Installation Date Sheet

Oxford Instruments Plasma Technology

PlasmaPro®**Estrelas**100

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Contents

About this data sheet

This data sheet provides basic information about the installation of the Oxford Instruments Plasma Technology (OIPT) **Plasma**Pro®**Estrelas**100 tool.

Hyperlinks

The PDF edition of this data sheet contains hyperlinks coloured blue. Click a link to go directly to the linked item.

Revision history

This is issue 04 of the **Plasma**Pro®**Estrelas**100 Installation Date Sheet, as shown in the footer at the bottom of each page. The changes made to this document and a summary of previous issues are listed in the table below.

Always use the latest issue of the manual.

Revision	Affected Page(s)	Summary of Changes
01	All pages.	First edition of the **Plasma**Pro®**Estrelas**100 Installation Date Sheet.
02	All pages.	Dimensions updated. New template and hazard notices applied.
03	3 20 Back All	Local installation regulations reference added. Room volume air changes added. Contact addresses updated. Template OI_TP_FM_01_04 applied.
04	5 6 7 9 3	Figure 1 updated with correct dimensions. Figure 2 updated with correct dimensions. Figure 3 updated with correct dimensions. Figure 5 updated with correct dimensions. Revision history updated.

Installation regulations

The installation of this system must be in accordance with the relevant requirements of the local regulations including, but not limited to, wiring regulations, local building regulations, building standards regulations and environmental regulations. This system has been designed to meet SEMI S2. If required, the installation requirements of SEMI S2, S8 and S6 should also be considered.

Floor and wall loadings

Table 1 lists typical weights of system components. Ensure that the floor is rated to support the weight of the main frame, the backing pump and the heater/chiller (if provided). Ensure that the wall is rated to support the weight of the external power box.

Table 1 Typical weights of system components

Item	Typical Weight	Comment
Main frame	800 kg	Dry weight
External power box	40 kg	fixings must be rated for four times this load.
Backing pump	Refer to the manufacturer's manual	
Heater/chiller	Refer to the manufacturer's manual	
PC controller	Refer to the manufacturer's manual	

Services

Consider the required services and plan how each service is to be provided to the system. There must be a means of isolating each service (e.g. electrical isolator, water shut-off valves, gas shut-off valves). The isolators must be:

- located in close proximity to the system
- clearly labelled
- easily accessible.

Cables and pipes must not restrict access to the main electrical isolator, the emergency off buttons, or any other safety features.

Attachment of process module to floor

The tool process module(s) must be bolted to the floor using eight, M12 fixings of specification 10.9 through the bolt-down brackets provided. This ensures that a safety hazard is not created if the turbomolecular pump decelerates rapidly, See Figure 1. Each fixing must be able to withstand a force of 105,000 N.

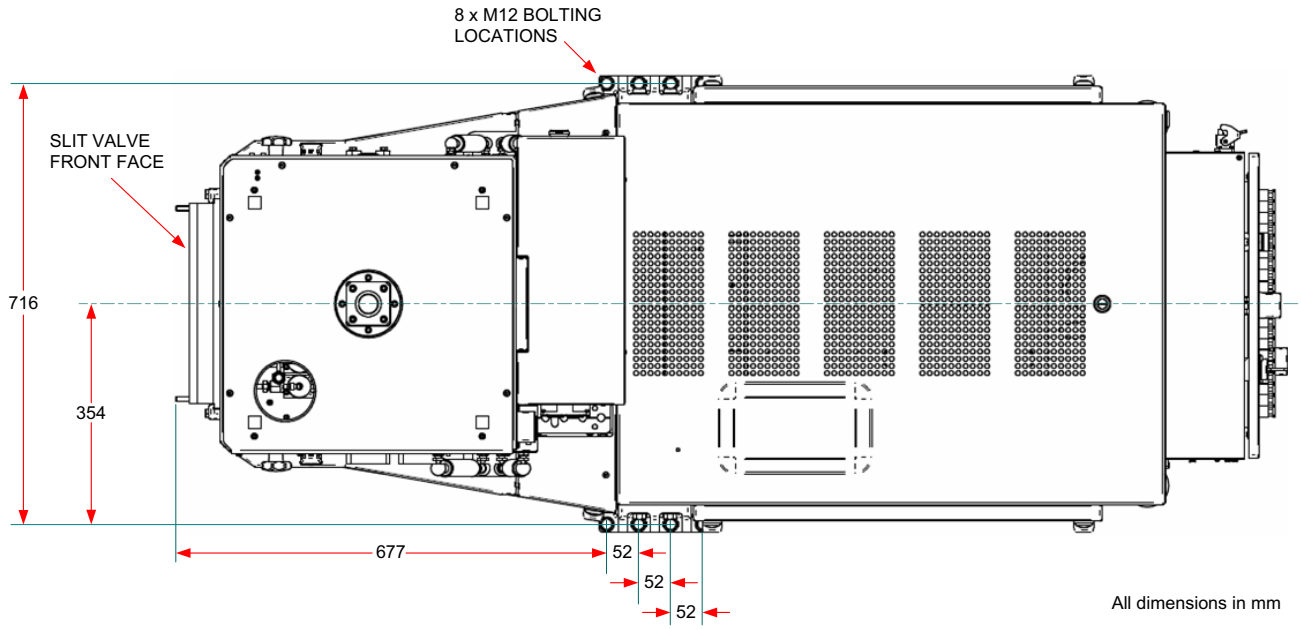


Figure 1 Floor fixing points for a typical PlasmaPro®Estrelas100 system

System dimensions

The generic drawings in Figure 2 to Figure 4 are for reference only. Dimensional drawings for a particular system can be obtained from OIPT on request.

