Phase Final	Document Description Triple Quad LC/MS/MS	Page 4 of 4
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ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

Sales Quotation

Quote Number	Quotation Date	Expiration Date	Page
CPQ-00040683	November 14, 2016	December 30, 2016	1
Lead Time	Payment Terms	Freight Terms	PO Submission
4-6 weeks	NET 30 DAYS UPON INVOICE DATE	Origin - Prepay And Add	See the end page
Company Name		Customer Name	
WV Dept of Agriculture		Linda Harper	

Thermo Electron North America LLC
5225 Verona Road
Madison WI 53711

1400 Northpoint Parkway
West Palm Beach FL 33407

Customer Information:

Customer Name: Linda Harper
Company Name: WV Dept of Agriculture
Address: 2019 Washington Street East
PO Box 50130
Charleston West Virginia 25305
United States
Phone: (304) 558-0468
Email: linda.b.harper@wv.gov

Sales Contact Information:

Contact Name: Sean Bennett
Phone: (585) 944-6356
Email: sean.bennett@thermofisher.com

Harper CRFQ AGR 17000000005r1

Item	Description	Unit Price	Qty	Total Price
1.1	TSQ-50003 TSQ ENDURA TSQ ENDURA	\$303,092.50	1	\$303,092.50

TSQ Endura Triple Stage Quadrupole MS/MS System contains the following:

An EASY-Max NG ion source API inlet source housing with x, y, probe positioning, a fixed on axis view port, all gas and voltage connections are hard connected automatically producing worry free performance and ultimate reliability.

EASY-Max NG ion source includes one HESI spray insert

EASY-Max NG ion source with APCI includes both HESI and APCI spray inserts.

An Integrated vacuum manifold with and RF lens, ion optics comprised of one RF only octopole and one square quadrupole incorporating a neutral blocking post to eliminate noise, providing effective ion transmission to the mass analyzer.

Two 4mm field radius quadrupole mass analyzers with a hyperbolic surface and a 10% RF imbalance provide excellent peak shape and transmission. A ninety degree square quadrupole collision cell with an axial DC field for acceleration of fragment ions enables high speed data acquisition rates. A detection system consisting of; a 15 kV conversion dynode, off axis electron multiplier, that is capable of detecting both positive and

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Company Name		Customer Name	
WV Dept of Agriculture		Linda Harper	

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5225 Verona Road
Madison WI 53711

1400 Northpoint Parkway
West Palm Beach FL 33407

Item	Description	Unit Price	Qty	Total Price
	negative ions. Vacuum system includes single three-port turbo molecular pump, and one rotary vacuum pump. System also features; an independent dual barrel syringe pump and injector/divert valve with mounting bracket, controlled via the data station for maximum flexibility, 10-3000 amu mass range, a minimum resolution of 0.4 FWHM, 15,000 amu/sec scan speed, SRM rates of 500SRM/sec, and an ion polarity switching time of 25msec. Computer System: OptiPlex 9010 Minitower Processor: 3rd Generation Intel Core i7-3770 Processor Memory: 8 GB, 3.4GHz w/ HD4000 Graphics Monitor: Dell S2740L (27") LED Monitor Video: Intel® Integrated Graphics w/o Adapters Hard Drive: 1TB SATA 6Gb/s with 32MB DataBurst Cache, 1TB DVD: 16X DVD +/- RW SATA, 16X DVD ROM SATA Keyboard: Dell USB Keyboard, English. Mouse: Dell USB Optical Mouse Operating System: Windows 7 Professional, 64-bit. Two licenses for Xcalibur Software (Computer Configuration subject to change) Installation & Application Performance Test; System will be installed and tested to assure components and system are functioning properly and installation specifications are met.			
1.7	5200.0330 ULTIMATE 3000 QUATERNARY RS SYSTEM W/DAD Dionex UltiMate 3000 Quaternary RSLC System with Diode Array Detector including semi-analytical flow cell, Mixer Kit for 35 µL mixing volume <(>,<)> 25 µL syringe and 25 µL sample loop for Well Plate Sampler, two Viper capillaries (0.13 x 450 mm and 0.18 x 950 mm, SST) and DCMSLink for Xcalibur Industry leading flow-pressure footprint with flow rates up to 8 mL/min and pressure up to 103.4 MPa (15 000 psi), ultrafast cooled autosampler <(>,<)> column temperature up to 110 °C, 100 Hz UV/VIS detector, real-time modification of Dionex instrument parameters from Xcalibur	\$64,768.61	1	\$64,768.61
1.2	OPTON-30099 KIT, TSQ PREINSTALLATION	\$500.00	1	\$500.00

Sales Quotation

Quote Number	Quotation Date	Expiration Date	Page
CPQ-00040683	November 14, 2016	December 30, 2016	3
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4-6 weeks	NET 30 DAYS UPON INVOICE DATE	Origin - Prepay And Add	See the end page
Company Name		Customer Name	
WV Dept of Agriculture		Linda Harper	

Thermo Electron North America LLC 5225 Verona Road Madison WI 53711 1400 Northpoint Parkway West Palm Beach FL 33407
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Item	Description	Unit Price	Qty	Total Price
1.3	702-027700 3-DAY LSMS TRNG COURSE AT CUSTOMER SITE	\$10,000.00	1	\$10,000.00
1.5	OPTON-30426 SW, EFS PESTICIDE STD & PREMIUM QUAN	\$2,550.00	1	\$2,550.00
1.6	OPTON-30159 KIT, SOURCE APCI INSTALLATION	\$4,100.00	1	\$4,100.00
1.8	OPTON-21731 PRINTER, HP LASERJET P3015DN, 110V, RoHS	\$2,031.41	1	\$2,031.41
1.4	LCCONSUMABLESTMO14 LC CONSUMABLES VOUCHER 	\$2,000.00	1	\$2,000.00

Item	Description	Unit Price	Qty	Total Price
3.0	6042.3020 Cap.Mxr 25µL,Viper,RS Pump f S/N 8030113	\$203.28	1	\$203.28
4.0	6042.5000 Mixer35UL,Ti/MP35N,RS Pmps fro SN8030113 Mixer for 35µL, Ti/MP35N, RS Pumps > S/N 8030113	\$392.58	1	\$392.58
13.0	6730.0006 POD,2PS-6PRT VALVE HT,SST,<103MPA,TCC-RS Pod for 2-Position 6-Port HT Valve, SST Variant, Pressure < 1034 bar (15000 psi)	\$1,712.58	2	\$3,425.16
14.0	6730.0001	\$771.12	1	\$771.12

Sales Quotation

Quote Number	Quotation Date	Expiration Date	Page
CPQ-00040683	November 14, 2016	December 30, 2016	4
Lead Time	Payment Terms	Freight Terms	PO Submission
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Company Name		Customer Name	
WV Dept of Agriculture		Linda Harper	

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VLV ACTUATION HT RIGHT SIDE<125 MPA,TCC
Valve Actuator Kit HT for Right Side of TCC-3000RS/SD
Pressure < 125 MPa (18130 psi)

15.0	6730.0002 VLV ACTUATION HT LEFT SIDE<125 MPA/18130 Valve Actuator Kit HT for Left Side of TCC-3000RS/SD Pressure < 125 MPa (18130 psi)	\$884.34	1	\$884.34
16.0	6722.0530 PRE-COLUMN HEATER 2UL,ID 0.13MM,TCC-3X00 Eluent Pre-Heater, 2µL, 0.13 mm (0.005) ID	\$334.44	1	\$334.44
17.0	6040.2225 VIPER CAP., IDXL 0,10X250,SST Viper UHPLC Fingertight Fitting incl. Capillary for 10-32 Fitting, ID 0.10 mm, Length 250 mm, SST	\$221.61	2	\$443.22
2.0	6040.2380 VIPER CAP., IDXL 0,18X850MM,SST Viper UHPLC Fingertight Fitting incl. Capillary for 10-32 Fitting ID 0.18 mm/0.007, Length 850 mm, SST	\$141.14	1	\$141.14
5.0	17326-102130 ACCUCORE AQ 100X2.1MM	\$815.06	2	\$1,630.12
6.0	25002-102130 100X2.1MM 1.9U HYPERSIL GOLD	\$861.94	1	\$861.94
7.0	60105-216 50mL Cenbtrifuge tube Dibasic 250Pk	\$1,048.00	1	\$1,048.00
8.0	701-890400 EX WAR PLAN BINARY PUMP	\$2,104.00	2	\$4,208.00
9.0	701-008301 Unity Ex War TCC3000SD Thermost Col Cmpt	\$414.00	2	\$828.00

Sales Quotation

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4-6 weeks	NET 30 DAYS UPON INVOICE DATE	Origin - Prepay And Add	See the end page
Company Name		Customer Name	
WV Dept of Agriculture		Linda Harper	

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10.0	701-005601 UTY EXT WAR WPS3000TRS,TBL,TSL,TBSL,TBRS	\$1,997.00	2	\$3,994.00
11.0	701-003901 EXT WARRNTY DAD-3000 DIODE ARRAY DETECTR	\$1,706.00	2	\$3,412.00
12.0	701-054687 2PM Service Quantiva and Endura Systems	\$20,706.00	2	\$41,412.00

Quote Subtotal:	\$453,031.86
Promotions / Discounts:	- \$199,867.05
Quote total less discounts:	\$253,164.81
Shipping:	\$900.00
Quotation Totals:	\$254,064.81

Sales tax exemption/resale certificates or direct pay permits must be provided with the order documents, if applicable. If valid sales tax exemption documentation is not provided, buyer shall pay all applicable federal, state & local taxes in addition to the price stated on this quotation.

TERMS AND CONDITIONS OF SALE FOR PRODUCTS AND SERVICES

1. **GENERAL.** Thermo Electron North America LLC ("**Seller**") hereby offers for sale to the buyer named on the face hereof ("**Buyer**") the products ("**Products**") and/or annual support plans ("**Support Plan(s)**") and billable services ("**Technical Support**") [Support Plans and Technical Support may be referred to collectively as "**Services**"] as listed on the face hereof on the express condition that Buyer agrees to accept and be bound by the terms and conditions set forth herein ("**Agreement**"). Any new or different provisions contained in any document issued by Buyer in response to this offer are expressly rejected; and if Buyer's response is deemed to be an offer, this document is a rejection of Buyer's offer and a counter offer by Seller and shall not constitute acceptance of any proposal by Buyer. Buyer's receipt of Products or Seller's commencement of Services hereunder will constitute Buyer's acceptance of this Agreement. This is the final, complete and exclusive statement of the contract between Seller and Buyer with respect to Buyer's purchase of Products and Services specified herein, which terms may not be altered in any way by Buyer's purchase order terms. No waiver, consent, modification, amendment or change of the terms contained herein shall be binding upon Seller unless agreed in writing and signed by Seller. Seller's failure to object to additional or different terms contained in any subsequent communication from Buyer will not be a waiver or modification of the terms set forth herein and all such proposals contained in Buyer's order are subject to acceptance in writing by an authorized representative of Seller.
2. **PRICE.** All prices published by Seller or Seller's representatives may be changed at any time without notice. All prices quoted by Seller or Seller's representatives are valid for thirty (30) days, unless otherwise stated in writing. All prices for the Products or Services will be as specified by Seller or, if no price has been specified or quoted, will be Seller's standard prices in effect at the time of shipment of Products or delivery of Services. All prices are subject to adjustment on account of specifications, quantities, raw materials, cost of production, shipment arrangements or other terms or conditions that are not part of Seller's original quotation. Unless otherwise stated in the quotation, the quoted rate for Technical Support includes Work Time, Travel Time and Standby Time in accordance with the following schedule and conditions; except that Technical Support requested without at least seven (7) days advanced notification shall be subject to airfare charges in addition to the Standard Rate.
- (a) **Work Time** – shall include all hours that Seller's service personnel are on the Buyer's job site, either working or ready for work and shall be payable at the applicable specified rates.
- (b) **Travel Time** – shall include the time spent by Seller's service personnel in traveling between their customary headquarters and the Buyer's job site and in returning (including travel occurring on Saturdays, Sundays and holidays). Except as otherwise stated in the Services quotation, Travel Time will be invoiced per diem at the applicable Travel Zone rates in Seller's standard service list prices. Air travel and car hire related expenses will be charged in addition to the daily rate at cost plus a 10% administration fee.
- (c) **Standby Time** – shall include the time that Seller agrees in writing, at its sole discretion, to reserve its service personnel to be ready to perform work for the Buyer, whether on the job site or not, up to a maximum of 8 hours a day, between the hours of 8:00 a.m. and 5:00 p.m., local standard time on Saturdays, Sundays and holidays. Standby Time shall be paid for at the special rates quoted by Seller at the time of Buyer's request or, if none, at the current Double Time Rate; and Standby Time preceded and/or followed by Work Time is cumulative in determining Overtime.
- (d) **Standard Rate** – the Service rate quoted by Seller that shall be paid for time worked on a regular schedule of eight (8) hours per day, Monday through Friday (excluding Seller's holidays), between 8:00 a.m. and 5:00 p.m. local standard time.
- (e) **Overtime Rate** – if applicable for the quoted Services, the rate of one and a half times the Standard Rate shall be paid for any time worked in excess of eight (8) hours or between the hours of 5:00 p.m. and 8:00 a.m. local standard time; but not exceeding sixteen (16) hours per day, Monday through Friday, and for any time on Saturdays, not to exceed sixteen (16) hours. Overtime shall be billed in 30 minute blocks; or longer time blocks, if quoted by the Supplier.
- (f) **Double Time Rate** – the rate of twice the Standard Rate shall be paid for time worked in excess of sixteen (16) hours per day, without a six (6) hour break, Monday through Friday, and for all time on Saturdays, Sundays and holidays. Holidays shall be those observed by Seller.
3. **TAXES AND OTHER CHARGES.** Prices for the Products and Services exclude all sales, use, value added and other taxes and duties imposed with respect to the sale, delivery, or use of any Products or Services covered hereby, all of which taxes and duties must be paid by Buyer. If Buyer claims any exemption, Buyer must provide a valid, signed certificate or letter of exemption for each respective jurisdiction.
4. **TERMS OF PAYMENT.** Seller may invoice Buyer immediately for the single lump sum amount equal to the total charges for the initial Term of a Support Plan, upon shipment of Products or upon completion of Technical Support for the price and all other charges payable by Buyer in accordance with the terms on the face hereof. If no payment terms are stated on the face hereof, payment shall be net thirty (30) days from the date of invoice. International Technical Support may require payment in advance. Buyer will grant a security interest in the Products sold under this Agreement until payment of the full purchase price to Seller in accordance with Article 9-103 of Uniform Commercial Code-Secured Transactions. If Buyer fails to pay any amounts when due, Buyer shall pay Seller interest thereon at the greater of a periodic rate of one and one-half percent (1.5%) per month or the highest rate stipulated by applicable law, together with all costs and expenses (including without limitation reasonable attorneys' fees and disbursements and court costs) incurred by Seller in collecting such overdue amounts or otherwise enforcing Seller's rights hereunder. Seller reserves the right to require from Buyer full or partial payment in advance, or other security that is satisfactory to Seller, at any time that Seller believes in good faith that Buyer's financial condition does not justify the terms of payment specified. All payments shall be made in U.S. Dollars unless otherwise specified in Seller's invoice.
- 5.A. **PRODUCT DELIVERY.** All Products will be shipped to the destination specified by Buyer, FCA (INCOTERMS 2010) at OEM shipping point or Seller's distribution facility, as applicable, which will vary depending on Product type and availability and may include points outside the United States (U.S.) (inquire for specific shipping point information). Notwithstanding specified INCOTERMS, Seller shall select carrier on Buyer's behalf and Seller agrees to arrange transportation of Products to Buyer's destination, and to act as the importer of record on behalf of Buyer to clear the Products through U.S. customs. All freight, taxes, duties and insurance, if any, charges shall be prepaid and added to Buyer's invoice. Seller may, at its election, make partial shipments of the Products and invoice each shipment separately. Seller reserves the right to withhold shipments in whole or in part and/or terminate any Services, if Buyer fails to make any payment to Seller when due or otherwise fails to perform its obligations hereunder. Seller's termination of Services will not relieve Buyer's obligation to pay all amounts due for Services provided by Seller prior to the termination date. All shipping dates are approximate only, and Seller will not be liable for any loss or damage resulting from any delay in delivery or failure to deliver which is due to any cause beyond Seller's reasonable control. In the event of a delay due to any cause beyond Seller's reasonable control, Seller reserves the right to terminate the order or to reschedule the shipment within a reasonable period of time, and Buyer will not be entitled to refuse delivery or otherwise be relieved of any obligations as

TERMS AND CONDITIONS OF SALE FOR PRODUCTS AND SERVICES

the result of such delay.

5. B. CANCELLATION OR CHANGES BY BUYER If Buyer requests that Seller delay delivery of Products for any reason, Seller may place Products in storage at Buyer's risk and expense and for Buyer's account. Orders in process may be cancelled only with Seller's written consent and upon payment of Seller's cancellation charges. Orders in process may not be changed except with Seller's written consent and upon agreement by the parties as to an appropriate adjustment in the purchase price therefor. Credit will not be allowed for Products returned without the prior written consent of Seller. Before returning any item, contact Seller's Order Administration Department for a Return Material Authorization (RMA) number at (800) 532-4752. Buyer may need to complete an RMA Form which includes a Hazard Free Form and/or Instrument Contamination Data Form. If authorized by Seller, Buyer must return items to Seller in their original or equivalent packaging, prepay shipping charges, and insure the shipment or accept the risk if the item is lost or damaged in shipment. In addition, Seller reserves the right to charge the Buyer the list price for missing components or subassemblies when incomplete items are returned to Seller. Authorized returns of any unused items which are free from material defects to Seller, in its sole discretion, may be subject to a twenty percent (20%) restocking charge.

Requests by Buyer to delay, postpone or suspend on-site Services, due to no fault of Seller, shall be subject to Seller's ability to recall its service representatives and to cancel and/or reschedule of any of their travel arrangements; and provided that, Buyer pays any and all additional costs (including, Travel Time and expenses) incurred by Seller as a result of the Services being postponed or suspended by Buyer. Cancellation of scheduled Services may be subject to a cancellation fee of twenty percent (20%) if Seller is notified less than 7 business days prior to the scheduled date of service.

6. DELIVERY OF SERVICES. Except as otherwise stated on the face hereof, all Services will be provided by Seller or its agent between the hours of 8:00 a.m. and 5:00 p.m. local standard time, Monday through Friday, excluding Seller's holidays, either at Seller's principal offices or, at Seller's option, at Buyer's installation address. If Seller advises Buyer that Services should be performed at Seller's facility, Buyer will properly package the Products to prevent damage, clearly mark the RMA number on the outer packaging, and ship it, via postage/freight prepaid, to the address set forth on the face hereof or such different address as Seller may from time to time provide to Buyer. After Seller completes the Services, or has made a determination that the products are beyond repair, Seller may, at its option, either advise Buyer to scrap the Products or to have the Products shipped, postage/freight prepaid, back to Buyer's installation address stated on the quotation, or to such other address as Buyer requests. In the event Buyer requires expedited delivery, such delivery will be made at Buyer's expense. If Seller advises Buyer that Services should be performed at Buyer's site, Buyer will use its best efforts to provide Seller with all requested diagnostic information for any products requiring Services; and subject to compliance with Buyer's reasonable security requirements, will allow Seller free access to all relevant equipment, documentation and records. In addition, Buyer will cooperate with Seller's efforts to perform the Services and will provide such additional assistance as Seller may reasonably request. At the completion of the Services, Seller's representatives will provide Buyer with a field service report on which will be indicated the number of hours spent and the materials used in completing the work. Buyer's signature on the field service report will signify approval of the information in the report and Seller's satisfactory completion of the Services. If Buyer does not sign the report or provide written objection within five (5) business days after receipt, then the report will be deemed unequivocally approved and accepted by Buyer.

7. TITLE AND RISK OF LOSS. Notwithstanding the transport terms indicated above, title to and risk of loss of the Products will pass to

Buyer upon delivery of possession of the Products by Seller to the carrier at the time and place of shipment; provided, however, that title to any software incorporated within or forming a part of the Products will at all times remain with Seller or the licensor(s) thereof, as the case may be.

All risk of loss or damage to Buyer's products being transported for Services shall remain with Buyer during shipment to and from the Buyer's site and during Seller's performance of Services hereunder.

8. WARRANTIES. Seller's sole obligation with respect to the Services is to provide the quoted Services in a workmanlike manner and if Buyer provides notice of defect in Service within ninety (90) days of completion of such Services, Seller will, at its sole option, either reperform the Services without charge to Buyer or grant Buyer a credit for the amount paid by Buyer with respect to such Service. Seller warrants that the Products will operate or perform substantially in conformance with Seller's published specifications and be free from defects in material and workmanship, when subjected to normal, proper and intended usage by properly trained personnel, for the period of time set forth in the Product documentation, published specifications or package inserts (the "**Warranty Period**"). If a Warranty Period is not specified in Seller's Product documentation, published specifications, or package inserts, the Warranty Period for new instruments is twelve (12) months from the date of shipment to Buyer; and for all other Products is ninety (90) days from the date of shipment. During the Warranty Period, Seller agrees to repair or replace, at Seller's option, defective Products so as to cause the same to operate in substantial conformance with Seller's published specifications; provided that Buyer (a) promptly notifies Seller in writing upon the discovery of any covered defect in the Products, including the Product model and serial number (if applicable) and details of the warranty claim; and (b) after Seller's review, Seller will provide Buyer with an RMA number and services data, which may include biohazard decontamination procedures and other Product-specific handling instructions. Then, if applicable, Buyer may return the defective Products to Seller with all costs prepaid by Buyer. Replacement parts may be new or refurbished, at the election of Seller. All replaced parts shall become the property of Seller. Shipment to Buyer of repaired or replacement Products will be made in accordance with the Delivery clause of this Agreement. Except for new consumable items manufactured and sold by Seller, this warranty expressly excludes all other consumable parts or components (e.g., bulbs, belts, cartridges, etc.) in the Products. If Seller elects to repair defective medical device instruments, Seller may, in its sole discretion, provide a replacement loaner instrument to Buyer as necessary for use while the instruments are being repaired.

Notwithstanding the foregoing, Products supplied by Seller that are obtained by Seller from an original manufacturer or third party supplier are not warranted by Seller; but Seller agrees to assign to Buyer any warranty rights in such Product that Seller may have from the original manufacturer or third party supplier, to the extent such assignment is allowed by such original manufacturer or third party supplier. In no event shall Seller have any obligation to make repairs, replacements or corrections under the Warranty, in whole or in part, as the result of or with respect to: (a) use of the Products in a manner for which they were not designed; (b) improper storage and handling of the Products; (c) use of the Products in combination with equipment or software not supplied by Seller (d) shipping damage incurred en route to Buyer's site or because of moving equipment, in which case Seller will promptly provide a cost estimate for Technical Support to the consignee for filing claims to carriers for shipping damage; (e) flood, lightning, earthquake, tornado, hurricane or fire, bombing, armed conflict, malicious mischief, sabotage or other natural or man-made disasters; (f) normal wear and tear, physical abuse, misuse, sprinkler damage, electrical surge or abnormal power variation; (g) repairs, maintenance, or modifications made by anyone other than Seller trained personnel or without Seller's supervision and/or approval; (h) relocation and

TERMS AND CONDITIONS OF SALE FOR PRODUCTS AND SERVICES

reinstallation of equipment; although upon request Seller will supervise the removing, crating, relocation and reinstallation of the Products at Seller's current Services rates; (i) maintenance or replacement of media (i.e., floppy disks, plotter supplies, etc.) whatever the reason for loss, failure or damage; (j) beta-site support; (k) operator training; or (l) repairing Product malfunctions if the fault is not with the equipment. If Seller determines that Products for which Buyer requested warranty services are not covered by this warranty, Buyer will pay or reimburse Seller for all costs of investigating and responding to such request at Seller's then prevailing time and materials rates. If Seller provides Services or replacement parts that are not covered by this warranty, Buyer shall pay Seller therefor at Seller's then prevailing time and materials rates.

ANY INSTALLATION, MAINTENANCE, REPAIR, SERVICE, RELOCATION OR ALTERATION TO OR OF, OR OTHER TAMPERING WITH, THE PRODUCTS PERFORMED BY ANY PERSON OR ENTITY OTHER THAN SELLER WITHOUT SELLER'S PRIOR WRITTEN APPROVAL, OR ANY USE OF REPLACEMENT PARTS NOT SUPPLIED BY SELLER, SHALL IMMEDIATELY VOID AND CANCEL ALL WARRANTIES WITH RESPECT TO THE AFFECTED PRODUCTS AND/OR SERVICES. THE OBLIGATIONS CREATED BY THIS WARRANTY STATEMENT FOR SELLER TO REPAIR OR REPLACE A DEFECTIVE PRODUCT OR TO REPERFORM OR CREDIT THE PRICE OF DEFECTIVE SERVICES SHALL BE THE SOLE REMEDY OF BUYER FOR SUCH DEFECTIVE PRODUCTS OR SERVICES UNDER THIS AGREEMENT. EXCEPT AS EXPRESSLY PROVIDED IN THIS WARRANTY STATEMENT, SELLER DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, ORAL OR WRITTEN, WITH RESPECT TO THE PRODUCTS, INCLUDING WITHOUT LIMITATION ALL IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR NONINFRINGEMENT. SELLER DOES NOT WARRANT THAT THE PRODUCTS OR SERVICES ARE ERROR-FREE OR WILL ACCOMPLISH ANY PARTICULAR RESULT.

9. INDEMNIFICATION.

9.1 By Seller. Seller will indemnify, defend and save Buyer, its officers, directors, and employees from and against any and all damages, liabilities, actions, causes of action, suits, claims, demands, losses, costs and expenses (including without limitation reasonable attorneys' fees) ("**Indemnified Items**") asserted by another party against Buyer for (i) bodily injury to or death of persons or damage to tangible property to the extent caused by the negligence or willful misconduct of Seller, its employees, agents or representatives or contractors in connection with the performance of Services at Buyer's premises under this Agreement; and (ii) claims that a Product infringes any U.S. patent, copyright or trade secret; provided, however, Seller's liability under this Section does not extend to any such Indemnified Items caused by either (u) the negligence or willful misconduct of Buyer, its employees, agents or representatives or contractors, (v) by any third party, (w) use of a Product in combination with equipment or software not supplied by Seller where the Product alone would not be infringing, (x) Seller's compliance with Buyer's designs, specifications or instructions, (y) use of the Product in an application or environment for which it was not designed, or (z) modifications of the Product by anyone other than Seller without Seller's prior written approval. Buyer will promptly notify Seller in writing of any claim covered by Seller's indemnification obligations hereunder. Seller may assume exclusive control of the defense of such claim or, at the option of the Seller, to settle the same. Buyer agrees to cooperate reasonably with Seller in connection with the performance by Seller of its obligations in this Section.

Notwithstanding the above, Seller's infringement related indemnification obligations shall be extinguished and relieved if Seller, at its discretion and at its own expense (a) procures for Buyer the right, at no additional

expense to Buyer, to continue using the Product; (b) replaces or modifies the Product so that it becomes non-infringing, provided the modification or replacement does not adversely affect the specifications of the Product; or (c) in the event (a) and (b) are not practical, refund to Buyer the amortized amounts paid by Buyer with respect thereto, based on a five (5) year amortization schedule. **THE FOREGOING INDEMNIFICATION PROVISION STATES SELLER'S ENTIRE LIABILITY TO BUYER FOR, AND BUYER'S SOLE AND EXCLUSIVE REMEDY IN RESPECT OF, THE CLAIMS DESCRIBED HEREIN.**

9.2 By Buyer. Buyer will indemnify, defend with competent and experienced counsel and hold harmless Seller, its parent, subsidiaries, affiliates and divisions, and their respective officers, directors, shareholders and employees, from and against any and all damages, liabilities, actions, causes of action, suits, claims, demands, losses, costs and expenses (including without limitation reasonable attorneys' fees and disbursements and court costs) to the extent arising from or in connection with (i) the negligence or willful misconduct of Buyer, its agents, employees, representatives or contractors; (ii) use of a Product in combination with equipment or software not supplied by Seller where the Product alone would not be infringing; (iii) Seller's compliance with designs, specifications or instructions supplied to Seller by Buyer; (iv) use of a Product in an application or environment for which it was not designed; or (v) modifications of a Product by anyone other than Seller without Seller's prior written approval.

10. SOFTWARE. With respect to any software products incorporated in or forming a part of the Products hereunder (i.e., firmware), Seller and Buyer intend and agree that such software products are being licensed and not sold, and that the words "purchase", "sell" or similar or derivative words are understood and agreed to mean "license", and that the word "Buyer" or similar or derivative words are understood and agreed to mean "licensee". Notwithstanding anything to the contrary contained herein, Seller or its licensor, as the case may be, retains all rights and interest in software products provided hereunder. Seller hereby grants to Buyer a royalty-free, non-exclusive, nontransferable license, without power to sublicense, to use software licensed hereunder solely for Buyer's own internal business purposes on its hardware Products and to use the related documentation solely for Buyer's own internal business purposes. This license terminates when Buyer's lawful possession of the hardware Products provided hereunder ceases, unless earlier terminated as provided herein. Buyer agrees to hold in confidence and not to sell, transfer, license, loan or otherwise make available in any form to third parties the software products and related documentation provided hereunder. Buyer may not disassemble, decompile or reverse engineer, copy, modify, enhance or otherwise change or supplement the software products provided hereunder without Seller's prior written consent. Seller will be entitled to terminate this license if Buyer fails to comply with any term or condition herein. Buyer agrees, upon termination of this license, to immediately stop using all software products and related documentation provided hereunder and all copies and portions thereof.

Certain of the software products provided by Seller may be owned by one or more third parties and licensed to Seller or may be stand-alone software products, which Buyer hereby agrees are subject to a separate browse-wrap, shrink-wrap or click-thru end user license agreement (EULA). Accordingly, the warranty and indemnification provisions herein do not apply to such software, which are exclusively provided in the applicable EULA.

11. LIMITATION OF LIABILITY. NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED HEREIN, THE LIABILITY OF SELLER UNDER THESE TERMS AND CONDITIONS (WHETHER BY REASON OF BREACH OF CONTRACT, TORT, INDEMNIFICATION, OR OTHERWISE, BUT EXCLUDING LIABILITY OF SELLER FOR BREACH OF

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WARRANTY (THE SOLE REMEDY FOR WHICH IS PROVIDED UNDER THE PRODUCT AND SERVICES WARRANTIES HEREIN) SHALL NOT EXCEED AN AMOUNT EQUAL TO THE LESSER OF (A) THE TOTAL PURCHASE PRICE THERETOFORE PAID BY BUYER TO SELLER WITH RESPECT TO THE PRODUCT(S) OR SERVICES GIVING RISE TO SUCH LIABILITY OR (B) ONE MILLION DOLLARS (\$1,000,000). NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED HEREIN, IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES (INCLUDING WITHOUT LIMITATION DAMAGES FOR LOSS OF USE OF FACILITIES OR EQUIPMENT, LOSS OF REVENUE, LOSS OF DATA, LOSS OF PROFITS OR LOSS OF GOODWILL), REGARDLESS OF WHETHER SELLER (a) HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES OR (b) IS NEGLIGENT.

12. **EXPORT RESTRICTIONS.** Buyer acknowledges that each Product and any related services, software and technology, including technical information supplied by Seller or contained in documents (collectively "Items"), may be subject to export controls of the U.S. government and/or other governments. Such export controls may include, but are not limited to, the Export Administration Regulations of the U.S. Department of Commerce (the "EAR"), which may restrict or require licenses for the export of Items from the U.S. and their re-export from other countries and all other applicable laws, regulations, laws, treaties, and agreements relating to the export, re-export, and import of any Item. Buyer shall not export, re-export, distribute or supply any Item, directly or indirectly, to (i) any country, person or entity, in each case, without first obtaining from the U.S. government and/or other appropriate government agency any license required to do so lawfully; (ii) any person or organization in Cuba, Iran, North Korea, Sudan, Syria, or other country then the subject of a U.S. embargo, or any person or entity considered a part of the government of any such country; or (iii) any person or entity who is involved in improper development or use of nuclear weapons, or of chemical/biological weapons (CBW) or missiles, or in terrorist activities. Buyer shall cooperate fully with Seller in any official or unofficial audit or inspection related to applicable export or import control laws or regulations, and shall indemnify and hold Seller harmless from, or in connection with, any violation of this Section by Buyer or its employees, consultants, agents and/or representatives.

13. **SUPPORT PLAN TERMS AND CONDITIONS.**

A. **General.** In the event Buyer purchases a Support Plan from Seller under this Agreement, Seller agrees to maintain and/or repair those Products or instruments identified on the face hereof as covered under a Support Plan ("**Covered Equipment**") in a manner consistent with the specifications and entitlements included in the purchased Support Plan as specified by Seller on the face hereof, which may include various levels of service at the Buyer's site(s) and/or Seller's Depot Repair locations and are purchased separate from the original Product Warranty above (the "**Support Service(s)**"). The Support Services will only be valid for Covered Equipment within the Region covered by the Plan (e.g. 48 contiguous U.S.), Monday through Friday (excluding Seller's holidays) during the hours of 8:00 a.m. to 5:00 p.m. local standard time ("**Normal Hours**") during the term of the Agreement. The Covered Equipment must be operated according to the manufacturer's supplied instructions, including without limitation the Operator's Manual(s) and any malfunction must be promptly reported to Seller. Support Service calls requested outside of Normal Hours or for any non-Covered Equipment or for services not included in the Support Plan will be billed at Seller's standard rates for Technical Support in effect at the time of Buyer's request. Seller reserves the exclusive right to determine the assignment of its employees in the performance of Support Services.

B. **Term.** (a) The Support Plan will begin and remain effective for the period of time stated on the face hereof ("**Term**"). To renew the Support

Plan, Buyer must sign a Renewal Service Agreement accompanied by a purchase order prior to the expiration of the current Term ("**Renewal**"), which shall also be subject to the terms and conditions of this Agreement. Either party may terminate a Support Plan for any/no reason by providing at least thirty (30) days written notice to the other party. Seller will use commercially reasonable efforts to stop work and to incur no additional expenses. Regardless, if a Support Plan is cancelled, Seller will charge Buyer for the total price of Services actually performed and expenses actually and reasonably incurred in servicing the covered equipment under the underlying Support Plan from its effective date until the cancellation date or the prorated price of the underlying Support Plan from its effective date until the cancellation date, whichever is greater, plus fifteen percent (15%) of the total fee paid for the underlying Support Plan. In the event Buyer prepaid the Support Plan fees in full and a credit balance exists for the underlying Support Plan, Seller will provide a credit or refund the amount remaining to Buyer.

C. **Pricing and Pricing Assumptions.** Except as otherwise agreed in writing, the annual charge for each Renewal will be Thermo Fisher's standard support plan rates in effect at the start of the Renewal. All Support Plan pricing is based on the assumption that the Covered Equipment operates in accordance with product specifications as of the coverage start date; therefore, prior to the start of each Term and Renewal, Seller reserves the right to verify and correct the condition of the Covered Equipment and invoice Buyer at Seller's current billable rates for any Support Services deemed reasonably necessary to bring the Covered Equipment into good operating condition. Notwithstanding the above, Seller agrees to waive its right to bill the Buyer for bringing the Covered Equipment into good operating condition if there is no lapse between the end date of the current Support Plan Term and the beginning of any Renewal.

D. **Parts and Consumables:** The Support Plan level defines when and if the cost of parts is included under the Support Plan. Notwithstanding the foregoing, the cost for parts that are consumed in the normal and usual operation of the Covered Equipment including, but not limited to, sample preparation and analysis, consumables, paper, ink cartridges, ribbons, pens, lamps and/or data media are not covered under any Support Plan.

