Varian 500-MS Series LC/MS Ion Trap Mass Spectrometer Pre-installation Instructions

Checklist

NOTE: Do not unpack the shipping cartons.

Check off each checklist box after satisfying each requirement as described in the instructions. All requirements must be met before requesting installation.

NOTE: If the installation site is not ready for installation when the Varian Representative arrives, Varian, Inc. reserves the right to invoice for the Representative's time.

REQUIREMENTS	☑
Installation site is in compliance with all relevant safety regulations.	☐
User Representative will be available during the installation and Varian certification period.	☐
Entrance to the installation site is at least 92 cm (36 in.) wide.	☐
Bench space is sufficient.	☐
Bench can support system weight.	☐
Bench does not vibrate.	☐
Exhaust system is suitable.	☐
Temperature maintained between 16 and 30 °C (61-86 °F).	☐
Relative humidity maintained between 20 and 80%.	☐
Installation site is free of excessive particulate matter.	☐
Specified electrical supply and power outlets are installed.	☐
Nitrogen gas (at least 99% pure), regulator, and gas lines are installed.	☐
Air (less than 0.1 ppm hydrocarbons), regulator, and gas lines are installed.	☐
Helium (99.999% pure), regulator, and gas lines are installed.	☐
Materials and solvents of specified grade are on site.	☐
Shipping cartons examined for damage. If there was any damage, the damaged shipping carton procedure was completed.	☐

Requesting Installation

After preparing your site, contact the Customer Service office in your region to schedule installation.

Contents

Introduction

The Pre-installation Instructions are a guide for each requirement of the checklist. Follow these instructions to ensure that the installation requires no more than the usual three days. Have the completed checklist available to schedule the installation. After the Varian Representative completes the installation and it is accepted, samples can be analyzed.

After meeting all of these requirements, contact the Customer Service office in your region to schedule installation.

The LC/MS operates reliably under carefully controlled environmental conditions. You must provide suitable power sources, operating environment, materials, and solvents. Failures may occur if you use or maintain the system outside of the power and operating environment ranges and limits described in these instructions. The Varian Warranty and Service contract specifically excludes the repair of failures due to such causes.

CAUTION

All phases of the installation site preparation must conform to local safety, electrical, and building codes. These codes take precedence over any recommendations in these instructions. Compliance is the responsibility of the customer.

Safety

Safety is the most important consideration for instrument use. Determine if the installation site complies with all relevant safety regulations.

Check the checklist box: ***Installation site is in compliance with all relevant safety regulations***

Before the Installation

User Representative

Schedule the installation when the User Representative will be available. One of the important duties of the Varian Representative is to familiarize the User Representative with the basic functions of the LC/MS.

☑ **Check the checklist box:** ***User Representative will be available during the installation and Varian certification period*****.**

Entrance

Before arranging for delivery of the LC/MS, determine that there is sufficient clearance to move the shipping cartons to the installation site. The largest shipping carton is 72 cm (28 in.) wide by 92 cm (36 in.) long. If the cartons are to be moved with the pallet, at least 92 cm (36 in.) clearance is needed. Allow additional room for maneuvering the shipping containers around corners or through doors.

☑ **Check the checklist box:** ***Entrance to the installation site is at least 92 cm (36 in.).***

CAUTION **The MS, foreline pump(s), and LC are heavy. To prevent personal injury, use appropriate moving and lifting techniques.**

Bench Space and Load

Use the following information to plan the layout of the modules of your LC/MS system. The Varian Representative will unpack the cartons and puts the modules on the bench shows a suggested layout for the LC/MS.

500-MS with 212-LC and ProStar 430

Figure 1 shows a possible layout for the LC/MS with the 212-LC pumps and the ProStar 430 AutoSampler. Modify this layout if you have the ProStar 220 pumps. The autosampler belongs on the side of the 212-LC pumps, not on top. The bench must be strong enough to support the weight of all modules, wide enough for all modules and at least 84 cm (33 in.) deep for the MS.

NOTE: Do not stack an autosampler on top of the 212-LC pumps.

Figure 1 Typical Layout

Table 1and Table 2 list the dimensions and weights of the modules in Figure 1

Table 1 Bench Space

Bench Width	CPU	Monitor and Keyboard	500-MS	ProStar 430	212-LC	Total
cm	18.6	43.8	54	28	26	170.4 cm
in.	7.4	17.25	21	11	10.5	67.15 in.