Front, plan and side views

Figure 2 shows the front, plan and side views of a typical **PlasmaPro®Estrelas100** system with a single wafer load lock attached.

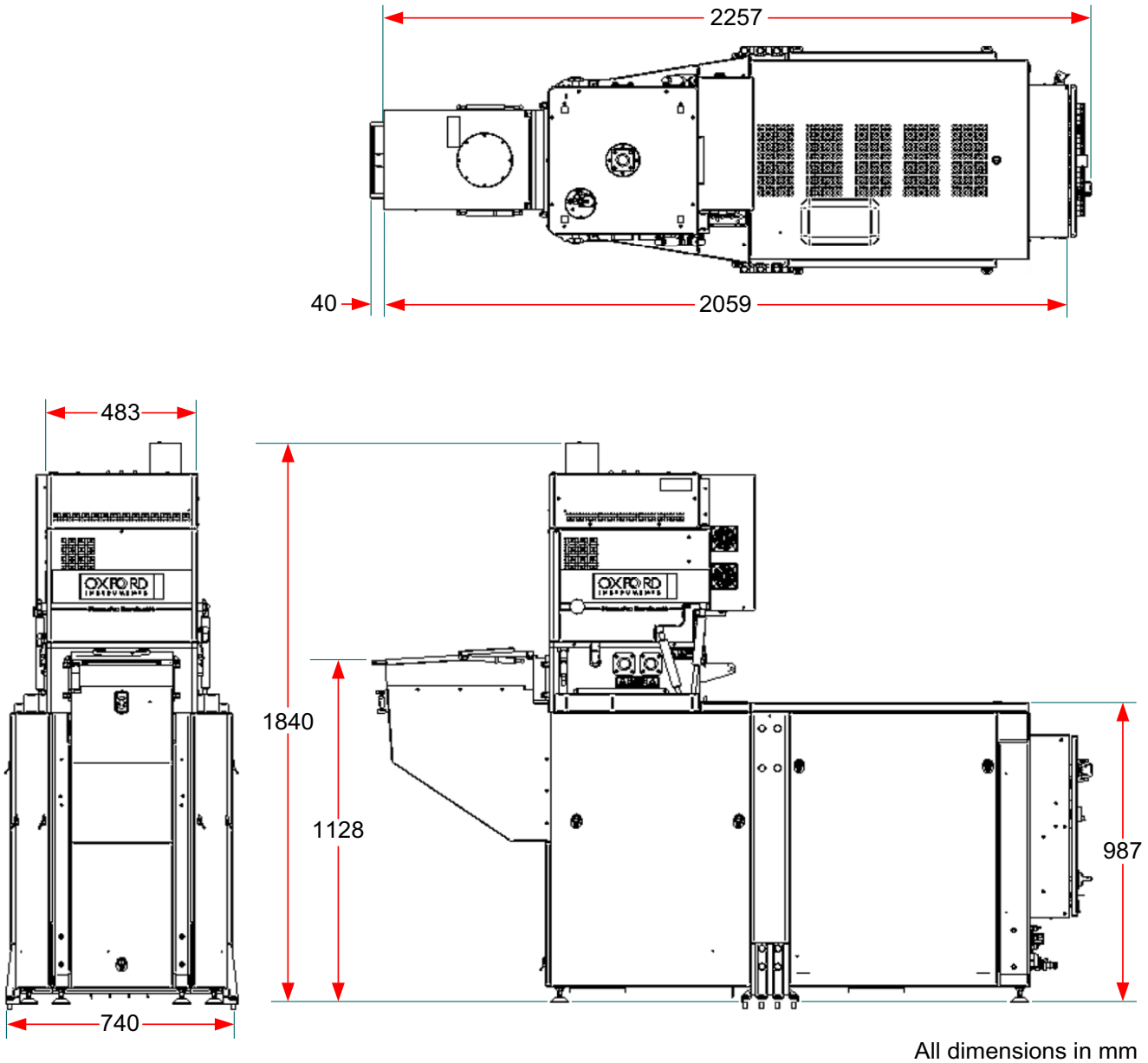
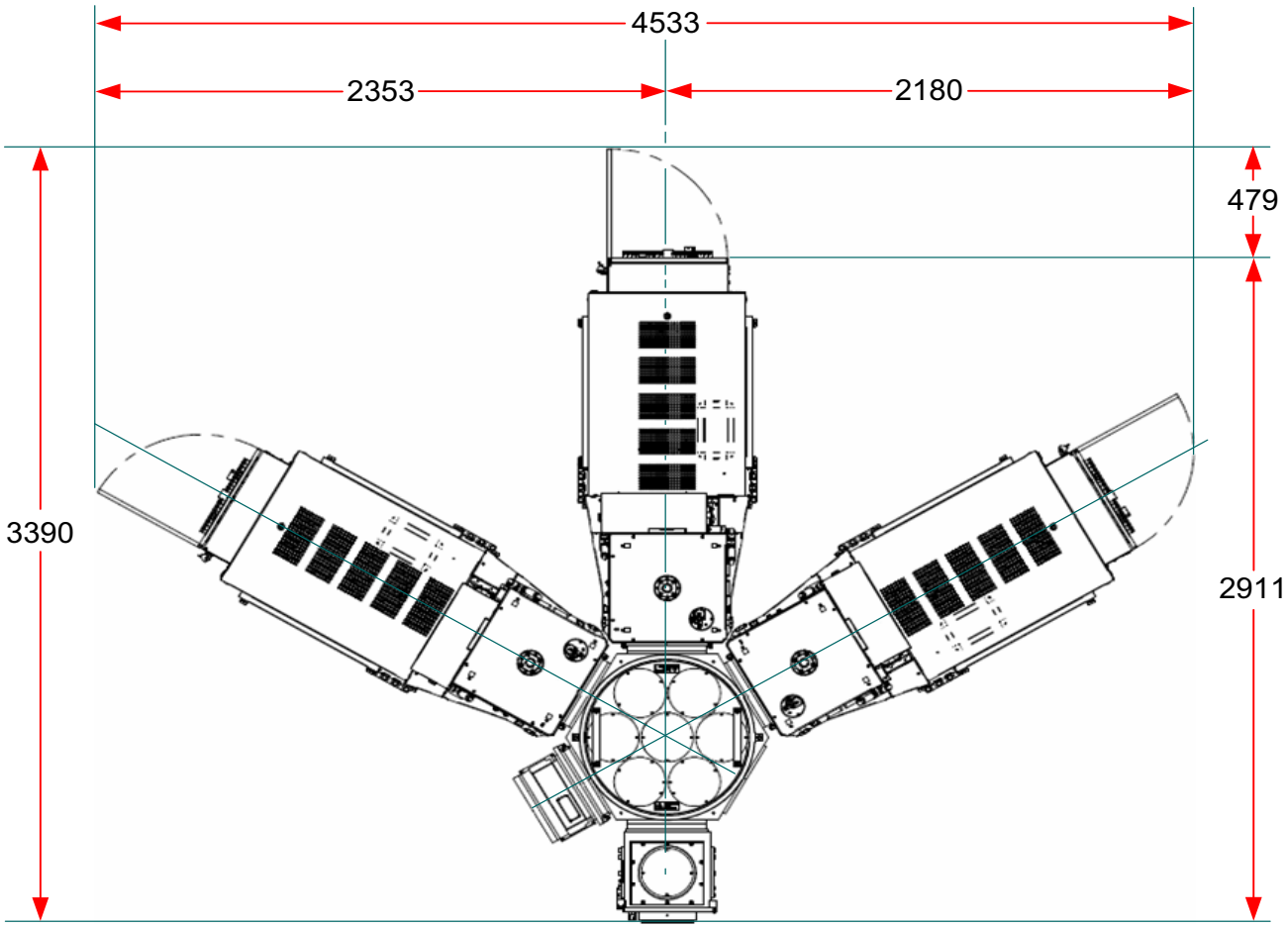