E. **Key Operator:** Buyer will designate a key operator of Covered Equipment who can describe instrument malfunctions to Seller's service representatives by telephone and who is qualified to perform simple adjustments and corrections to the Covered Equipment as requested by Seller's service representatives. Buyer's failure to designate a key operator or to perform or to have an authorized representative perform the routine maintenance specified in the Covered Equipment's instructions or Owner's Manual may result, at Seller's option, in Buyer being invoiced at Seller's standard Technical Support rates to provide such non-covered services.

F. **Equipment Modification:** Seller reserves the right to make any changes in the design or construction of Seller's Products without incurring any obligation to make any updates or changes whatsoever in the Covered Equipment under the Support Plan. Buyer agrees to allow Seller, at its expense and option, to make retrofits or design changes which improve product reliability, but do not change its performance characteristics. Any Buyer requests to modify or add devices or accessories to Covered Equipment that are not manufactured by Seller are outside the scope of the Support Plans and covered Support Services.

G. **Support Services Warranty:** Seller's sole obligation under any Support Plan is to provide the Support Services in a workmanlike manner in accordance with the entitlements of the Support Plan purchased by Buyer hereunder. SELLER MAKES NO OTHER WARRANTIES FOR SUPPORT SERVICES PROVIDED UNDER A SUPPORT PLAN, EXPRESS OR IMPLIED, AND DISCLAIMS ALL WARRANTIES INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY OTHER OBLIGATIONS OR LIABILITIES

TERMS AND CONDITIONS OF SALE FOR PRODUCTS AND SERVICES

WHETHER IN CONTRACT, WARRANTY, NEGLIGENCE OR OTHERWISE.

I. Support Plan Exclusions: The following occurrences are not covered by any Support Plan purchased by Buyer from Seller under this Agreement:

- (a) Covered Equipment malfunctions caused by any of the following abnormal conditions; and if Seller performs Support Services as a result thereof, Seller will invoice Buyer at Seller's standard billable rates for service, travel or move, labor and parts: (i) Shipping damage incurred en route to Buyer's site or any subsequent transport thereafter; (ii) Force Majeure events, including for example, floods, lightning, earthquake, tornado, hurricane or fire, bombing, terrorism, armed conflict, malicious mischief, sabotage or other such natural or manmade disasters; (iii) Physical abuse, misuse, sprinkler damage, electrical surge or abnormal power variation; (iv) Repairs, maintenance, or modifications made by anyone other than Seller's trained personnel or without Seller's supervision and/or approval; and (v) Relocation and reinstallation of Covered Equipment are not covered under the Support Plan; however, upon request Seller, will supervise the removing, crating, relocation and reinstallation of its products at Seller's standard billable rates for service, travel or move, labor and parts.
- (b) Maintenance or replacement of media (i.e., floppy disks, printer supplies, etc.) whatever the reason for loss, failure or damage;
- (c) Servicing of material or instruments manufactured by anyone other than Seller, including third-party material or instruments purchased for engineering specials;
- (d) Beta-site support;
- (e) Service calls made to train operators; and/or
- (f) Service calls made as a result of Buyer-identified areas of responsibility, i.e. malfunctions related to Buyer's site conditions, utilities and/or facilities (power, water, temperature, humidity, vibration, dust, etc.) or site computer/data network problems or integrity.

J. Buyer Responsibilities: Buyer will give Seller's personnel reasonable access to the Covered Equipment whenever Support Service is required. Buyer will cooperate with Seller's personnel so that Support Services can be performed efficiently and without interruption. Buyer will permit Seller to use of Buyer's equipment, including Covered Equipment, that Seller's personnel deem necessary to perform the Support Services. Buyer is solely responsible for the procurement, installation, maintenance and fees associated with all third party communication equipment and media as needed for the performance of Support Service under the Support Plan including, but not limited to, telephone and equipment for remote transmission of data.

14. INSURANCE. For the Term of a Support Plan and/or for the provision of on-site Services purchased hereunder, as applicable, Seller agrees to maintain and carry liability insurance in amounts set forth below with insurance companies rated B+ or better by "BEST" rating services. Insurance includes (a) commercial general liability insurance for a limit of US\$2,000,000 (two million) for each occurrence and US\$4,000,000 (four million) in the aggregate, (b) Statutory workers' compensation and employer's liability insurance for a limit of US\$1,000,000 (one million), (c) Automobile liability of US\$2,000,000 (two million) and (d) Umbrella coverage of US\$5,000,000 (five million). No policy will include a waiver of subrogation. Upon request from Buyer related to applicable Services, Seller will provide to Buyer a certificate of insurance using the standard ACORD form to evidence the insurance coverage required herein.

15. MEDICARE/MEDICAID REPORTING REQUIREMENTS. If Buyer is a recipient of Medicare/Medicaid funds, Buyer acknowledges that it has been informed of and agrees to fully and accurately account for, and report on its applicable cost report, the total value of any

discount, rebate or other compensation paid hereunder in a way that complies with all applicable federal, state and local laws and regulations which establish "Safe Harbor" for discounts. Buyer may make written request for additional information from Seller as needed to satisfy Buyer's reporting requirements. Buyer acknowledges that agreement to such reporting requirement was a condition precedent to Seller's agreement to provide Products and that Seller would not have entered into this Agreement had Buyer not agreed to comply with such obligations.

16. MISCELLANEOUS. (a) Buyer may not delegate any duties or assign any rights or claims hereunder without Seller's prior written consent, and any such attempted delegation or assignment shall be void. (b) The rights and obligations of the parties hereunder shall be governed by and construed in accordance with the laws of the Commonwealth of Massachusetts, U.S.A. without reference to its choice of law provisions. Each party hereby irrevocably consents to the exclusive jurisdiction of the state and federal courts located in the County of Suffolk, Massachusetts U.S.A. for any action arising out of or relating to this Agreement. Each party hereby waives any other venue to which it may be entitled by domicile or otherwise. (c) In the event of any legal proceeding between the Seller and Buyer relating to this Agreement, neither party may claim the right to a trial by jury, and both parties waive any right they may have under applicable law or otherwise to a right to a trial by jury. Any action arising under this Agreement must be brought within one (1) year from the date that the cause of action arose. (d) In the event that any one or more provisions contained herein shall be held by a court of competent jurisdiction to be invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein shall remain in full force and effect, unless the revision materially changes the bargain. (e) Seller's failure to enforce, or Seller's waiver of a breach of, any provision contained herein shall not constitute a waiver of any other breach or of such provision. (f) Unless otherwise expressly stated on the Product or in the documentation accompanying the Product, software and/or Services, they are not approved medical devices and are intended by Seller to be for "Research Use Only" as defined by the U.S. Food and Drug Administration regulations and is not to be used for any illegal or unapproved regulatory purposes, including without limitation, *in vitro* diagnostic uses, *ex vivo* or *in vivo* therapeutic uses, or any type of consumption by or application to humans or animals. (g) Seller agrees not to knowingly disclose any confidential information or data obtained by it during the performance of Services when such information or data is clearly identified in writing by Buyer as confidential. Buyer agrees that all pricing, discounts and technical information that Seller provides to Buyer are the confidential and proprietary information of Seller. The parties agree to keep such information confidential and not disclose each other's confidential information to any third party for one (1) year hereafter, and to use such information solely for Buyer's internal purposes and in connection with the Products supplied hereunder. Nothing herein shall restrict the use of information available to the general public. (h) Any notice or communication required or permitted hereunder must be in writing and shall be deemed received when personally delivered, upon delivery by any internationally recognized carrier such as Federal Express or similar overnight delivery service, or three (3) business days after being sent by certified mail, postage prepaid, to a party at the address specified herein or at such other address as either party may from time to time designate to the other. (i) Seller may, in its sole discretion, provide (I) applicable Product training to Buyer or its employees, or (II) samples of Products to Buyer for distribution to patients of Buyer. Buyer agrees to distribute any such samples to patients for patient use or, if not so distributed, to return them to Seller. Buyer may not use the samples to provide care to patients and must not bill any patients or third party payers when Buyer dispenses the samples.

Purchase Order - Submission Details

Quote Number	Quotation Date	Expiration Date	Page
CPQ-00040683	November 14, 2016	December 30, 2016	11
Lead Time	Payment Terms		PO Submission
4-6 weeks	NET 30 DAYS UPON INVOICE DATE		See below
Inco Terms 1	Inco Terms 2	Shipping Method	
Origin - Prepay And Add		Fed Ex Ground	

Thermo Electron North America LLC
5225 Verona Road
Madison WI 53711

1400 Northpoint Parkway
West Palm Beach FL 33407

To place your order and expedite shipment, please 1) sign and date the last page of this document; and 2) fax or e-mail it along with your Purchase Order to one of the addresses below.

Please note-all Purchase Orders must show the vendor name of Thermo Electron North America LLC

Thermo Electron North America LLC
5225 Verona Road
Madison WI 53711

or

Thermo Electron North America LLC
1400 Northpoint Parkway
West Palm Beach FL 33407

Complete System Orders:

Fax: 412-200-6542

e-mail: usmad.orderprocessing@thermofisher.com

Parts or Service Orders:

Fax: 877-680-2565

e-mail: USMAD.ServiceOE.PO@thermofisher.com

Notes:

- Items marked with an asterisk (*) on the face of the quotation are non-Thermo Electron North America LLC products.
- Prices, warranty, installation and service on the items quoted herein are available only in the United States and may not be otherwise assigned.
- Tax exemption certificates or direct pay permits must be provided with the order documents, if applicable. If tax exemption documentation is not provided, buyer shall pay federal, state and local taxes in addition to the price stated on this quotation.
- Buyer shall not export or re-export technical data or products supplied by Thermo Electron North America LLC in violation of applicable export regulation. Buyer who exports products purchased hereunder assumes all responsibility for obtaining required export documentation, authorization, and payment of all applicable fees.
- All prices are quoted in USD.

In the event of a conflict between any of the Thermo Electron North America LLC terms and conditions and those contained in the State of West Virginia Solicitation No. CRFQ 1400 AGR1700000005 terms and conditions, the

Purchase Order - Submission Details

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Origin - Prepay And Add		Fed Ex Ground	

Thermo Electron North America LLC
5225 Verona Road
Madison WI 53711

1400 Northpoint Parkway
West Palm Beach FL 33407

terms of Thermo Electron North America shall prevail. Thermo Electron North America LLC also agrees to be bound by the laws of the State of West Virginia. We would like to negotiate mutually acceptable terms.

As an Authorized representative of the Buyer, your signature below creates an agreement to buy the products and services listed herein and your acceptance of the Seller's Standard Terms and Conditions of Sale included herein as the sole and exclusive terms for your purchase.

BUYER

SELLER

By:

By:

Print Name:

Print Name:

Print Title:

Print Title:

Date:

Date:

_____ Initial here to indicate Buyer's agreement to automatically apply Seller's Standard Terms and Conditions of Sale for Products and Services to all future orders of Products and Services from Seller, whether or not the Agreement is referenced on Seller's quote or Buyer's Purchase Orders, for _____ (write # of years) from later date of the parties' signature, or until either party provides written notice that this Agreement is terminated.

November 14, 2016

Linda Harper
West Virginia Department of Administration
Purchasing Division
2019 Washington St. East
Charleston, WV 25305

RE: Request for Quotation AGR1700000005

Dear Ms. Harper,

Thermo Electron North America LLC (Thermo) is pleased to respond to **CRFQ AGR1700000005** with the enclosed proposal for a Triple Quad LC/MS/MS System. Thermo is bidding in accordance with **Quotation CPQ-00040683**, which is enclosed and hereby incorporated by reference. Please refer to our quotation for complete product listing, product descriptions, and individual pricing. If Thermo should be the successful bidder, please reference our quotation number on your purchase order.

The Thermo proposal includes the TSQ Endura Triple Quadrupole mass spectrometer (including the additional items requested in the bid specifications) along with the UltiMate 3000 Quaternary RSLC system with Diode Array Detector. The Thermo LC/MS/MS system meets and exceeds the specifications set forth in the solicitation.

The TSQ Endura Triple-stage Quadrupole mass spectrometer offers outstanding quantitative performance with unprecedented robustness and ease of use. The TSQ Endura offers:

- ▶ **Femtogram sensitivity**
- ▶ **Unprecedented usability**
- ▶ **Exceptional robustness**

The Thermo LC/MS/MS system comes standard with several additional benefits which separates Thermo from other vendors. Among these are several layers of training and ongoing post-sales support. Upon installation, the end user(s) will be furnished with initial training from the field service engineer on proper use and routine maintenance of the system. In addition to this training, the system includes a three day **on-site** training course. This course is taught by a certified instructor from the Thermo Training Institute located in West Palm Beach, FL. Thermo goes beyond what other vendors provide in regards to training. Thermo will also provide post-sale training by our field-based Marketing Specialists including support of the Pesticide Explorer bundle. This team will work with the end user(s) to train them on advanced LC/MS/MS method development for pesticides, drugs, poisons and any other analyte of interest

In addition to the standard benefits, Thermo's proposal includes 3 very aggressive year end promotions that are applicable to WV Dept of Ag's work flow and provide significant value

1. **3 year warranty** – The entire TSQ Endura/RSLC Quaternary DAD system is covered by a 3 year warranty including parts, labor and travel. The only costs to WV Dept of Ag for the first 3 years are consumables such as solvents, columns, vials, tubing, standards, etc. This represents a savings of over \$60k. Competitors offering a one year warranty would need to add over \$60k of services to match Thermo's offering
2. **Pesticide Explorer Bundle** – Included in the package is the Standard Pesticide Explorer Bundle with canned methods, software, sample prep and column for a complete turnkey pesticide solution. Thermo's Center of Excellence team will assist implementation for pesticides as well as screens for drugs and poisons. Having a turnkey solution with on site applications support is critical for seamless implementation of the complex methods described in the RFQ.

<https://www.thermofisher.com/us/en/home/industrial/food-beverage/food-analytical-testing/pesticide-residues-analysis/pesticide-explorer-collection-solution.html>

3. **Consumables Voucher** – A consumable voucher for worth **\$2k** is provided free of charge and can be applied towards any product in the Thermo Scientific catalog. An inside sales representative will assist the end user's purchase of a wide range of products needed in every lab including sample prep items, columns, vials, solvents and routine lab supplies

Thermo appreciates the opportunity to provide this response. This letter and the following list of enclosures complete the offer from Thermo Electron North America LLC.

- ▶ Completed form
- ▶ Bid Response Cover Letter
- ▶ Quotation CPQ-00040683
- ▶ Thermo W-9 TENA Form
- ▶ TSQ Endura Site Requirements
- ▶ TSQ Endura Product Specifications
- ▶ RSLC Quaternary Product Specs including pumps, autosampler and diode array detector

The Thermo Scientific TSQ Endura Triple Quad Mass Spectrometer exceeds the most stringent analytical requirements. With Active Ion Management technology, the TSQ Endura achieves best in class LODs and LOQs and provides unsurpassed ultra-low-level quantitation of complex and difficult-to-run samples. Close integration with application-specific software ensures maximum productivity. This extreme analytical performance doesn't come at the cost of complexity or durability; breakthrough software and hardware make operation far easier and more reliable than in previous-generation triple quadrupoles.

The RSLC Quaternary UHPLC system with DAD detector is a perfect match with outstanding performance and reliability. The RSLC system offers the widest pressure/flow rate footprint of any UHPLC with ultra low carry over and unmatched retention time reproducibility. The system is plumbed with Viper connections for finger tight UHPLC connections.

Finally, the value added with a complete 3 year warranty, Pesticide Explorer turnkey solution and consumables voucher goes well above and beyond the CRFQ requirements. This is a unique offering valid until the end of the year on services, capabilities and lab consumables that are directly applicable to WV Dept of Ag's applications, available only from Thermo.

Please consider the TSQ Endura/RSLC Quaternary DAD with year-end promotion proposal for the challenging needs of your analytical laboratory. If you have any questions regarding our bid response, please contact your local sales representative Sean Bennett at (585) 944 6356.

Sincerely,

Debbie Erickson

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 NON-MANDATORY PRE-BID meeting will be held at the following place and time:

☐ 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 person attending the pre-bid meeting may represent more than one Vendor.

An attendance sheet provided at the pre-bid meeting shall serve as the official document verifying attendance. The State will not accept any other form of proof or documentation to verify 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 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 in order 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: Friday, November 4, 2016, 3:00 p.m.

Submit Questions to: Linda Harper, Senior Buyer
2019 Washington Street, East
Charleston, WV 25305
Fax: (304) 558-4115 (Vendors should not use this fax number for bid submission)
Email: Linda.B.Harper@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: Triple Quad LC/MS/MS
BUYER: Linda B. Harper
SOLICITATION NO.: CRFQ AGR1700000005
BID OPENING DATE: November 17, 2016
BID OPENING TIME: 1:30 p.m.
FAX NUMBER:

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 an Expression of Interest or 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 plus N/A convenience copies of each to the Purchasing Division at the address shown above. Additionally, the Vendor should identify the bid type as either a technical or cost proposal on the face of each bid envelope submitted in response to a request for proposal as follows:

BID TYPE: (This only applies to CRFP)

- ☐ Technical
☐ Cost

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: November 17, 2016, 1:30 p.m.

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. ALTERNATES: 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.

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 only be granted upon written request and only in accordance with the West Virginia Code § 5A-3-37 and the West Virginia Code of State Rules. A Vendor Preference Certificate form has been attached hereto to allow Vendor to apply for the preference. Vendor's failure to submit the Vendor Preference Certificate form with its bid will result in denial of Vendor Preference. Vendor Preference does not apply to construction projects.

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 by the Purchasing Division staff immediately upon bid opening. The Purchasing Division will consider any file that cannot be immediately opened and/or 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 if those documents are required with the bid.

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.

GENERAL TERMS AND CONDITIONS:

1. CONTRACTUAL AGREEMENT: Issuance of a Award Document signed by the Purchasing Division Director, or his designee, and approved as to form by the Attorney General's office constitutes acceptance of this Contract made by and between the State of West Virginia and the Vendor. Vendor's signature on its bid 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: This Contract becomes effective on _____ and extends for a period of _____ year(s).

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 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. Renewal of this Contract is limited to _____ successive one (1) year periods or multiple renewal periods of less than one year, provided that the multiple renewal periods do not exceed _____ months in total. Automatic renewal of this Contract is prohibited. Notwithstanding the foregoing, Purchasing Division approval is not required on agency delegated or exempt purchases. Attorney General approval may be required for vendor terms and conditions.

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, the vendor agrees that maintenance, monitoring, or warranty services will be provided for one year thereafter with an additional _____ successive one year renewal periods or multiple renewal periods of less than one year provided that the multiple renewal periods do not exceed _____ months in total. Automatic renewal of this Contract is prohibited.

☒ **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:** See attached.

4. NOTICE TO PROCEED: Vendor shall begin performance of this Contract immediately upon receiving notice to proceed unless otherwise instructed by the Agency. Unless otherwise specified, the fully executed Award Document will be considered notice to proceed.

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 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 a 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 below must be provided to the Purchasing Division by the Vendor as specified below.

☐ **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 _____. The performance bond must be received by the Purchasing Division prior to Contract award. On construction contracts, the performance bond must be 100% of the Contract value.

☐ **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.

☐ **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.

☐ **INSURANCE:** The apparent successful Vendor shall furnish proof of the following insurance prior to Contract award and shall list the state as a certificate holder:

☐ **Commercial General Liability Insurance:** In the amount of _____ or more.

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

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The apparent successful Vendor shall also furnish proof of any additional insurance requirements contained in the specifications prior to Contract award regardless of whether or not that insurance requirement is listed above.

☐ **LICENSE(S) / CERTIFICATIONS / PERMITS:** In addition to anything required under the Section entitled Licensing, of the General Terms and Conditions, the apparent successful Vendor shall furnish proof of the following licenses, certifications, and/or permits prior to Contract award, in a form acceptable to the Purchasing Division.

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

8. WORKERS' COMPENSATION INSURANCE: The apparent successful 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.

9. LITIGATION BOND: The Director reserves the right to require any Vendor that files a protest of an award to submit a litigation bond in the amount equal to one percent of the lowest bid submitted or \$5,000, whichever is greater. The entire amount of the bond shall be forfeited if the hearing officer determines that the protest was filed for frivolous or improper purpose, including but not limited to, the purpose of harassing, causing unnecessary delay, or needless expense for the Agency. All litigation bonds shall be made payable to the Purchasing Division. In lieu of a bond, the protester may submit a cashier's check or certified check payable to the Purchasing Division. Cashier's or certified checks will be deposited with and held by the State Treasurer's office. If it is determined that the protest has not been filed for frivolous or improper purpose, the bond or deposit shall be returned in its entirety.

10. LIQUIDATED DAMAGES: Vendor shall pay liquidated damages in the amount of

for _____.

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.

11. 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.

12. 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.

13. PAYMENT: Payment in advance is prohibited under this Contract. Payment may only be made after the delivery and acceptance of goods or services. The Vendor shall submit invoices, in arrears.

14. PURCHASING CARD ACCEPTANCE: The State of West Virginia currently utilizes a Purchasing Card program, administered under contract by a banking institution, to process payment for goods and services. The Vendor must accept the State of West Virginia's Purchasing Card for payment of all orders under this Contract unless the box below is checked.

☐ Vendor is not required to accept the State of West Virginia's Purchasing Card as payment for all goods and services.

15. 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.

16. 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 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.

17. 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.

18. 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 § 148-1-6.1.e.

19. TIME: Time is of the essence with regard to all matters of time and performance in this Contract.

20. 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.

21. COMPLIANCE: 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.

22. 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.

23. 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.

24. 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.

25. 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.

26. 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. Notwithstanding the foregoing, Purchasing Division approval may or may not be required on certain agency delegated or exempt purchases.

27. 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.

28. 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.

29. BANKRUPTCY: In the event the Vendor files for bankruptcy protection, the State of West Virginia may deem this Contract null and void, and terminate this Contract without notice.

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. 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.

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, all Vendors are required to sign, notarize, and submit the Purchasing Affidavit stating that neither the Vendor nor a related party owe a debt to the State in excess of \$1,000. The affidavit must be submitted prior to award, but should be submitted with the Vendor's bid. A copy of the Purchasing Affidavit is included herewith.

38. ADDITIONAL AGENCY AND LOCAL GOVERNMENT USE: This Contract may be utilized by other agencies, spending units, and political subdivisions of the State of West Virginia; county, municipal, and other local government bodies; and school districts ("Other Government Entities"). Any extension of this Contract to the aforementioned Other Government Entities must be on the same prices, terms, and conditions as those offered and agreed to in this Contract, provided that such extension is in compliance with the applicable laws, rules, and ordinances of the Other Government Entity. If the Vendor does not wish to extend the prices, terms, and conditions of its bid and subsequent contract to the Other Government Entities, the Vendor must clearly indicate such refusal in its bid. A refusal to extend this Contract to the Other Government Entities shall not impact or influence the award of this Contract in any manner.

39. 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.

40. 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.requisitions@wv.gov.

41. BACKGROUND CHECK: In accordance with W. Va. Code § 15-2D-3, the Director of the Division of Protective Services shall require any service provider whose employees are regularly employed on the grounds or in the buildings of the Capitol complex or who have access to sensitive or critical information to submit to a fingerprint-based state and federal background inquiry through the state repository. The service provider is responsible for any costs associated with the fingerprint-based state and federal background inquiry.

After the contract for such services has been approved, but before any such employees are permitted to be on the grounds or in the buildings of the Capitol complex or have access to sensitive or critical information, the service provider shall submit a list of all persons who will be physically present and working at the Capitol complex to the Director of the Division of Protective Services for purposes of verifying compliance with this provision. 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.

42. 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. The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:
- c. 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
- d. 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.

43. 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.

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.

Debbie Erickson, Order Administrator
(Name, Title)
Debbie Erickson, Order Administrator
(Printed Name and Title)
5225 Verona Road Madison WI 53711
(Address)
800-5532-4752/ 412-200-6542
(Phone Number) / (Fax Number)
usmadorderprocessing@thermofisher.com
(email address)

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.

Thermo Electron North America LLC
(Company)

Debbie S Erickson, Order Administrator
(Authorized Signature) (Representative Name, Title)

Debbie S Erickson, Order Administrator
(Printed Name and Title of Authorized Representative)

11/15/16
(Date)

800-532-4752/412-200-6542
(Phone Number) (Fax Number)

REQUEST FOR QUOTATION
Liquid Chromatography/Mass Spectrometer (LC/MS) Instrument

SPECIFICATIONS

1. **PURPOSE AND SCOPE:** The West Virginia Purchasing Division is soliciting bids on behalf of West Virginia Department of Agriculture to establish a contract for the one time purchase of a **Liquid Chromatography Triple Quadrupole Mass Spectrometer (LC/MS/MS), workstation PC, software, printer, shipping, installation, validation, warranty, training, and service.**
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 “APCI” means atmospheric pressure chemical ionization.
 - 2.2 “Contract Services” means the LC/MS/MS with inside delivery, installation, validation, warranty, and training.
 - 2.3 “ESI” means electrospray ionization.
 - 2.4 “FG” means femtogram.
 - 2.5 “Installation” means unpacking and setting instrumentation in place with all connections secured for the instrument(s) to be in working order including software installation on the computer connected to the instrument.
 - 2.6 “LC/MS/MS” means Liquid Chromatography Triple Quadrupole Mass Spectrometer.
 - 2.7 “MRM” means multiple reactions monitoring.
 - 2.8 “MSMS” means tandem mass spectrometry.
 - 2.9 “Pricing Page” means the pages, contained in wvOASIS or attached as Exhibit A, upon which Vendor should list its proposed price for the Contract Items.
 - 2.10 “Service” means performing routine maintenance work or repair to the instrument or software.
 - 2.11 “SIM” means selected ion monitoring
 - 2.12 “S/N” means signal noise.

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Liquid Chromatography/Mass Spectrometer (LC/MS) Instrument

- 2.13 **“Solicitation”** means the official notice of an opportunity to supply the State with goods or services that is published by the Purchasing Division.
- 2.14 **“Training”** means teaching staff how to use and maintain the instrument and software.
- 2.15 **“Validation”** means is the process used to confirm that the analytical procedure employed for a specific test or matrices is suitable for its intended use.
- 2.16 **“Warranty”** means the written warranty of the manufacturer of a new instrument of its condition and fitness for use, including any terms or conditions precedent to the enforcement of obligations under that warranty.

3. GENERAL REQUIREMENTS:

- 3.1 **Mandatory Contract Item Requirements:** Contract Item must meet or exceed the mandatory requirements listed below for the **Liquid Chromatography Triple Quadrupole Mass Spectrometer (LC/MS/MS)**.

3.1.1 Liquid Chromatography Triple Quadrupole Mass Spectrometer (LC/MS/MS)

- 3.1.1.1 Must be capable of detecting a variety of analytes including pesticides, herbicides, toxins, and drugs in matrices such as foods, soil, vegetation, animal feed, and water.
- 3.1.1.2 MSMS must have two ion sources that operate independently which can be set to electrospray ionization (ESI) or atmospheric pressure chemical ionization (APCI). The instrument must enable combinations such as ESI/APCI, ESI/ESI, APCI/APCI with the same or opposite polarities without having to remove the sources to switch modes.
- 3.1.1.3 Minimum sensitivity requirement for positive ion mode: signal/noise (S/N) 2000:1 25 femtograms (fg) of reserpine on column. Minimum sensitivity requirement for negative ion mode: signal/noise (S/N)>2000:1, 25 femtograms (fg) of chloramphenicol on column.
- 3.1.1.4 The source probes must be easy to remove without the use of tools.
- 3.1.1.5 Ion source must have flat response across flow rate up to 3 milliliters per minute without loss of sensitivity.

REQUEST FOR QUOTATION
Liquid Chromatography/Mass Spectrometer (LC/MS) Instrument

- 3.1.1.6 Capable of switching between rapidly between positive and negative ion detection without high voltage switching.
- 3.1.1.7 Acquisition modes: Q1 scan, Q2 scan, multiple reactions monitoring (MRM), selected ion monitoring (SIM), Neutral Loss scans, Product Ion, Precursor Ion, Time managed MRM
- 3.1.1.8 Minimum mass range requirement: 5-1500 mass to charge ratio (m/z)
- 3.1.1.9 Mass stability required: 0.05 atomic mass unit (amu) in 24 hours
- 3.1.1.10 Mass accuracy needed: minimum 0.1 unit across mass range
- 3.1.1.11 Scan speed: $\leq 30,000$ daltons per second (da/s)
- 3.1.1.12 Quad resolution: unit, low and high, minimal sensitivity loss at 0.1 Daltons resolutions
- 3.1.1.13 Polarity switching time: ≤ 15 milliseconds
- 3.1.1.14 Dynamic range: 6 orders
- 3.1.1.15 Dual source switching speed: < 20 milliseconds
- 3.1.1.16 Minimum multiple reactions monitoring (MRM) Dwell Time: 1 millisecond
- 3.1.1.17 MRM transitions: 450 per time segment $> 40,000$ ion transactions per method
- 3.1.1.18 Must have high selectivity mass filter at 0.3 Daltons. Signal loss must not be more than 10%.
- 3.1.1.19 For minimal tuning during method development and minimal maintenance of the ion path, the LC/MS/MS utilizes Hot Source Induced Desolvation interface to the mass analyzer by patented Laminar Flow Ion Guide using gas flow
- 3.1.1.20 High performance liquid chromatograph capable of solvent and column switching without user intervention
- 3.1.1.21 High performance liquid chromatograph capable of regulating column temperature of at least 2 different columns
- 3.1.1.22 High performance liquid chromatograph with an autosampler
- 3.1.1.23 The LC/MS/MS instrument must be fully automated for analysis with a system controller that is loaded with the necessary software.
- 3.1.1.24 The LC/MS/MS must include a maintenance kit.
- 3.1.1.25 Vendor must provide documentation for recommended environmental conditions, electrical requirements, gas requirements, or any other factor that would affect instrument performance.

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Liquid Chromatography/Mass Spectrometer (LC/MS) Instrument

3.1.2 Workstation and software

- 3.1.2.1** Data station with windows based operating system capable of multitasking allowing data processing and data acquisition simultaneously.
- 3.1.2.2** Operating system must be fully integrated to control LS/MS/MS.

3.1.3 Shipping, Installation, Validation, Warranty, Training and Service

- 3.1.3.1** Vendor must be on-site for delivery and perform the installation (labor and supplies included) of the LCMSMS.
- 3.1.3.2** The vendor must provide a written validation of the instrument's performance after installation.
- 3.1.3.3** Vendor will provide a full one-year parts and labor warranty on all items, including 2 preventative maintenances.
- 3.1.3.4** Vendor must be able to perform resolutions to service requests within 72 hours which includes on-site resolutions.
- 3.1.3.5** Vendor will provide on-site training (labor and non-consumable supplies included) for all instruments and software.
- 3.1.3.6** Vendor will provide copies of all system manuals (operations, training, technical, service, maintenance).

4. CONTRACT AWARD:

4.1 Contract Award: The Contract is intended to provide Agencies with a purchase price for the Contract Items. The Contract shall be awarded to the Vendor that provides the Contract Items 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 placing all inclusive information in each column for item number, model/brand name, unit price and extended amount. There should be a price for the LCMSMS, workstation, software, printer, shipping/inside delivery, installation, validation, warranty, training and service. If there is no charge for any deliverable, indicate in the cell with "no charge". The bidder/vendor information must be completed and include an authorize signature. 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.

Vendor should type or electronically enter the information into the Pricing Page to prevent errors in the evaluation.

REQUEST FOR QUOTATION
Liquid Chromatography/Mass Spectrometer (LC/MS) Instrument

5. PAYMENT:

5.1 Payment: Vendor shall accept payment in accordance with the payment procedures of the State of West Virginia.

6. DELIVERY AND RETURN:

6.1 Shipment and Delivery: Vendor should ship the Contract Items immediately after being awarded this Contract and receiving a purchase order or notice to proceed. Contract Items must be delivered to Agency at 313 Gus R. Douglass Lane, Charleston, WV 25312.

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 either make arrangements for the return within 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

REQUEST FOR QUOTATION
Liquid Chromatography/Mass Spectrometer (LC/MS) Instrument

be the lower of the Vendor's customary restocking fee or 5% of the total invoiced value of the returned items.

7 VENDOR DEFAULT:

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

- 7.1.1 Failure to provide Contract Items in accordance with the requirements contained herein.
- 7.1.2 Failure to comply with other specifications and requirements contained herein.
- 7.1.3 Failure to comply with any laws, rules, and ordinances applicable to the Contract Services provided under this Contract.
- 7.1.4 Failure to remedy deficient performance upon request.

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

- 7.2.1 Immediate cancellation of the Contract.
- 7.2.2 Immediate cancellation of one or more release orders issued under this Contract.
- 7.2.3 Any other remedies available in law or equity.

8 FACILITIES ACCESS: Performance of Services will require access to the facility.

- 8.1 Vendor must identify principal service personnel who will be asked for identification upon entrance to the facility.
- 8.2 Anyone performing under this Contract will be subject to Agency's security protocol and procedures.
- 8.3 Vendor shall inform all staff of Agency's security protocol and procedures.

PRICING PAGE					
Item No.	Description	Model No/Brand Name	Quantity	Unit Price	Extended Amount
3.1.1 & 3.1.2	LCMSMS, workstation, software, printer	T5Q-50003/ T5Q Endura	1		\$ 194,346.81
3.1.3	Shipping charges and inside delivery		1		\$ 900.00
3.1.3	Installation/validation		1		
3.1.3	Training/warranty		1		\$17,406.00
3.1.3	Service		1		\$41,412.00
	Failure to use this form may result in disqualification			GRAND TOTAL	\$254,064.81
	Bidder / Vendor Information				
Name:	Debbie S Erickson				
Address:	Thermo Electron North America LLC				
	5025 Verona Rd				
	Madison WI 53711				
Phone:	1-800-532-4752				
Email					
Address:	us mad order processing@thermofisher.com				
Signature:	Debbie S Erickson				

State of West Virginia

VENDOR PREFERENCE CERTIFICATE

Certification and application is hereby made for Preference in accordance with **West Virginia Code, §5A-3-37**. (Does not apply to construction contracts). **West Virginia Code, §5A-3-37**, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the **West Virginia Code**. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Vendor Preference, if applicable.

1. Application is made for 2.5% vendor preference for the reason checked:

- ☐ Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or**,
☐ Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or**,
☐ Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; **or**,

2. Application is made for 2.5% vendor preference for the reason checked:

- ☐ Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or**,

3. Application is made for 2.5% vendor preference for the reason checked:

- ☐ Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or**,

4. Application is made for 5% vendor preference for the reason checked:

- ☐ Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; **or**,

5. Application is made for 3.5% vendor preference who is a veteran for the reason checked:

- ☐ Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; **or**,

6. Application is made for 3.5% vendor preference who is a veteran for the reason checked:

- ☐ Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.

7. Application is made for preference as a non-resident small, women- and minority-owned business, in accordance with West Virginia Code §5A-3-59 and West Virginia Code of State Rules.

- ☐ Bidder has been or expects to be approved prior to contract award by the Purchasing Division as a certified small, women- and minority-owned business.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

Under penalty of law for false swearing (West Virginia Code, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.

Bidder: N/A Signed: N/A

Date: _____ Title: _____

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: 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 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: Thermo Electron North America LLC

Authorized Signature: Debbie D. Erickson Date: 11/15/16

State of Wisconsin

County of Dane, to-wit:

Taken, subscribed, and sworn to before me this 15th day of November, 2016.

My Commission expires June 14th, 2020.

