Pre-Installation Requirements For ICP-MS

Room Space and Environment Requirement

1. The entrance to the facility and the width of all hallways, elevators, etc., should have a minimum width of 36-40”and additional room for manoeuvring the shipping containers around doors.
2. Special handling arrangements necessary if access to the laboratory is on first floor
3. Because of its weight of about ~150 kg, handling the instrument alone might cause muscle strain and back injury while lifting and moving. Using of pallet jack to lift the mass spectrometer onto the workbench is recommended
4. Recommended room size 12 ft x12 ft
5. The room must not have excessive dust i.e. must be dust free
6. Use a static-dissipating floor covering (such as tile or conductive linoleum) in the room that houses the ICP.
7. The optimal operating temperature is between 18and 21 °C. The air-conditioning system must maintain a constant temperature (within the operational limits) around the system. Short-term (1.5 h) variations must be no more than 2 °C. Install appropriate Split AC (1.5 tonnes). Advisable to have two air conditioners so that each can be run for alternatively.
8. Air conditioning units must not be positioned directly above the mass spectrometer. To avoid adverse operation, do not locate the instrument in direct sunlight, under an air duct, near windows, or near heating and cooling sources..
9. The relative humidity of the operating environment must be between 20 and 80%, with no condensation and non-corrosive atmosphere.
10. An exhaust system is needed for the instrument to remove gases that may contain ozone and other noxious substances. A flexible exhaust hose must be connected to the exhausts during operation of the instrument. Locate the blower as close to the discharge outlet as possible
11. The duct casing and venting system should be made of materials suitable for temperatures as high as 70˚C
12. It is recommended that the laboratory be equipped with a temperature and humidity monitor to ensure that your laboratory is always within the required temperature and humidity specifications.
13. Provide an appropriate waste container to collect Waste solvents occurring during operation
14. Good lighting for the work area more enjoyable. A small, high-intensity lamp is recommended for cleaning instrument components, source inspection, and manipulation of small components.
15. Use laboratory chairs covered with natural fibre or other static dissipating material.
16. When operating the instrument, wear laboratory coats and clothing made of natural fibre

II Bench Space Requirement

7. The table must be strong enough to support the weight of all modules, wide enough for all modules, and at least 4 ft deep.
8. The length of the table must be a minimum of 6-7 ft and with stand a load of ~150 kg
9. The bench surface should ideally be 30-36” (80-85 cm) above the floor.

10. Recommended table size 6(l)x 4 (w) ft x 3(h) ft
5. Ensure that the benches are free from vibrations, especially those caused by equipment in adjoining locations.
6. The workbench that holds the data system must be located next to the workbench that holds the mass spectrometer.
7. Free access to the mains switch and circuit breaker is needed to allow shutting off the instrument in an emergency at all times.
8. Allow at least 70 -100 cm (30-40 “) of clear space left of the system for clearance of the gas lines, electrical connections, as well as for the exhaust line and vacuum hose of the fore vacuum pump.
9. A vacuum pump, a power cable for connecting the pump to the mains, and an exhaust hose for connecting the fore vacuum pump to the exhaust system is provided. It can be placed below the table.
10. The vibration of the fore vacuum pump might impede the performance of the instrument. Install the fore vacuum pump on the floor beneath the mass spectrometer. Do not install the fore vacuum pump near the system on the workbench.

III Power Requirements

11. The power supply to the site must 200-240 V AC, 50/60 Hz AC, single phase
12. Mains voltage fluctuations must not exceed ±10%.
13. Power sources must have the proper protective grounding. The supplies must be wired with a protective earth and fused or fitted with circuit-breakers of the specified ratings, in accordance with local regulations
14. A measured ground to neutral potential of greater than 3 volts ac or dc indicates grounding problems that will need correction.
15. The electrical wall outlet for the main power of the instrument should be located at the wall near the intended location of the instrument, ideally at the left side of the instrument.
16. Additional single-phase outlets are needed for additional parts such as fore vacuum pump, computer and monitor. At least five spare outlets in the near vicinity of the left side of the system and five close to the workbench space recommended
17. The fore vacuum pump requires a separately fused wall outlet due to the high current of the pump. This wall outlet must be fused with 15 A or 16 A, tripping characteristic ‘C’ or ‘D’
18. It is recommended that time delay fuses and circuit-breakers are used to prevent nuisance tripping.
19. Various line voltage conditioning devices are available that can correct any line voltage problem.