Figure 2 Front, plan and side views of a typical PlasmaPro®Estrelas100 system

System footprints

Figure 3 shows the plan view of a typical cluster system incorporating **PlasmaPro®Estrelas100** modules. Figure 4 shows the process module within the MESC envelope.



All dimensions in mm.

Figure 3 External dimensions of a cluster with three PlasmaPro®Estrelas100 process modules

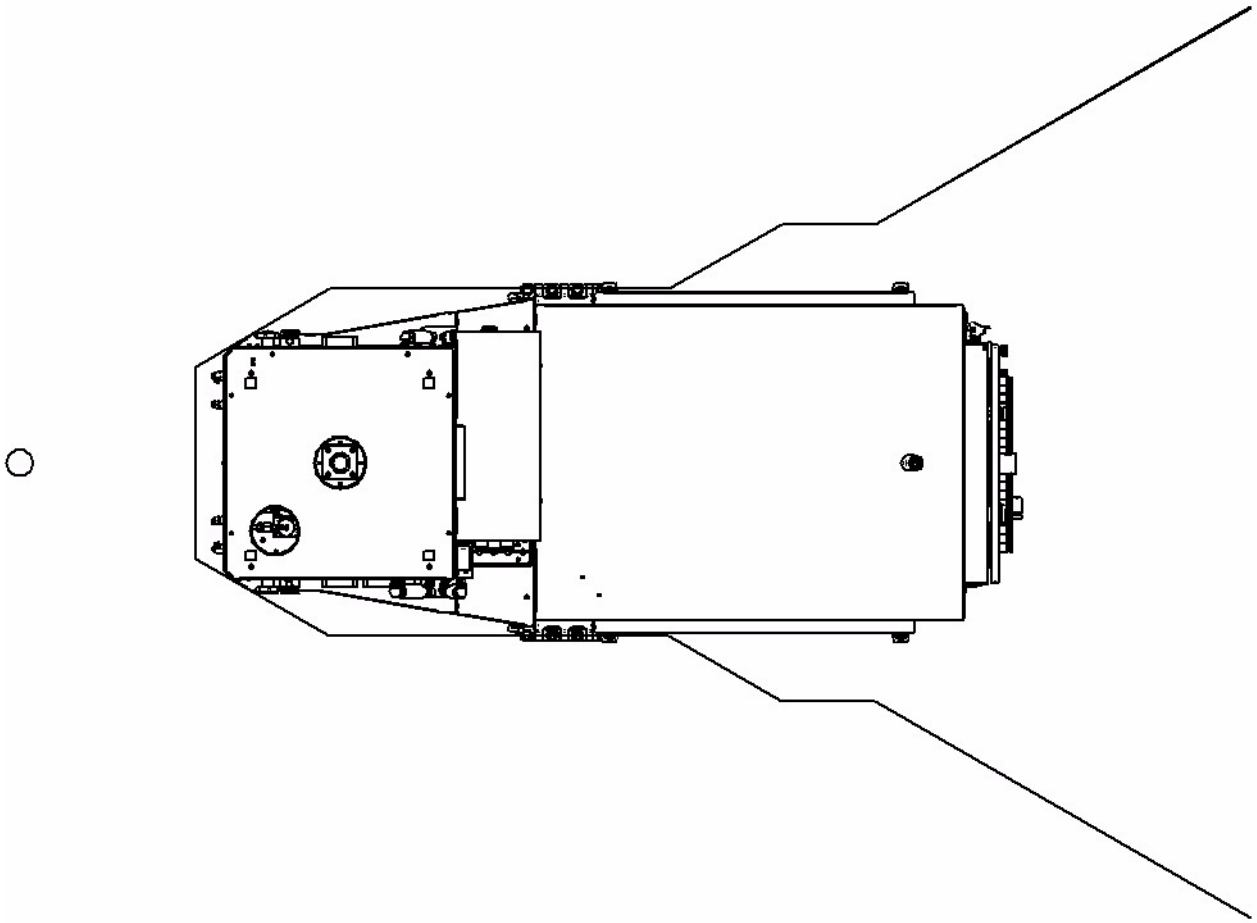


Figure 4 Process module within MESC envelope

External power box dimensions

Figure 5 shows the dimensions of the external power box.