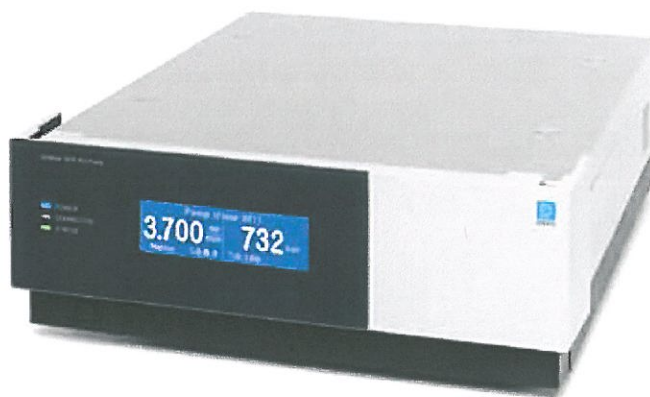
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Purchasing Affidavit (Revised 08/01/2015)



UltiMate 3000 Series Rapid Separation Pumps



UHPLC⁺
focused

Dionex products are UHPLC compatible by design, establishing the new standard in conventional LC. Integrating hardware, software, and separation chemistry, Dionex offers the UHPLC to everyone—for all needs.

With four models of Rapid Separation pump systems, Dionex offers the most complete choice of 103 MPa (15,000 psi) pumps in the industry. Whatever your UHPLC challenge is, the family of UltiMate® 3000 Rapid Separation pumps always offers the right solution with its industry-leading flow-pressure footprint. With intelligently designed technology, all UltiMate 3000 Rapid Separation pumps provide value in terms of performance, reliability, and ease of use.

Rapid Separation Pump Systems for the Widest Range of UHPLC Applications

- SmartFlow® technology ensures optimal performance for any flow, pressure, or solvent composition.
- Automatic compressibility compensation, no manual solvent setting needed.
- Innovative SpinFlow mixing design perfectly balances gradient delay volume against mobile phase mixing efficiency.
- All pumps are equipped with an active rear-seal wash system.
- AutoQ™ equipment qualification tests and predictive performance indicators.

- Self-diagnostics and preprogrammed test routines help identifying problems quickly.
- An on-line troubleshooting guide and advanced system status reports facilitate timely resolution of work-flow interruptions.
- Easy front-panel access to all fluidic components for routine maintenance and quick replacement without disassembling the instrument.
- Unique dual-gradient Rapid Separation pump system provides ultrahigh speed and resolution of UHPLC with the benefits of advanced chromatographic techniques and without occupying additional bench space.



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Performance and Reliability

The Rapid Separation pumps offer an industry-leading flow-pressure footprint of 103 MPa (15,000 psi) at up to 5 mL/min and 80 MPa (11,600 psi) at 8 mL/min. With its superior performance, it is the best choice for any ultrahigh-speed and ultrahigh-resolution applications but perfectly suitable for conventional analytical applications as well. The completely redesigned pump ensures highest flow precision and reliability even at the elevated backpressure range.

The unrivaled flow-pressure footprint covers the full range of HPLC, including conventional LC and UHPLC.

Several optional mixers are available to adapt the mixing performance to application requirements while keeping the gradient delay as small as possible.

Versatile and Flexible

The UltiMate 3000 Rapid Separation pump family offers the right solution for a wide range of different applications.

The newly developed dual-gradient Rapid Separation pump now combines the best of two worlds: ultrahigh speed and ultrahigh performance from UHPLC with advanced chromatographic techniques.

Application Areas

The Rapid Separation pumps are recommended for research as well as routine laboratories that require the whole range of chromatographic performance, from maximum resolution to maximum speed in just a single LC system.

Furthermore, it is the perfect choice for any method development, LC-MS application, and for high-throughput analyses using conventional LC and UHPLC methods.

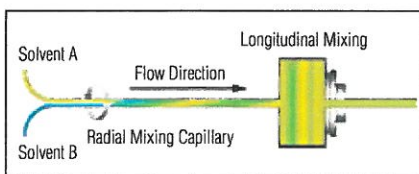


Figure 1. Innovative mixing design for exceptionally high mixing performance.

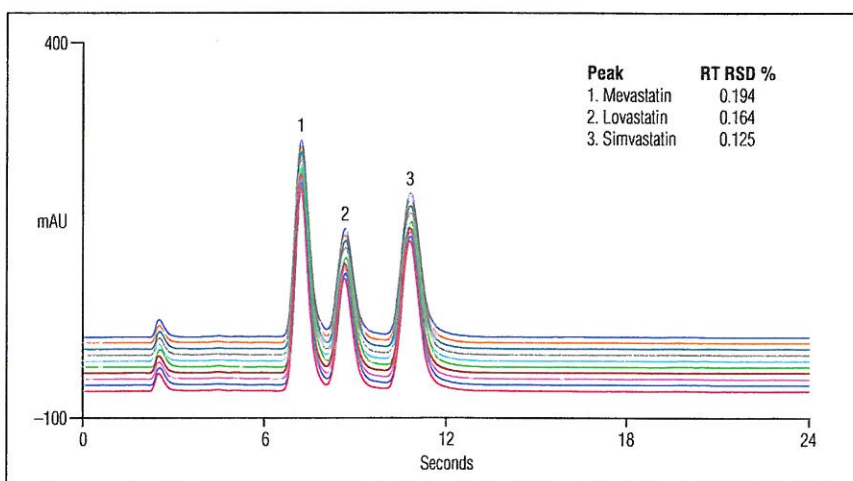


Figure 2. Retention time precision for a Rapid Separation application of Simvastatin at 3.35 mL/min and 74 MPa.

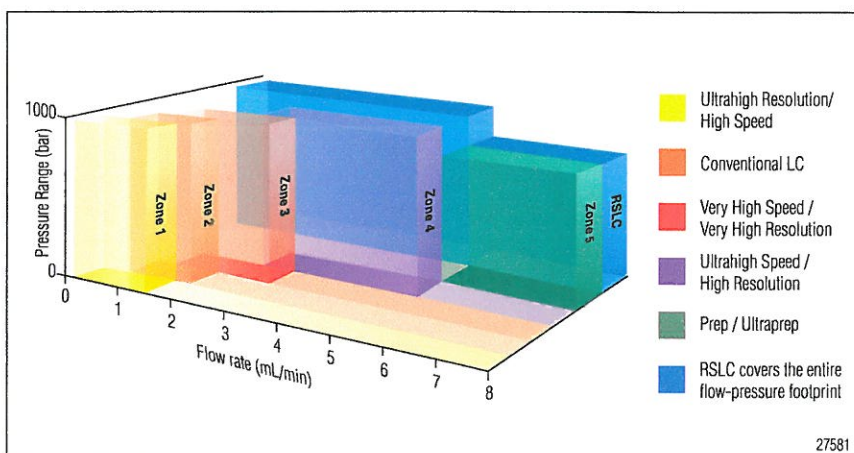
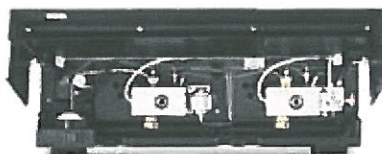


Figure 3. Industry-leading flow-pressure footprint of the Rapid Separation pumps.

UltiMate 3000 Series: The Binary Rapid Separation Pump

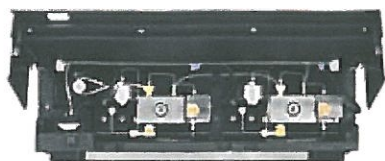


Features

- Unrivaled flow-pressure footprint of 103 MPa at up to 5 mL/min and 80 MPa at 8 mL/min.
- Fast separations, with gradient delay volumes between 35 μ L for MS front end configuration and 200 μ L in the default configuration.

- Innovative SpinFlow mixing design for exceptional high mixing performance at low gradient delay for fast separations.
- Active rear-seal wash for maximum seal lifetime, and reduced instrument down time.
- Suitable for all applications using sub-3 μ m and sub-2 μ m particle size columns.
- Improved robustness and lifetime through completely redesigned mechanics.

The UltiMate 3000 Series: Dual-Gradient Rapid Separation Pump



The dual-gradient Rapid Separation pump is the first pump of its kind that combines the ultrahigh speed and resolution of RSLC with advanced chromatographic techniques, such as tandem, parallel, and 2D-LC.

It is ideally suitable for laboratories that require both high sample throughput and chromatographic resolution.

Features

- Two ternary gradient Rapid Separation pumps in a single instrument enclosure.
- Unique SpinFlow mixing design for exceptional high mixing performance at low gradient delay for fast separations.
- Set up two different applications on a dual-gradient Rapid Separation system with different solvents and columns, and switch between them without any need for replumbing.
- Achieve up to 100% higher sample throughput, without changing existing methods, by running samples in a tandem UHPLC (off-line column regeneration) or parallel UHPLC (simultaneous operation of two columns) mode.
- Suitable for all application using sub-3 μm and sub-2 μm particle size columns.
- Control all dual-gradient systems with the Chromeleon® Chromatography Data System software including control of two gradients in parallel, and wizards to assist method setup.

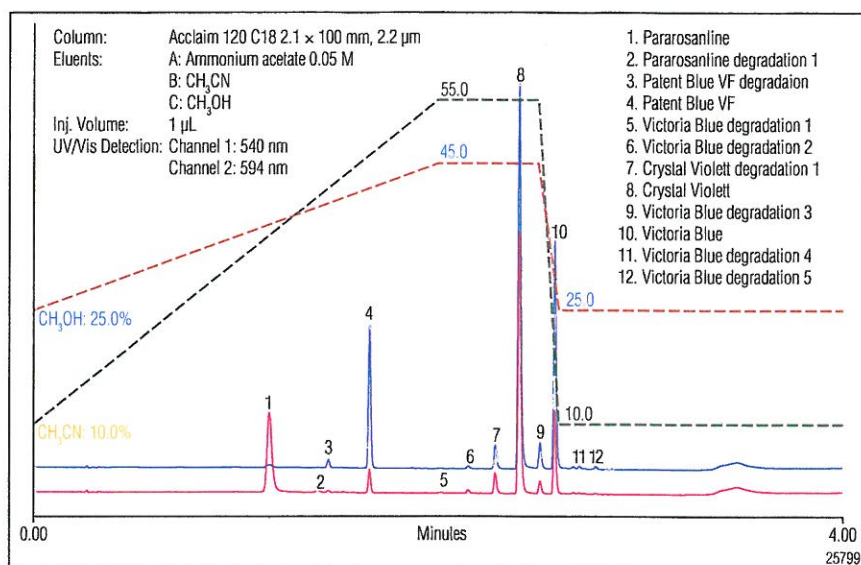
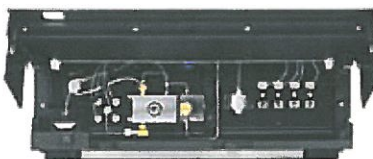


Figure 4. Ternary gradient separation of ink under Rapid Separation conditions. This separation is 6 x faster than the conventional forensic LC method.

The UltiMate 3000 Series: Quaternary Rapid Separation Pump



The quaternary Rapid Separation pump provides the highest degree of flexibility in solvent proportioning for RSLC applications. This pump is recommended for a wide range of research and routine applications, and for method development.

Features

- Delivers up to four solvents for convenient method development, system flushing, and preparation of isocratic and gradient solvent mixtures.
- Reliable vacuum degassing—a four-channel micromembrane degasser, equipped with vacuum level monitoring, is built into the pump.
- Suitable for all applications using sub-3 μm and sub-2 μm particle size columns.
- Unique SpinFlow mixing design for exceptional high mixing performance at low-gradient delay for fast separations.
- Active rear-seal wash for maximum seal lifetime, and reduced instrument down time.

ULTIMATE 3000 RSLC PUMP SPECIFICATIONS

	Binary Rapid Separation Pump HPG-3200RS	Quaternary Rapid Separation Pump LPG-3400RS	Dual-Gradient Rapid Separation Pump DGP-3600RS
Operating principle	Serial dual-piston		
Flow range (settable range)	0.05–8 mL/min (0.001–8 mL/min)	0.1–8 mL/min (0.001–8 mL/min)	
Flow accuracy	±0.1%		
Flow precision	<0.05% RSD or <0.01 min SD, whichever is greater		
Pressure range	2–103.4 MPa (15,000 psi) up to 5 mL/min, 2–80 MPa (11,600 psi) up to 8 mL/min		
Pulsation	Typically: <2 bar or <1% whichever is greater		
Gradient formation	High-pressure proportioning	Low-pressure proportioning	
Proportioning accuracy	±0.2% (of full scale)	±0.5% (of full scale)	
Proportioning precision	<0.15% SD		
Number of eluent lines	2	4	6 (2 × 3)
Gradient delay volume	200 µL (35–1500 µL with optional mixer kits)	690 µL (325–1790 µL with optional mixer kits)	
Version with Solvent Selector Valve	HPG-3400RS		
Solvent degassing	External (optional)	Built-in, 4 channels	External (optional)
Dimensions	(h × w × d): 16 × 42 × 51 cm (6.3 × 16.5 × 20 in.)		
GLP Features	Full support of Automatic Equipment Qualification (AutoQ™), Qualification Status and System Wellness Monitoring. All system parameters are logged in the Chromeleon Audit Trail		
I/O Interfaces	2 digital inputs, 2 relay outputs		
Communications	USB for PC connection; USB hub with 3 sockets integrated; 15-pin D-Sub connector for solvent rack/degasser connection		
Power Requirements	100–120 V, 60 Hz; 200–240 V, 50 Hz		

ORDERING INFORMATION

In the U.S., call (800) 346-6390, or contact the Dionex Regional Office nearest you. Outside the U.S., order through your local Dionex office or distributor. Refer to the following part numbers:

UltiMate 3000 Rapid Separation Pumps

Binary Rapid Separation Pump HPG-3200RS	5040.0026
Binary Rapid Separation Pump with solvent selector valves HPG-3400RS	5040.0046
Quaternary Rapid Separation Pump LPG-3400RS	5040.0036
Dual-Gradient Rapid Separation Pump DPG-3600RS	5040.0066

UltiMate 3000 Solvent Racks

Solvent Rack (without degasser) SR-3000	5035.9200
Solvent Rack with 6 degasser channels SRD-3600	5035.9230
Solvent Rack with 4 degasser channels SRD-3400	5035.9245
Solvent Rack with 2 degasser channels SRD-3200	5035.9250

Optional Mixer Kits are available upon request. For more UltiMate 3000 pump Systems and Solvent Racks, see the Dionex Product Catalog, LC Pumps and LC Solvent Tray/Degasser section.

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LPN 2194-03 10/10
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Fast Screening and Quantification of Pesticide Residues Using a Comprehensive LC-MS Solution: The Pesticide Explorer Collection – Standard Quantitation

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Key Words

Pesticide Explorer Collection, European Regulation 396/2005, Commission Directive 2006/125/EC, European Commission 2002/657/EC, SANCO/12571/2013, European Commission 788/2012/EC, pesticide, food, QuEChERS, UltiMate 3000, TSQ Endura, TraceFinder

Goal

To present a fully tested LC-MS/MS workflow for rapid and robust quantification of more than 250 pesticides below maximum residue limits (MRLs) with sensitivity, accuracy, and precision that meets stringent EU guidelines.

Introduction

Pesticides are chemicals used on crops to protect them from the negative activity of pests. Inappropriate application of pesticides can have adverse effects on health; therefore, determination and quantification of pesticide residues in foods and food products is an important part of routine food control. The European Union (EU) legislation (European Regulation 396/2005 and Commission Directive 2006/125/EC) requires an extensive and comprehensive study determining pesticides in various products of plant and animal origin. The requirements for low limits of quantification (LOQ) of pesticides pose significant analytical challenges, especially for some complicated food matrices.

This study presents a multi-residue analysis method enabled by Thermo Scientific™ Pesticide Explorer Collection Standard Quantitation Solution, comprising liquid chromatography–triple-stage mass spectrometry (LC-MS/MS), for rapid and robust quantitation of more than 250 pesticides below their required maximum residue limits (MRL). This comprehensive solution includes the Thermo Scientific™ QuEChERS sample preparation kit, Dionex™ UltiMate™ 3000 LC system, TSQ Endura™ triple quadrupole mass spectrometer, TraceFinder™ software, Accucore™ aQ column, and method parameters to provide a start-to-finish workflow for pesticide analysis. The method results address the stringent EU guidelines concerning sensitivity, accuracy and precision.

Experimental

Overview

The workflow overview from sample preparation through LC-MS/MS analysis is shown in Figure 1. Samples were homogenized and extracted according to the European EN 15662 QuEChERS protocol prior to injection into the LC-MS/MS system.^{1,2} The ready-to-use QuEChERS sample preparation kit containing extraction tubes and associated protocol was used for sample preparation. Identification of pesticide residues was based on retention time, the presence of a minimum of two product ions, and ion-ratio confirmation using selected reaction monitoring (SRM) of characteristic transition ions. Quantification was calculated using matrix-matched calibration. All method performance criteria were established according to the relevant EU guidelines.³⁻⁷

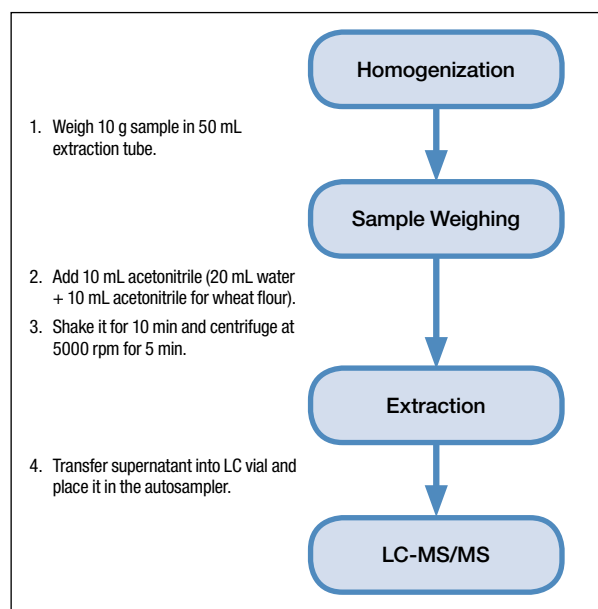


Figure 1. Workflow overview.

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Method Supplies

Table 1 lists reagents, instruments, and consumables used.

The pesticides standards were purchased from Sigma-Aldrich® (Germany) and Laboratory Instruments Srl (CASTELLANA GROTTE, Italy). Quality control materials used were FAPAS #T19140 (lettuce puree), FAPAS #19110 (lettuce puree), FAPAS #T19142 (melon puree), and FAPAS #T0983 (wheat flour). FAPAS samples were selected primarily based on their content of target pesticides. However, due to limited availability, some of the matrices are different from the matrices spiked and analyzed (i.e. lettuce and melon puree versus strawberry and leek).

Table 1. Reagents, instruments, and consumables.

Method Supplies	Fisher Scientific Part Number/ Source
Reagents	
Acetonitrile (ACN), LC/MS grade	AC61514-0025
Ammonium formate, 99%	AC40115-2500
Formic acid, Optima™ LC/MS grade	A117-50
Methanol, Optima™ LC/MS grade	A456-212
Purified water	Obtained from Thermo Scientific™ Barnstead™ Easypure™ II water system
Water, LC-MS grade	AC61515-0025
Instruments	
TSQ Endura triple quadrupole mass spectrometer	
UltiMate 3000 RSLC	
Method Supplies	Thermo Fisher Scientific Part Number
Consumables	
QuEChERS extraction tube, 50 mL, 250 pack	60105-216
Accucore aQ column 100 x 2.1 mm, 2.6 µm	17326-102130

Sample Preparation

Blank matrix samples [strawberry (SB), wheat flour (WF) and leek (LK)] used for validation experiments were purchased in local retail stores and were homogenized with an Ultra-Turrax homogenizer and extracted prior to fortified sample preparation. Matrix extracts were used as matrix blank samples and for preparation of matrix-matched calibration standards. Ready to use QuEChERS extraction kits were used for sample preparation, and contained 4 g MgSO₄, 1 g NaCl, 1 g trisodium citrate dehydrate, and 0.5 g sodium citrate for buffered extraction of target compounds. The same QuEChERS sample preparation protocol was applied to all three of the matrices analyzed, however a modification was made for flour in which water was added to wet the matrix. No cleanup was used.

Homogenization of matrices was performed using the following steps:

1. A relatively large amount of each matrix (~500 g) was placed into an appropriately sized beaker and labeled.
2. A G25 dispergation tool was attached to the Ultra-Turrax homogenizer. (Note: For better recovery for some unstable compounds cryogenic homogenization is advised.⁸).
3. Homogenization was performed at middle rotation speed (speed level 2–3) to create smooth homogenate.

Sample extraction was performed using the following steps:

1. 10 g sample was weighed into a 50 mL QuEChERS extraction tube.
2. 10 mL ACN was added to the SB and LK samples. For WF, 20 mL water was added to completely wet samples, and then 10 mL ACN was added.
3. Samples were shaken for 10 min on a horizontal shaker and centrifuged at 5000 rpm for 5 min.
4. The supernatant was collected and 1 mL was transferred into a LC vial for instrumental analysis.

LC-MS/MS Analysis

LC-MS/MS analysis was carried out using an UltiMate 3000 RSLC system coupled to a TSQ Endura triple quadrupole mass spectrometer. TraceFinder software (revision 3.2 SP2) was used for instrument control, analysis, data review, and reporting. The LC conditions and gradient are shown in Tables 2 and 3. The LC gradient was optimized to reduce analysis time to 15 minutes, while maintaining good chromatographic separation.

Table 2. LC conditions.

LC conditions	
Injection volume	1 µL
Column temperature	25 °C
Flow rate	300 µL/min
Analytical column	Accucore aQ column, 100 x 2.1 mm, 2.6 µm
Run time	15 minutes
Tray temperature	10 °C
Needle-cleaning solvent	20% Methanol in water
Sample loop	100 µL
Mobile phases	A: Water with 5 mM ammonium formate and 0.1% formic acid
	B: Methanol with 5 mM ammonium formate and 0.1% formic acid

Table 3. LC gradient.

Time (min)	Flow (mL/min)	A%	B%
0	0.300	100	0
0.5	0.300	100	0
7	0.300	30	70
9	0.300	0	100
12	0.300	0	100
12.1	0.300	100	0
15	0.300	100	0

The TSQ Endura triple quadrupole mass spectrometer was operated in timed-SRM mode. All SRM traces (parent, qualifier, quantifier ion) were individually tuned for each target analyte by direct infusion of each working standard solution. The mass spectrometer settings are provided in Table 4. For convenience and fast method implementation, the complete method including SRM settings is included with the Pesticide Explorer Collection Standard Quantitation Configuration.

Table 4. MS settings.

MS settings	
Ionization mode	Heated electrospray (HESI)
Scan type	Timed-SRM
Polarity	Positive/Negative switching
Spray voltage for Positive mode	3700 V
Spray voltage for Negative mode	2500 V
Sheath gas pressure	30 arbitrary units (Arb)
Aux gas pressure	6 Arb
Sweep gas pressure	1 Arb
Ion transfer tube temperature	325 °C
Vaporizer temperature	350 °C
CID gas pressure	2 mTorr
Cycle time	0.5 s
Q1 resolution (FWHM)	0.7
Q3 resolution (FWHM)	0.7
Chrom filter	3 s

Results and Discussion

To evaluate method performance, three matrices, strawberry, leek (the most complex), and wheat flour, were analyzed. European Union guidelines for single laboratory validation and pesticide residue analysis were used to establish method performance criteria, including linearity, matrix effect, LOD, LOQ, precision, and trueness (bias). All method performance parameters were compared to the relevant legislative requirements and MRLs. For compounds containing more than one isoform, only one performance criterion was established.

Figure 2 shows the LC-MS/MS chromatogram of the strawberry extract spiked with more than 250 pesticides at a concentration of 100 µg/kg (1 µL injection). Despite the short chromatographic run time (15 min), good separation and detection of the pesticide compounds were achieved using the timed-SRM mode. With timed-SRM, data acquisition for a particular target compound is performed in a short retention time window around the known compound retention time. Timed-SRM significantly reduces the number of SRM transitions that are monitored in parallel within a certain retention time window. A longer measurement time (dwell time) is therefore available for each transition, resulting in higher sensitivity and lower quantitation limits, improved RSDs and more data points per chromatographic peak—in this case a minimum of 10 to 12 data points.

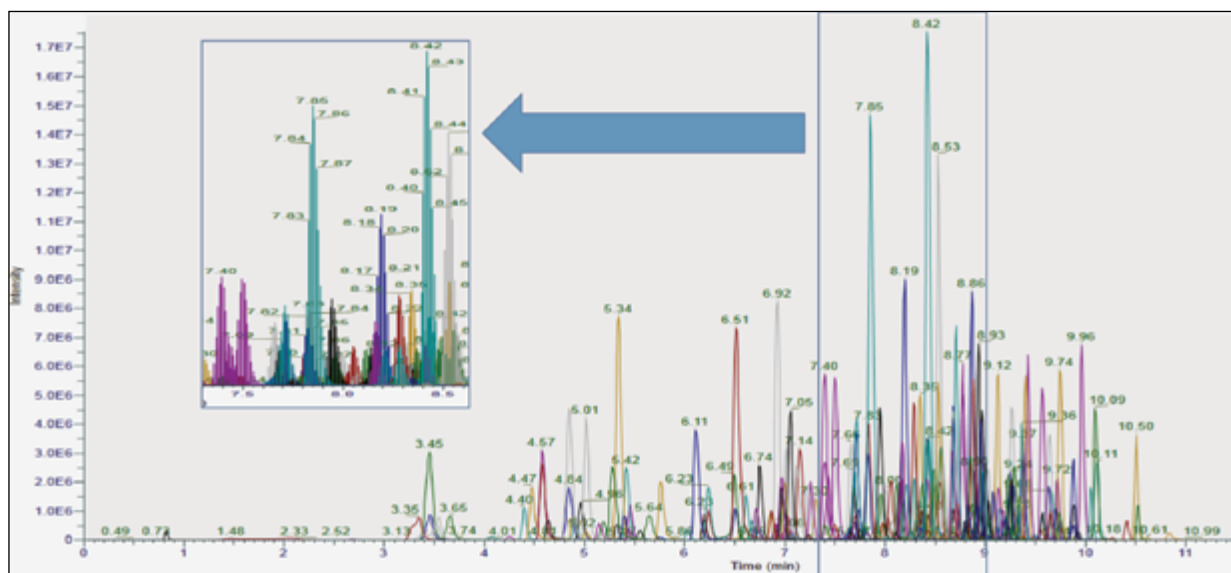


Figure 2. The LC-MS/MS chromatogram of more than 250 pesticides spiked into strawberry extract at 100 µg/kg shows good separation of compounds. Enough scans across the chromatographic peak were obtained throughout the chromatogram.

For the three matrices, including the very complex leek matrix, the LOD and LOQ values obtained demonstrated that the method enabled quantification of target pesticides below regulated MRLs. Table 5 presents the method LODs and LOQs for the target pesticides in the matrices tested. Table 6 compares the LOQ values obtained with the MRLs for selected pesticides. The pesticides selected in Table 6 represent different ionization modes and a range of retention times across the chromatogram. All compounds were detected and quantified below established MRLs.

Table 5. Method performance: LODs and LOQs ($\mu\text{g/kg}$) for target pesticides by matrix tested. LOQs were estimated taking into account reproducibility ($\text{RSDs} \leq 15\%$) and ion ratio criteria.

	Name	Polarity	RT	Strawberry		Leek		Flour	
				LOD	LOQ	LOD	LOQ	LOD	LOQ
1	2,4-D	-	7.6	5	10	5	10	2	5
2	Abamectin b1a (NH_4)	+	10.2	0.1	0.2	0.3	1	0.3	1
3	Acephate	+	2.9	0.5	1	0.5	1	1	3
4	Acetamiprid	+	5.6	0.1	0.5	0.3	1	0.1	0.3
5	Acibenzolar-S-methyl	+	8.8	1	2	2	5	0.1	0.3
6	Alachlor	+	8.9	1	5	1	5	1	3
7	Aldicarb sulfone	+	4.8	0.5	1	0.5	1	0.3	1
8	Allethrin	+	8.7	0.3	1	0.3	1	1	3
9	Ametryn	+	7.8	0.2	0.6	0.1	0.3	0.1	0.3
10	Aminocarb	+	3.5	0.05	0.1	0.05	0.1	0.03	0.1
11	Ancymidol	+	7.1	0.5	1	0.5	1	0.1	0.3
12	Anilofos	+	9.1	0.03	0.1	0.03	0.1	0.1	0.3
13	Aramite (NH_4)	+	9.7	0.03	0.1	0.03	0.1	0.03	0.1
14	Atrazine	+	7.7	0.1	0.5	0.1	0.5	0.03	0.1
15	Azaconazole	+	8.0	0.5	1	0.1	0.5	0.2	0.6
16	Azamethiphos	+	6.7	0.05	0.1	0.3	1	0.1	0.3
17	Azinphos-ethy	+	8.8	5	10	5	10	0.3	1
18	Azinphos-methyl	+	8.2	0.5	1	1	5	1	5
19	Azoxystrobin	+	8.2	0.003	0.01	0.003	0.01	0.1	0.3
20	Bendiocarb	+	6.9	0.3	1	0.3	1	0.3	1
21	Benodanil	+	7.7	0.1	0.5	0.1	0.3	0.1	0.3
22	Benoxacor	+	8.1	0.3	1	0.3	1	0.3	1
23	Bensulfuron methyl	+	8.1	0.1	0.5	0.3	1	0.3	1
24	Bentazon	-	6.7	0.3	1	0.2	0.6	0.1	0.3
25	Benzoximate	+	9.3	0.1	0.5	0.3	1	0.3	1
26	Benzoylprop-ethyl	+	9.2	0.1	0.5	0.3	1	0.3	1
27	Bifenazate	+	8.7	0.3	1	2	5	2	5
28	Bitertanol	+	9.3	0.5	2	0.5	2	2	5
29	Boscalid	+	8.4	0.5	1	0.05	0.1	0.1	0.3
30	Brodifacoum	+	10.4	0.1	0.5	0.2	0.5	0.2	0.6
31	Bromacil	+	6.9	0.3	1	0.3	1	0.3	1
32	Bromoxynil	+	7.6	0.1	0.5	0.2	0.6	0.1	0.3
33	Bromuconazole	+	8.7	0.5	1	0.5	1	1	3
34	Bupirimate	+	8.8	0.5	1	0.5	1	0.3	1
35	Buprofezin	+	9.7	0.2	0.5	0.3	1	0.3	1
36	Butachlor	+	9.8	0.2	0.6	1	3	2	5
37	Butafenacil (NH_4)	+	8.7	0.1	0.3	0.1	0.3	0.03	0.1
38	Butocarboxim sulfoxide	+	3.5	0.5	1	1	3	1	3
39	Butoxycarboxim	+	4.8	0.1	0.3	0.1	0.3	0.3	1
40	Carbaryl	+	7.3	0.3	1	0.3	1	0.3	1
41	Carbendazim	+	4.6	0.2	0.5	0.2	0.5	0.1	0.3
42	Carbetamide	+	6.6	0.03	0.1	0.1	0.5	0.3	1
43	Carbofuran	+	6.9	0.03	0.1	0.03	0.1	0.03	0.1
44	Carbofuran-3-hydroxy	+	5.4	0.3	1	0.3	1	0.3	1
45	Carfentrazone-ethyl	+	9.0	0.3	1	0.03	0.1	0.1	0.3
46	Carpropamid	+	9.2	0.3	1	0.3	1	0.1	0.3
47	Chlorantraniliprole	+	8.0	0.3	1	0.3	1	0.3	1

	Name	Polarity	RT	Strawberry		Leek		Flour	
				LOD	LOQ	LOD	LOQ	LOD	LOQ
48	Chlorbromuron	+	8.6	0.2	0.5	0.3	1	0.3	1
49	Chlorfenvinphos	+	9.1	0.03	0.1	0.05	0.1	0.1	0.3
50	Chlorfluazuron	+	10.1	0.3	1	0.3	1	0.1	0.3
51	Chloridazon (pyrazone)	+	5.6	0.3	1	0.3	1	0.3	1
52	Chlormequat	+	0.7	0.2	0.5	0.03	0.1	0.01	0.03
53	Chlorotoluron	+	7.7	0.3	1	0.3	1	0.3	1
54	Chloroxuron	+	8.8	0.2	0.5	0.2	0.6	0.1	0.3
55	Chlorpyrifos	+	9.9	0.03	0.1	0.1	0.3	0.3	1
56	Cinosulfuron	+	6.7	0.03	0.1	0.2	0.6	0.001	0.005
57	Clethodim	+	9.5	0.3	1	2	6	2	5
58	Clomazone	+	8.2	0.03	0.1	0.03	0.1	0.1	0.3
59	Clothianidin	+	5.2	0.3	1	0.5	2	1	3
60	Coumaphos	+	9.2	0.3	1	0.3	1	0.3	1
61	Crotoxyphos (NH ₄)	+	8.4	0.03	0.1	0.1	0.3	0.3	1
62	Cumyluron	+	8.7	0.03	0.1	0.3	1	0.1	0.3
63	Cyanazine	+	6.7	0.03	0.1	0.3	1	0.1	0.3
64	Cyazofamid	+	8.9	0.03	0.1	0.3	1	0.3	1
65	Cycloate	+	9.5	0.3	1	0.3	1	0.1	0.3
66	Cycluron	+	7.9	0.3	1	0.3	1	0.1	0.3
67	Cyflufenamid	+	9.2	0.3	1	0.1	0.3	0.1	0.3
68	Cyromazine	+	1.7	2	5	2	5	5	10
69	Demeton-S-methyl sulfone	+	4.4	0.03	0.1	0.1	0.3	0.1	0.3
70	Desmedipham	+	8.0	10	30	2	5	10	20
71	Desmethyl-pirimicarb	+	5.0	0.1	0.5	0.2	0.6	0.3	1
72	Desmetryn	+	7.1	0.1	0.5	0.2	0.6	0.2	0.6
73	Diclobutrazol	+	8.8	0.3	1	1	3	0.1	0.3
74	Diclotophos	+	4.9	0.3	1	1	3	1	3
75	Diethofencarb	+	8.1	0.2	0.5	0.3	1	0.1	0.3
76	Difenacoum	+	10.1	0.03	0.1	0.2	0.6	0.1	0.3
77	Difenoconazole	+	9.4	0.2	0.5	0.03	0.1	0.03	0.1
78	Diflubenzuron	+	9.0	0.3	1	0.1	0.3	0.03	0.1
79	Dimefuron	+	8.0	0.1	0.3	0.3	1	0.3	1
80	Dimethametryn	+	8.9	0.1	0.3	0.1	0.3	0.2	0.6
81	Dimethenamid	+	8.4	0.3	1	0.1	0.3	0.1	0.3
82	Dimethoate	+	5.5	0.03	0.1	0.1	0.3	0.1	0.3
83	Dimethomorph	+	8.3	0.3	1	0.03	0.1	0.1	0.3
84	Dimoxystrobin	+	9.0	0.2	0.5	0.03	0.1	0.1	0.3
85	Diniconazole	+	9.4	0.3	1	0.3	1	0.3	1
86	Dinotefuran	+	3.7	0.3	1	0.3	1	0.3	1
87	Dithiopyr	+	9.5	0.3	1	2	5	0.3	1
88	Diuron	+	7.5	0.03	0.1	0.1	0.3	0.3	1
89	DNOC	-	7.7	0.3	1	1	3	0.3	1
90	Dodemorph	+	8.1	0.3	1	1	3	0.3	1
91	Epoxiconazole	+	8.9	0.3	1	0.03	0.1	0.1	0.3
92	Esprocarb	+	9.7	0.03	0.1	0.1	0.3	0.1	0.3
93	Etaconazol	+	8.8	0.3	1	0.3	1	0.1	0.3
94	Ethiofencarb	+	8.2	0.3	1	2	5	1	3
95	Ethiofencarb-sulfone	+	4.9	0.3	1	0.3	1	0.1	0.3