Table 2 Bench Load

Bench Load	CPU, Monitor and Keyboard	500-MS	ProStar 430	212-LC	Total
kg	17.9	62	21	14.5	115.4 kg
lb	39.4	135	46	32	252.4 lb

Determining Space and Load

The system requires a clean, flat bench. The bench must have enough space for modules, the mouse, solvent bottles, and such, see Table 3. The bench must be strong enough to support the weight of the modules. If the bench is against a wall, drill a hole large enough for the vacuum tubing of your pump(s) through the rear of the bench. The area under the bench must be large enough for the height of the foreline pump(s), see Table 6. If the bench is higher than 92 cm (36 in.) place a vibration-isolation bench under the pump(s). The vibration–isolation bench must be capable of supporting the pump(s).

Refer to the Varian LC Systems Pre-installation Instructions, part number 391483100, for information about LC modules.

Plan to put the monitor and keyboard on the same bench as the LC/MS. If the plan is to use a separate bench, position them within 3 m (10 ft) of the rear of the LC/MS. The CPU can go on or under the bench.

Table 3 Additional Bench Space Requirements

Function	Space Allowance
Provide space for air circulation, gas lines, and electrical connections.	15 to 30 cm (6 to 12 in.) behind the system.
Dissipate room heat and allow for routine maintenance.	At least 76 cm (30 in.) above the above the system.
Analytical Systems only: Provide space for solvent bottles.	At least 30 cm (12 in.) to the side of the LC.

Decide how to arrange the modules. Use Table 4 and Table 5 to determine the width of the bench and the load the bench must support. Regardless of modules, the bench must be at least 84 cm (33 in.) deep to accommodate the MS.

Table 4 Bench Width Worksheet

Bench Length	___-LC	Auto-sampler	Other Modules	500-MS	CPU	Monitor and Keyboard	Total
cm	_____	_____	_____	54	18.6	43.8	___cm
in.	_____	_____	_____	21	7.4	17.25	____in.

Table 5 Bench Load Worksheet

Bench Load	___-LC	Auto-sampler	Other Modules	500-MS	Monitor, CPU and Keyboard	Total
kg	_____	_____	_____	62	17.9	_____kg
lb	_____	_____	_____	135	39.4	_____lb

☑ **Check the checklist box: *Bench space is sufficient.***

☑ **Check the checklist box: *Bench can support system weight.***

Vibration

Ensure that the benches are free from vibrations, especially those caused by equipment in adjoining locations. Because the foreline pump(s) vibrates during operation, it belongs on the floor below the LC/MS, not a on the bench with the LC/MS.

☑ **Check the checklist box: *Bench does not vibrate.***

Foreline(s) Pumps

The following table has general information about the foreline pump(s).

Table 6 Foreline Pump Information

Item	Pump(s)
Weight or Load for optional foreline pump bench	72 kg or 160 lb
Diameter of hole in wall, if needed	2 each 5.8 cm (2.3 in.)
Width	35.6 cm (14 in.)
Depth	52.1 cm (20.5 in.)
Height	48.3 cm (19 in.)
Vacuum line length	2 each 1.8 m (6 ft)
Power cord length	2.0 m (6 ft and 7 in.)
Serial cable length	2.7 m (9 ft)
Dedicated circuits	1 for each pump
Power	10A, 200-240V ac
Power cord plug	CEE 7/7 or NEMA 6-15P

Exhaust System

Do not put the foreline pump(s) in an enclosed space. Foreline pumps exhaust most compounds introduced into the MS and small amounts of oil vapor.

Provide an adequate fume exhaust system for the outlet of each foreline vacuum pump. Each foreline pump must be vented at least 2 L/min. The API spray chamber must be vented at least 12 L/min to a separate vent line. Ensure that the exhaust system does not pull a vacuum on the API chamber. Consult local regulations for the proper method of exhausting the fumes.

☑ **Check the checklist box: *Exhaust system is suitable.***

Temperature

The optimal operating range is between 16 and 30 °C (61-86 °F), for best mass stability, the temperature should not vary by more than ±3 °C (±5 °F) during instrument operation.

NOTE: As the installation site temperature increases, system reliability decreases due to heat generated by electronic components during operation. This heat must dissipate to the surrounding air for reliable operation.