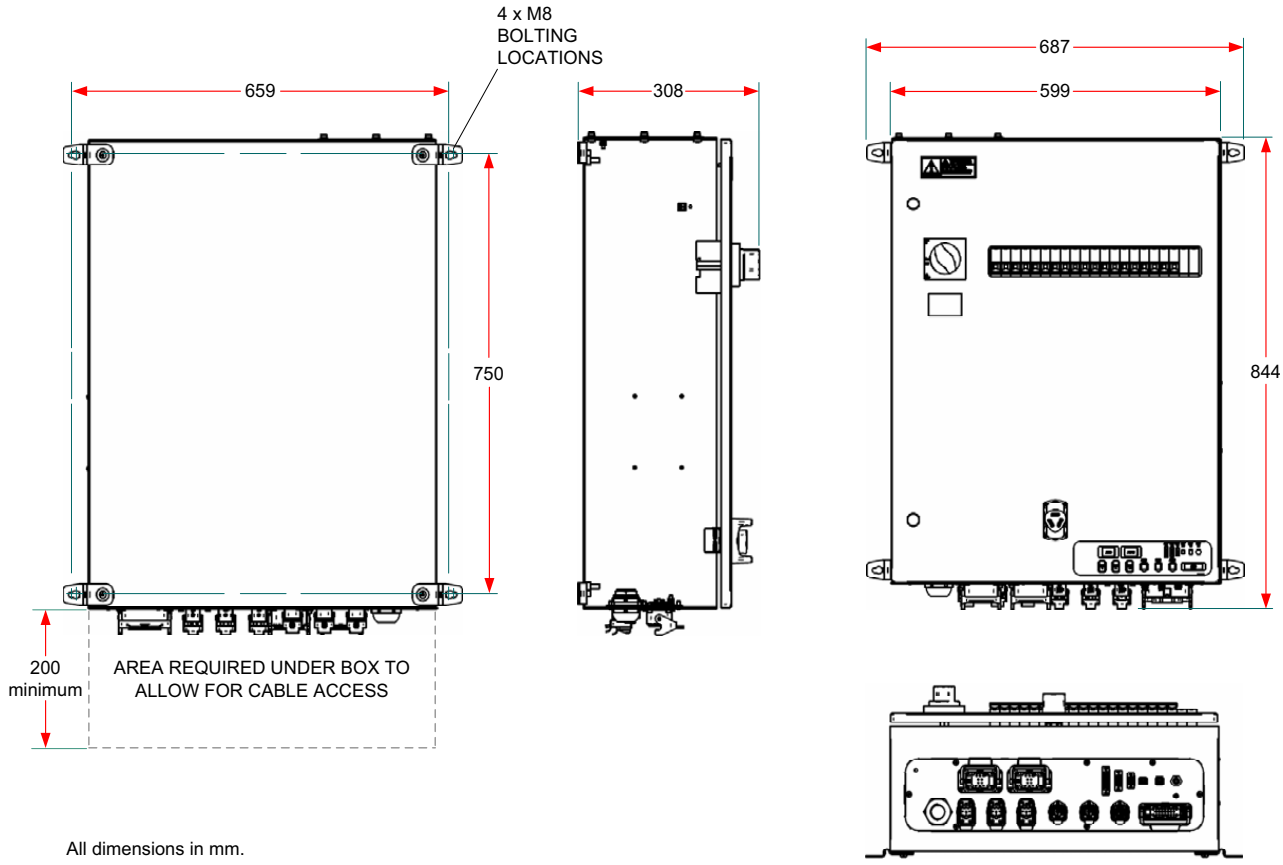


Figure 5 External power box dimensions

Services

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Cables and pipes must not restrict access to the main electrical isolator, the emergency off buttons, or any other safety features.

Figure 6 and Table 2 show the layout of the services panel for the **PlasmaPro®Estrelas100** tool.

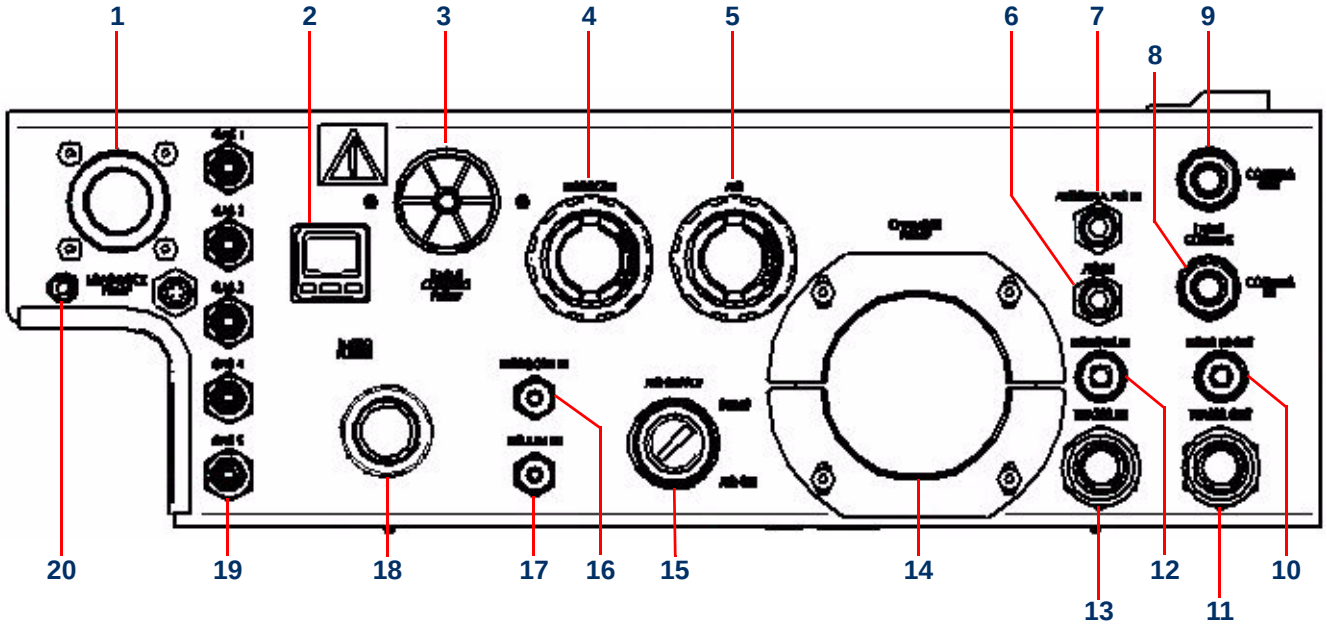

Figure 6 **PlasmaPro®Estrelas100 services panel layout**

Table 2 **PlasmaPro®Estrelas100 services panel items**

Item	Component
1	Loadlock pump
2	Nitrogen purge pressure regulator
3	Table cooling flow gauge
4	Nitrogen regulator with gauge
5	Air regulator with gauge
6	Antenna cooling air out, 8 mm push fit
7	Antenna cooling air in, 8 mm push fit
8	Table cooling in, Swagelock® $^1/_2$”
9	Table cooling out, Swagelock® $^1/_2$”
10	Liquid nitrogen out, Swagelock® $^3/_8$”

Item	Component
11	Water out, $^3/_4$” push on
12	Liquid nitrogen in, Swagelock® $^3/_8$”
13	Water in, $^3/_4$” push on
14	Chamber pump
15	Air supply manual dump
16	Nitrogen in, Swagelock® $^1/_4$”
17	Helium in, Swagelock® $^1/_4$”
18	Nitrogen regulator
19	Process gas inputs, Swagelock® $^1/_4$” VCR
20	Earth/ground

Electrical power supply requirements

The system requires one of the electrical supplies specified in Table 3.