	Name	Polarity	RT	Strawberry		Leek		Flour	
				LOD	LOQ	LOD	LOQ	LOD	LOQ
96	Ethiofencarb-sulfoxide	+	5.0	0.03	0.1	0.03	0.1	0.1	0.3
97	Ethiprole	+	8.3	0.3	1	1	3	1	3
98	Ethirimol	+	6.2	0.3	1	0.1	0.5	0.1	0.3
99	Ethofumesate	+	8.3	0.3	1	5	20	5	20
100	Ethoxyquin	+	7.7	0.3	1	1	3	0.3	1
101	Etofenprox (NH ₂)	+	10.5	0.03	0.1	0.3	1	1	3
102	Etoazole	+	10.0	0.02	0.05	0.03	0.1	0.1	0.3
103	Etrimfos	+	9.1	0.3	1	0.1	0.3	1	3
104	Fenamidone	+	8.3	0.03	0.1	0.3	1	0.3	1
105	Fenamiphos	+	8.9	0.03	0.1	0.03	0.1	0.03	0.1
106	Fenarimol	+	8.8	0.3	1	0.1	0.3	0.1	0.3
107	Fenazaquin	+	10.5	0.1	0.3	1	3	0.5	1.5
108	Fenbuconazole	+	8.9	0.3	1	0.3	1	2	5
109	Fenhexamid	+	8.7	0.003	0.01	1	3	0.3	1
110	Fenobucarb	+	8.2	0.03	0.1	0.1	0.3	0.1	0.3
111	Fenoxanil	+	9.4	0.1	0.3	0.03	0.1	0.1	0.3
112	Fenoxycarb	+	9.0	0.1	0.5	0.03	0.1	0.03	0.1
113	Fenpyroximat	+	10.1	0.003	0.01	0.01	0.03	0.03	0.1
114	Fensulfothion	+	7.8	0.03	0.1	0.03	1	0.3	1
115	Fenthion	+	9.2	0.3	1	1	3	0.3	1
116	Fenthion-sulfoxide	+	7.3	0.06	0.2	0.1	0.3	0.1	0.3
117	Fenuron	+	5.3	0.1	0.3	0.1	0.3	0.03	0.1
118	Flazasulfuron	+	8.1	0.1	0.3	0.3	1	0.03	0.1
119	Florasulam	+	6.2	0.1	0.3	0.03	0.1	0.1	0.3
120	Fluazifop	+	8.3	0.3	0.6	0.3	1	1	3
121	Fluazinam	-	9.7	0.03	0.1	0.3	1	0.1	0.3
122	Flubendiamide	+	9.0	1.5	5	1.5	5	5	10
123	Flufenacet	+	8.8	0.1	0.3	0.3	1	0.1	0.3
124	Flufenoxuron	+	9.9	0.3	1	0.1	0.3	0.3	1
125	Flumetsulam	+	5.3	0.1	0.3	0.3	1	0.3	1
126	Fluometuron	+	7.5	0.3	1	0.1	0.3	0.03	0.1
127	Fluopicolide	+	8.5	0.3	1	0.1	0.3	0.1	0.3
128	Fluopyram	+	8.7	0.03	0.1	0.03	0.1	0.1	0.3
129	Fluorochloridone	+	8.7	0.3	1	0.3	1	1	3
130	Fluoxastrobin	+	8.7	0.2	0.5	0.3	1	0.1	0.3
131	Fluquinconazole	+	8.7	0.3	1	0.5	1	0.3	1
132	Flusilazole	+	9.0	0.2	0.5	0.2	0.5	0.2	0.6
133	Flutriafol	+	7.7	0.1	0.3	0.3	1	0.3	1
134	Forchlorfenuron	+	8.0	0.1	0.5	0.1	0.3	0.1	0.3
135	Formetanate hydrochloride	+	3.4	0.3	1	0.3	1	0.1	0.3
136	Formothion	+	6.6	2	5	2	5	3	10
137	Fosthiazate	+	7.4	0.1	0.3	0.1	0.3	0.01	0.03
138	Fuberidazole	+	5.4	0.2	0.6	1	3	0.3	1
139	Furathiocarb	+	9.6	0.3	1	5	10	1	3
140	Griseofulvin	+	7.7	0.3	0.6	0.3	1	0.3	1
141	Halofenozide	-	8.4	0.3	0.6	0.3	1	0.01	0.03
142	Haloxypop	+	8.9	0.3	1	0.1	0.3	0.03	0.1
143	Haloxypop-methyl	+	9.4	0.02	0.05	0.3	1	0.1	0.3

	Name	Polarity	RT	Strawberry		Leek		Flour	
				LOD	LOQ	LOD	LOQ	LOD	LOQ
144	Heptenophos	+	7.9	0.3	1	1	3	0.3	1
145	Hexaconazole	+	9.2	0.3	1	0.5	1.5	0.3	1
146	Hexaflumuron	-	9.5	0.3	1	0.3	1	0.1	0.3
147	Hexazinone	+	7.0	0.03	0.1	0.1	0.3	0.1	0.3
148	Hexythiazox	+	9.9	0.03	0.1	0.1	0.3	0.1	0.3
149	Imazalil	+	7.7	0.3	1	0.1	0.3	0.3	1
150	Imazaquin	+	7.0	0.2	0.6	0.3	1	0.1	0.3
151	Imazethapyr	+	6.5	0.03	0.1	0.1	0.3	0.1	0.3
152	Imibenconazole	+	9.8	0.1	0.3	0.3	1	1	3
153	Imidacloprid	+	5.1	0.1	0.3	0.1	0.3	0.5	1.5
154	Indoxacarb	+	9.4	0.3	1	1	3	0.1	0.3
155	Ioxynil	-	8.1	1	3	0.3	1	1	3
156	Iprovalicarb	+	8.7	0.3	1	1	3	1	3
157	Isocarbophos	+	7.8	0.3	1	0.1	0.3	2	5
158	Isoprocarb	+	7.7	0.2	0.6	0.3	1	0.3	1
159	Isoprothiolane	+	8.5	0.3	1	0.1	0.3	1	3
160	Isoproturon	+	7.8	0.1	0.3	0.1	0.3	0.03	0.1
161	Isoxaben	+	8.4	0.02	0.05	0.03	0.1	0.1	0.3
162	Isoxadifen-ethyl	+	9.0	0.3	1	0.3	1	0.1	0.3
163	Kresoxim-methyl	+	9.0	0.3	1	1	3	2	5
164	Lenacil	+	7.7	0.03	0.1	0.3	1	0.3	1
165	Malaoxon	+	7.0	0.1	0.3	0.5	1.5	0.1	0.3
166	Mandipropamid	+	8.4	0.3	1	0.3	1	0.3	1
167	MCPA	-	7.8	0.5	2	1	3	2	5
168	Mefenacet	+	8.7	0.03	0.1	0.03	0.1	0.03	0.1
169	Mepiquat chloride	+	0.8	0.1	0.3	0.03	0.1	0.03	0.1
170	Mepronil	+	8.6	0.1	0.3	0.1	0.3	0.03	0.1
171	Metamitron	+	5.4	0.3	1	1	3	1	3
172	Metazachlor	+	7.7	0.3	1	0.1	0.3	0.1	0.3
173	Metconazole	+	7.2	0.1	0.3	0.1	0.3	0.1	0.3
174	Methabenzthiazuron	+	8.0	0.1	0.3	0.03	0.1	0.03	0.1
175	Methamidophos	+	2.1	0.3	1	1	3	1	3
176	Methiocarb	+	8.4	0.2	0.6	0.1	0.3	0.1	0.3
177	Methiocarb-sulfone	+	5.8	0.1	0.3	0.1	0.3	0.1	0.3
178	Methiocarb-sulfoxide	+	5.3	0.03	0.1	0.1	0.3	0.1	0.3
179	Methomyl	+	4.2	0.03	0.1	0.1	0.3	0.3	1
180	Methoprotryne	+	7.9	0.1	0.3	0.1	0.3	0.3	1
181	Methoxyfenozide	+	8.6	0.1	0.3	1	3	1	3
182	Metobromuron	+	7.8	0.1	0.3	1	3	0.3	1
183	Metolachlor	+	8.9	0.3	1	0.1	0.3	0.3	1
184	Metolcarb	+	6.6	0.2	0.6	0.3	1	0.3	1
185	Metosulam	+	7.1	0.1	0.3	0.3	1	0.1	0.3
186	Metoxuron	+	6.4	0.3	1	2	5	1	3
187	Metrafenone	+	9.3	0.1	0.3	0.3	1	0.3	1
188	Metsulfuron-methyl	+	7.0	0.3	1	0.1	0.3	0.1	0.3
189	Mevinphos	+	6.0	0.03	0.1	1	3	0.1	0.3
190	Mexacarbate	+	4.8	0.03	0.1	0.1	0.3	0.3	1
191	Monocrotophos	+	4.6	0.2	0.6	0.1	0.3	0.1	0.3

	Name	Polarity	RT	Strawberry		Leek		Flour	
				LOD	LOQ	LOD	LOQ	LOD	LOQ
192	Monolinuron	+	7.5	0.03	0.1	0.1	0.3	0.1	0.3
193	Napropamide	+	8.9	0.1	0.3	0.3	1	0.03	0.1
194	Neburon	+	9.1	0.3	1	0.1	0.3	2	5
195	Nicosulfuron	+	6.9	0.3	1	0.1	0.3	0.1	0.3
196	Nuarimol	+	8.3	0.3	1	0.3	1	1	3
197	Ofurace	+	7.0	0.3	1	0.3	1	0.3	1
198	Omethoate	+	3.3	0.1	0.3	0.1	0.3	0.1	0.3
199	Oxadixyl	+	6.5	0.3	1	0.3	1	0.3	1
200	Oxamyl (NH4)	+	4.0	0.1	0.3	0.1	0.3	0.01	0.05
201	Paclobutrazol	+	8.5	0.3	1	0.3	1	1	3
202	Penconazole	+	9.1	0.1	0.3	0.1	0.3	0.2	0.6
203	Pencycuron	+	9.4	0.1	0.3	0.1	0.3	0.1	0.3
204	Phenmedipham	+	8.0	2	5	2	5	5	10
205	Phenthoate	+	9.0	0.1	0.3	0.1	0.3	0.3	1
206	Phoxim	+	9.3	0.3	1	2	5	2	5
207	Picoxystrobin	+	9.0	0.03	0.1	0.3	1	0.3	1
208	Piperonyl butoxide	+	9.8	0.003	0.01	0.1	0.3	0.03	0.1
209	Piperophos	+	9.4	0.03	0.1	0.03	0.1	0.03	0.1
210	Pirimicarb	+	6.2	0.1	0.3	0.3	1	0.3	1
211	Pirimiphos-methyl	+	9.3	0.03	0.1	0.03	0.1	0.03	0.1
212	Primisulfuron-methyl	+	8.6	0.2	0.5	0.3	1	0.1	0.3
213	Prochloraz	+	9.3	0.1	0.3	0.1	0.3	0.3	1
214	Profenophos	+	9.6	0.03	0.1	0.01	0.03	0.03	0.1
215	Promecarb	+	8.5	0.1	0.3	0.3	1	0.1	0.3
216	Prometon	+	7.4	0.03	0.1	0.1	0.3	0.3	1
217	Prometryn	+	8.4	0.2	0.6	0.2	0.6	0.2	0.6
218	Propamocarb	+	3.5	0.03	0.1	0.03	0.1	0.03	0.1
219	Propazine	+	8.3	0.1	0.3	0.3	1	0.3	1
220	Propetamphos	+	8.6	0.3	1	1	3	0.03	0.1
221	Propiconazole	+	9.2	0.1	0.3	0.1	0.3	0.1	0.3
222	Propoxur	+	6.9	0.3	1	0.3	1	0.03	0.1
223	Propyzamide	+	8.6	0.3	1	0.3	1	1	3
224	Prosulfocarb	+	9.6	0.1	0.3	0.3	1	0.1	0.3
225	Pymetrozine	+	3.5	0.1	0.3	0.1	0.3	0.1	0.3
226	Pyraclostrobin	+	9.3	0.03	0.1	0.1	0.3	0.01	0.03
227	Pyrimethanil	+	8.3	0.3	1	0.3	1	0.3	1
228	Pyroxsulam	+	7.0	0.1	0.3	0.03	0.1	0.1	0.3
229	Quinoxifen	+	10.1	0.03	0.1	0.1	0.3	0.1	0.3
230	Quizalofop-ethyl	+	9.6	0.03	0.1	0.1	0.3	0.1	0.3
231	Quizalofop-p	+	8.9	0.3	1	2	5	2	5
232	Resmethrin	+	10.3	1	3	n	n	10	20
233	Rimsulfuron	+	7.4	0.03	0.1	0.3	1	0.3	1
234	Rotenone	+	8.9	0.3	1	0.3	1	0.3	1
235	Schradan	+	5.8	0.03	0.1	0.3	1	0.03	0.1
236	Sethoxydim	+	9.7	2	5	50	100	2	5
237	Simeconazole	+	8.8	0.3	1	5	10	5	10
238	Simetryn	+	7.1	0.3	1	0.3	1	0.3	1
239	Spinosad A	+	9.3	0.3	1	0.3	1	0.3	1

	Name	Polarity	RT	Strawberry		Leek		Flour	
				LOD	LOQ	LOD	LOQ	LOD	LOQ
240	Spiromesifen	+	9.9	0.3	1	1	3	1	3
241	Spirotetramat	+	8.7	0.03	0.1	0.1	0.3	0.3	1
242	Spiroxamine	+	8.6	0.1	0.3	0.3	1	0.3	1
243	Sulfotep	+	9.1	0.1	0.3	0.3	1	0.3	1
244	Sulprofos	+	9.9	1	3	1	3	2	5
245	Tebuconazole	+	9.1	0.3	1	0.03	0.1	0.1	0.3
246	Tebufenozide	+	9.0	0.3	1	1	3	2	5
247	Tebufenpyrad	+	9.7	0.03	0.1	0.3	1	0.1	0.3
248	Tebuthiuron	+	7.1	0.03	0.1	0.1	0.3	0.3	1
249	Teflubenzuron	+	9.4	1	3	2	5	5	10
250	Tepraloxymid	+	8.7	1	3	5	10	5	10
251	Terbumeton	+	7.5	0.1	0.3	0.1	0.3	0.1	0.3
252	Terbutylazine	+	8.4	0.1	0.3	0.1	0.3	0.1	0.3
253	Terbutryn	+	8.5	0.1	0.3	0.3	1	0.3	1
254	Tetraconazole	+	8.8	0.3	1	0.3	1	0.1	0.3
255	Tetramethrin	+	9.7	0.3	1	2	5	1	3
256	Thiabendazole	+	5.3	0.3	1	0.3	1	0.3	1
257	Thiacloprid	+	6.1	0.03	0.1	0.03	0.1	0.03	0.1
258	Thiamethoxam	+	4.5	0.03	0.1	0.1	0.3	0.1	0.3
259	Thidiazuron	+	7.1	0.3	1	0.3	1	0.3	1
260	Thiobencarb	+	9.4	0.1	0.3	0.1	0.3	0.1	0.3
261	Thiophanate-methyl	+	6.9	0.3	1	0.3	1	0.3	1
262	Tolfenpyrad	+	9.7	0.03	0.1	0.1	0.3	0.1	0.3
263	Tralkoxydim	+	9.9	0.1	0.3	0.03	0.1	0.03	0.1
264	Triadimefon	+	8.6	1	3	5	10	1	3
265	Triadimenol	+	8.5	0.3	1	0.3	1	1	3
266	Triazophos	+	8.7	0.01	0.05	0.1	0.3	0.1	0.3
267	Trichlorfon	+	5.2	1	3	1	3	1	3
268	Tricyclazole	+	6.5	0.03	0.1	0.1	0.3	0.1	0.3
269	Tridemorph	+	9.2	0.3	1	2	5	0.1	0.3
270	Trietazine	+	8.8	0.3	1	0.1	0.3	0.1	0.3
271	Trifloxystrobin	+	9.4	0.03	0.1	0.03	0.1	0.03	0.1
272	Triflumizole	+	9.6	0.03	0.1	0.3	1	0.3	1
273	Vamidothion	+	5.4	0.01	0.03	0.03	0.1	0.1	0.3
274	Zoxamide	+	9.2	0.1	0.3	0.3	1	0.3	1

Table 6. Comparison of the method LOQ to the MRL for selected pesticides.

Analyte	MRL ($\mu\text{g/kg}$)			LOQ ($\mu\text{g/kg}$)		
	Strawberry	Leek	Flour	Strawberry	Leek	Flour
Acephate	10	10	10	1	1	1
Azoxystrobin	50000	10000	300	0.01	0.01	0.3
Carbaryl	50	10	500	1	1	1
Dimethomorph (sum of isomers)	50	1500	10	1	0.1	0.3
Diniconazole	50	10	10	1	1	1
Oxamyl	50	10	10	0.3	0.3	0.05
Pencycurone	50	50	50	0.3	0.3	0.3
Pyraclostrobin	100	700	200	0.1	0.3	0.03
Spinosad A	50	500	1000	1	1	1
Zoxamide	50	20	20	0.3	1	1

The relative standard deviation (RSD) is an important qualitative parameter that can be used instead of signal-to-noise ratio to provide a better estimate of LODs and LOQs. For pesticide residue analysis, SANCO/12571/2013 specifies repeatability criteria of 20% RSD for all compounds within the method scope. For example, as shown in Figure 3, 2.9% RSD was obtained for seven replicate injections of bentazon in the leek matrix at 10 $\mu\text{g/kg}$. The method RSDs at the MRLs were below 15%, establishing method reproducibility.

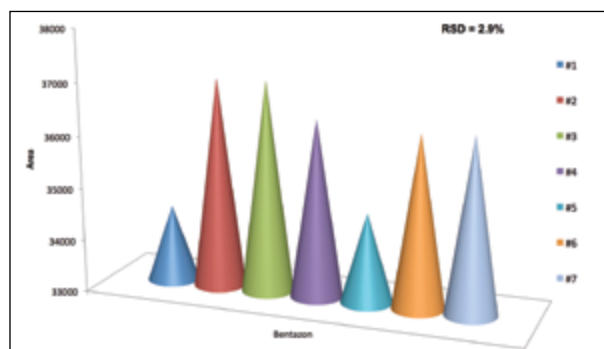


Figure 3. An RSD of 2.9% was obtained for seven replicate injections of bentazon in leek matrix at 10 $\mu\text{g/kg}$.

When using ESI, matrix effects can challenge accurate quantitation of pesticides. Though there are different strategies to compensate for these effects, the results presented in this application note are based on matrix-matched calibration. Figure 4 shows the effect of matrix on peak area. Although ion suppression is observed in the leek and wheat flour matrices, the method proved effective regardless of the matrix analyzed.

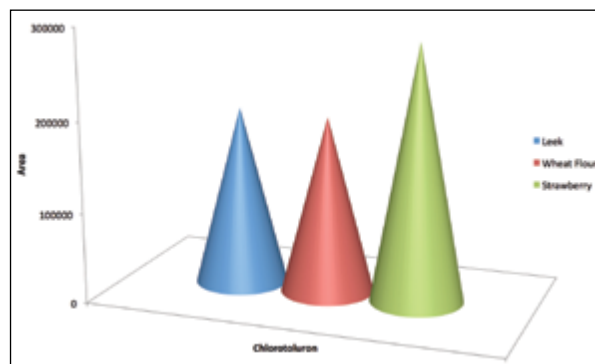


Figure 4. Matrix effects on peak area of chlorotoluron.

QuEChERS sample preparation offers a convenient and effective approach for extraction of pesticide residues in food matrices. The robust procedure has a number of compelling advantages: high recoveries, accurate results, high sample throughput, low solvent and glassware usage, reduced labor and bench space, and lower reagent costs. As shown in Figure 5, the percent recoveries achieved for selected pesticides at the 10 µg/kg level were acceptable and generally between 80 and 110% in the matrices analyzed. The pesticides selected represent results typical of all pesticides studied.

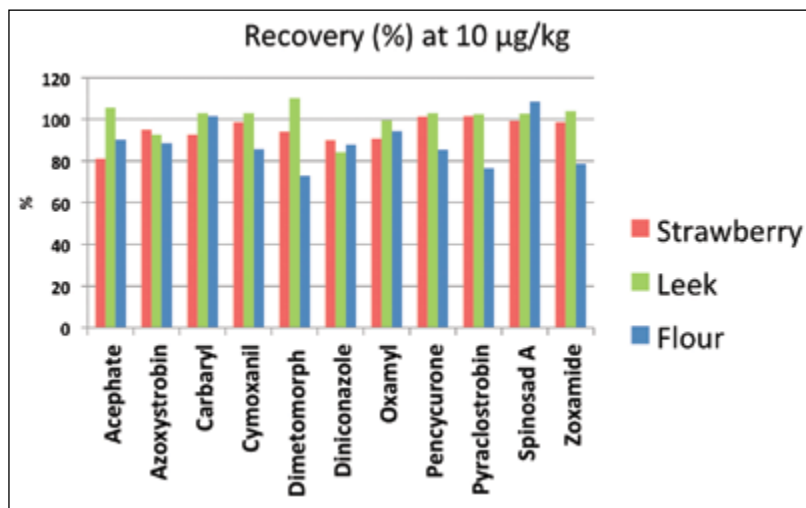


Figure 5. Recovery (%) of selected pesticides at the 10 µg/kg-level by matrix.

The quality control samples FAPAS #T19140 (lettuce puree), FAPAS #19110 (lettuce puree), FAPAS #T19142 (melon puree) and FAPAS #T0983 (wheat flour) were analyzed for their content of target pesticides to provide external quality control for method validation. As shown in Table 7, the measured target analyte values consistently fell within the acceptance range with acceptable %RSD values.

Table 7. External quality control (FAPAS) results for the relevant compounds.

Analyte	Fapas No.	Fapas Matrix	Assigned value (µg/kg)	Acceptance range (µg/kg)	Measured value (µg/kg)	RSD (%)
Carbaryl	T19142	Melon Puree	89.0	49.9–128.2	91.1	1.1
Diniconazol			52.3	29.3–75.3	59.7	9.0
Zoxamide			91.7	51.4–132.1	108.4	3.0
Pencycuron	T19140	Lettuce Puree	73.2	41.0–105.4	45.9	6.0
Thiamethoxam			48.8	27.3–70.3	36.3	9.1
Azoxystrobin	19110	Lettuce Puree	188.0	110–265	132.5	15.4
Dimetomorph (sum of isomers)			181.0	106–256	160.1	11.9
Propyzamide			197.0	116–277	195.1	16.5
Azoxystrobin	T0983	Wheat Flour	383.0	241–524	361.2	1.7
Fenhexamid			110.0	61–158	125.4	10.4
Imazalil			161.0	93–229	157.2	8.2
Thiabendazole				49.3–126.7	67.6	7.3

Conclusion

Regulations of the European Union pose some significant challenges to the analytical methods quantifying pesticide residues in complex matrices. This application note described a multi-residue LC-MS/MS method that uses the TSQ Endura triple quadrupole mass spectrometer-based Pesticide Explorer Collection Standard Quantitation solution for rapid and robust quantitation of more than 250 pesticides in fruit and vegetable matrices at their respective MRLs. For convenience and fast method implementation, the complete instrument and data processing method including SRM settings is included with the Pesticide Explorer Collection start-to-finish workflow solution.

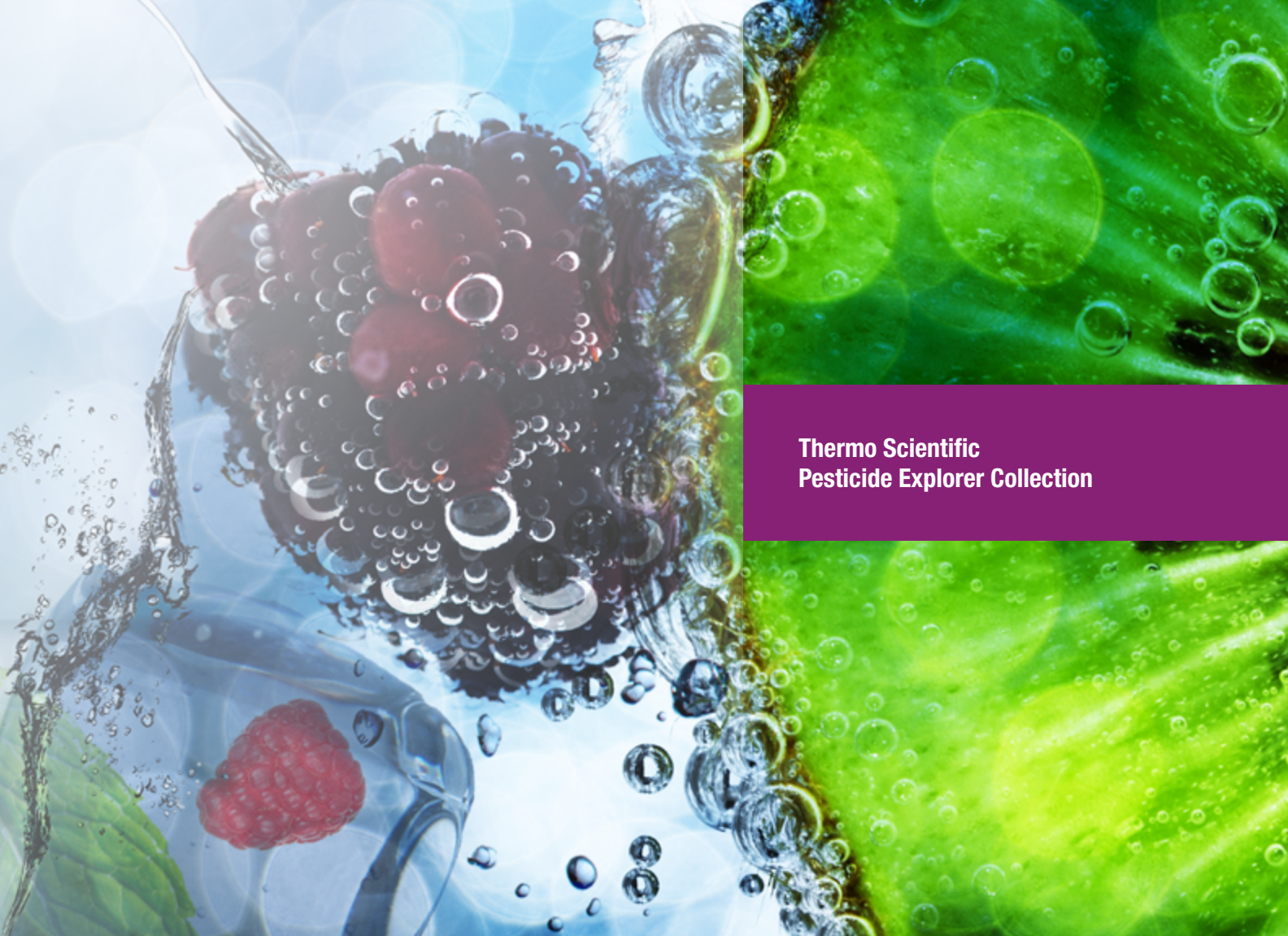
The method results were shown to comply with the stringent guidelines set forth in SANCO/12571/2003 concerning sensitivity, accuracy, and precision. In 15 minutes, all target pesticides were detected and quantified in food matrices below established MRLs. Method RSDs at the MRLs were below 15%, establishing the method's reproducibility. Percent recoveries achieved at the 100 µg/kg-level using a standard QuEChERS sample preparation protocol were in general between 80 and 110%. The QuEChERS sample extraction procedure enabled analysis of only 1 µL sample, without need for dispersive SPE sample cleanup or sample dilution, with increased robustness and throughput.

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Selection table	Triple Quadrupole Solutions		Orbitrap Solutions	
	1–Standard Quan	2–Premium Quan	3–HRAM Quan	4–HRAM Quan/Qual
Lab Profile				
<i>Routine - Standard Quantitation</i>	●			
<i>Routine - High Sensitivity Quantitation</i>		●		
<i>Routine - Targeted HRAM Quantitation</i>			●	
<i>Routine Plus - Targeted and Non-targeted Screening and Quantitation</i>				●
Workflow and Components	Targeted	Targeted	Targeted	Targeted + Non-targeted
<i>Thermo Scientific™ QuEChERS kit</i>	●	●	●	●
<i>Pre-set Methods (LC-MS)</i>	●	●	●	●
<i>Thermo Scientific™ Accucore™ aQ C18 LC columns (100 x 2.1 mm, 2.6µm)</i>	●	●	●	●
<i>Thermo Scientific™ UltiMate™ 3000 LC system (HPG-3400RS)</i>	●	●	●	●
MS System				
<i>Thermo Scientific™ TSQ Endura MS</i>	●			
<i>Thermo Scientific™ TSQ Quantiva MS</i>		●		
<i>Thermo Scientific™ Q Exactive™ Focus MS</i>			●	●
Software				
<i>Thermo Scientific™ TraceFinder™ software</i>	●	●	●	●
<i>Thermo Scientific™ Compound Discoverer™ software</i>				●
<i>Thermo Scientific™ SIEVE™ software</i>				●
<i>Thermo Scientific™ HRAM MS/MS Spectral Library</i>			●	●
<i>Quick-Start Manual</i>	●	●	●	●
<i>3-day training</i>	●	●	●	●



The Thermo Scientific™ Pesticides Explorer Collection is a comprehensive set of liquid chromatography-mass spectrometry (LC-MS) solutions designed for laboratories performing routine quantitation, targeted and non-targeted screening of pesticide residues in food matrices. Each configuration includes all the workflow components needed—consumables, hardware, software and built-in instrument and data processing methods—pre-configured and tested, from your single trusted supplier, Thermo Fisher Scientific.

Choice of configurations simplify complex pesticide methods

To ensure your immediate success, the Pesticide Explorer Collection is available in four pre-configured, pre-tested solutions.

For laboratories performing routine targeted quantitation, the Pesticide Explorer Collection offers two triple quadrupole mass spectrometer workflow-based configurations for Standard and Premier Quantitation. The Standard Quantitation configuration includes the TSQ Endura triple quadrupole mass spectrometer and ensures compliance against regulated levels of detection. For quantitative applications demanding the highest possible sensitivity, the Premier Quantitation configuration features the TSQ Quantiva triple quadrupole mass spectrometer to meet or exceed regulatory limits.

For laboratories offering specialized analytical services, there is a choice of two Thermo Scientific™ HRAM Orbitrap configurations for quantitation and screening employing the Thermo Scientific™ Q Exactive™ Focus mass spectrometer. HRAM capability significantly enhances quantitative accuracy even when analyzing complex sample matrices with limited prior clean up as well as the ability to quantify and confirm in one single analysis.

Configurations available in the Pesticide Explorer Collection

- Pesticide Explorer Collection – Standard Quantitation
- Pesticide Explorer Collection – Premier Quantitation
- Pesticide Explorer Collection – Orbitrap HRAM Quantitation
- Pesticide Explorer Collection – Orbitrap HRAM Screening and Quantitation

Robust, Routine Workflows for Triple Quadrupo

The Standard and Premier Quantitation configurations provide everything needed to perform robust, routine workflows for SRM-based quantitation of pesticides, from the QuEChERS sample extraction kit to proven multi-class pesticide residue analysis methods. Pre-configured methods for each solution are easy to access on the USB drive included with the Pesticide Explorer Collection installation guide.



Select compounds from the compound database to automatically create the instrument and processing method.

Users can quickly and easily set up a new method using the TraceFinder software compound database, or by uploading and modifying pre-configured methods.



UltiMate 3000 LC System with TSQ Endura MS or TSQ Quantiva MS

SELECT

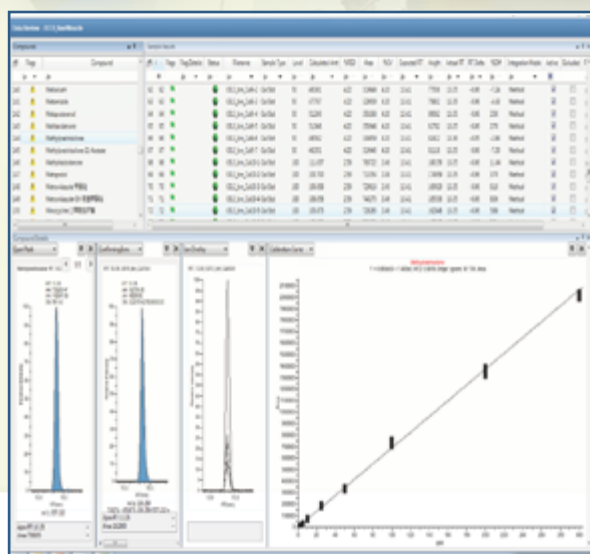


Select a pre-configured TSQ-tested method with column and conditions. Load and go!

Compound	Retention Time (min)	Product Mass	Target Peaks	Library
1,2,3,4-Tetrachlorobenzene	10.1	286.0	286.0	1
1,2,3,5-Tetrachlorobenzene	10.2	286.0	286.0	1
1,2,4,5-Tetrachlorobenzene	10.3	286.0	286.0	1
1,3,4,5-Tetrachlorobenzene	10.4	286.0	286.0	1
1,2,3,6-Tetrachlorobenzene	10.5	286.0	286.0	1
1,2,4,6-Tetrachlorobenzene	10.6	286.0	286.0	1
1,3,4,6-Tetrachlorobenzene	10.7	286.0	286.0	1
1,3,5,6-Tetrachlorobenzene	10.8	286.0	286.0	1
1,4,5,6-Tetrachlorobenzene	10.9	286.0	286.0	1
1,2,3,7-Tetrachlorobenzene	11.0	286.0	286.0	1
1,2,4,7-Tetrachlorobenzene	11.1	286.0	286.0	1
1,3,4,7-Tetrachlorobenzene	11.2	286.0	286.0	1
1,3,5,7-Tetrachlorobenzene	11.3	286.0	286.0	1
1,4,5,7-Tetrachlorobenzene	11.4	286.0	286.0	1
1,2,3,8-Tetrachlorobenzene	11.5	286.0	286.0	1
1,2,4,8-Tetrachlorobenzene	11.6	286.0	286.0	1
1,3,4,8-Tetrachlorobenzene	11.7	286.0	286.0	1
1,3,5,8-Tetrachlorobenzene	11.8	286.0	286.0	1
1,4,5,8-Tetrachlorobenzene	11.9	286.0	286.0	1
1,2,3,9-Tetrachlorobenzene	12.0	286.0	286.0	1
1,2,4,9-Tetrachlorobenzene	12.1	286.0	286.0	1
1,3,4,9-Tetrachlorobenzene	12.2	286.0	286.0	1
1,3,5,9-Tetrachlorobenzene	12.3	286.0	286.0	1
1,4,5,9-Tetrachlorobenzene	12.4	286.0	286.0	1
1,2,3,10-Tetrachlorobenzene	12.5	286.0	286.0	1
1,2,4,10-Tetrachlorobenzene	12.6	286.0	286.0	1
1,3,4,10-Tetrachlorobenzene	12.7	286.0	286.0	1
1,3,5,10-Tetrachlorobenzene	12.8	286.0	286.0	1
1,4,5,10-Tetrachlorobenzene	12.9	286.0	286.0	1

Flexibility in the instrument method allows you to create or edit pre-configured methods with SRM transitions and retention times with ease.