IV Consumables

20. **Cooling water**: The water used for the coolant set up should be free of suspended matter to avoid clogging of the cooling circuit. Supply Rate > 5.5 L/min, Supply Rate > 5.5 L/min, Pressure 0.25 to 0.6 MPa (2.5 to 6 bar), Recommended conductivity < 1000 µS/cm
21. **Argon:** Argon gas to generate the inductively coupled plasma and for controlling internal functions with the aid of pneumatics. Purity 99.996% or better, Maximum Water Content 5 ppmv, min. Gas pressure 0.55MPa (5.5 bar) max. 0.6 MPa (6 bar) using a two-stage pressure high quality regulator (200 bar to 10 bar, 230 bar to 10 bar or 300 bar to 10 bar).

22. **CCT gas:** Helium Purity 99.999% or better Maximum Water Content 2 ppmv. The quality of the CCT gas regulator is critical to ensure optimum performance of the instrument. A high quality two-stage pressure regulator is absolutely essential, and it must be qualified for the purity specification of the CCT gas. The CCT gas regulator should have a specification of 0.3 MPa (3 bar) outlet pressure (max. 0.8 MPa [8 bar])
    - **Cleaning agent:** A diluted solvent like isopropanol in water and distilled water.

Note: This is a guiding document for reference purpose, however, specific pre-installation requirement for each equipment will be provided by particular Original Equipment Manufacturer (OEM) only.

Pre-Installation Requirements For GC-MS/MS

I. Room Space And Environment Requirement

1. Sufficient clearance to move the shipping cartons to the installation site. Entrance to the lab is at least 36 -40 in. (92-102 cm). Allow additional room for manoeuvring the shipping containers around doors.
2. Special handling arrangements necessary if access to the laboratory is on first floor
3. Recommended room size 12 ft x12 ft
4. The room must not have excessive dustier must be dust free
5. Use a static-dissipating floor covering (such as tile or conductive linoleum) in the room that houses your instrument.
6. The optimal operating temperature is between 15 and 27 °C. The air-conditioning system must maintain a constant temperature (within the operational limits) around the system. Short-term (1.5 h) variations must be no more than 2 °C. Install appropriate Split AC (1.5 tonnes). Advisable to have two air conditioners so that each can be run for alternatively.
7. Air conditioning units must not be positioned directly above the mass spectrometer. To avoid adverse operation, do not locate the instrument in direct sunlightDo not locate the under an air duct, near windows, or near heating and cooling sources..
8. The maximum overall heat dissipation into the room from the instrument and pumps is approximately 2.7 kW.
9. The relative humidity of the operating environment must be between 20 and 80%, with no condensation.
10. The active exhaust vent must provide a minimum vacuum of 2 millibar below atmospheric pressure (negative pressure). It must be capable of supporting a maximum instrument exhaust gas load of 2000 L/hour.

II Bench Space Requirement

11. The table must be strong enough to support the weight of all modules, wide enough for all modules,
12. Recommended to use two vibration free work benches. The length of the table1) must be a minimum of 6 x 4ft and capable of supporting the weight of the mass spectrometer gas chromatograph a load of 150-170 kg and 2) The workbench for the data system must have minimum dimensions of 4 x 4 and be capable of supporting the weight of the data system computer, monitor, and optional printer [26 kg (57 lbs)]
13. Recommended table sizes 6 x4 ft and 4x 4 ft
14. These Bench Space Requirements
15. Provide space for air circulation, gas lines, and electrical connections (24” behind the system)
16. Dissipate room heat and allow for routine maintenance (at least 3 feet above the system)
17. Ensure that the benches are free from vibrations, especially those caused by equipment in adjoining locations.
18. The area under the bench must be large enough for the foreline pump(s).The rotary pump or optional scroll pump must be positioned on the floor, either behind or underneath the

instrument. Make sure there is adequate ventilation around the rotary/scroll pump so that the ambient temperature around the pump does not exceed 40 °C.