Table 3 Electrical supply specification

Function	Parameter	Specification
System electrical supply (for a 208 V system)	Voltage	208 VAC ±10%
	Current	75 A
	Frequency	50/60 Hz
	Phases	3 phase, N + E
System electrical supply (for a 400 V system)	Voltage	400 VAC ±10%
	Current	40 A
	Frequency	50/60 Hz
	Phases	3 phase, N + E

Figure 7 shows the recommended electrical installation.

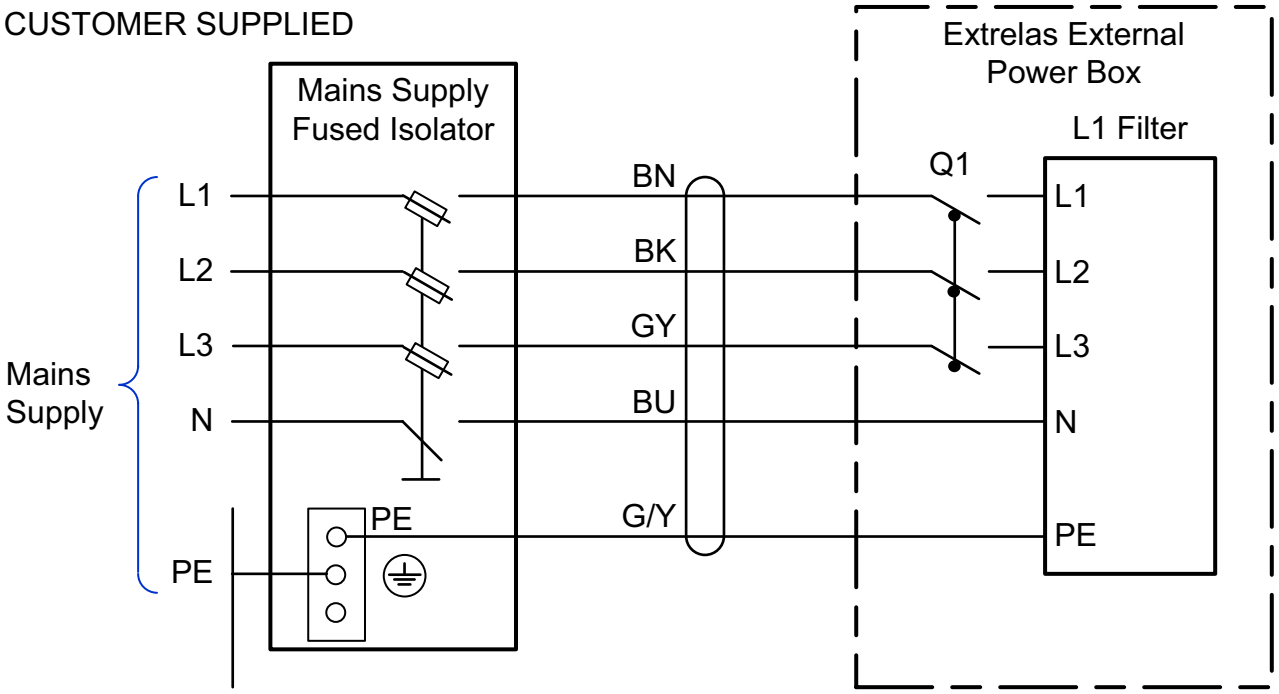

Figure 7 Recommended electrical installation

Notes on the electrical installation

a) The fused isolator (or similar) should be wired according to local regulations.

b) The external fuses/circuit breakers should be rated to work with the value of Q1 in the **Plasma**Pro®**Estrelas**100 external power box.

c) The mains cable to the **Plasma**Pro®**Estrelas**100 system must be suitable for fuses/circuit breakers selected.

d) The external fuse/circuit breaker must be capable of interrupting 10 kA min.

Neutral supply bonding

The system is designed for a TN-S system with separate neutral and protective earth conductors. If the supply is not a TN-S type, the wiring is to be adapted in line with local regulations.

The neutral conductor should be earthed at source (in line with local regulations).

Residual current circuit breakers

Fitting a residual current circuit breaker (RCCB), also known as an *earth leakage circuit breaker* (ELCB or ELB) to the electrical supply of the system is NOT recommended. This is because the equipment contains filters on the power lines, which create small leakage currents that can cause spurious trips of the RCCB.

NOTE: The leakage current caused by the filters is in accordance with International standard IEC 60950-1.

Oxford Instruments Plasma Technology accepts no responsibility if the customer fits an RCCB which proves unsuitable.