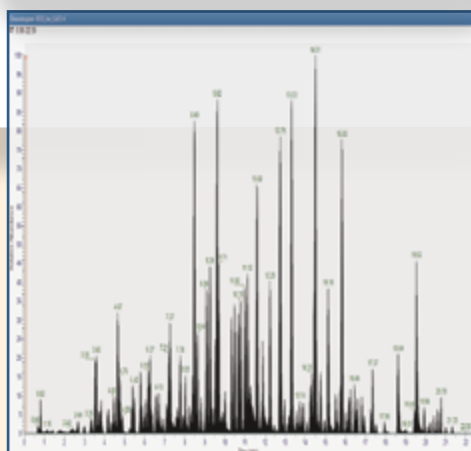
File-Based Quantitation



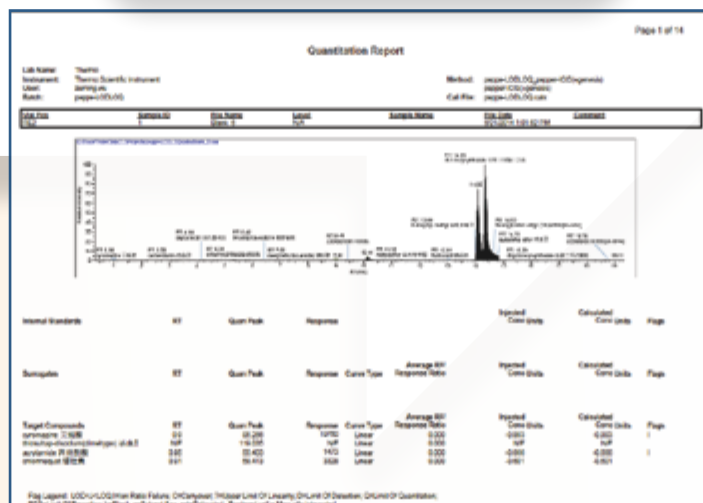
The color flagging features in TraceFinder software enable the analyst to quickly review and confirm results.

LOAD METHOD AND ACQUIRE DATA

REVIEW AND REPORT



Data is acquired under optimal conditions for large multi-component pesticide residue analysis.

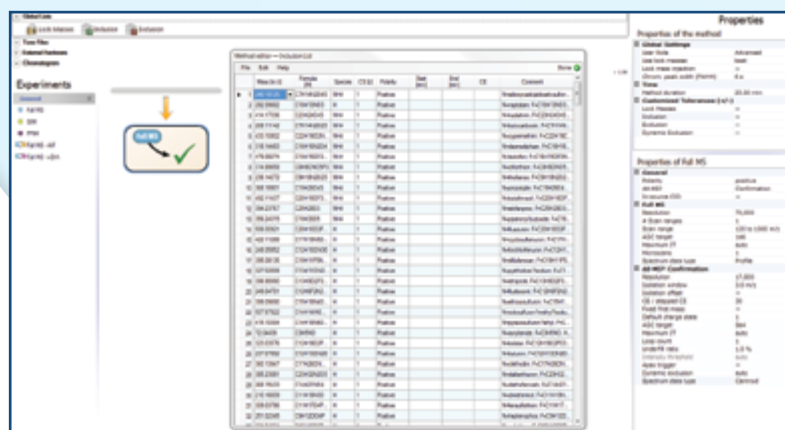


After data review, generate high-quality standard and custom reports to rapidly turn your samples into results.

Routine Workflows for Orbitrap HRAM Targeted

The Orbitrap HRAM Quantitation configuration provides high resolution accurate mass analysis, a unique capability that enables quantitation without compromise in sensitivity, accuracy, precision, or linear dynamic range. High resolving power is particularly useful for the analysis of contaminants in complex matrices and can overcome the masking effects of isobaric inferences, allowing detection of analytes at very low concentrations.

Reduce method development time by using the HRAM spectral fragmentation library and compound database to identify compounds with speed and confidence.



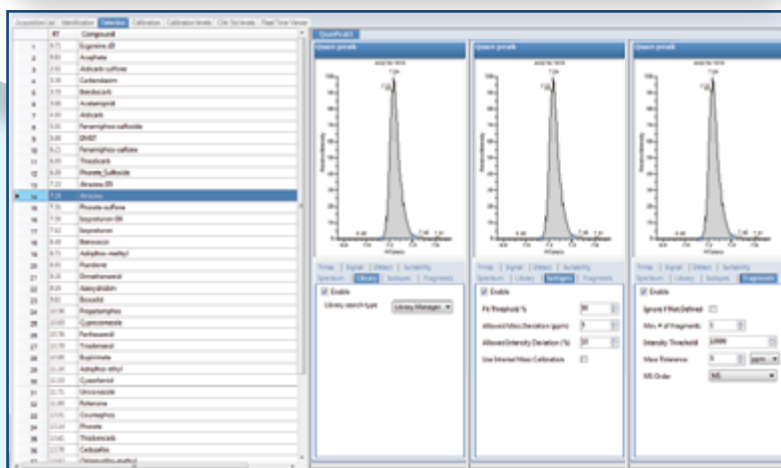
Pre-configured instrument methods for targeted quantitation enable the user to quickly start acquiring data.

SELECT



Q Exactive Focus MS and UltiMate 3000 LC System

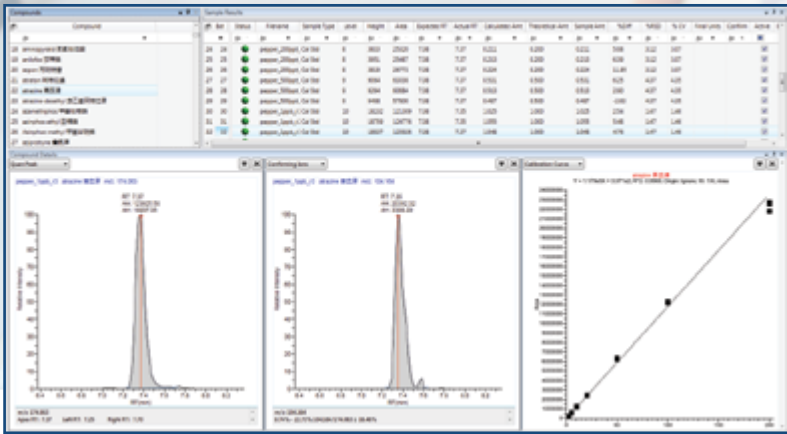
LOAD METHOD AND ACQUIRE DATA



Master Method templates available with the Pesticide Explorer Collection instantly allows users to acquire and process data for quantitation.

Quantitation

Review results rapidly by flagging method criteria and/or regulatory levels. Choose from a large number of pre-defined and customizable report templates meeting a variety of regulatory requirements. View the result of changes to the data processing method immediately without manual intervention.



In data review, the analyst is able to quickly glance through all compounds and samples in a single view.

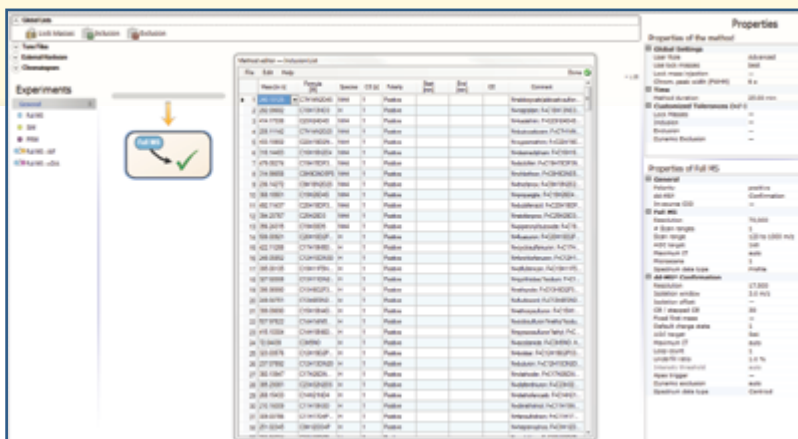
REVIEW AND REPORT

Quantitation Report - 2									
MS Integ Parameters:		Quant Method:		Table:		Last Update:		Data Acq Method:	
Quant Parameters:		Sample Name:		Sample Date:		Sample Time:		Sample Comment:	
Quant Results:		Quant Results File:		Quant Results Date:		Quant Results Time:		Quant Results User:	
Internal Standards									
#	Compound Name	RT	Quant Peak	Response	Conc. Units	Det. (ppm)	Flags		
1	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
2	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
3	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
Sample Compounds									
#	Compound Name	RT	Quant Peak	Response	Conc. Units	Det. (ppm)	Spikes Amt	Recovery	Flags
1	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
2	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
3	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
Target Compounds									
#	Compound Name	RT	Quant Peak	Response	Conc. Units	Det. (ppm)	Flags		
1	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
2	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
3	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
4	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
5	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
6	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
7	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
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15	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
16	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
17	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
18	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
19	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
20	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
21	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
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24	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
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26	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
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29	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
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67	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
68	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
69	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
70	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
71	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
72	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
73	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
74	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
75	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
76	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
77	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
78	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
79	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
80	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
81	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
82	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
83	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
84	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
85	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
86	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
87	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
88	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
89	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
90	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
91	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
92	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
93	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
94	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
95	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
96	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
97	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			
98	Epigallocatechin gallate	7.16	221.1524	207627821	1.000	0.00			
99	Epigallocatechin gallate	7.04	213.1885	304362680	1.000	0.00			
100	Epigallocatechin gallate	9.72	189.1313	339415070	1.000	0.00			

Customizable reports can easily be exported in MS Excel format for possible LIMS integration.

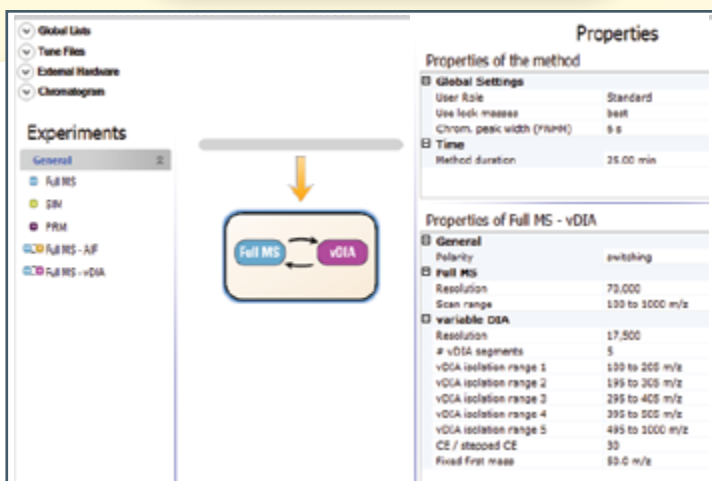
New Analytical Capability Workflows For

The Q Exactive Focus mass spectrometer produces data that can be used for highly sensitive and selective quantitation as well for in-depth screening. Built-in databases designed for food safety and environmental analyses make quantitation, and targeted as well as non-targeted screening from a single data set seamless, with the option to reanalyze data retrospectively at a future date without the need for sample reinjection. Even without using reference standards, TraceFinder software allows the user to perform relative quantitation between multiple samples in their workflow.



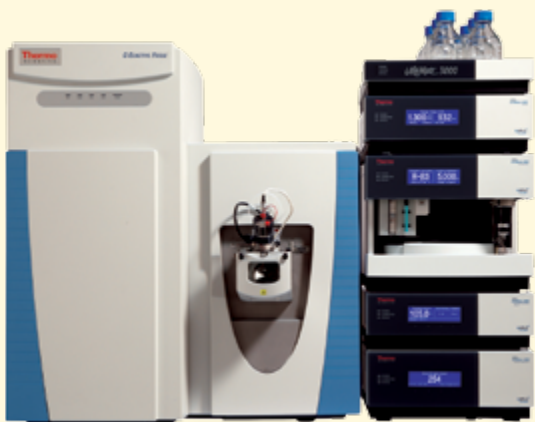
With full-scan, targeted data-dependant MS/MS, the analyst enjoys greater flexibility to detect large sets of compounds in a single run.

METHOD SELECTION



With variable data independent acquisition (vDIA), full-scan MS and MS/MS HRAM analysis, no sample-specific method optimization is necessary, and the risk of missing important non-targeted compounds is greatly reduced.

Targeted Screening



Q Exactive Focus MS and UltiMate 3000 LC System

Non-targeted Screening

Orbitrap HRAM Screening and Quantitation

Built-in databases in TraceFinder software allow the user to perform quantitation.



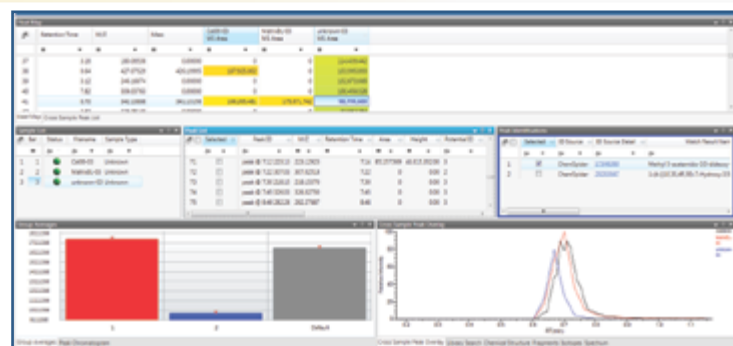
Target Screening Summary Report									
1	Batch:	SPV Screening Focus							
2	Method:	SPV Screening							
3	Best Method:	SPV Screening							
4	Sample ID:	Unknown_2							
5	Sample Type:	Unknown_2							
6	Sample File:	Unknown_2							
7	Sample Path:	Unknown_2							
8	Sample Name:	Unknown_2							
9	Sample Date:	2012/11/14 11:14:11							
10	Sample Time:	2012/11/14 11:14:11							
11	Sample Location:	Unknown_2							
12	Sample Operator:	Unknown_2							
13	Sample Status:	Unknown_2							
14	Sample Comment:	Unknown_2							
15	Sample Notes:	Unknown_2							
16	Sample ID:	Unknown_2							
17	Sample File:	Unknown_2							
18	Sample Path:	Unknown_2							
19	Sample Name:	Unknown_2							
20	Sample Date:	2012/11/14 11:14:11							
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23	Sample Operator:	Unknown_2							
24	Sample Status:	Unknown_2							
25	Sample Comment:	Unknown_2							
26	Sample Notes:	Unknown_2							
27	Sample ID:	Unknown_2							
28	Sample File:	Unknown_2							
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37	Sample Notes:	Unknown_2							
38	Sample ID:	Unknown_2							
39	Sample File:	Unknown_2							
40	Sample Path:	Unknown_2							
41	Sample Name:	Unknown_2							
42	Sample Date:	2012/11/14 11:14:11							
43	Sample Time:	2012/11/14 11:14:11							
44	Sample Location:	Unknown_2							
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64	Sample Date:	2012/11/14 11:14:11							
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98	Sample Time:	2012/11/14 11:14:11							
99	Sample Location:	Unknown_2							
100	Sample Operator:	Unknown_2							

View positive hits during data review; confirmation is easily done using fragmentation, spectra, retention time, and isotope pattern information.

Detailed reports are generated and exported for printing and also customizable for individual customers.

CONFIRM RESULTS

REVIEW AND REPORT



When integrated into the TraceFinder workflow, SIEVE software extracts compound spectra from complex data and performs differential and statistical analysis to determine the compounds that vary significantly within the sample set.



Compound Discoverer software can be used to identify the degradants and metabolites of known target compounds.

Power of HRAM MS/MS Spectral Libraries and Compound Databases

The Thermo Scientific Pesticide Explorer Collection includes the High-Resolution Accurate-Mass MS/MS Spectral Libraries and TraceFinder compound databases. These were designed specifically for targeted screening, quantitation and analysis of non-targeted contaminants in food, environmental, clinical research and forensic toxicology sample matrices. Fully integrated and searchable using TraceFinder software with over 2,600 compounds and more than 15,000 spectra, the HRAM MS/MS Spectral Libraries can be used to screen and identify a variety of known and unknown compounds with speed and confidence. To reduce method development time and increase confidence in compounds detected, the HRAM MS/MS compound database includes retention times that were determined using the same internal standards.

Laboratories using The Pesticide Explorer Collection comprising of either the Orbitrap HRAM Quantitation or Orbitrap HRAM Screening and Quantitation configuration will enjoy the time-savings provided by an “off-the-shelf” database of MS/MS spectra – no need to build your own libraries! To meet specific laboratory requirements, the libraries can be expanded and customized by adding new compounds and spectra.

COMPOUND CLASS	
Food Safety and Environmental	Forensic Toxicology
Emerging Environmental Contaminants	Drugs of Abuse
Pesticides	Natural and Industrial Toxins
Veterinary Drugs	Prescription Drugs
Mycotoxins	Performance Enhancing Drugs
Perfluorinated Compounds (PFCs)	Other Drug Monitoring Research

Table 1. Compound classes provided in the HRAM MS/MS spectral libraries.

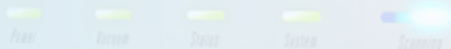
Compound Groupings	Unique Entries	Total Spectra
Environmental and Food Safety	1,634	8,906
Clinical Research and Forensic Toxicology	926	4,630

Table 2. Unique entries and total spectra in the HRAM MS/MS spectral libraries.



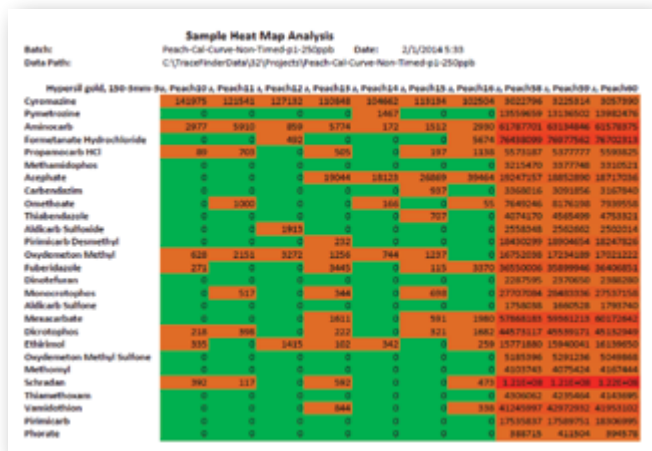
Thermo Scientific m/z Cloud Library assists with unknown identification

The m/z Cloud library is a continuously expanding, highly curated mass spectral fragmentation database that assists in the identification of compounds when they are not in local spectral fragmentation libraries. The library features a freely searchable collection of HRAM spectra that can be accessed using an advanced spectral correlation algorithm.



Q EXACTIVE FOCUS

Comprehensive, High Productivity Reporting



As the identification of pesticide residues becomes increasingly important, so does that ability to review and report results quickly and accurately. In particular, high productivity multi-residue analyses require accurate and robust reporting across multiple regulatory agencies. The TraceFinder software reporting system allows creation and automated generation of quantitative and qualitative reports covering a broad array of pesticide residue analysis methods. The reports can be tailored to meet specific reporting needs.

The heat map reporting templates allow for the quick evaluation of the presence of components and their relative abundance across the sample set.

Powerful Software Empowers Your Pesticide Analyses



TraceFinder software provides an extensive suite of targeted quantitation and screening LC-MS workflows, experiments and reports for environmental and food safety applications as well as protects the integrity of the analytical data.

Further updates on the TraceFinder compound database are offered to registered users at <https://thermo.flexnetoperations.com>



SIEVE software enables label-free, semi-quantitative differential analysis of complex LC-MS data sets. Whether your analytes are large or small molecules or whether you are comparing two or hundreds of samples, SIEVE software confidently and reproducibly identifies components with statistically significant inter-sample differences in abundance.



Designed to save time, Compound Discoverer software includes an extensive set of tools to ensure confident compound identification and structural elucidation in pharmaceutical metabolism, impurity analysis, forensic toxicology, and food and environmental applications.

Single Provider Solution Ensures Your Success

The Pesticide Explorer Collection provides start-to-finish workflows tailored to help food monitoring and testing laboratories reduce startup time and cost. The collection provides compelling productivity and efficiency enhancements for both startup laboratories and laboratories adding new analytical capabilities to address evolving customer and industry demands. Regardless of staff or laboratory expertise, the Pesticide Explorer Collection is designed to make it easier for both new and experienced users to obtain reliable, unambiguous, high-quality LC-MS/MS results. At Thermo Fisher Scientific, we'll match you to the right products - through experienced commercial support combined with the most comprehensive line of instruments, equipment, consumables, chemicals, reagents and software available.



QuEChERS products are a convenient and effective approach for determining pesticide residues in fruit, vegetables and other foods. The extraction and clean-up products are easy to use and enable researchers to determine greater numbers of pesticides than with standard SPE.



Perform the full range of HPLC or nano HPLC applications on one system platform using UltiMate 3000 RSLC systems. For added mobile phase flexibility, the included Thermo Scientific™ Dionex™ Ultimate™ HPG-3400RS Rapid Separation Binary Pump is included, provides true ballistic gradients with excellent retention time precision.



Simplify and improve your analytical results with Thermo Scientific™ HPLC columns. Available in particle sizes and column designs to meet all separation needs, they improve resolution, enhance sensitivity, and deliver faster analysis and consistent performance.



Meet today's challenges with us to safeguard the global food supply. Triple quadrupole MS delivers SRM sensitivity and speed to detect targeted compounds more quickly and HRAM solutions using Thermo Scientific™ Orbitrap™ MS enables screening with accurate quantitation of hundreds of contaminants.



Screening, identification, and quantification of food and environmental contaminants are faster and more confident with High-Resolution Accurate-Mass MS/MS Spectral Libraries. The libraries provide high-resolution, accurate-mass (HRAM) MS/MS spectra for identification, confirmation, and quantification of thousands of compounds.

www.thermofisher.com/Pesticides-LCMS

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Thermo Scientific TSQ Endura Triple-Stage Quadrupole Mass Spectrometer

Extreme quantitative value with unprecedented ease

- Extreme quantitative value in a triple quadrupole mass spectrometer
- Best-in-class sensitivity
- Ultrafast selected-reaction monitoring enables quantification of more compounds in less time
- Superb robustness and reliability
- Close integration with application-specific software ensures maximum productivity
- Simple method development and easy operation



The Thermo Scientific™ TSQ Endura™ triple-stage quadrupole mass spectrometer provides unparalleled value, with LODs and LOQs unrivaled in its class. It delivers this best-in-class quantitation run after run and day after day, even for complex and difficult-to-run samples. Close integration with application-specific software ensures maximum productivity. The instrument's

excellent analytical performance doesn't come at the price of complexity or lack of durability; breakthrough software and hardware developments make operation far easier and more reliable than in previous-generation triple quadrupoles. The TSQ Endura MS helps users spend more time thinking about their analyses and less time worrying about instrument setup and operation.



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Hardware Features

Thermo Scientific™ EASY-Max NG™ API Source

- Automatic connection of all gases and voltages on installation for simpler operation and greater reliability
- Automatic source recognition for ease of use and simplified data logging
- Sweep gas reduces chemical noise
- Enhanced exhaust port efficiently removes solvent vapor, improving uptime and reducing chemical noise
- Optimal 60 degree spray angle
- Minimal adjustment
- Interchangeable HESI and APCI ionization probes
- Dual-mode HESI and APCI capability

Ion Optics

RF-Lens

The progressively spaced stacked-ring ion guide (RF-Lens) captures and efficiently focuses ions in a tight beam. Large variable spacing between electrodes provides better pumping efficiency and improved ruggedness. Automatic tuning program optimizes ion transmission.

Ion Beam Guide

The ion beam guide, with its neutral blocker, stops neutrals and high-velocity clusters, keeping the ion optics cleaner, reducing noise, and increasing sensitivity.

Hyperbolic Quadrupole Mass Filter (Q1 and Q3)

Hyperbolic quadrupoles with high ion transmission at isolation widths down to 0.4 amu provide excellent sensitivity and selectivity.

Active Collision Cell (Q2)

The high-pressure argon-filled collision cell produces efficient fragmentation for high sensitivity. An axial DC field speeds ion transits, yielding up to 500 SRM/s with zero cross talk.

Vacuum System

- Four-stage differentially pumped vacuum manifold
- Advanced triple-inlet turbomolecular pump integrated with the vacuum manifold
- Single rotary vacuum pump configuration

Detector

- Dual-mode discrete-dynode detector increases sensitivity by operating in pulse-counting mode when ion flux is low and analog mode when ion flux is high
- Six orders of dynamic range provide high-confidence quantitation

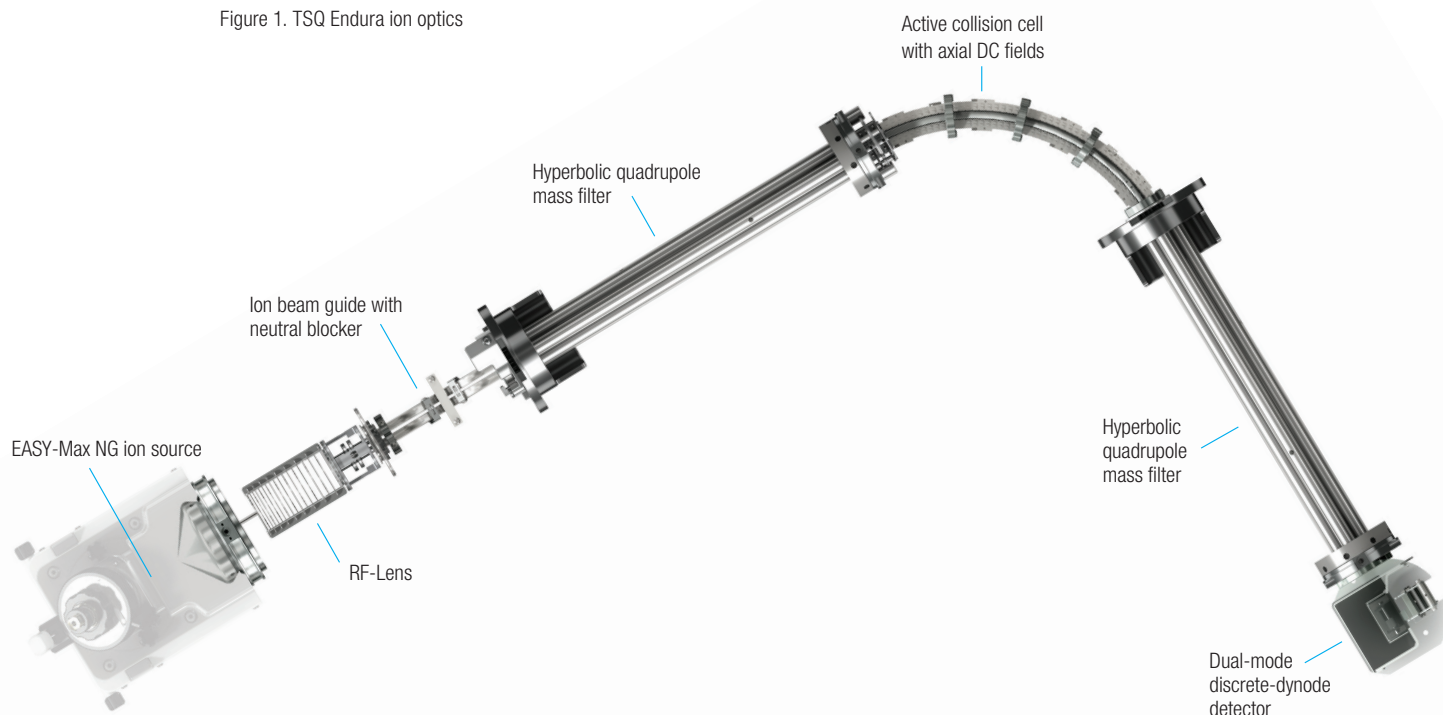
Integrated Divert Valve and Syringe Pump

Fully automated data system control of the divert valve enables switching the solvent front, gradient end point, or any portion of the HPLC run to waste.

Optional Ion Sources

- Thermo Scientific™ Ion Max NG™ ion source provides ultimate performance with full adjustments for optimization
- Thermo Scientific™ EASY-Spray NG™ ion source is designed for maximum nanoelectrospray performance with no need for adjustments
- Thermo Scientific™ Nanospray Flex NG™ ion source is designed for ultimate nanoelectrospray performance with complete flexibility of column selection

Figure 1. TSQ Endura ion optics



Software Features

Data System

- High-performance PC with Intel® microprocessor
- High-resolution LCD color monitor
- Microsoft® Windows® 7 operating system (64 bit)
- Microsoft Office 2010 software

Standard MS Software

- Thermo Scientific™ Xcalibur™ processing and instrument control software
- Tune editor for system calibration, diagnostics, and manual data acquisition
- Method editor with comprehensive application-specific template library and drag-and-drop user interface to facilitate method development
- Automated optimization of all instrument parameters, including gas pressures and collision energy, within an experiment
- Direct control of multiple vendors' LC systems and autosampler configurations through Xcalibur software
- Foundation of shared, state-of-the-art software makes it easier to transfer methods between next-generation instruments

Scan Functions

- Highly sensitive full-scan MS in Q1 or Q3
- Selected-ion monitoring (SIM) in Q1 or Q3
- Selected-reaction monitoring (SRM) with up to 30,000 SRMs definable and up to 500 SRMs/s
- High-resolution (0.4 Da) selected-reaction monitoring
- Product ion scanning
- Precursor ion scanning
- Neutral-loss scanning
- Reverse energy ramp (RER) MS/MS spectra gives information-rich MS/MS spectra for solid compound identification
- Polarity switching capabilities
- Quantitation-enhanced data-dependent (QED) MS/MS
- Mixed Mode Scan Function

Optional Application-Specific Software

- Thermo Scientific™ LCQUAN™ quantitation software supports 21 CFR Part 11 compliance
- Thermo Scientific™ TraceFinder™ software simplifies method development and routine analysis in food safety, environmental, clinical research, and forensic toxicology laboratories
- Thermo Scientific™ Mass Frontier™ spectral interpretation and classification software for the identification of unknowns
- Supports the use of Skyline software (MacCoss Lab, University of Washington) for method development and data analysis for peptide applications

Performance Specifications

Sensitivity

Positive Electrospray (HESI)

A 2 µL injection of a 500 fg/µL reserpine solution will produce a minimum signal-to-noise ratio of 80,000:1 for the transition of the protonated molecule at m/z 609.3 to the fragment ion at m/z 195.1 when operated in selected-reaction monitoring (SRM) mode with Q1 and Q3 resolution set to 0.4 and 0.7 Da FWHM respectively.

Atmospheric Pressure Chemical Ionization (APCI)

A 2 µL loop injection of a 500 fg/µL reserpine solution will produce a minimum signal-to-noise ratio of 25,000:1 for the transition of the protonated molecular ion at m/z 609.3 to the fragment ion at m/z 195.1 when operated in selected reaction monitoring (SRM) mode with Q1 and Q3 resolution both set to 0.7 Da FWHM.

Negative Electrospray (nESI)

A 2 µL loop injection of a 500 fg/µL chloramphenicol solution will produce a minimum signal-to-noise ratio of 80,000:1 for the transition of the deprotonated molecular ion at m/z 321.0 to the fragment ion at m/z 152.0 when operated in selected reaction monitoring mode (SRM) with Q1 and Q3 resolution set to 0.4 and 0.7 Da FWHM, respectively.

Mass Range

m/z 10–3400

Resolution

Q1 and Q3 adjustable to 0.4 Da peak width (FWHM) across the entire mass range

Scan Rate

15,000 amu/second at a resolution of 2 FWHM

500 SRM/second (for any resolution from 0.4 through 2.0 FWHM)

25msec polarity switching

Mass Stability

Mass assignment will be within ± 0.05 Da over a 24 hour period. The laboratory room temperature must be maintained between 18–27 °C (65–81 °F). The room temperature may not change by more than 5 °C (9 °F) during this period.

Installation Requirements

Power

- Three 230 Vac $\pm 10\%$, 50/60 Hz at 16 A minimum
- Four 120 Vac $+6-10\%$, 50/60 Hz at 20 A or four 230 Vac $\pm 10\%$, 50/60 Hz at 13 A
- Earth ground hardwired to main panel
- Free from voltage variations above or below the recommended operating range

Gas

- Collision gas: 99.995% pure argon
- Collision gas supply pressure: 135 ± 70 kPa (20 ± 10 psig)
- Sheath/aux/sweep gas: 99% pure nitrogen
- Sheath/aux/sweep gas supply pressure: 690 ± 140 kPa (100 ± 20 psig)
- Maximum sheath gas consumption: ≈ 20 L/min

Environment

- Functional temperature range: $15-27$ °C ($59-81$ °F)
- Optimal temperature range: $18-21$ °C ($65-70$ °F)
- Heat output: 1550 W (5400 Btu/h)
- Total system heat output: 4420 W (15,380 Btu/h)
- Particulate matter: $<3,500,000$ particles per cubic meter of air ($<100,000$ particles of >5 μ m diameter per cubic foot of air)
- Relative humidity: 20% to 80%, without condensation
- Floors must be free of vibration

Dimensions

Size

- TSQ Endura MS¹: $680 \times 760 \times 840$ mm (h, w, d – $27 \times 30 \times 33$ in)
- Oerlikon® SV 65 forepump: $270 \times 320 \times 489$ mm (h, w, d – $10 \times 13 \times 19$ in)

Weight

- TSQ Endura MS: 125 kg (275 lb)
- Oerlikon® SV 65 forepump: 52 kg (115 lb)

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Thermo Scientific Dionex UltiMate 3000 Well Plate Autosampler

The Benchmark in LC Liquid Handling

Thermo Scientific™ Dionex™ UltiMate™ 3000 products are UHPLC compatible by design, establishing the new standard in conventional LC. Integrating hardware, software, and separation chemistry, we offer UHPLC to everyone—for all needs.



UHPLC⁺
focused

Versatile and Flexible

The UltiMate 3000 Autosamplers ensure reliable, precise, and accurate injections from nL to mL sample volumes, supporting pressure up to 125 MPa (18,130 psi) for UHPLC and HPLC applications. They manage flow ranges from nano/capillary to micro and from analytical to semipreparative scale.

Beyond the unique UHPLC autosamplers, dedicated autosamplers are available for biochromatographic separations, electrochemical detection, as well as fractionation in the μ L and mL volume range (Table 1).

A large variety of tray formats are supported by all UltiMate 3000 autosamplers. This provides tremendous flexibility for sampling and fractionation, as well as automated sample preparation steps.

All autosamplers provide a uniform fluidic design making the fluidics easy to upgrade.

Precise and Reliable

Fast high-precision syringe drives offer excellent injection accuracy and precision within the in-line split-loop (flow-through) and pulled-loop autosampler series. This also allows easy and robust method transfer between UltiMate 3000 systems.

High-quality autosampler components, intelligent mechanical and electronic design, and rigorous quality assurance testing guarantee durable and reliable operation. Automated equipment qualification tests and predictive performance indicators simplify installation, qualification, and performance verification. Easy front-panel access and a clean and intuitive fluidic design ensure optimum ease of use and effortless maintenance.

Unique and Elaborate

The flow-through autosamplers achieve injection cycle times < 15 s for 5 μ L for maximum sample throughput, even with ultrahigh-speed UHPLC applications.

The Thermo Scientific Dionex Viper™-based autosampler fluidics eliminate dead volume which contributes to carryover and loss of separation efficiency.

Sample injection and fractionation for automated off-line multidimensional and multistep liquid chromatography becomes easy using the unique needle-in-needle pulled-loop autosampler with a second valve incorporated.

Thermo
SCIENTIFIC



UHPLC

Nano/Cap Injections
In-line Split-Loop
Low Carryover
Pulled-Loop
Viper Fluidics

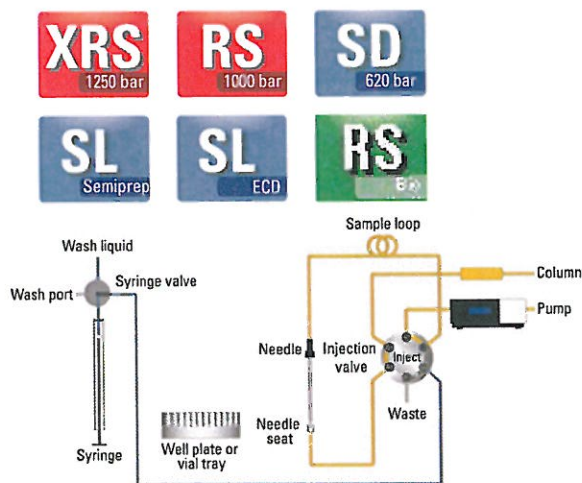


Figure 1. In-line split-loop injection principle (wash port not shown).