The turbomolecular pumps have a temperature cutoff control that protects the bearings and prolongs the pump lifetime. If the temperature rises above 30 °C (86 ° F), the pump may shut down. Operating the MS at optimal temperatures prolongs the turbo pump lifetime.

The airflow around the system must be adequate. The air-conditioning system must maintain a constant temperature (within operational limits) around the system. Do not place the system near air ducts, windows, or heating and cooling systems. The average steady-state heat load for the MS alone is 5200 Btu/hr, with a possible short-term heat dissipation of 8900 Btu/hr during startup.

☑ **Check the checklist box*: Temperature maintained between 16 and 30 °C (61-86 °F).***

Humidity

The relative humidity of the operating environment must be between 20 and 80%, with no condensation. Operating the LC/MS at a very low humidity may result in the accumulation and discharge of static electricity, shortening the life of electronic components. Operating the system at high humidity may produce condensation and result in short circuits.

Varian recommends using a combination temperature and humidity monitor in your installation site.

☑ **Check the checklist box: *Relative humidity maintained between 20 and 80%.***

Particulate Matter

The installation site must not have excessive dust, smoke, or other particulate matter. Particulate matter may block airflow vents and cause the electronics to overheat.

☑ **Check the checklist box: *Installation site is free of excessive particulate matter.***

Power Requirements

212-LC

Power Input: 85-264V ac; 47-63 Hz; 60 Watts 100VA

216-LC

115V ac; +15/-20%; 50/60 Hz; 250VA
230V ac; +15/-20%; 50/60 Hz; 250VA

(For UPS, assume 250W)

For 115V ac: one 5.0 AT-fuse (5 x 20 mm, IEC 127)
For 230V ac: one 2.5 AT-fuse

All fuses supplied with the 216-LC instrument are UL-listed and CSA-certified.

The 216-LC must be used with appliances and power sources that have the proper protective grounding.

500-MS

The 500-MS requires a separate circuit and the outlet must have adequate amperage capacity and a reliable ground. The power source must be clean and provide 220-240V ac, 50/60 Hz ±3 Hz, 1.0 kW 3200 VA (steady state).

500-MS LC/MS

The 500-MS LC/MS has the circuits, power plug and outlet types listed onTable 7.

Table 7 500-MS LC/MS Circuit, Power Plug and Outlet Types

Component	Circuit	Power Plug and Outlet type
MS	1 each 220V	US: 1 each NEMA 6-15P EU: 1 each CEE 7/7 plugs
Foreline Pump	2 each 220V	US: 1 each NEMA 6-15P EU: 1 each CEE 7/7 plugs
Computer	1 each 110V	US: 1 each NEMA 5-15P
	1 each 220V	US 1 each NEMA 6-16P EU: 1 each CEE 7/7 plugs
LC modules	110V or 220V see appropriate user manual	

Use a separate dedicated power source for the HPLC modules, additional instruments, and equipment. Never plug the mass spectrometer and the chromatograph into the same power source or the power source may overload. Never use the free outlet on any of the power sources for equipment that draws more than 2A. Table 8 has the power requirements for the modules of the LC/MS.

Table 8 LC/MS Power Requirements

Modules	Max Current Draw (Amps) 200-240V ac System
500-MS	6
Foreline Pump	5 per pump

Power Cables

Table 9 has information about the power cords and plugs. Figure 2 shows the plug types

Table 9 MS and Foreline Pump(s) Power Cords

Module	500-MS	Foreline Pump(s)
Power Cord	1 each 2.5 m (8 ft)	2 each 2.0 m (6 ft 7 in.)
Power Plug	1 each CEE 7/7 plugs	2 each CEE 7/7 plugs

The power cables for the CPU, monitor, and printer are approximately 2.13 m (7 ft) long. They have NEMA 5-15P plugs.

CAUTION

Replacing or substituting power cords or plugs must be done with strict compliance with all regulations, including electrical codes, power cord color coding, and appropriate regulatory agency certification marks.