Water cooling requirements

The system requires cooling water as specified in Table 4.

Table 4 Cooling water specification

Unit	Specified Flow		Inlet Temp (°C)		Max. Coolant Pressure		Coolant
	gpm[1]	l/min	Max	Min	kPa	psi	
RF generator HFV 8000 (8 kW)	3.0	11.4	30	15	414	60	Water
RF generator HFV 8000 (5 kW)	3.0	11.4	30	15	414	60	Water
RF generator CB 600/ 300	0.5	1.9	-	-	414	60	Water
Main turbo pump ATH2300 MT	0.3	1.0	25	15	-	-	Water
Main turbo pump ATH1600MT	0.3	1.0	25	15	-	-	Water
Turbo backing pump A203H	0.3	1.0					
HDP3 etch source	1.1	4.2	-	-	-	-	Water

1. US gallons per minute.

The maximum flow capacity required is 5.2 gpm (19.5 l/min) at the specified coolant supply pressure.

Compressed air requirement

Compressed air must be supplied via a filter and oil mist separator as shown in Figure 8.

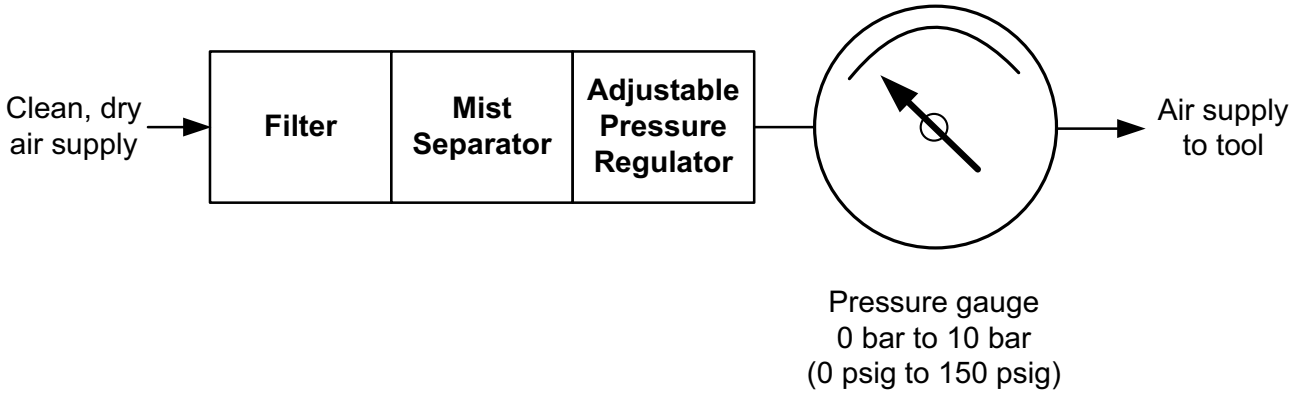

Figure 8 Compressed air supply

The system requires compressed, clean dry air (CDA) in accordance with the specifications given in Table 5.

Table 5 CDA specification

Function	Connection	Parameter	Specification
CDA inlet to filter/mist separator/regulator unit	Customer specific	Minimum pressure	6 bar (90 psig)
CDA inlet to system	6 mm push-fit connector	Maximum flow rate	135 lpm (5 cfm). (This flow is in addition to the antenna cooling flow)
		Regulated pressure	3.0 to 6.0 bar. (45 to 90 psi)
		Pressure monitoring	0 to 10 bar. (0 to 150 psi)
		Oil content	Less than 10 ppm
		Maximum moisture content (expressed as the dew point)	-3°C (25°F)
		Filtration	Maximum particle size of 0.3 microns
CDA inlet to antenna cooling	6 mm push-fit connector	Flow	50 lpm (2 cfm). (This flow is in addition to the system flow)
		Pressure	4.0 to 6.0 bar. (60 to 90 psi)

NOTE: The CDA inlet pressures to the system must be limited to 6 bar (90 psi).

Nitrogen requirement

Compressed nitrogen must be supplied via a filter and semiconductor grade pressure regulator as shown in Figure 9. All tubing used in the installation must be electropolished stainless steel. All pipe-work fittings and pressure regulators must be semiconductor grade.

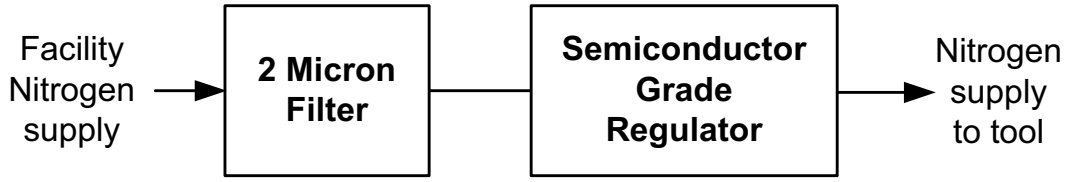

Figure 9 Nitrogen supply to the system

The system requires nitrogen in accordance with the specification given in Table 6.