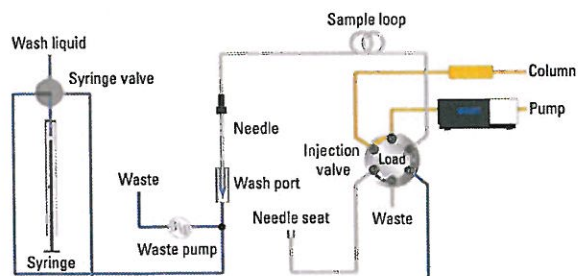


Figure 2. External wash operation of UltiMate 3000 in-line split-loop autosamplers.

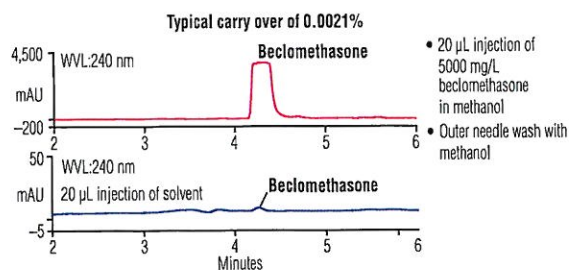


Figure 3. In-line split-loop autosampler: carryover example using beclomethasone.

Future-Proof UHPLC Autosamplers

With various UHPLC autosampler versions to choose from, we provide a future-proof autosampler platform for small molecule and biomolecule analyses. Autosamplers for UHPLC and conventional applications with up to 125 MPa (18,130 psi) at analytical and micro flow rates and 90 MPa (13,050 psi) at nano/cap flow rates ensure extraordinary application flexibility and maximum sample throughput for ultrahigh speed and ultrahigh resolution LC, LC-MS and LC-MS/MS analyses.

XRS

The 125 MPa (18,130 psi) in-line split-loop (flow-through) UHPLC autosampler has been optimized for low extra-column volume and carryover for maximum peak resolution and reliable results in MS.

RS/BioRS

The 103 MPa (15,000 psi) in-line split-loop (flow-through) UHPLC Rapid Separation (RS) autosampler ensures unrivaled injection performance in the conventional and ultra-high pressure range at analytical and micro flow rates. It is also available as a biocompatible version with corrosive-resistant sample flow path.

NC

The 90 MPa (13,050 psi) needle-in-needle, pulled-loop RSLCnano autosampler allows handling of nL samples at nano/cap flow rates and UHPLC pressures.

SD

The in-line split-loop (SL) (flow-through) analytical autosampler combines state-of-the-art LC with UHPLC compatibility. It supports pressures up to 62 MPa (9000 psi) at analytical and micro flow rates.

In-line Split-loop (Flow-through) Autosamplers

Within in-line split-loop (flow-through) autosamplers, the sample loop, needle, and needle seat are integral parts of the high pressure fluidic path (Figure 1). The autosampler aspirates only the sample volume injected onto the column. The needle and sample loop are constantly rinsed with mobile phase, achieving the lowest carryover.

In-line split-loop injections are highly accurate and precise, and are adjustable over a wide injection volume range.

The sample loop bypass mode reduces system gradient delay volume and enables overlapping sample aspiration for maximum sample throughput.

- High injection volume flexibility
- Near zero-carry-over
- No sample loss
- Low sample dispersion
- Excellent injection precision and linearity
- Very short cycle times
- Highest versatility and productivity
- Biocompatible flow path (WPS-3000TBRS Autosampler)

Low Carryover for Every Injection

Carryover is of concern in all cases where high and low concentration samples are processed in the same sequence (for example, analysis of environmental samples) or when injecting compounds which tend to stick within the fluidics. The UltiMate 3000 well plate autosamplers feature an active needle wash (Figure 2).

This removes analytes from the outer needle surface and demonstrates carryover < 0.004% for in-line split-loop (flow-through) autosamplers (typically < 0.01% for pulled-loop autosamplers), even for sticky compounds, such as chlorhexidine or beclomethasone (Figure 3).

Dedicated Autosampler Solutions

In addition to the UHPLC autosamplers, we also offer dedicated autosamplers for special applications such as semipreparative separations, electrochemical detection, biocompatible analyses, and fractionation and re-injection.

SL – Semiprep

The in-line split-loop (flow-through) semipreparative autosampler is designed for all semipreparative LC tasks with injection volumes of up to 2.5 mL and pressures up to 62 MPa (9000 psi).

SL – ECD

The in-line split-loop (flow-through) analytical autosampler for electrochemical detection ensures low baseline noise and high detection sensitivity with optimized autosampler fluidics and a PEEK sample loop.

NC – Bio, PL – Bio

Biocompatible needle-in-needle, pulled-loop autosamplers provide metal-free flow paths for routine use with aggressive mobile phases and buffers (salt and/or pH extremes), as well as for metal-sensitive biomolecule analyses at nano, capillary, micro and analytical flow rates with pressures up to 35 MPa (5000 psi).

FC – Standard, FC – Bio

The needle-in-needle, pulled-loop analytical autosamplers with a fractionation valve enables injection, fractionation, and re-injection of samples in a single instrument and therefore provide the means for multi-dimensional LC (bio-) separations.



Biocompatible
Electrochemical Detection
In-line Split-Loop
Fraction Collection
Pulled-Loop
Semipreparative LC

Pulled-Loop Autosamplers

In pulled-loop autosamplers, the needle is not an integral part of the high pressure fluidic path (Figure 4). Therefore, all autosampler parts in contact with the sample can be made of inert material. High injection precisions are achieved in full-loop injections at a fixed-sample loop volume. Variable injection volumes are accessible in partial-loop injection mode.

- Lowest injection volumes—down to the nL range
- Biocompatible flow paths

- Microliter pick-up—virtually zero sample loss for pulled-loop injections
- Excellent injection precision even at low volume injections—precisions of < 1%, can easily be achieved at 20 nL
- Optional fractionation capabilities

The pulled-loop autosamplers are most suited for precise injections of minute volumes, e.g., in nano LC with virtually zero sample loss. Maximum sample integrity for metal-sensitive analytes is assured.

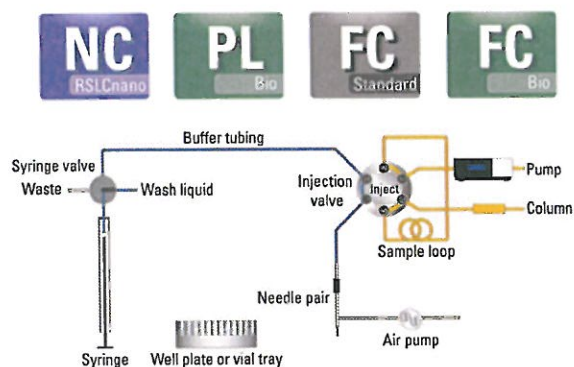


Figure 4. Pulled-loop injection principle (wash port not shown).

Viper and nanoViper Autosampler Fluidics

Autosamplers have many connections in the sample-containing flow paths, for example, the sample loop connected to the injection valve. Due to the design of conventional fitting systems these connections might create additional dead volume and have detrimental effects on autosampler performance, e.g. carryover, as well as peak shape and peak resolution.

All of our UHPLC autosamplers are equipped with the Thermo Scientific Dionex Viper or nanoViper™ Fingertight Fitting System.











Viper fitting systems directly seal at the tip of the capillary and its counterpart, e.g. the sample loop and injection valve, thus eliminating any source of dead volume within this connection by design.

The Viper and nanoViper Fingertight Fitting systems make each fluidic connection within the autosampler more robust and reproducible than any other conventional fitting system.



Figure 5. The Viper Fingertight Fitting System for secure connections within the WPS-3000TXRS autosampler.

Table 1. UltiMate 3000 Autosampler Classes

Autosampler Class	Thermo Scientific Dionex Autosampler Configuration	Max. Operating Pressure (MPa/psi)	Recommended Injection Volume Range (µL)	Autosampler Configuration
	WPS-3000 TXRS Rapid Separation Autosampler	125/18,130	0.2–25 1–100	Default configuration With optional 100 µL Viper sample loop/syringe
	WPS-3000(T)RS Rapid Separation Autosampler	103/15,000	1–100 0.2–25 1.5–250 1.5–500	Default configuration With optional 25 µL Viper sample loop With optional 250 µL Viper Injection volume kit With optional 500 µL Viper injection volume kit
	WPS-3000TBRS Biocompatible Rapid Separation Autosampler	103/15,000	0.2–25 1–100 1.5–250 1.5–500	Default configuration With 100 µL Viper sample loop included With optional 250 µL Viper Injection volume kit With optional 500 µL Viper injection volume kit
	WPS-3000(T)SL Analytical Autosampler	62/9000	See WPS-3000(T)RS Autosampler	
	WPS-300TBSL Analytical Autosampler	35/5000	1–100	
	WPS-3000(T)SL Semipreparative Autosampler	62/9000	100–2500 10–1000	Default configuration With optional 1000 µL injection volume kit
	WPS-3000(T)PLRS RS Nano/Cap Rapid Separation Autosampler	90/13,050 (optional: biocompatible 35/5000)	0.02–1 0.02–5 0.02–20 0.1–125	Default configuration With optional 5 µL nanoViper sample loop With optional 20 µL nanoViper sample loop With optional 125 µL upgrade kit
	WPS-3000TBPL Biocompatible Analytical Autosampler	35/5000	0.1–50 0.25–250	Default configuration
	WPS-3000TFC Analytical Autosampler with Fractionation Valve	35/5000 (optional: 90/13,050)	0.1–50 0.25–250 0.02–1	Default configuration With different sample and buffer loop configuration (included) With optional modification kit for nano/cap applications
	WPS-3000TBFC Biocompatible Analytical Autosampler with Fractionation Valve	35/5000	See WPS-3000TFC Analytical Autosampler with fractionation valve	

High Sample Capacity and Flexibility

The Thermo Scientific Dionex UltiMate 3000 WPS Autosampler series supports a great variety of sample trays coMPatible with many sample formats including micro, analytical, semi-preparative, and preparative sample vials; normal and deep well plates; PCR plates; and even Eppendorf® tubes (Figure 6).

- High sample vial capacity and flexibility.
- High sample throughput in high speed UHPLC and conventional HPLC.
- Reliable, unattended long-term operation.
- Maximum vial flexibility for all sample analysis and sample preparation tasks.



Figure 6. Sample format and tray variety for the UltiMate 3000 Autosampler Series.

Table 2. UltiMate 3000 Autosampler Sample Tray Formats

Sample Containments	Sample Tray ¹	Total Vials in Carousel (plus 15 × 10 mL vials)
Micro, cylindrical 0.3 mL vials	0.3 mL rack	3 × 72 = 216
Analytical, conical 1.1 mL vials	1.1 mL rack	3 × 40 = 120
Analytical, cylindrical 1.2 mL minivials	1.2 mL rack	3 × 72 = 216
Analytical, cylindrical 1.8 mL/2 mL vials	2 mL rack	3 × 40 = 120
Micro, conical 250 µL vial inserts		3 × 40 = 120
Semipreparative, cylindrical 4 mL vials	4 mL rack	3 × 22 = 66
Semipreparative, cylindrical 10 mL vials	10 mL rack	3 × 10 = 30
96 normal well plate	0.3, 1.1, 1.2, 2, or 10 mL rack	3 × 96 = 288
384 normal well plate		3 × 384 = 1152
24 deep well plate ³		3 × 24 = 72
96 deep well plate	Deep well plate support rack	3 × 96 = 288
384 deep well plate		3 × 384 = 1152
0.5 mL Eppendorf tubes ²	0.5 mL Eppendorf tube rack	3 × 40 = 120
1.5 mL Eppendorf tubes ²	1.5 mL Eppendorf tube rack	3 × 40 = 120
Low well PCR plate (8–12 mm) with 384 wells	0.3, 1.1, 1.2, 2, or 10 mL rack + support rack (adapter) for low PCR-plates	3 × 384 = 1152

¹ Three sample trays can be used in any combination in the autosampler carousel.

² The in-line split-loop (flow-through) autosamplers (WPS-3000SL, WPS-3000RS and WPS-3000XRS series) support sampling from uncapped (open) Eppendorf tubes. The pulled-loop autosamplers (WPS-3000PL and WPS-3000FC series) support piercing Eppendorf tube caps which are marked or specified as pierceable.

³ With vial pusher adapter

Unique Thermal Control for All Sample Tray Formats

Peltier elements, in combination with circulating cooling liquid, are responsible for the UltiMate 3000 Autosampler's accurate, stable temperature control capabilities. Direct contact between the vial and the temperature regulated surface ensures that samples achieve the actual set point between 4 °C and 45 °C (max. 22 °C below ambient).

All thermostatted autosamplers guarantee optimal protection for thermally sensitive analytes. A built-in peristaltic pump automatically removes water that may accumulate as a result of condensation. Sample compartment heating can be used for sample derivatization.

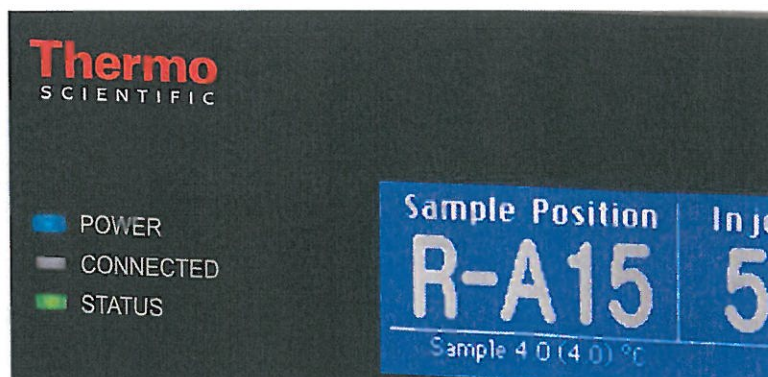


Figure 7: Sample thermostating down to 4 °C ensures sample integrity.

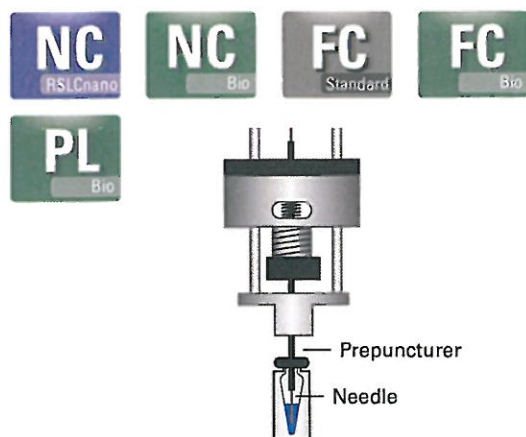


Figure 8. Needle-in-needle injection design.

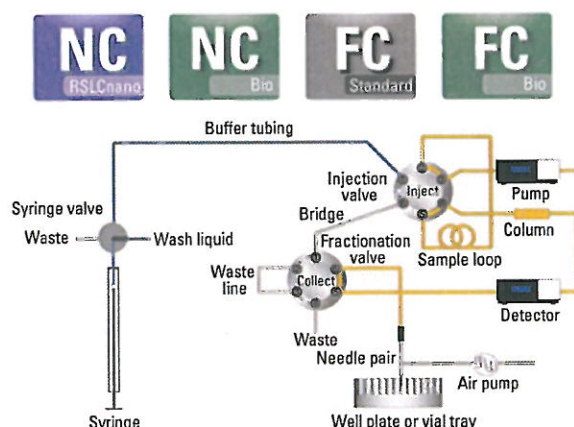


Figure 9. Flow diagram for automated injection, fractionation, and re-injection with a second integrated valve (WPS-3000T(B)FC).

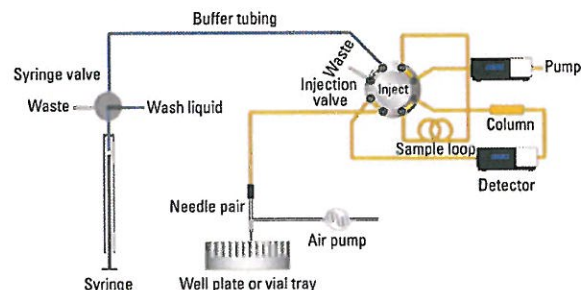


Figure 10. Flow diagram for automated injection, fractionation, and re-injection with the optional 8-port injection valve (microfraction collection option).

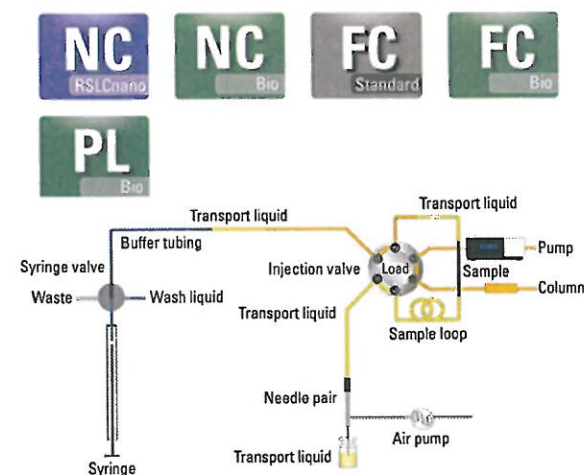


Figure 11. In microliter pickup the sample plug (shown in red) is transported into the loop, sandwiched by a plug of transport liquid (shown in yellow).

Needle-in-Needle, Pulled-Loop Design for Flexible Sampling from Different Sample Tray Formats

The Thermo Scientific Dionex UltiMate 3000 Autosampler with pulled-loop injection design uses a needle-in-needle injection technique (Figure 8). The outer needle pierces the vial septum or well seal while the inner, biocompatible micro-needle (fused silica or PEEK) then moves into position to aspirate the sample. The injection system can be programmed to the optimum depth for each sample container format.

This technique provides robust operation for different sample tray formats.

- Supports minute injection volumes as low as 20 nL.
- Supports all applications from nano to analytical scale.

Injection, Fractionation, and Re-Injection

Autosamplers supporting injection, fractionation, and re-injection in a single instrument are based on the pulled-loop injection principle.

The second integrated valve in the analytical pulled-loop well plate autosampler with fractionation valve (Figure 9) or the optional 8-port injection valve in the RSLCnano autosampler (Figure 10) allow fractionation in additional sample vials located in the sample carousel. Fractions can then be re-injected on a second column, e.g. with different selectivity.

- Fractionation and re-injection support automated off-line multidimensional and multistep liquid chromatography for fractions in the mL to μ L volume range.
- The needle-in-needle design allows fractionation in (sealed) well plates and capped or uncapped vials.
- Optimized flow path and low delay volume assure high chromatographic resolution
- Automated re-injection of samples reduces manual handling steps and ensures the highest level of precision.
- Reduced bench space required – two instruments in one

Microliter Pickup and Low Dispersion Mode

The unique pulled-loop design features of microliter pickup and low dispersion mode enables zero-sample-loss injections, extremely low sample consumption, and enhances peak resolution.

In microliter pickup mode a transport liquid is aspirated before and after the sample plug, thus only the sample injected onto the column is consumed (Figure 11). Valuable sample for other analyses is saved and the scale-down of sample preparation steps is facilitated.

In the low dispersion mode the valve is switched to the LOAD position at a certain time, so that the tailing part of the sample plug is cut off. This results in an optimized injection profile with significantly reduced peak tailing. The low-dispersion mode is available in full-loop and partial-loop mode.

Reliable peak identification and quantification is ensured through enhanced peak shapes and peak resolution.

Easy Method Transfer from System-to-System

Fast high-precision drives, the in-line split-loop (flow-through) injection principle and the compatibility of the Viper-based autosampler fluidics ensure reliable system-to-system and HPLC-to-UHPLC method transfer for the UltiMate 3000 XRS, RS, and SD systems.

- Consistent volumetric injection accuracy of typically better than 0.5% at 20, 50, and 90 μL for in-line split-loop (flow-through) autosamplers.
- Conventional methods are easily transferred from the UltiMate 3000 SD to the UltiMate 3000 RS system.
- Conventional methods running on HPLC columns are easily brought up to speed on the Thermo Scientific Dionex UltiMate 3000 RS system.
- Maximum injection volume accuracy and precision provide highly reproducible results.
- Injection cycle times < 15 s for 5 μL (in-line split-loop autosamplers) for maximum sample throughput even with ultrahigh speed UHPLC applications.
- Interchangeable fluidic parts like the Viper sample loop and needle seat capillary ensure trouble-free method transfer between all SD, RS and XRS well plate autosamplers.

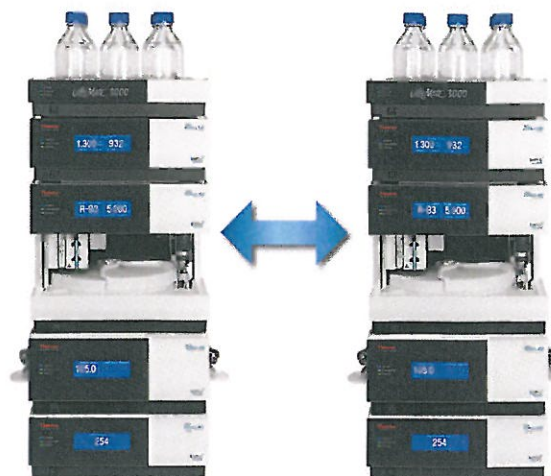


Figure 12. Easy HPLC-to-UHPLC and system-to-system method transfer between the UltiMate 3000 XRS, RS, and SD product lines.

Reliability Features

Extensive autosampler self tests, user-scheduled diagnostic tests, and predictive performance indicators ensure instrument reliability, robust operation, and increase system uptime (Figure 13).

- All autosampler sensors are checked at startup and during sample processing.
- Autosampler diagnostic tests indicate even the smallest leaks caused by valve and needle seat wear.
- Counters monitor common wear parts like rotor seal, syringe, needle, and needle seat to easily schedule maintenance.

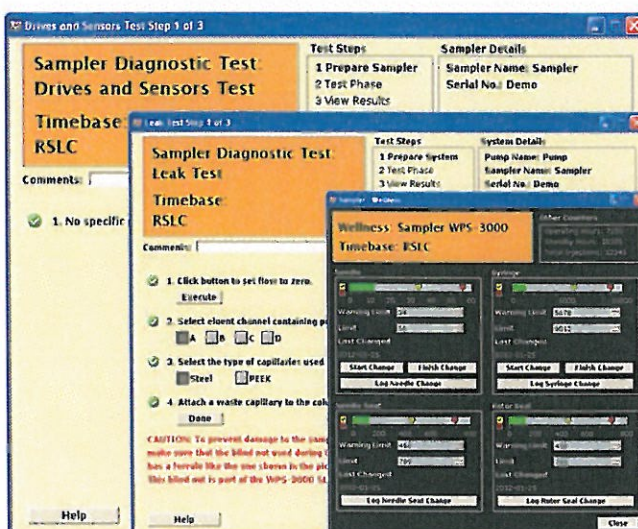


Figure 13. Autosampler diagnostic wizards and wellness panels in Thermo Scientific Dionex Chromleon software.

User-defined Sample Preparation and Injection Programs

Unique low-level autosampler commands enable users to define their own injection programs for a large variety of injection routines (Figure 14). Automated sample preparation like sample dilution and sample derivatization will be handled by the autosampler to save labor time and yield accurate and precise results. Up to eight reagent vials can be defined which provides a high level of flexibility for sample preparation.

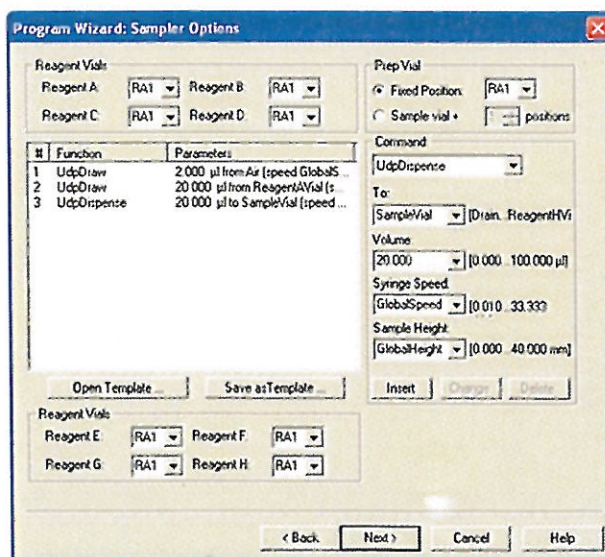


Figure 14. User-defined injection program setup in Chromleon software.



Figure 15. The UltiMate 3000 XRS Autosampler is an essential part of the UltiMate 3000 XRS.

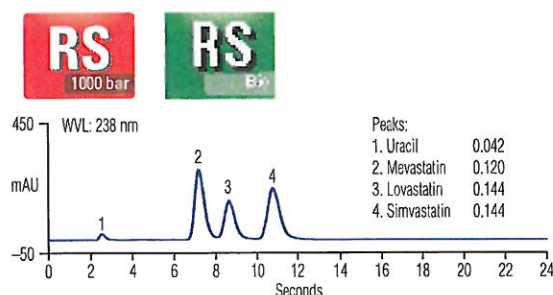


Figure 16. Excellent peak area precision < 0.31% RSD for ten consecutive 1 μ L injections at 3.35 mL/min and 74 MPa.

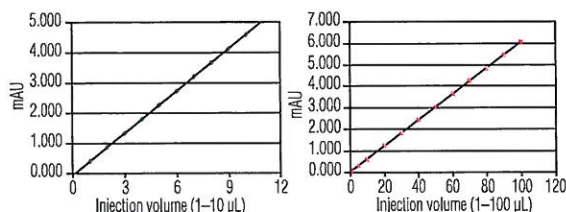


Figure 17. Excellent linearity performance at 1–10 μ L (correlation coefficient of 0.999997, 0.13% RSD) and 1–100 μ L (correlation coefficient of 0.999998, 0.10% RSD), three replicates per injection) demonstrate the flexibility of the UltiMate 3000 Rapid Separation Autosampler.

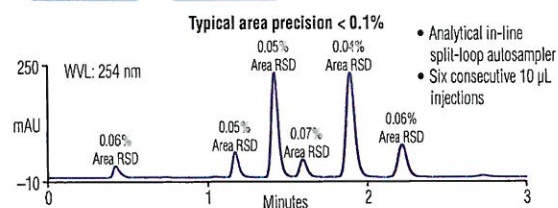


Figure 18. Typical peak area precision < 0.1 % for six consecutive 10 μ L injections using the in-line split-loop autosampler.

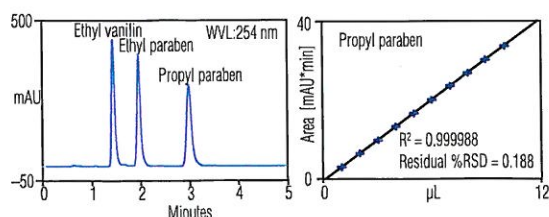


Figure 19. Injector linearity application example of an analytical in-line split-loop autosampler (three replicates per level).

XRS Well Plate Autosampler

The UltiMate 3000 XRS Autosampler provides an optimized fluidic pathway with 100 μ m i.d. Viper tubing for LC and LC/MS. With UHPLC pressures of up to 125 MPa (18,130 psi) it combines low gradient delay and extra column volume, and low carryover with excellent injection performance. This supports ultrahigh throughput and ultrahigh-resolution analyses. The WPS-3000TXRS Autosampler features all advantages of the in-line split-loop (flow-through) design for UHPLC, as well as HPLC performance.

- Fast cycle times < 20 s for 5 μ L injections support high-throughput applications.
- Support of very long sub-2 μ m particle columns applied for natural products screening, life sciences, and complex environmental and food and beverage sample analysis.
- Support of sub-1 μ L injections on short UHPLC columns.
- Lowest autosampler gradient delay volume of only 42 μ L supports ballistic gradients.

RS Well Plate Autosamplers

The UltiMate 3000 RS and BioRS Autosamplers provide the highest degree in flexibility. No matter if you are operating in the conventional HPLC pressure range or at UHPLC pressures up to 103 MPa (15,000 psi) the WPS-3000(T)RS autosamplers assure excellent injection performance for reliable results in both pressure domains.

- High injection volume flexibility is guaranteed due to a standard injection volume range of 1–100 μ L (recommended range); for RS autosampler: standard, for BioRS autosampler: optional.
- Corrosion-resistant materials in the complete sample flow path reduce the risk of bioanalyte interaction with internal surfaces (BioRS Autosampler).
- Peak area precision is typically less than 0.15% for 5 μ L injections in standard HPLC and 0.3% for a 1 μ L injection in UHPLC mode.
- Excellent injector linearity ($r^2 > 0.9999$) is achieved in the 1–10 and 1–100 μ L injection volume range.
- Fast cycle times < 15 s (RS autosampler) and < 20 s (BioRS autosampler) for 5 μ L injections support high-throughput applications.
- The autosampler can easily be upgraded for micro injection volumes down to 0.2 μ L (recommended range, RS autosampler only).

SL Analytical Well Plate Autosamplers

The UltiMate 3000 Standard In-line Split-loop (Flow-through) Analytical Autosamplers offers future-proof application flexibility and excellent injection performance. The WPS-3000(T)SL Analytical Autosampler is best suited for standard HPLC applications and due to its pressure capabilities of up to 62 MPa (9,000 psi)—is fully compatible with short fully porous UHPLC and fused core columns.

- High injection volume flexibility is guaranteed due to a standard injection volume range of 1–100 μ L (recommended range).
- Peak area precision is typically less than 0.1 % for 10 μ L injections, increasing confidence in your results.
- Excellent injector linearity ($r^2 > 0.9999$) is achieved due to the combination of a high-precision drive mechanism and in-line split loop (flow-through) injection principle.
- The autosampler can easily be upgraded for micro injection volumes down to 0.2 μ L.
- The SL autosampler is also available for electrochemical detection (ECD) with pressures up to 35 MPa.

Semipreparative Well Plate Autosampler

The Thermo Scientific Dionex UltiMate 3000 Semipreparative Autosamplers are designed for all semipreparative LC tasks where injections volumes in the mL range and low backpressure contribution from the autosampler are required (Figure 20).

- Large volume injections up to 2.5 mL
- The flow path has been designed to generate low backpressure even at flow rates up to 50 mL/min.

- Supports up to 66 × 4 mL, 30 × 10 mL vials, or 3 × 24 deep well plates plus 15 additional 10 mL vials for multiple large volume injections of the same sample.
- Supports analytical injections down to 10 µL volume when equipped with the optional 1000 µL sample loop and syringe.

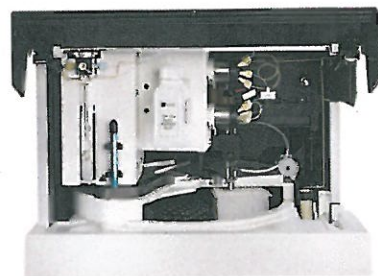


Figure 20. The UltiMate 3000 Semipreparative Autosampler provides large volume injections up to 2.5 mL.

RSLCnano Well Plate Autosamplers

The Thermo Scientific Dionex UltiMate 3000 RSLCnano Well Plate Autosamplers fulfill all the special requirements of ultralow-flow chromatography with pressures up to 90 MPa (13,050 psi). Due to their flexibility they support ultrahigh pressure and high-resolution applications in the field of proteomics, metabolomics, and biopharmaceutical analysis.

- Ideally suited for all LC/MS applications using column i.d. formats of 1 mm or smaller.
- Wide-injection volume ranges from 20 nL to 1 µL (standard) and up to 125 µL (optional).

- Excellent injection precisions (typically <0.3% for 1 µL full loop injections and <1% for 20 nL partial-loop injection), independent of the sample format (Figure 21).
- Low-dispersion mode and µL-pickup routine.
- PAEK/PEEK® upgrade kit (35 MPa/5000 psi) is available for applications which require bio-inert flow paths.
- The microfraction collection option provides access to automated offline multi-dimensional LC applications with pressures up to 35 MPa (5000 psi).

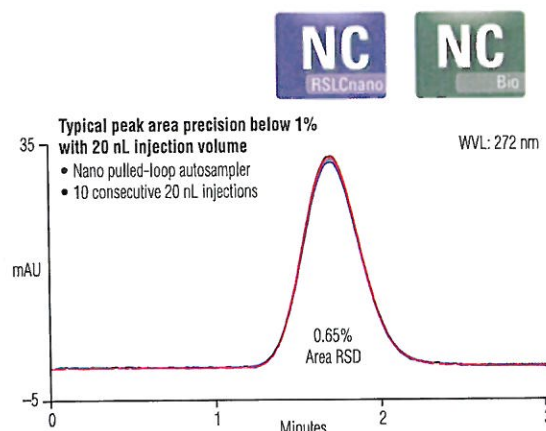


Figure 21. Typical 20 nL injection precision of < 1% (WPS-3000TBPL Nano/Cap autosampler)

Analytical Well Plate Autosamplers with Fractionation Valve

In combination with the extended fraction collection capabilities of the Dionex Chromeleon Chromatography Data System software, the Thermo Scientific Dionex Analytical Well Plate Autosampler with a fractionation valve enables fully automated injection, fractionation, and re-injection of samples. It is the ideal tool for biomolecule analysis, including protein and antibody fractionation and purification (Figure 22). It fully automates off-line multidimensional and multistep LC in analytical and micro flow rate ranges.

- The stainless steel and biocompatible PAEK/PEEK version support pressures up to 35 MPa (5000 psi).
- The optional 90 MPa (13,050 psi) SST valve supports UHPLC applications.

- Wide application flexibility, including automated off-line 2D-LC, multistep protein purification and analysis, sample derivatization, protein digestion, neutralization is provided.
- Fraction collection of flow rates up to 6 mL/min.
- A unique fractionation wizard facilitates easy method set-up for all fractionation tasks and multidimensional chromatography.
- The UltiMate 3000 LC system with dual gradient pumps and fractionation option allows fully automated purification and analysis, e.g., combining affinity with SEC or IEX columns.
- Nano/Cap modifications kit is available.

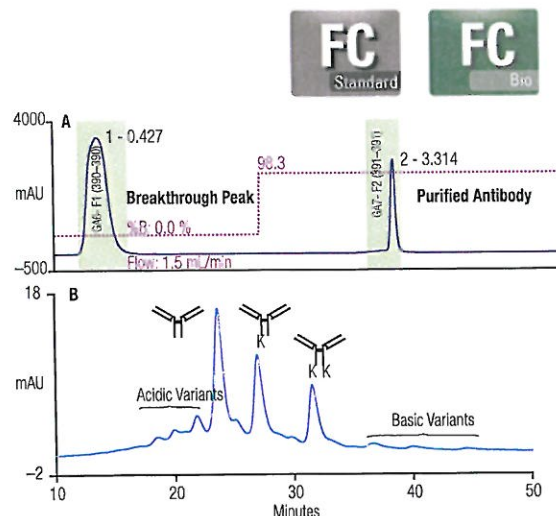


Figure 22. A) Automated monoclonal antibody purification on Protein A and B) isoform separation on a ProPac® WCX column.

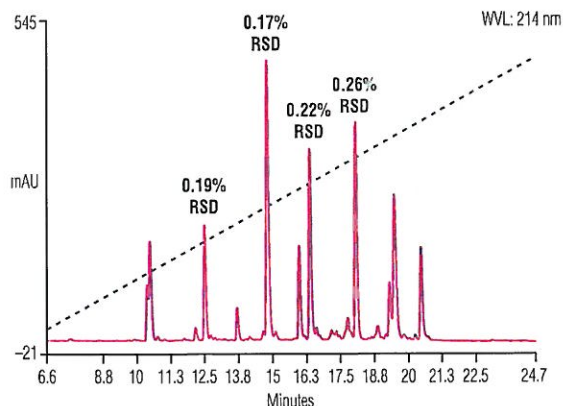






Figure 23. Peak area precision of a lysozyme digest for five consecutive 10 µL partial loop injections (WPS-3000TBL Biocompatible Analytical Autosampler).

Biocompatible Analytical Well Plate Autosampler

The Thermo Scientific Dionex UltiMate 3000 Biocompatible Analytical Well Plate Autosampler perfectly matches the requirements for injections of complex samples containing biomolecules, such as recombinant proteins or monoclonal antibodies.