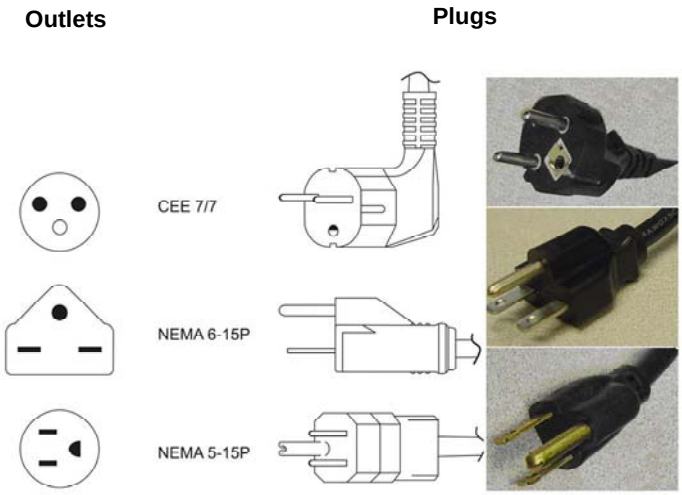

Figure 2 CEE 7/7, NEMA 6-15P, NEMA 5-15P Outlets and Power Plugs

☑ **Check the checklist box:** ***Specified electrical supply and power outlets are installed.***

Installation Site Power

In the United States, the power supply to the installation site must be 100-120V ac and 200-240 V ac.

In Europe, the power supply to the site must be 200-240V ac,

The power supply must be stable (free of fluctuations due to slow changes in the average voltage or to changes resulting from surges, sags, or transients).

A measured ground to neutral potential of greater than 3 volts ac or dc indicates grounding problems that may need correction before connecting an instrument module to the power source. Evaluate any power source suspected of having noise problems evaluated with a recording-type power line monitor before operating the system.

NOTE: If concerned about the quality of the power, install an uninterrupted power supply or a power conditioner or both. Table 10 has more information.

Table 10 Power Consumption

MS Configuration	Maximum Power Consumption
500-MS without foreline pumps	1200VA
500-MS with foreline pumps	3200VA

☑ **Check the checklist box:** ***Specified electrical supply and power outlets are installed.***

Qualified Computer Equipment

If the Varian MS Workstation software is to be installed on a computer not purchased from Varian, the customer is responsible to ensure that the computer is adequately equipped and compatible with the operation of the data system and its communication interfaces. Please check the current list of requirements, available at the following web site.

http://www.varianinc.com/cgi-bin/nav?products/chrom/gcms/msws_computer_req

Varian does not guarantee the function of the Varian MS Workstation software on computer hardware or operating systems that do not meet the specified requirements.

NOTE: Contact your Sales Representative for a list of qualified equipment or for more information.

Gas Requirements

Nitrogen

A nitrogen gas supply that can provide up to a maximum of 12 L/min of gas regulated at 80 psi is sufficient for ESI or APCI operation for one LC/MS. If there is more than one LC/MS, use a nitrogen supply that can deliver a maximum of 18 L/min. The nitrogen must be at least 99% pure with less than 0.1 ppm hydrocarbons and less than 1% oxygen. It must be clean and dry with a −40 °C dew point. Use a nitrogen generator, or a liquid nitrogen boil-off to supply the nitrogen gas. All nitrogen generators require regular maintenance. The customer is responsible for setting up the preventive maintenance procedures and schedules (contact the nitrogen generator manufacturer). Any MS problems caused by poor gas quality are not covered by the Varian Warranty. It is the responsibility of the customer to conform to all regulations regarding the installation and operation of the gas system. The nitrogen supply uses ¼ in connectors.

☑ **Check the checklist box:** ***Nitrogen gas (at least 99% pure), regulator, and gas lines are installed.***

Air

A compressed air gas supply, capable of providing up to 2 L/min of gas regulated to 80 psi with a two-stage regulator, is required as a nebulizing gas for negative ESI. The customer is responsible to conform to all regulations for the installation and operation of the gas system. The air must be clean and dry, with less than 0.1 ppm total hydrocarbons, including methane, and have a −40 °C dew point. The air supply uses ¼ in. connectors.

☑ **Check the checklist box:** ***Air (less than 0.1 ppm hydrocarbons), regulator, and gas lines are installed.***

Helium

Use helium as the ion trap damping gas with a flow rate of 1 mL/min. Helium must be at least 99.999% pure and regulated to 40 psi (2750 bar). The minimum requirement is one 257 ft^3 tank with an Alltech regulator #AL8111 or equivalent tank and regulator. If you are concerned about the cleanliness of the helium, use a Gas Clean filter (Varian Part Number CP17973).

☑ **Check the checklist box:** ***Helium (at least 99.999% pure), regulator, and gas lines are installed.***

Materials and Solvents

The Varian Representative prepares solutions to tune and evaluate the LC/MS. Please supply the materials on Table 11 and the solvents on Table 12.