19. 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 rotary/scroll pump exhaust gases must be vented to the atmosphere outside the laboratory via a user-supplied fume hood or industrial vent. The exhaust may be connected to an existing laboratory vent carrying gases from other sources.

III Power Requirements

20. The power supply to the site must be 200-240V ac
21. Nominal voltage of 230 V ac, ±10%.The power source must be clean and capable of providing up to 220-240V ac, 50/60 Hz ±3 Hz
22. Power supply must be stable, that is, it must be free of fluctuations due to slow changes in the average voltage or to changes resulting from surges, sags, or transients.
23. The following devices can be used to free line power from voltage changes, sags, surges, and transients, e available: 1) Noise suppression transformer 2) Buck/boost transformer 3) Power conditioning
24. Power sources must have the proper protective grounding. The supplies must be wired with a protective earth and fused or fitted with circuit-breakers of the specified ratings, in accordance with local regulations
25. A measured ground to neutral potential of greater than 3 volts ac or dc indicates grounding problems that will need correction.
26. Never plug the mass spectrometer and the chromatograph into the same power source or the power source may overload
27. Use two power boards as source. The GC/MS system requires the following: 1) One dedicated duplex single-phase power source with earth grounds hard-wired to the main power panel ground for the gas chromatograph and 2) One four plex power source for the mass spectrometer, computer, and monitor. The power supply boards with sockets must be located within 2 m (6.5 ft.) of the instrument.
28. Installing a complete GC/MS system can require extensive electrical resources. Plan the power system properly, with numerous outlets, to ensure that you can connect and power all of your equipment. Recommended
29. It is recommended that time delay fuses and circuit-breakers are used to prevent nuisance tripping.
30. Additional protection to be provided for the instrument by means of Ground Fault Circuit Interrupters

IV Gas Requirements

31. **Argon:** The argon for the collision gas must be high purity (99.995%) with less than 1.0 ppm each of water, oxygen, and total hydrocarbons. The required gas pressure is 135 ± 70 kPa (20 ±10 psi). Avoid particulate filters, which can be a source of contamination and regulated), using a two-stage high purity gas regulator with stainless steel diaphragm
32. **Helium**: For GC carrier gas, use 99.995% helium with less than 1.0 ppm each of water, oxygen, and total hydrocarbons. One full-size tank has an outlet pressure of 400 to 700 kPa

(60 to 100 psi). Oxygen and hydrocarbon traps to be used. Use Single- or dual-stage high purity regulators that contain stainless steel diaphragms. The regulator output pressures must be consistent with the pressures

33. **Chemical ionisation:** For chemical ionization reagent gas, use 99.995% purity for best results. The required gas pressure is 65 to 205 kPa (10 to 30 psi) for methane. The gas pressure of other reagent gases requires optimization.

Note: This is a guiding document for reference purpose, however, specific pre-installation requirement for each equipment will be provided by particular Original Equipment Manufacturer (OEM) only.

Pre-installation requirements for LC-MS/MS

I. Room Space And Environment Requirement

1. Sufficient clearance to move the shipping cartons to the installation site (largest carton max width 36-40", height 4ft and length 5-6 ft). Allow additional room for manoeuvring the shipping containers around doors.
2. Special handling arrangements necessary if access to the laboratory is on first floor
3. Recommended room size 12 ft x12 ft
4. The room must not have excessive dust ie must be dust free
5. The optimal operating temperature is between 16 and 25 °C. The air-conditioning system must maintain a constant temperature (within the operational limits) around the system. Short-term (1.5 h) variations must be no more than 2 °C. Install appropriate Split AC (1.5 tonnes). Advisable to have two air conditioners so that each can be run for alternatively.
6. Air conditioning units must not be positioned directly above the mass spectrometer. To avoid adverse operation, do not locate the instrument in direct sunlight.
7. The maximum overall heat dissipation into the room from the instrument and pumps is approximately 2.7 kW.
8. The relative humidity of the operating environment must be between 20 and 80%, with no condensation.
9. The active exhaust vent must provide a minimum vacuum of 2 millibar below atmospheric pressure (negative pressure). It must be capable of supporting a maximum instrument exhaust gas load of 2000 L/hour.