- Inert PEEK flow paths allow routine use of aggressive mobile phases, buffers (salt and/or pH extremes), and metal-sensitive biomolecules.
- A wide injection volume range from 0.1 to 250 µL allows for maximum injection flexibility.
- High-peak-area precision is guaranteed by an excellent injection precision of < 0.3% RSD—even in partial loop mode (Figure 23).
- Low-dispersion full-loop and partial-loop injections result in an optimized injection profile with significantly reduced peak tailing.

ULTIMATE 3000 WELL PLATE

Autosampler class				
	WPS-3000TXRS	WPS-3000(T)RS	WPS-3000TBR	WPS-3000(T)SL Analytical
Injection methods	In-line split-loop (flow-through) injections, bypass mode, user-defined columns			
Fractionation modes	n.a.			
Injection volume (recommended)	0.001–25 µL (0.2–25 µL) Optional: 0.1–100 µL	0.01–100 µL (1–100 µL) Optional: 0.2–25 µL, 1.5–250 µL, 1.5–500 µL	0.01–25 µL (0.2–25 µL) Optional: 1–100 µL, 1.5–250 µL, 1.5–500 µL	0.01–100 µL (1–100 µL) Optional: 0.2–25 µL, 1.5–250 µL, 1.5–500 µL
Injection volume accuracy	Typically ±0.5% at 20 µL			Typically ±0.5% at 50 and 90 µL
Minimum sample required	1 µL out of 5 µL (250 µL conical vial)			
Injection volume precision	<0.25% RSD at 2 µL (typically <0.15% RSD) caffeine in water	<0.25% RSD at 5 µL (typically <0.15% RSD) caffeine in water	<0.30% RSD at 2 µL (typically <0.15% RSD) caffeine in water	<0.25% RSD at 5 µL (typically <0.15% RSD) caffeine in water
Linearity	Corr. coeff. >0.9999, RSD <0.5% at 1–20 µL, caffeine in water	Corr. coeff. >0.9999, RSD <0.5% at 5–90 µL, caffeine in water	Corr. coeff. >0.9999, RSD <0.5% at 1–20 µL, caffeine in water	Corr. coeff. >0.9999, RSD <0.5% at 5–90 µL, caffeine in water
Carryover	<0.004% for caffeine with external wash at 20 MPa			<0.004% for caffeine with
Injection cycle time	<20 s for 5 µL	<15 s for 5 µL	<20 s for 5 µL	<15 s for 5 µL
Wetted parts	PEEK, stainless steel, PCTFE, Fused Silica, Vespel®	PEEK, stainless steel, PCTFE, Fused Silica	Titanium, PEEK, MP35N, PCTFE, Fused Silica	PEEK, stainless steel,







COMMON ULTIMATE 3000 WELL PLATE AUTOSAMPLER SPECIFICATIONS

Sample capacity	216 × 0.3 mL vials, 120 × 1.1 mL conical vials, 216 × 1.2 mL vials, 120 × 1.8 mL/2.0 mL vials, 66 × 4 mL vials, 30 × 10 mL vials, 3 × 24 deep well plates, 96 and/or 384 normal or deep well plates, 3 × 40 0.5 mL and/or 1.5 mL Eppendorf tubes*, and/or 3 × 384 low well PCR plates + 15 × 10 mL vials (depending on sample tray configuration; also for fractionation in (un-)capped vials, WPS-3000T(B)FC)
Needle wash	Active external needle wash
Sample thermostating	4–45 °C or 22 °C below ambient (thermostatted autosampler versions)
Sample temperature accuracy	± 2 °C (thermostatted autosampler versions)**
GLP Features	Full support of Thermo Scientific Dionex Automatic Equipment Qualification (AutoQ™), Qualification Status and System Wellness Monitoring. All system parameters are logged in the Chromeleon Audit Trail.
Communications	All functions controllable via USB; integrated USB hub with three USB 1.1 ports
I/O Interface	4 digital inputs, 4 programmable relay outputs
Emission sound pressure level	Typically < 65 dB(A) in 1-m-distance
Dimensions (h x w x d)	36 × 42 × 51 cm (14.2 × 16.5 × 20 in.)
Power requirements	100–120 V, 60 Hz; 200–240 V, 50 Hz
Weight	19 kg (42 lb), without cooling, 24 kg (53 lb) with cooling; WPS-3000T(B)FC: 25 kg (55 lb)

* The in-line split-loop (flow-through) autosamplers (WPS 3000SL, WPS-3000RS, and WPS-3000XRS series) support sampling from uncapped (open) Eppendorf tubes. The pulled-loop autosamplers (WPS-3000PL and WPS-3000FC series) support piercing Eppendorf tube caps which are marked or specified as pierceable.

** At a setpoint of 10 °C at ambient temperatures of ≤25 °C and ≤50% relative humidity.

AUTOSAMPLER SPECIFICATIONS

					
WPS-3000(T)SL Semipreparative	WPS-3000TBSL Analytical	WPS-3000(T)PL RS NanoCap	WPS-3000TBPL Analytical	WPS-3000TFC	WPS-3000TBFC
		Full-loop and partial-loop injections, low dispersion mode, microliter pickup, user-defined programs			
		optional	n.a.	Time slices, peak signal, manual and external trigger	
0.01–2500 µL (100–2000 µL) Optional: 10–1000 µL	0.01–100 µL (1–100 µL)	0.001–20 µL (20 nL–20 µL)	0.01–250 µL (0.1–250 µL)		
Typically ± 1% at 2000 µL	Typically ± 0.5% at 50 and 90 µL	n.a.			
n.a.	1 µL out of 5 µL (250 µL conical vial)	1 µL out of 1 µL (microliter pickup)			
<0.3% RSD at 100 µL (typically <0.15% RSD) caffeine in water	<0.25% RSD at 5 µL (typically <0.15% RSD) caffeine in water	< 0.4% RSD at 1 µL in full-loop and < 1% RSD at 200 nL partial-loop mode, caffeine in water	< 0.25% RSD at 5 µL in full-loop and < 0.3% RSD at 5 µL and 20 µL partial-loop mode, caffeine in water		
Corr. coeff. >0.9995, RSD <1% at 100–2000 µL caffeine in water	Corr. coeff. >0.9999, RSD <0.5% at 5–90 µL, caffeine in water	Corr. coeff. >0.9995, at 100–500 nL, partial-loop injection, caffeine in water	Corr. coeff. >0.9999, RSD <0.5% at 5–30 µL, caffeine in water		
external wash at 7.5 MPa		< 0.02% for caffeine with external wash			
<20 s for 100 µL	<15 s for 5 µL	< 30 s for 1 µL full-loop injection	< 60 s for 5 µL full-loop injection, < 90s for 5 µL partial-loop injection		
PCTFE, Fused Silica		PEEK, stainless steel, PAEK, PCTFE, PEEKsil™, Fused Silica	PEEK, PAEK, PCTFE	PEEK, PAEK, PCTFE stainless steel	PEEK, PAEK, PCTFE

Fully Controlled by Various Software Packages

All autosamplers are controlled by a variety of software programs.

Chromeleon Software

No other data system comes close to providing the capabilities and the usability of Chromeleon Chromatography Data System (CDS) software—it's Simply Intelligent™. The software is designed to take users from samples to results in the shortest possible time. Sequence set-up, processing, and result calculations can all be performed quickly, easily, and without training. It controls IC, LC and GC instruments from a wide range of manufacturers.

Other Software Integration

Chromeleon software has the capability to integrate full instrument control for the complete range of UltiMate 3000 LC modules with other software. Thermo Scientific Dionex DCMSLink™ provides the integration with Xcalibur™, Analyst®, and HyStar™ mass spectrometry software. Additionally, UltiMate 3000 instrument interfaces are available for Thermo Scientific Atlas™ and Empower™ 3 chromatography data acquisition software. These solutions provide Chromeleon's advanced instrument control capabilities in the user's familiar software environment.

Enjoy Industry-Leading Support

Thermo Fisher Scientific Customer Support Centers are located in the United States, Europe, and Asia. These state-of-the-art laboratories are equipped with the full line of Thermo Scientific instrumentation and software capabilities. Support Centers provide accessible locations for advanced training and enhanced application development capabilities. Users can visit these laboratories or sign up to learn new skills in addressing challenging applications, receive training and support, and discover new, innovative HPLC, GC, and IC solutions.

ORDERING INFORMATION

Part No.	Well Plate Autosamplers
5843.0020	WPS-3000TXRS Rapid Separation Thermostatted Autosampler with Extended Pressure Range
5840.0020	WPS-3000TRS Rapid Separation Thermostatted Autosampler
5840.0010	WPS-3000RS Rapid Separation Autosampler
5841.0020	WPS-3000TBRS Biocompatible Rapid Separation Thermostatted Autosampler
5822.0020	WPS-3000TSL Analytical Thermostatted Autosampler
5822.0010	WPS-3000SL Analytical Autosampler
5827.0020	WPS-3000TBLS Analytical Thermostatted Autosampler for Electrochemical Detection
5822.0028	WPS-3000TSL Semipreparative Thermostatted Autosampler
5822.0018	WPS-3000SL Semipreparative Autosampler
5826.0020	WPS-3000TPL RS Rapid Separation Thermostatted Nano/Capillary Autosampler
5826.0010	WPS-3000PL RS Rapid Separation Nano/Capillary Autosampler
5823.0020	WPS-3000TBPL Biocompatible Analytical Thermostatted Autosampler
5824.0020	WPS-3000TFC Analytical Thermostatted Autosampler with Fractionation Valve
5825.0020	WPS-3000TBFC Biocompatible Analytical Thermostatted Autosampler with Fractionation Valve

Autosampler Accessories

6820.4091	Sample tray for 72 cylindrical 0.3 mL vials
6820.4087	Sample tray for 40 conical 1.1 mL vials
6820.4090	Sample tray for 72 cylindrical 1.2 mL vials
6820.4070	Sample tray for 40 cylindrical 1.8/2 mL vials
6820.4084	Sample tray for 22 cylindrical 4 mL vials
6820.4086	Sample tray for 10 cylindrical 10 mL vials
6820.4079	Sample support rack for deep well plates, 34–46 mm
6820.4083	Sample support rack for deep well plates, 30–36 mm
6820.4088	Support rack (adapter) for low well PCR plates, 8–12 mm
6820.4096	Sample tray for 0.5 mL Eppendorf tubes
6820.4094	Sample tray for 1.5 mL Eppendorf tubes
6820.4097	Sample Tray for 72 Micro Dialysis 0.3 mL Vials
6820.2402	Vial Pusher Adapter
6820.1427	Transparent front cover
6820.2452	Sample loop, 25 µL, Viper WPS-3000TXRS, WPS-3000(T)RS and WPS-3000(T)SL Analytical
6841.2451	Sample loop, 100 µL, Viper, WPS-3000TXRS, WPS-3000(T)RS and WPS-3000(T)SL Analytical
6841.2452	Sample Loop, 25 µL, Viper, WPS-3000TBRS
6822.0002	Syringe, 100 µL
6822.2442	Injection volume kit, 250 µL, Viper, WPS-3000(T)RS and WPS-3000(T)SL Analytical
6841.2442	Injection volume kit, 250 µL, Viper, WPS-3000TBRS
6822.2443	Injection volume kit, 500 µL, Viper, WPS-3000(T)RS and WPS-3000(T)SL Analytical
6841.2443	Injection volume kit, 500 µL, Viper, WPS-3000TBRS
6822.2436	Injection volume kit, 1000 µL, WPS-3000(T)SL Semipreparative
6826.0011	Injection valve upgrade, 90 MPa/13,050 psi, SST, WPS-3000TFC
6821.0045	PAEK/PEEK Upgrade Kit, WPS-3000(T)PL RS Nano/Cap

www.thermofisher.com/dionex

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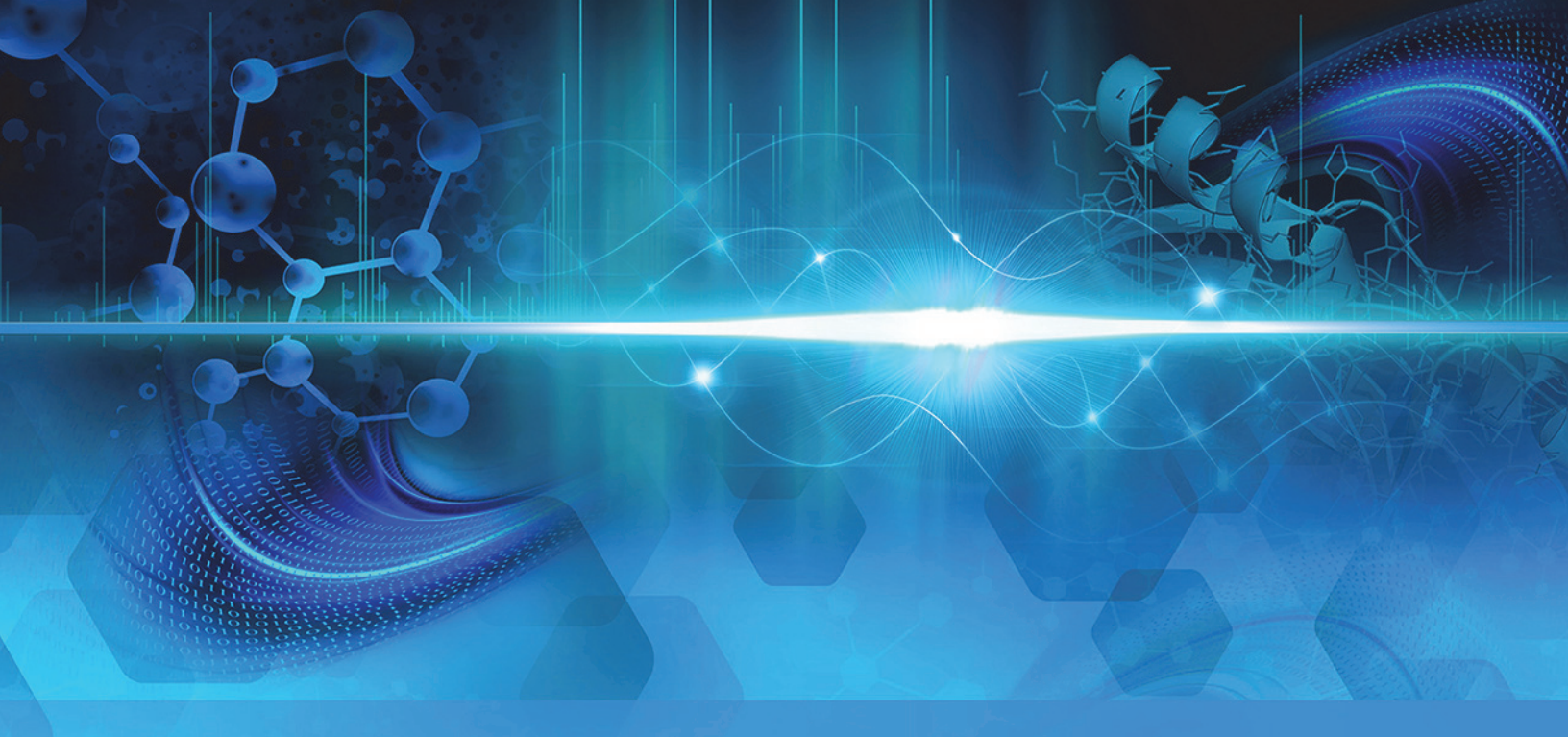
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SCIENTIFIC
 Part of Thermo Fisher Scientific



TSQ Series

TSQ Endura and TSQ Quantiva

Preinstallation Requirements Guide

80100-97015 Revision B July 2015



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Release history: Rev A, November 2013; Rev B, July 2015

For Research Use Only. Not for use in diagnostic procedures.

TSQ Endura and TSQ Quantiva Installation Request Form

Before completing this installation request form, read all of the *TSQ Endura and TSQ Quantiva Preinstallation Requirements Guide*. For U.S. laboratory locations, send this completed and signed form to us.customer-support.analyze@thermofisher.com. For other countries or regions, go to www.thermoscientific.com/support, click **Contact Us**, click the email option, , and attach this form to your request to schedule the installation.

Laboratory setup

- ☐ 1. All laboratory remodeling is complete and complies with all relevant safety regulations.
- ☐ 2. The TSQ Endura or TSQ Quantiva is on site.
- ☐ 3. A principal operator will be on site during the installation/certification period.
- ☐ 4. Doorways, hallways, and so on are a minimum width of 94 cm (37 in.).
- ☐ 5. Laboratory lighting is adequate.
- ☐ 6. Air conditioning is adequate for temperature, humidity, and particulate matter control.
- ☐ 7. Relative humidity is 40–80%, noncondensing.
- ☐ 8. The work area is free from magnetic disruption and electrostatic discharge.
- ☐ 9. A step stool is on site.
- ☐ 10. A voice telephone line is installed near the system.
- ☐ 11. (Optional) The laboratory has Internet access.
- ☐ 12. Floor space is sufficient and flooring will support the load.

Power

- ☐ 13. Main power is installed and complies with local electrical codes.
- ☐ 14. Power is free from fluctuations due to slow changes in the average voltage or changes due to surges, sags, or transients.
- ☐ 15. Power outlets are of the correct configuration for the power cords. See [page 18](#).
Note NEMA type: _____
- ☐ 16. Voltage of power outlet has been measured.
Note measured voltage:
AC line-to-ground: _____ V
AC neutral-to-ground: _____ V
AC line-to-neutral: _____ V
- ☐ 17. Power outlets are available for testing and cleaning equipment.

Gas and exhaust

- ☐ 18. All required gases are on site, gas lines are installed, and appropriate gas regulators are available. For pressures, see [page 21](#).
Note gas types and actual purity levels:
Gas: _____ purity: _____
Gas: _____ purity: _____
- ☐ 19. All gas lines are clean and have no leaks.
- ☐ 20. A suitable fume exhaust system is separate from the solvent waste and is within 2.4 m (8 ft) of the system. See [page 6](#) and [page 25](#).

System setup

- ☐ 21. Data system computer: (a) a new computer shows no changes to ANY settings and has no additional software, or (b) an existing computer meets the software system requirements. (a) ___ (b) ___
- ☐ 22. System setup provides for collecting solvent waste from the API source.
- ☐ 23. A new or recently cleaned HPLC system is available that produces pulse-free, continuous flow of 100–1000 $\mu\text{L}/\text{min}$.
- ☐ 24. Optima LC/MS-grade acetonitrile, formic acid, isopropyl alcohol, methanol, and water are available for testing the instrument's performance.
- ☐ 25. Sufficient bench or table space is available for all of the equipment. Note the dimensions:
Width: _____
Depth: _____
Height: _____
Does the bench (table) have wheels? Yes ___ No ___
- ☐ 26. Sufficient clearance is provided behind the bench (or table). See [page 5](#).
- ☐ 27. The bench (or table) can support *twice* the load of the instrument (262 kg [576 lb]) and is free from vibration.

IMPORTANT Thermo Fisher Scientific reserves the right to invoice for the field service engineer's time if the installation requirements are not met by the installation date.



For customized installations

Does your contract contain any special acceptance specifications?

☐ Yes

☐ No

If YES, attach full details of the specifications.

Does the system require additional equipment?

☐ Yes

☐ No

If YES, attach full details of the additional equipment.

I certify that the preinstallation requirements for the TSQ Endura or TSQ Quantiva are complete and accurate.

Signature _____ Date _____

Print name _____ Telephone _____

Email address _____

Principal instrument operator:

Print name _____ Telephone _____

Email address _____

Company _____ Telephone _____

Address _____

Address _____

City _____ State _____ Country _____

Sales order number _____

Note This form is intended to cover the essential components of your TSQ Endura or TSQ Quantiva installation. However, you must use the information in this guide and any additional information that your Thermo Fisher Scientific field service engineer provides to ensure the proper setup of your system. After receiving this form, the field service engineer contacts you to schedule the installation.

Regulatory Compliance

Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as described in the next section or sections by product name.

Changes that you make to your system may void compliance with one or more of these EMC and safety standards. Changes to your system include replacing a part or adding components, options, or peripherals not specifically authorized and qualified by Thermo Fisher Scientific. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Thermo Fisher Scientific or one of its authorized representatives.

EMC Directive 2004/108/EC

EMC compliance has been evaluated by TÜV Rheinland of North America.

EN 55011: 2009, A1: 2010	EN 61000-4-6: 2009
EN 61000-3-2: 2006, A2: 2009	EN 61000-4-11: 2004
EN 61000-3-3: 2008	EN 61326-1: 2013
EN 61000-4-2: 2009	CISPR 11: 2009, A1: 2010
EN 61000-4-3: 2006, A2: 2010	ICES-003 Issue 5: 2012
EN 61000-4-4: 2004, A1: 2010	CFR 47, FCC Part 15, Subpart B, Class A: 2012
EN 61000-4-5: 2006	

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 2006/95/EC and harmonized standard EN/UL/CAN 61010-1.

FCC Compliance Statement

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.



CAUTION Read and understand the various precautionary notes, signs, and symbols contained inside this manual pertaining to the safe use and operation of this product before using the device.



Notice on Lifting and Handling of Thermo Scientific Instruments

For your safety, and in compliance with international regulations, the physical handling of this Thermo Fisher Scientific instrument *requires a team effort* to lift and/or move the instrument. This instrument is too heavy and/or bulky for one person alone to handle safely.

Notice on the Proper Use of Thermo Scientific Instruments

In compliance with international regulations: This instrument must be used in the manner specified by Thermo Fisher Scientific to ensure protections provided by the instrument are not impaired. Deviations from specified instructions on the proper use of the instrument include changes to the system and part replacement. Accordingly, order replacement parts from Thermo Fisher Scientific or one of its authorized representatives.

WEEE Directive

2012/19/EU



Thermo Fisher Scientific is registered with B2B Compliance ([B2Bcompliance.org.uk](https://www.b2bcompliance.org.uk)) in the UK and with the European Recycling Platform ([ERP-recycling.org](https://www.eur-ecycling.org)) in all other countries of the European Union and in Norway.

If this product is located in Europe and you want to participate in the Thermo Fisher Scientific Business-to-Business (B2B) Recycling Program, send an email request to weee.recycle@thermofisher.com with the following information:

- WEEE product class
- Name of the manufacturer or distributor (where you purchased the product)
- Number of product pieces, and the estimated total weight and volume
- Pick-up address and contact person (include contact information)
- Appropriate pick-up time
- Declaration of decontamination, stating that all hazardous fluids or material have been removed from the product

For additional information about the Restriction on Hazardous Substances (RoHS) Directive for the European Union, search for RoHS on the Thermo Fisher Scientific European language websites.

IMPORTANT This recycling program is **not** for biological hazard products or for products that have been medically contaminated. You must treat these types of products as biohazard waste and dispose of them in accordance with your local regulations.

Directive DEEE

2012/19/EU



Thermo Fisher Scientific s'est associé avec une ou plusieurs sociétés de recyclage dans chaque état membre de l'Union Européenne et ce produit devrait être collecté ou recyclé par celle(s)-ci. Pour davantage d'informations, rendez-vous sur la page www.thermoscientific.fr/rohs.

WEEE Direktive

2012/19/EU



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Preface

The *TSQ Quantiva and TSQ Endura Preinstallation Requirements Guide* provides information for planning and preparing your laboratory before delivery and installation of your Thermo Scientific™ TSQ Endura™ or TSQ Quantiva™ mass spectrometer (MS). Read each section carefully to ensure that your lab is ready for the system.

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- [Mass Spectrometer Models](#)
- [Related Documentation](#)
- [Cautions and Special Notices](#)
- [Contacting Us](#)

❖ To suggest changes to the documentation or to the Help

Complete a brief survey about this document by clicking the button below.
Thank you in advance for your help.



Mass Spectrometer Models

This guide is intended for the following mass spectrometer models:

- TSQ Endura—Requires one forepump.
- TSQ Quantiva—Requires two forepumps.

Related Documentation

The TSQ Endura and TSQ Quantiva mass spectrometers include complete documentation. In addition to this guide, you can also access the following documents as PDF files from the data system computer:

- *TSQ Endura and TSQ Quantiva Getting Connected Guide*
- *TSQ Endura and TSQ Quantiva Getting Started Guide*
- *TSQ Endura and TSQ Quantiva Hardware Manual*
- *Ion Max NG and EASY-Max NG Ion Sources User Guide*
- *Safety and Regulatory Guide*

The TSQ Endura and TSQ Quantiva also ship with a printed copy of the *Safety and Regulatory Guide*. This guide contains important safety information about Thermo Scientific liquid chromatography (LC) and mass spectrometry (MS) systems. Make sure that all lab personnel have read and have access to this document.

❖ To view the product manuals

From the Microsoft™ Windows™ taskbar, do the following:

- For a Thermo Scientific mass spectrometer, choose **Start > All Programs > Thermo Instruments > model x.x**, and then open the applicable PDF file.
- For an LC instrument controlled by a Thermo Scientific application, choose **Start > All Programs > Thermo Instruments > Manuals > LC Devices** and so on.

❖ To download user documentation from the Thermo Scientific website

1. Go to www.thermoscientific.com.
2. In the Search box, type the product name and press Enter.
3. In the left pane, select **Documents & Videos**, and then under Refine By Category, click **Operations and Maintenance**.
4. (Optional) Narrow the search results or modify the display as applicable:
 - For all related user manuals and quick references, click **Operator Manuals**.
 - For installation and preinstallation requirements guides, click **Installation Instructions**.
 - For documents translated into a specific language, use the Refine By Language feature.
 - Use the Sort By options or the Refine Your Search box (above the search results display).

5. Download the document as follows:
 - a. Click the document title or click **Download** to open the file.
 - b. Save the file.

Cautions and Special Notices

Make sure you follow the cautions and special notices presented in this guide. Cautions and special notices appear in boxes; those concerning safety or possible system damage also have corresponding caution symbols.

This guide uses the following types of cautions and special notices.



CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

IMPORTANT Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the system.

Note Highlights information of general interest.

Tip Highlights helpful information that can make a task easier.

The *TSQ Endura and TSQ Quantiva Preinstallation Requirements Guide* contains the following caution-specific symbols (Table 1).

Table 1. Caution-specific symbols and their meaning (Sheet 1 of 2)











Symbol	Meaning
	Chemical hazard: Wear gloves and other protective equipment, as appropriate, when handling toxic, carcinogenic, mutagenic, corrosive, or irritant chemicals. Use approved containers and proper procedures to dispose of waste oil and when handling wetted parts of the instrument.
	Heavy object: Never lift or move the instrument by yourself; you can suffer personal injury or damage the instrument.
	Risk of electric shock: This instrument uses voltages that can cause electric shock and/or personal injury. Before servicing, shut down the instrument and disconnect it from line power. While operating the instrument, keep covers on.

Table 1. Caution-specific symbols and their meaning (Sheet 2 of 2)

Symbol	Meaning
	Risk of eye injury: Eye injury could occur from splattered chemicals or airborne particles. Wear safety glasses when handling chemicals or servicing the instrument.
	Trip obstacle: Be aware of cords, hoses, or other objects located on the floor.

Contacting Us

There are several ways to contact Thermo Fisher Scientific for the information you need. You can use your smartphone to scan a QR code, which opens your email application or browser.

Contact us	Customer Service and Sales	Technical Support
	(U.S.) 1 (800) 532-4752	(U.S.) 1 (800) 532-4752
	(U.S.) 1 (561) 688-8731	(U.S.) 1 (561) 688-8736
	us.customer-support.analyze@thermofisher.com 	us.techsupport.analyze@thermofisher.com 

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Introduction

For the Thermo Scientific TSQ Endura and TSQ Quantiva system, you are responsible for providing a suitable location, a carefully controlled operating environment, a source of power of acceptable quality, correct gases and solvent supplies, and proper waste and exhaust systems.



CAUTION Operating a system or maintaining it outside the power and operating environment specifications described in this guide might cause failures of many types. The repair of such failures is specifically excluded from the Thermo Fisher Scientific standard warranty and service contract coverage.

Note

- For preinstallation support and additional information, contact your local Thermo Fisher Scientific office.
- Unless otherwise noted, the information in this guide applies to both models.

Site Preparation

You are responsible for providing an acceptable installation site for the TSQ Endura or TSQ Quantiva system before the Thermo Fisher Scientific service engineer arrives. Make sure your laboratory meets these requirements:

- When transporting the equipment to the designated site, you have a wide turning radius through entrances, hallways, elevators, and so on. Remember to consider the width of the device transporting the shipping container to the lab.
- The lab has a designated location for the system modules.
- The laboratory has large, strong workbenches to support the weights of the mass spectrometer, LC instrument, and data system module.

Contents

- [Entrance](#)
- [Space and Load Requirements](#)
- [Forepumps](#)
- [Telephone](#)

Entrance

The entrance to your facility and the width of all hallways, elevators, and so on must be a minimum of 95 cm (37 in.). However, allow additional room for maneuvering the system around corners, into elevators, or through doorways.

The system ships in multiple containers. The main shipping container measures 104 cm l , 95 cm w , and 135 cm h (41 in. l , 37 in. w , and 53 in. h) and, including its contents, weighs approximately 187 kg (410 lb). Use this information to determine how to transport and remove its contents.

Note If the lab entrance cannot accommodate a 95 cm (37 in.) container, remove the modules from the container before moving them into the room. If you remove the instrument from its shipping container before it is delivered to the lab site, ensure that all the container contents remain with the instrument.

Other equipment in your order have their own smaller shipping containers and do not require special consideration. These modules—such as the forepumps, data system computer, monitor, and other options—ship in separate containers. The chemicals kit typically arrives earlier than the other parts of your order.

Space and Load Requirements

Table 2 lists the dimensions and weights for the data system and mass spectrometer system modules. Use this information to ensure that all workbenches are large enough and strong enough to support the modules.

Table 2. Space and load requirements for the system modules

Modules	Width (w) cm (in.)	Height (h) cm (in.)	Depth (d) cm (in.)	Weight kg (lb)
LC/MS system				
(Optional) Thermo Scientific Dionex™ UltiMate™ 3000 ^a	41 (16)	97 (38)	46 (18)	62 (138)
TSQ Quantiva or TSQ Endura mass spectrometer ^b	76 (30)	70 (28)	80 (32)	131 (288)
Forepump (each)	32 (12.6)	26.4 (10.4)	48 (19)	52 (115)
Data system				
Computer, mini-tower	17.5 (7)	36 (14.2)	41.7 (16.4)	9.4 (21)
Monitor	64 (25.3)	54 (21) ^c	20 (8)	7 (15.8)
Ethernet switch	15.4 (6.1)	2.9 (1.14)	11 (4.5)	0.17 (0.4)
(Optional) Laser printer	45 (18)	32 (12.4)	41 (16)	16 (35)

^a Approximate. The actual value depends on your equipment.

^b Includes the divert/inject valve

^c Fully extended

This section discusses the following:

- [Workbench Requirements](#)
- [LC/MS System Layout](#)

Workbench Requirements

Table 3 lists the recommended minimum surface dimensions and load capacities for each workbench that you must provide. Thermo Fisher Scientific recommends that workbenches have a load capacity of at least twice the combined weight of all expected devices.



CAUTION Heavy object. Never lift or move the mass spectrometer by yourself; you can suffer personal injury or damage the instrument.

Table 3. Minimum workbench surface dimensions and load capacities

Equipment	Surface	Load capacity
LC system ^a	—	—
Mass spectrometer	81.3 × 86.4 cm (32 × 34 in.)	261.3 kg (576 lb)
Data system	122 × 91.4 cm (48 × 36 in.)	65.3 kg (144 lb)

^a Refer to the product manual for information about the LC system's workbench.

Follow these clearance guidelines for the workbenches:

- Place the data system and MS workbenches adjacent to each other to prevent strain on the interconnecting Ethernet communications cables.

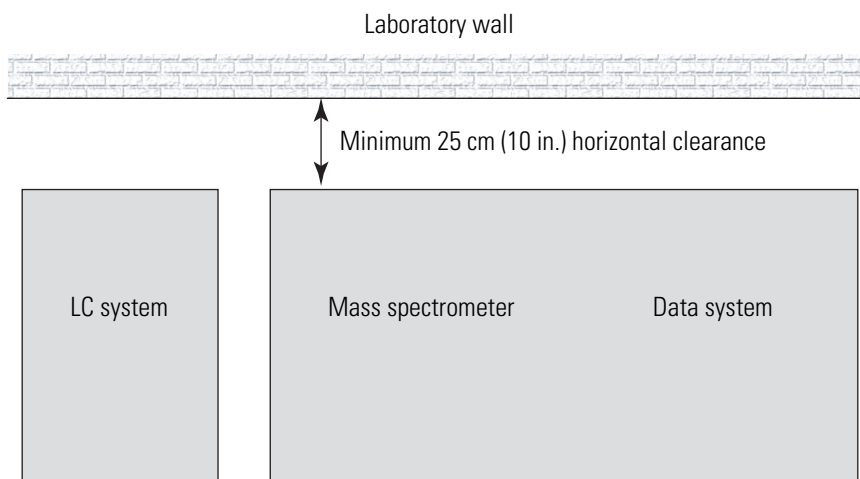


CAUTION Safety and EMC regulations require the use of Category 5e shielded Ethernet communications cables, maximum 3 m (10 ft) long.

- For all systems, allow for a minimum vertical clearance of 92 cm (36 in.) between the top of the system and any shelves above it.
- For the MS system, allow for these minimum horizontal clearance for proper air circulation and for the installed gas lines and tubing:
 - 25 cm (10 in.) behind the instrument
 - 46 cm (18 in.) on the right side of the instrument

Figure 1 shows the top view (footprint) for the system workbenches.

Figure 1. Top view and recommended placement of the workbenches (tables)



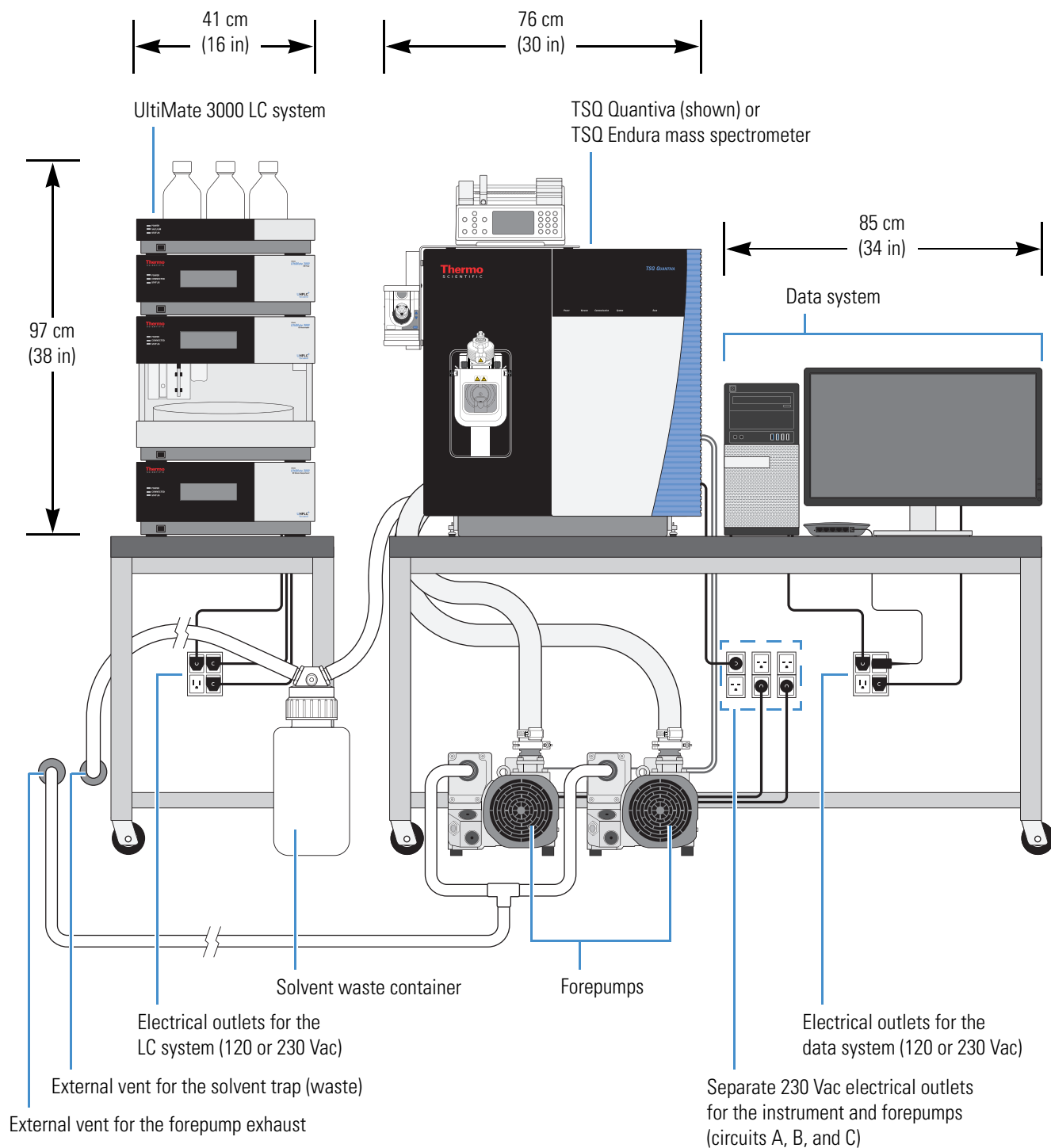
LC/MS System Layout

Figure 2 shows the recommended layout for the data system, LC instrument, and mass spectrometer. Not all connections are shown; for connection information, refer to the *TSQ Endura and TSQ Quantiva Getting Connected Guide* and the LC product manual.