Table 11 Materials

Materials	
Quantity (each)	**Item**
1	100 mL clean and new volumetric flasks
3	10 mL clean and new volumetric flasks
1	Micropipette capable of dispensing 1.0 mL and tips
1	Micropipette capable of dispensing 200 µL and tips

Table 12 Solvents for ESI and APCI

Solvents for ESI and APCI	
Quantity (each)	**Solvent**
2	4-liter bottles LC-MS grade water, new and unopened
2	4-liter bottles LC-MS grade acetonitrile, new and unopened
2	4-liter bottles LC-MS grade methanol, new and unopened

Additional tubing is required to complete the installation. Most of this tubing is included in the accessory kits of the LC modules. Additional tubing (PEEK® or stainless steel) may be required for installation of special valves or modules. For most analytical HPLC systems, use 1/16 in. tubing with an ID of 0.005 in. Use 0.005 in. ID or smaller tubing downstream of the sample injector and autosampler to prevent peak broadening. Keep the tubing as short as possible to prevent peak broadening and to minimize run time.

☑ **Check the checklist box:** ***Materials and solvents of specified grade are on site.***

When the LC/MS Arrives

Inspecting the Shipping Cartons

After the LC/MS arrives, carefully inspect the exterior of the shipping cartons for evidence of any damage that might have occurred during shipment. Inspect the cartons for the following:

- Water stains.
- Cuts, punctures, or deep indentations.
- Crushed corners or excessively abraded edges.
- Blue beads in the Tip (N) Tell arrow point.

One Tip (N) Tell indicator label is on the exterior of each shipping carton. Read and follow the instructions on the label. If the Tip (N) Tell arrow point is blue, the carton was on its side or tipped in transit and instrument damage may have occurred.

If no external damage is apparent, sign the receiving documents, "*Received but not inspected*" to indicate that the cartons were not opened.

If the customer receives obviously damaged materials without noting the damage on the receiving documents, Varian will not accept the liability.

Do not open any cartons. The Varian Representative opens them during installation. Move the shipping containers to a warm, dry, and secure area near the installation site.

If a shipping carton shows evidence of damage, do the following damaged shipping carton procedure:

1. Report the conditions to the carrier when you receive the shipment.
2. Note the damage on all copies of the shipping documents.
3. Write a brief description of the damage.
4. Ask the driver to sign next to your comments to signify agreement with the observations.
5. Contact the appropriate Varian office to report the damage.

Systems are shipped either **FOB Varian** or **FOB Destination**. The manner of shipment determines who is responsible for filing a claim against the carrier, if the system was damaged in transit. Most systems are shipped **FOB Varian**, so the purchaser and the carrier are responsible for any damages incurred during shipping. Contact the Varian office for assistance with filing claims and billing repairs. If the system is shipped **FOB Destination**, contact the Varian office, and that office files a claim against the carrier.

☑ **Check the checklist box:** ***Shipping cartons examined for damage. If there was any damage, the damaged shipping carton procedure was completed.***

Unpacking and Installation

The Varian Representative will review the Pre-installation Checklist with the customer to ensure that the site requirements were met. The Varian Representative will unpack and install the instrument and demonstrate the fundamental operation and maintenance procedures. The User Representative must be present during the installation.

The Varian Representative will demonstrate that the system meets the performance specifications, which are on the data sheet, and any additional criteria explicitly written into the sales contract.

Plan to analyze samples only after the installation is complete and the conditions of delivery are accepted. The process requires at least three days.

Spare Parts

The *500-MS Ion Trap Mass Spectrometer Hardware Operation Manual* (part number 395407600), which is on the MS Workstation CD, has a list of spare parts for routine operation.

Preventive Maintenance

The customer is responsible for performing routine and preventive maintenance of the LC, autosampler, MS, and data system. If using a nitrogen generator, perform the preventive maintenance to ensure that the nitrogen supply is clean and dry. Any instrument problems resulting from a contaminated gas supply are billable and not included in the Varian Warranty

Perform regular preventive maintenance to increase the life of the system, to maximize system uptime, and optimize system performance. Refer to the *500-MS, Ion Trap Mass Spectrometer Hardware Operation Manual* for details. The Varian Representative will describe and demonstrate these procedures during the installation.

Trademark Acknowledgment