II Bench Space Requirement

10. The table must be strong enough to support the weight of all modules, wide enough for all modules, and at least 4 ft deep for the MS.
11. The length of the table must be a minimum of 6-7 ft and with stand a load of 130-150 kg
12. Recommended table size 7(l)x 4 (w) ft x4 (h) ft
13. Additional Bench Space Requirements
14. Provide space for air circulation, gas lines, and electrical connections (24" behind the system)
15. Dissipate room heat and allow for routine maintenance (at least 3 feet above the system)
16. Ensure that the benches are free from vibrations, especially those caused by equipment in adjoining locations.
17. The area under the bench must be large enough for the fore line pump(s).The rotary pump or optional scroll pump must be positioned on the floor, either behind or underneath the instrument. Make sure there is adequate ventilation around the rotary/scroll pump so that the ambient temperature around the pump does not exceed 40 °C.
18. Provide an adequate fume exhaust system for the outlet of each fore line vacuum pump. Each fore line pump must be vented at least 2 L/min. The rotary/scroll pump exhaust gases must be vented to the atmosphere outside the laboratory via a user-supplied fume hood or

industrial vent. The exhaust may be connected to an existing laboratory vent carrying gases from other sources.

III Power Requirements

19. The power supply to the site must be 200-240V ac
20. Mains voltage fluctuations must not exceed ±10%.
21. Power sources must have the proper protective grounding. The supplies must be wired with a protective earth and fused or fitted with circuit-breakers of the specified ratings, in accordance with local regulations
22. A measured ground to neutral potential of greater than 3 volts ac or dc indicates grounding problems that will need correction.
23. Use a separate dedicated power source ie boards for 1) Mass spectrometer (1 socket) 2)HPLC modules and additional instruments and equipment 5-6 sockets and 3) Foreline pumps (3-4 sockets)
24. The power supply boards with sockets must be located within 2 m (6.5 ft.) of the instrument.
25. The power source must be clean and capable of providing up to 220-240V ac, 50/60 Hz ±3 Hz,
26. It is recommended that time delay fuses and circuit-breakers are used to prevent nuisance tripping.
27. Additional protection to be provided for the instrument by means of Ground Fault Circuit Interrupters

IV Gas Requirements

28. **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. Nitrogen purity must be >99.999%. All nitrogen generators require regular maintenance.
29. **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 air must be clean and dry, with less than 0.1 ppm total hydrocarbons, including methane, and have a −40 °C dew point.
30. **Collision gas:** Argon is required as collision gas for MS/MS work with triple quadrupole instruments. The argon must be dry, high purity (99.997%), and regulated), using a two-stage high purity gas regulator with stainless steel diaphragm

V Solvents and Reagents For Test Samples/Standards Preparation

31. Clean, high-purity solvents and reagents and clean glassware must be used to ensure the optimum performance of the LC-MS system. Significant delays to the installation may occur if clean solvents and glassware are not provided by the customer prior to commencing the installation.
32. High-purity solvents (i.e. LC-MS grade) are required, these are used for making up standard solutions for performance tests and for cleaning instrument components. The solvents required are

- Water
- Acetonitrile
- Methanol
- Formic acid

33. Facilities for preparing test samples/standards must made available at site. The requirements are (but is not limited to):
    - 1 L clean and new bottles for mobile phase reservoirs Minimum 2
    - 2 L or larger bottle for LC/MS waste
    - Calibrated syringes spanning range 1 µL to 1 mL or Pipette man
    - Measuring cylinders, spanning range 100 mL to 1 L
    - Volumetric flasks - 10-mL flasks (up to 11 required); 50-mL flasks (up to 7 required)
    - Calibrated analytical balance
    - Nitrile gloves
    - Lint-free tissue

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