CAUTION For information about the LC drainage systems, refer to the LC instrument manual.

Figure 2. Workbenches for the optional UltiMate 3000 LC system (left), mass spectrometer (center), and data system



Forepumps

The TSQ Endura system uses one forepump, whereas the TSQ Quantiva system uses two. Depending on available space, you have two options for the placement of the forepumps and for connecting the vacuum hose from the mass spectrometer to the forepumps.

- If the workbench has space underneath, place the forepumps under the workbench immediately behind the mass spectrometer. Either run the vacuum hose behind the workbench or make a 6.4 cm (2.5 in.) diameter hole through the bench for the vacuum hose. Allow for room to run the power cords from the forepumps through the hole.
- If the workbench has no space under it, place the forepumps at the end of the workbench.



CAUTION Trip hazard. Whenever possible, provide space under the workbench for the forepumps. If placed in front of the mass spectrometer, the forepumps become a trip hazard.



CAUTION

- Do not place the forepump on a shelf or other surface connected to the workbench. Vibration from the pump can affect system performance.
- The exhaust hose tubing acts as a trap for exhaust fumes that would otherwise recondense in the forepump oil.
 - To maintain forepump integrity, route the exhaust tubing from the exhaust port down to the floor, not from the forepump vertically toward the ceiling.
 - Run the exhaust hose at floor level for a minimum of 2 m (79 in.) before it reaches the external exhaust system.

Telephone

Make sure all of the laboratory staff have access to a telephone (landline or mobile) in the lab near the system so that, if necessary, you can operate the mass spectrometer while speaking with Thermo Fisher Scientific Technical Support. For a landline connection, make sure that the telephone jack is within 1.8 m (6 ft) of the mass spectrometer.

Operating Environment

For proper operation of the system, you are responsible for providing the operating environment described in this chapter. Attention to the operating environment ensures continued high performance of your Thermo Scientific LC/MS system. Any expenditures for air conditioning are more than offset by good sample throughput and reduced repair costs.

Contents

- [Summary of Environmental Requirements](#)
- [Humidity](#)
- [Temperature](#)
- [Particulate Matter](#)
- [Electrostatic Discharge](#)
- [Lighting](#)
- [Vibration](#)

Summary of Environmental Requirements

Table 4 lists the environmental requirements for the designated laboratory.

Table 4. Summary of environmental requirements (Sheet 1 of 2)

Parameter	Specification
Humidity	40–80%, noncondensing
Temperature	<ul style="list-style-type: none"> • Standard performance: 15–27 °C (59–81 °F) • Optimum performance: 18–21 °C (65–70 °F) • Ambient temperature: Fluctuations of less than 1 °C or 2 °F over a one-hour period
Particulate Matter	Does not exceed 3 500 000 particles per cubic meter (100 000 particles per cubic foot).

Table 4. Summary of environmental requirements (Sheet 2 of 2)

Parameter	Specification
Electrostatic Discharge (ESD)	Follow the stated precautions to help prevent ESD.
Lighting	<ul style="list-style-type: none">• Operating: Typical laboratory lighting• Cleaning: Use a small, high-intensity lamp
Vibration	Choose a lab location that is vibration-free.

Humidity

Maintain the relative humidity in the designated lab at 40–80 percent, without condensation.

Operating a Thermo Scientific mass spectrometer in an environment with very low humidity can cause the accumulation and discharge of static electricity that can shorten the life of the electronic components. Operating the mass spectrometer in an environment with high humidity can cause condensation, oxidation, and short electronic circuits. It can also cause the accumulation of dust that can block filters on cooling fans.

To ensure that the lab is always within the required temperature and humidity specifications, Thermo Fisher Scientific recommends that you install a temperature and humidity monitor in the lab.

Temperature

For precision instruments, such as a Thermo Scientific mass spectrometer, maintain the lab temperature at 15–27 °C (59–81 °F). For optimum performance, maintain the lab temperature at 18–21 °C (65–70 °F). Temperature control is vital to acquiring accurate mass measurements. Therefore, make sure that during any one-hour period, ambient temperature fluctuations are less than 1 °C or 2 °F.

IMPORTANT

- All electronic components generate heat while operating. This heat must dissipate to the surrounding air for the components to continue to operate reliably.
- Do not locate the instrument under an air duct, near windows, or near heating and cooling sources. As the lab temperature increases, the LC/MS system reliability decreases.

There must be good air flow around the system, and the air conditioning system must maintain a constant temperature in the immediate vicinity of the instrument. [Table 5](#) lists the approximate heat output (power) for the system. For the heat output of your specific LC devices and the data system components, refer to the instrument manuals.

Table 5. Maximum heat output

Module	Heat output (W)	Heat output (Btu/h)
Liquid chromatograph (LC) ^a	1060	3690
TSQ Endura or TSQ Quantiva mass spectrometer	1550	5396
Forepump (each)	1500	5220
Data system modules (mini-tower computer, monitor, and optional laser printer)	889	3033
Total—TSQ Endura system (one forepump)	4999	17 339
Total—TSQ Quantiva system (two forepumps)	6499	22 559

^a Approximate values for the UltiMate 3000. The actual values depend on your installed equipment.

Particulate Matter

Make sure that the air in the lab is free from excessive dust, smoke, or other particulate matter in excess of 5 µm—that is, fewer than 3 500 000 particles per cubic meter (100 000 particles per cubic foot).

Dust can clog the air filters, causing a reduction in air flow around electronic components. Dust on electronic components can act as an insulating blanket, which reduces the transfer of heat from the components to the surrounding air.

Electrostatic Discharge

Electrostatic discharge (ESD) can damage the electronic components of the TSQ Endura or TSQ Quantiva mass spectrometer.

Most Thermo Scientific instruments are designed to withstand ESD up to 4 kV (air discharge) and 4 kV (contact discharge) with all panels in place. However, removing the panels and handling the printed circuit boards (PCBs) without proper precautions might damage the electrical components or cause them to fail prematurely.

Because of ESD, Thermo Fisher Scientific recommends the following precautions, especially when operating the system at the lower end of the relative humidity specification:

- Use a static-dissipating floor covering (such as tile or conductive linoleum) in the lab.
- Use laboratory chairs covered with natural fibers or other static-dissipating material.
- Wear a laboratory coat and clothing made of natural fiber or other static-dissipating material when operating the instrument.
- Keep Styrofoam™ cups or packing materials away from the instrument.

Lighting

Good lighting makes any work area more enjoyable. Thermo Fisher Scientific recommends that you use a small, high-intensity lamp when cleaning the mass spectrometer components.

Vibration

Select a lab location that is free from vibration—floors at ground level usually have less vibration. When selecting the location, be aware of adjacent rooms with equipment that could transmit vibrations through the floor to the mass spectrometer workbench.

Because of the natural vibration of the forepump during operation, install the forepump on the floor under the mass spectrometer.

Line Power

You are responsible for providing a power source of acceptable quality to operate the system. The quality of line power (ac mains power system) delivered to the TSQ Endura or TSQ Quantiva system can affect its performance and longevity. To ensure that the system performs optimally and is not damaged by line power fluctuations, verify that the lab's electrical supply complies with all power quality requirements.



CAUTION To support compliance and safety requirements, all devices connected between the power source and the mass spectrometer must be certified by recognized organizations for your country or territory (for example, UL, CSA, SEMKO, VDE, or TÜV).

Such devices include the power supply cords, electrical outlets, circuit breakers, uninterruptible power supplies (UPSs), and so on.

Contents

- [Quality of Power](#)
- [Power Monitoring Devices](#)
- [Power Conditioning Devices](#)
- [Uninterruptible Power Supply](#)
- [Circuit Breakers](#)
- [Earth Ground](#)
- [Electrical Outlets](#)
- [Power Supply Cords](#)
- [Technical Assistance](#)

Quality of Power

Establishing the quality of power supplied to the LC/MS system is very important for these reasons:

- Constant high line voltage, impulses, or surges in voltage can cause overheating and component failures.
- Constant low line voltage or sags in voltage can cause the system to function erratically or not at all.
- Transients—even a few microseconds in duration—can cause electronic devices to degrade or fail catastrophically, shortening the lifetime of the system.

Before the service engineer arrives to install your system, make sure the line voltage is stable and within the recommended specifications. The line voltage must be free of fluctuations due to slow changes in the average sags, surges, transients, or voltage. For the mass spectrometer's electrical ratings, see [Table 7](#) on [page 17](#).

[Table 6](#) lists the definitions for the three most common voltage disturbances.

Table 6. Common voltage disturbances

Voltage disturbance	Definition
Slow average	A gradual, long-term change in average root mean square (RMS) voltage level, with typical durations greater than 2 s
Sags and surges	Sudden changes in average RMS voltage level, with typical durations between 50 ms and 2 s
Transients or impulses	A brief voltage spike of up to several thousand volts, with typical durations up to 50 μ s

Power Monitoring Devices

Several devices are available to monitor the quality of the line power. These devices provide a continuous record of line performance by analyzing and printing out data for the three most common voltage disturbances (see [Table 6](#)).

In the first two cases, the time interval recording indicates the duration and the amplitude of the disturbance. A power line disturbance analyzer detects and records most types of line power problems. The Dranetz™ system¹ is an example of a suitable analyzer. In some countries, you can rent power line analyzers from electrical equipment suppliers.

¹ Thermo Fisher Scientific does not endorse any power monitoring company, nor does it endorse products other than its own. Companies and products listed in this guide are given as examples only.

Monitor the power line 24 hours a day for seven consecutive days. If inspection of the printout indicates disturbances, stop the test and take corrective action. Monitor the power again as previously described.

Power Conditioning Devices

You can correct a line voltage problem by using various line voltage conditioning devices. If the power regulation is good but the power line disturbance analyzer shows transient voltages, an isolation/noise-suppression transformer can resolve the problem. For both transient and regulation problems, consider the use of power conditioners to control these problems. See the CAUTION statement on [page 13](#).



CAUTION Any conditioning devices installed with the system must be able to handle the potentially high currents that are drawn during the initial startup of the system. For example, during startup, the forepump or forepumps can draw a high inrush current.

Because the TSQ Endura and TSQ Quantiva mass spectrometers require the use of one or two forepumps, the system draws an inrush current. The maximum inrush (start) current for one forepump (Oerlikon Leybold Vacuum™, model SOGEVAC™ SV 65 BI) is 12 A. The average duration of the forepump's inrush current is less than 1 s. Therefore, this initial energy demand from the ac power line is very low.

Thermo Scientific systems are protected from overcurrents with time-delay fuses and active switches. For more information, contact your Thermo Fisher Scientific service engineer.

When the line voltage is free from voltage sags, surges, and impulses but is more than 10 percent outside of the voltage specifications, a buck/boost transformer can lower (buck 10 percent) or raise (boost 10 percent) the line voltage as appropriate for the rated voltage.

Order the Buck/Boost Transformer Kit (P/N OPTON-01460) from Thermo Fisher Scientific San Jose. Each buck/boost transformer is encased in a metal housing approximately 13 × 13 × 26 cm (5 × 5 × 10 in.) and ships with a 2 m (6.5 ft) power supply cable. Have a certified electrician install the transformer, using the installation instructions that are included. Then, install the TSQ Endura or TSQ Quantiva system.



CAUTION Systems installed in areas with 208 Vac power can experience voltage sags during high use periods that might place the line voltage below the operating parameters discussed in this section. In this case, protect the system by using a buck/boost transformer to ensure that power stays within the specified parameters.

Uninterruptible Power Supply

If your local area is susceptible to corrupted power or power disruptions, install an uninterruptible power supply (UPS) in the lab. See the Caution on [page 13](#).

Circuit Breakers

Make sure that each circuit breaker is suitably rated so that the equipment connected to the electrical outlets does not lose power by triggering a current overload condition. For added protection, install a surge protector at the input to the circuit breaker panel.

Earth Ground

Make sure that the earth ground connections in the lab are hardwired to the same ground used for the main circuit breaker panel. Multiple external ground points can cause noise current to flow through the ground loop that is formed.

Electrical Outlets

Installing a complete TSQ Endura or TSQ Quantiva system can require extensive electrical resources for connecting all of the equipment. Plan the power system properly, with a sufficient number of grounded, electrical outlets that are suitably rated. In addition, Thermo Fisher Scientific recommends having several additional outlets close to the work area for testing and cleaning equipment, such as an oscilloscope and a sonicator.



CAUTION To avoid an electric shock, always have a certified electrician install any new wall receptacles.

Table 7 lists the electrical ratings (labels) and required number of outlets for the modules in a typical lab setup. For the LC modules, refer to the manufacturer's manuals. To prevent overloading the outlets, select outlets with a load rating that is suitable for the expected total current draw per outlet.

IMPORTANT

- Thermo Fisher Scientific recommends that you connect the mass spectrometer and each forepump to separate electrical outlets that have their own dedicated single-phase, circuit breakers rated 230 Vac, 15 A for North America and 230 Vac, 16 A for other countries and territories. For example, the TSQ Quantiva system requires three separate, dedicated electrical outlets (one for the instrument and two for the forepumps). See also Figure 2.
- In North America, the LC/MS system requires both 120 and 230 Vac single-phase electrical outlets.

Table 7. Electrical ratings and required outlets per module

Module	Voltage (Vac)	Current (A)	Required outlets
MS system			
TSQ Endura or TSQ Quantiva mass spectrometer ^a	230	5	1
Forepump (SV 65 BI) ^b	230	8	1 or 2
Thermo Scientific divert/inject valve	110–220	1.5	1
Thermo Scientific syringe pump	110/220	0.2/0.1	1
Data system			
Computer, mini-tower	100–240	5.4	1
Monitor	100–240	1.5	1
Ethernet switch	100–240	Less than 1	1
(Optional) Laser printer	110 –or– 220	8.6 –or– 4.2	1
Optional devices^c			
High-intensity lamp (for instrument maintenance)	–	–	1
Laboratory stereoscope (for inspecting fused-silica parts)	–	–	1
Total number of electrical outlets^d:		10+ (one-forepump system) 11+ (two-forepump system)	

^a Manufacturer-tested within $\pm 10\%$ of the electrical rating

^b The values are for one forepump.

^c Refer to the equipment manual for the electrical ratings.

^d Remember to add the number of outlets required for your LC system.

IMPORTANT After planning the location of the workbenches (see [Chapter 2](#)), consider the following before installing the electrical outlets:

- Each module's location and whether each requires a 120 or 230 Vac outlet (see [Table 7](#))
- The minimum number of outlets needed for a given voltage and adding the number of outlets needed for any additional lab equipment (see [Table 7](#))
- The length of the power supply cords (see [Power Supply Cords](#))

Power Supply Cords

Your order includes the power supply cords for the TSQ Endura or TSQ Quantiva mass spectrometer, one or two forepumps, and peripheral components. The mass spectrometer and forepump use the same power plugs and receptacles. The power supply cords for the mass spectrometer and forepump are 2.5 m (8 ft) long. The power supply cords for the data system components are 1.8 m (6 ft) long.

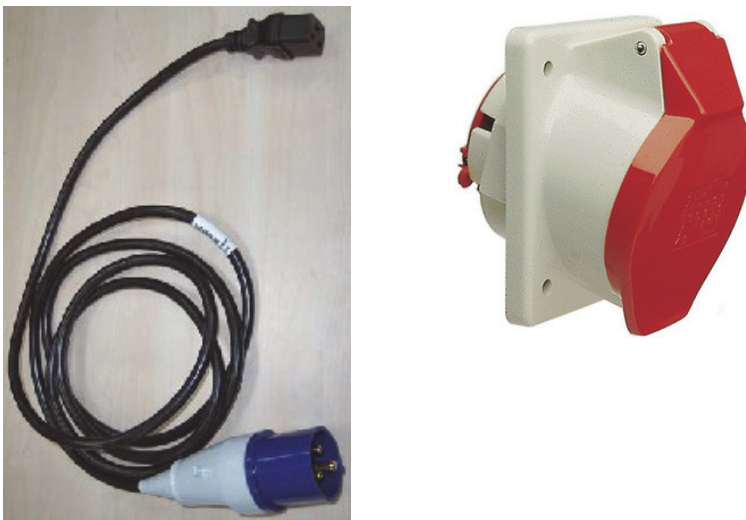
Figure 3 shows an example of the NEMA 6-15 plug and receptacle configuration (rated 250 Vac, 15 A) for use in North America and other locations that use the same configuration.

Figure 3. NEMA 6-15 plug (left) and receptacle (right) for North America (example)



Figure 4 shows the international power supply cord and receptacle (rated 250 Vac, 16 A) with a CEE (3-pole) configuration for use in locations outside of North America.

Figure 4. MS power supply cord and receptacle for outside of North America (provided)



The peripheral components (syringe pump, divert/inject valve, data system computer, monitor, and Ethernet switch) ship with detachable power supply cords that are appropriate for your country or territory. The power supply cords for the data system components are 1.8 m (6 ft) long. The power supply cord for the optional laser printer has either a NEMA 5-15P plug or a European CEE 7/7 (Schuko) plug, which is rated 16 A, 220 Vac.

Technical Assistance

Occasionally, you might encounter line power sources with unacceptable quality that adversely affect the operation of the LC/MS system. You are responsible for correcting any line power problems. Contact Thermo Fisher Scientific for assistance in monitoring the line voltage in your lab and in selecting a line conditioner.

Specifying power conditioning equipment is a complex task that is best handled by a company or consultant specializing in that field. Contact Thermo Fisher Scientific for assistance in locating a power consultant in your area.

Gases and Solvents

You are responsible for providing the correct gas, solvent, and regulators to operate the TSQ Endura or TSQ Quantiva system. The mass spectrometer requires ultra-high-purity (UHP) argon gas, high-purity (HP) nitrogen gas, and solvents. The Thermo Fisher Scientific service engineer might also require certain solvents for the installation verification of your system.

The gas connections are located on the left side of the instrument. For information about connecting the gas lines, refer to the *TSQ Endura and TSQ Quantiva Getting Connected Guide*.

Contents

- [Gases](#)
- [Solvent Recommendation](#)

Gases

The instrument can use large amounts of gas during daily operations. Make sure that the gases are delivered with the necessary pressure and purity as listed in [Table 8](#).

Table 8. Summary of the required gases for the mass spectrometer

Type	Recommended purity	Required gas pressure	Typical daily consumption ^a	Function
Argon	UHP (99.995%)—Has less than 1.0 ppm each of water, oxygen, and total hydrocarbons.	135 ±70 kPa (20 ±10 psi)	17 L (0.6 ft ³)	Collision gas
Nitrogen	HP (99%)	690 ±140 kPa (100 ±20 psi)	11 500–26 700 L (406–943 ft ³)	Venting gas; API source auxiliary gas, sheath gas, and sweep gas

^a Approximate value when operating 24 hours and 7 days a week



CAUTION

- Contaminants introduced during the installation of house lines used for gas delivery can cause damage to the mass spectrometer. Make sure that all gas lines used with the instrument have been cleaned of all particulates and oils. You are responsible for any damage to the instrument caused by contaminants introduced from your gas delivery system.
- Because particulate filters can be a source of contamination, Thermo Fisher Scientific does not recommend their use.

Argon Supply

To dispense UHP argon from a tank (such as one containing 245 ft³ of argon), use a Matheson™ 3120 Series¹ regulator (or equivalent tank and regulator). Particulate filters are not recommended because they can be a source of contamination. Use either stainless steel tubing or the provided copper tubing for the argon gas line, and make sure that it is free of oil and preferably flame dried. Terminate the argon gas supply lines with 1/8 in., female, Swagelok™-type connectors.

Note After you start using the mass spectrometer, do not shut off the argon gas. Optimum performance requires a continuous flow of argon.

Nitrogen Supply

You must provide a regulator for the nitrogen gas supply that you can adjust over the specified pressure range. Thermo Fisher Scientific recommends one of the following sources for the HP nitrogen supply:

- A large, sealed, thermally insulated cylinder containing liquid nitrogen from which the nitrogen gas is boiled off. Because the 35 psi (240 kPa) and 80 psi (550 kPa) models do not provide sufficient gas pressure, Thermo Fisher Scientific recommends a 230 psi (1590 kPa) model. A typical 240 L cylinder yields 143 850 L (5080 ft³) of gas. Replace the cylinder approximately once every month.
- A nitrogen generator that can generate up to 5560 L (200 ft³) per day at 99% purity with 100 psi (689 kPa) at the side panel. Maximum consumption of nitrogen gas is 21 L/min (40 ft³/h). Nitrogen generators require an air compressor. Because some models of air compressors are quite noisy, be careful to select a quiet compressor. A generator is a continuous source, with no replacement required.

¹ For more information, visit www.mathesonogas.com. Thermo Fisher Scientific does not endorse any products other than its own. Companies and products listed in this guide are given as examples only.

Note Liquid nitrogen conversion factors:

- 1.0 lb of liquid nitrogen = 0.5612 L
- 1.0 kg of liquid nitrogen = 1.237 L

Terminate the nitrogen gas supply line with a quick-connect connector. Because particulate filters can be a source of contamination, Thermo Fisher Scientific does not recommend their use.



CAUTION When you turn on the system, the initial nitrogen surge might exceed the capacity of the nitrogen generator. This sudden surge causes a flow rate drop that can trigger a low nitrogen warning from the mass spectrometer. If low nitrogen warnings happen frequently, call your Thermo Fisher Scientific service engineer.

Solvent Recommendation

As specified in [Table 9](#), use only LC/MS-grade solvents and reagents for operating and maintaining the TSQ Endura or TSQ Quantiva system. Installation of the instrument requires LC/MS-grade methanol and water. Installation of some systems might also require solvent modifiers.



CAUTION Avoid exposure to potentially harmful materials.

By law, producers and suppliers of chemical compounds are required to provide their customers with the most current health and safety information in the form of Material Safety Data Sheets (MSDSs) or Safety Data Sheets (SDSs). The MSDSs and SDSs must be freely available to lab personnel to examine at any time. These data sheets describe the chemicals and summarize information on the hazard and toxicity of specific chemical compounds. They also provide information on the proper handling of compounds, first aid for accidental exposure, and procedures to remedy spills or leaks.

Read the MSDS or SDS for each chemical you use. Store and handle all chemicals in accordance with standard safety procedures. Always wear protective gloves and safety glasses when you use solvents or corrosives. Also, contain waste streams, use proper ventilation, and dispose of all laboratory reagents according to the directions in the MSDS or SDS.

Table 9. Recommended solutions

Solvent	Grade	Size ^a	Part number
Acetonitrile	Optima™ LC/MS	Amber glass, 4 L	A955-4
Formic acid (modifier)	Optima LC/MS	Ampule, 10 × 1 mL	A117-10X1AMP
Methanol	Optima LC/MS	Amber glass, 4 L	A456-4
Water	Optima LC/MS	Amber glass, 4 L	W6-4

^a Size for the stated part number

IMPORTANT

- Some solvent impurities are transparent to a UV-Vis detector. Therefore, some HPLC-grade solvents might contain contaminants that interfere with the performance of the mass spectrometer. To operate the mass spectrometer, choose HPLC solvents with minimum contamination.
- Do not filter solvents. Filtering solvents can introduce contamination.

Note Visit www.fishersci.com for a wide variety of solvents and consumables for purchase.

Waste and Exhaust

You are responsible for providing the proper waste and exhaust systems that are required to operate the TSQ Endura or TSQ Quantiva system. The waste and exhaust arrangements can affect the proper performance of the system. You must vent vacuum and solvent wastes separately, and collect and dispose of wastes properly.

For information about setting up the exhaust and waste systems, refer to the *TSQ Endura and TSQ Quantiva Getting Connected Guide*.

Contents

- [Exhaust System](#)
- [Solvent Waste](#)

Exhaust System

To properly operate one or both forepumps, Thermo Fisher Scientific strongly recommends connecting the forepump to an efficient fume exhaust system. The forepump eventually exhausts much of what is introduced into the mass spectrometer, including the small amount of oil vapor that a mechanical pump can emit.

Note Most API applications contribute to solvents accumulating in the forepump. Although Thermo Fisher Scientific recommends that you periodically open the ballast valve (on the side of the pump) to purge the accumulated solvents, opening the valve might allow a large volume of volatile solvent waste to enter the fume exhaust system. Choose an exhaust system that can accommodate the periodic purging of these solvents. The frequency of the purging depends on the throughput of the system.

The forepump requires one 15 mm (0.6 in.) OD exhaust port. The exhaust system for the forepump must be able to accommodate an initial inrush flow rate of 3 L/min (6.4 ft³/hr) and a continuous flow rate of 1 L/min (2 ft³/hr). The exhaust tubing from the forepump to the exhaust system is 0.5 in. ID, 3/4 in. OD, and 3 m (10 ft) long.

IMPORTANT The port for the lab exhaust system must be close enough to the forepump or forepumps so that the exhaust hose is at floor level for a minimum of 2 m (78.7 in.). This hose acts as a trap for exhaust fumes that would otherwise recondense in the forepump oil.

Equip your lab with at least two fume exhaust systems:

- The analyzer optics become contaminated if the drain/waste tubing and the exhaust tubing from the forepump connect to the same fume exhaust system. Route the exhaust tubing from the forepump to a dedicated fume exhaust system.



CAUTION Do NOT run the forepump exhaust lines vertically near the forepump. Solvents and oils can condense in the line and flow back into the pump, causing pump damage, and diminished pump capability.

- Do not vent the Tygon™ drain tube (or any vent tubing connected to the waste container) to the same fume exhaust system that connects to the forepump. Vent the waste container to a dedicated fume exhaust system. The exhaust system for the API source must accommodate a flow rate of up to 30 L/min (64 ft³/h).

Solvent Waste

The mass spectrometer comes with parts to collect the solvent waste from the API source. Because the API source can accommodate high flow rates, you must use a method of collecting the waste solvent that avoids pressure buildup in the source. The solvent drain/waste exhaust port is located on the left side of the instrument.

IMPORTANT The solvent waste tubing that connects from the waste container to the exhaust system is 1 in. ID, 1-3/8 in. OD. Make sure that your lab exhaust system can accommodate this tubing without using reducing connectors along the solvent waste path.

Use these guidelines for the API source drain:

- Use the Tygon tubing provided with the solvent waste container to connect the solvent waste container to the lab's fume exhaust system.
- To prevent solvent waste from backing up into the mass spectrometer, make sure that all Tygon tubing is above the level of liquid in the waste container as follows:
 - From the mass spectrometer to the solvent waste container
 - From the solvent waste container to the exhaust system

For additional information, refer to the *TSQ Endura and TSQ Quantiva Getting Connected Guide*.

Instrument Shipments

Electronic equipment carriers that specialize in the handling and transport of delicate machinery ship the TSQ Endura or TSQ Quantiva mass spectrometer to your site. When the instrument arrives, move it to a protected indoor location. If you have questions about moving your instrument, contact your local office for Thermo Scientific San Jose products (see “[Contacting Us](#)” on [page xiv](#)).



CAUTION Heavy object. Never lift or move the instrument by yourself; you can suffer personal injury or damage the instrument.

On the occasion when shipments arrive that appear damaged, take these immediate actions.

Contents

- [Receiving Shipping Packages and Reporting Damage](#)
- [Filing a Damage Claim Against the Carrier](#)

Receiving Shipping Packages and Reporting Damage

Upon delivery, visually inspect for any damage to the shipment packages.

❖ To visually inspect for damage

Carefully inspect for obvious damage or evidence of rough handling.

If the instrument shipping container, ShockWatch™, or other indicators show visible evidence of damage or mishandling, do NOT open the container.

Follow the next procedure, and then call your Thermo Fisher Scientific sales representative for further instructions.

❖ **To record damages on the receiving documents**

1. Read the information in [Filing a Damage Claim Against the Carrier](#) to determine which parties might be responsible for filing a claim against the carrier.
2. On all copies of the receiving documents, note any apparent external damage and briefly describe the extent of the damage.
3. Have the driver sign or initial next to your comments to signify agreement with your observations.
4. Report the list of damages to your Thermo Fisher Scientific representative.

IMPORTANT Freight insurance requires that you note obvious damage on the receiving documents. Thermo Fisher Scientific does not accept liability for damage if materials are received with obvious damage AND the damage is not recorded on the receiving documents.

Filing a Damage Claim Against the Carrier

If the instrument is damaged in transit, the shipment method determines the party who assumes the risk of damage and files a claim against the carrier—Thermo Fisher Scientific or the purchaser. To determine the shipment method for instruments shipped from the San Jose, CA site, check the sales agreement or the sales quote.

[Table 10](#) lists the party who files the damage claim against the carrier for instruments damaged in transit based on the shipment method.

Table 10. Shipment methods for delivery from the San Jose, CA site to domestic and international destinations

Destination	Shipment method	Party responsible for filing a damage claim
Domestic (United States)	Destination or Origin—Thermo Fisher Scientific pays the carrier.	Thermo Fisher Scientific
	Origin—The purchaser pays the carrier.	Purchaser
International	Carriage Paid To (CPT) named destination ^a	Purchaser
	Carriage and Insurance Paid (CIP) to named destination ^b	Thermo Fisher Scientific

^a Unless specified differently, Thermo Fisher Scientific uses this shipment method for international shipments.

^b Under special circumstances, Thermo Fisher Scientific uses this shipment method for international shipments.

Installation

Complete all preparations described in the previous chapters before your Thermo Fisher Scientific service engineer installs the TSQ Endura or TSQ Quantiva system.

IMPORTANT If the instrument shipping container, ShockWatch, or other indicators show any evidence of damage or mishandling during shipment, do NOT open the container. Call your Thermo Fisher Scientific representative for instructions on what to do. If the instrument arrives safely, proceed with the following instructions.

After you have completed the laboratory site preparation and received the TSQ Endura or TSQ Quantiva system, send the completed and signed “[TSQ Endura and TSQ Quantiva Installation Request Form](#)” on [page iii](#) to your local office for Thermo Fisher Scientific San Jose products. After receiving this form, the service engineer contacts you to schedule the installation.



CAUTION Heavy object. Never lift or move the instrument by yourself; you can suffer personal injury or damage the instrument.

Contents

- [Installation Kits](#)
- [Customer-Supplied Hardware](#)
- [Basic On-Site Training](#)
- [Advanced Training Courses](#)
- [Preventive Maintenance](#)

Installation Kits

The TSQ Endura and TSQ Quantiva mass spectrometers include the following kits ([Table 11](#)).

Table 11. Kits provided with the mass spectrometer

Kit name	Description
Preinstallation Kit (North American or International, as applicable)	Contains this guide and the Chemicals Kit. The International Preinstallation Kit also includes three 230 Vac CEE (3-pole) wall receptacles.
Chemicals Kit (P/N 80100-62006)	Contains the chemicals for demonstrating the system performance specifications.
Calibration Kit (P/N 80000-62013)	Contains a syringe and the installation components, such as fittings and tubing.
MS Setup Kit (P/N 80100-62003)	Contains the components to connect the mass spectrometer to the forepump or forepumps, the gas supplies, the Ethernet switch, and the waste container.
Performance Specification Kit (P/N 80100-62008)	Contains the plumbing hardware for demonstrating the system performance specifications.
Single Mechanical Pump Kit (P/N 80100-62004) –or– Dual Mechanical Pump Kit (P/N 80100-62013)	Contains the forepump (single pump kit) or forepumps (dual pump kit), relay control cable, and installation components, such as the exhaust waste tubing.

Depending on your system configuration, you might have other kits with your shipment.

Customer-Supplied Hardware

Thermo Fisher Scientific does not provide all parts, materials, or tools that are required for installation. To complete the installation, you must provide these additional parts (Table 12).

Table 12. Customer-supplied hardware for installation

Item	Description
Communications cable	Connects from the Ready Out and Injection Hold pins (peripheral control connector) on the mass spectrometer to a device not controlled by one of the Thermo Scientific mass spectrometer applications, such as the Thermo Xcalibur™ data system. Refer to the <i>TSQ Endura and TSQ Quantiva Getting Connected Guide</i> .
Gas line fitting, argon	Connects the 1/8 in. ID copper or stainless steel tubing to the argon gas supply. Refer to the <i>TSQ Endura and TSQ Quantiva Getting Connected Guide</i> .
Gas line fitting, nitrogen	Connects the 1/4 in. OD Teflon™ PFA tubing to the nitrogen gas supply. Refer to the <i>TSQ Endura and TSQ Quantiva Getting Connected Guide</i> .
LC system	IMPORTANT If your LC system is manufactured by another company, you must verify that it is suitable for use with the TSQ Endura or TSQ Quantiva mass spectrometer. The output (start) signal from the external device must be <i>Normally Hi</i> (+5 Vdc) and momentarily go to <i>Low</i> . If you cannot configure the external device to go from <i>Normally Hi</i> to <i>Low</i> momentarily, you cannot use it with the mass spectrometer.
LC system, solvents	Used by the service engineer to calibrate the system during the initial setup. For details, refer to the appropriate manual.

Basic On-Site Training

When your new TSQ Endura or TSQ Quantiva system is on site and ready for installation, the Thermo Fisher Scientific service engineer unpacks and installs it.

During the installation, the service engineer demonstrates the following:

- Basics of the instrument operation and routine maintenance
- Marketing specifications that are in effect when you purchased the system

Tip To receive maximum benefit from this on-site training opportunity, plan for the system operators to be available during the entire installation process.

Do not use the new system for sample analysis until the installation is complete and you have signed the Acceptance Form.

Advanced Training Courses

Thermo Fisher Scientific provides introductory and advanced training courses in analytical techniques, in addition to specialized operation and maintenance courses for Thermo Scientific products.

Thermo Fisher Scientific recommends that the key user receive advanced training for operating and maintaining the TSQ Endura or TSQ Quantiva system after using it for several months. After this training from Thermo Fisher Scientific, the key user can conduct in-house training for other staff members, certifying them to operate the system.

Preventive Maintenance

You are responsible for the routine and preventive maintenance of the TSQ Endura or TSQ Quantiva system.

Regular preventive maintenance is essential. It increases the life of the system, maximizes the uptime of the system, and provides optimum system performance. You can find maintenance procedures in the following manuals:

- *TSQ Endura and TSQ Quantiva Hardware Manual*
- *Ion Max NG and EASY-Max NG Ion Sources User Guide*
- Manuals shipped with other devices for your system

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