Table 6 Nitrogen supply specification

Function	Connection	Parameter	Specification
Regulated N_2 inlet to system	1/4” stainless steel Swagelok®	Flow	10 lpm (0.4 cfm)
		Pressure	3.0 bar (45 psi) minimum
		Regulation	0.5 bar to 5 bar (7.5 to 75 psig)
		Filtration	2 micron filter mounted adjacent to the system
		Purity	Better than 99.99% to satisfy process requirements
Backing pump purge	It is the responsibility of customers to ensure that a rotary pump purge connection is fitted and used correctly. The purge flow is necessary to protect the pumping system from the customer's process, and may also be required by local safety regulations. Customer requirements vary, so special kits can be supplied on request. Any damage caused by the omission of a satisfactory pump purge supply cannot be covered by any system warranty in effect at the time of use.		

Helium requirement

Helium must be supplied via a local pressure regulator as shown in Figure 10. All tubing used in the installation must be electropolished stainless steel. All pipe-work fittings and pressure regulators must be semiconductor grade.

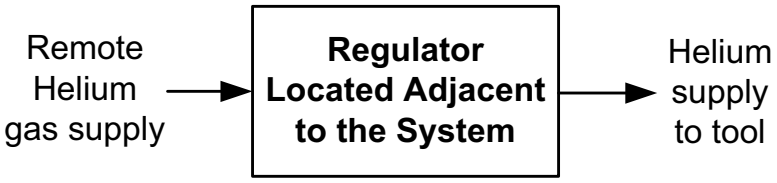

Figure 10 Helium supply to the system

The **PlasmaPro®Estrelas100** tool is fitted with the helium substrate cooling. The system requires compressed helium that complies with the specification in Table 7.

Table 7 Helium supply specification

Function	Connection	Parameter	Specification
System He	1/4” stainless steel Swagelok®	Flow	50 sccm
		Pressure	3.0 bar (45 psi) minimum

Process gas requirement

Process gas is supplied directly to the tool and optionally to an external gas pod from an external supply. All tubing used for process gas supply must be electropolished steel. All pipework fittings and pressure regulators must be semiconductor grade.

On all gas lines, the customer must fit manual shut-off valves as close to the gas pod inlets as possible. Each valve must be clearly labelled with the gas it controls. These valves are sometimes referred to as *point-of-use* valves. Figure 11 shows a typical installation.

Figure 11 Gas supply point-of-use valves

All process gas supplies must conform to the specification given in Table 8.

Table 8 Process gas supply specification

Function	Parameter	Specification
Process gas supplies	Pressure	2 bar (30 psig) minimum [1]
	Regulation	0.5 to 5 bar (7.5 to 75 psig)
	Purity	At least 99.99% to satisfy process requirements
	Filtration	A 2 micron filter is fitted to each gas line, as part of the gas pod. Other grades of filter can be fitted, if required.

1. Low vapour pressure gases can be used (see Installation of low vapour pressure gases), but they require special consideration to prevent unwanted condensation of material in the gas lines. It may be necessary to heat the gas lines and the gas handling equipment in the gas pod. Contact Oxford Instruments Plasma Technology for advice.

The system requires a pipework connection between the tool service panel or the external gas pod (if fitted) and the system gas inlet. This connection must comply with the specification given in Table 9.

Table 9 System gas inlet specification

Function	Connection	Parameter	Specification
Process gas in	1/4” electropolished stainless steel pipe, welded at the gas pod	Pressure	2.0 to 3.0 bar (30 to 45 psi)
	1/4” stainless steel VCR at the system		

Installation of low vapour pressure gases

Special precautions must be taken if low pressure gases (such as C_4F_8) are used. The low vapour pressure can lead to condensation in the gas supply lines, particularly where the gas passes through a cooler region of pipework. Condensation can result in a build up of liquid in the gas pipe, usually at the low points or U-bends in the gas line. Liquid build-up can produce unstable gas flows, especially if liquid condenses or flows into the mass flow controller (MFC).

The gas pressure at the system can be very low if the gas cylinder is cold, e.g. if it is kept outdoors in the winter. Observe the following guidelines if using low vapour pressure gases:

Keep the gas cylinder indoors

Keep the gas cylinder in an extracted gas cabinet to avoid loss of line pressure when the outside temperature is cold. DO NOT heat the gas cylinder with a heated jacket as this can cause condensation when the gas passes through the cooler gas lines.

Maintain a positive temperature gradient

Maintain a positive temperature gradient from the cylinder to the MFC. This is best achieved by positioning the gas pod close to the system, resulting in short pipe runs. If this is not possible, then the gas lines should be heated by wrapping them in suitable heater tape.

It may be necessary to heat the MFC in the gas pod. OIPT offers a heated MFC kit for use with low vapour pressure gases.

The MFC temperature should be maintained above the temperature of the gas line which should, in turn, be maintained at a higher temperature than the gas cylinder. A typical setup might be as shown in Figure 12.

MFC 40°C (104°F) or above;
gas line 30°C to 40°C (86°F to 104°F);
gas cylinder at room temperature.

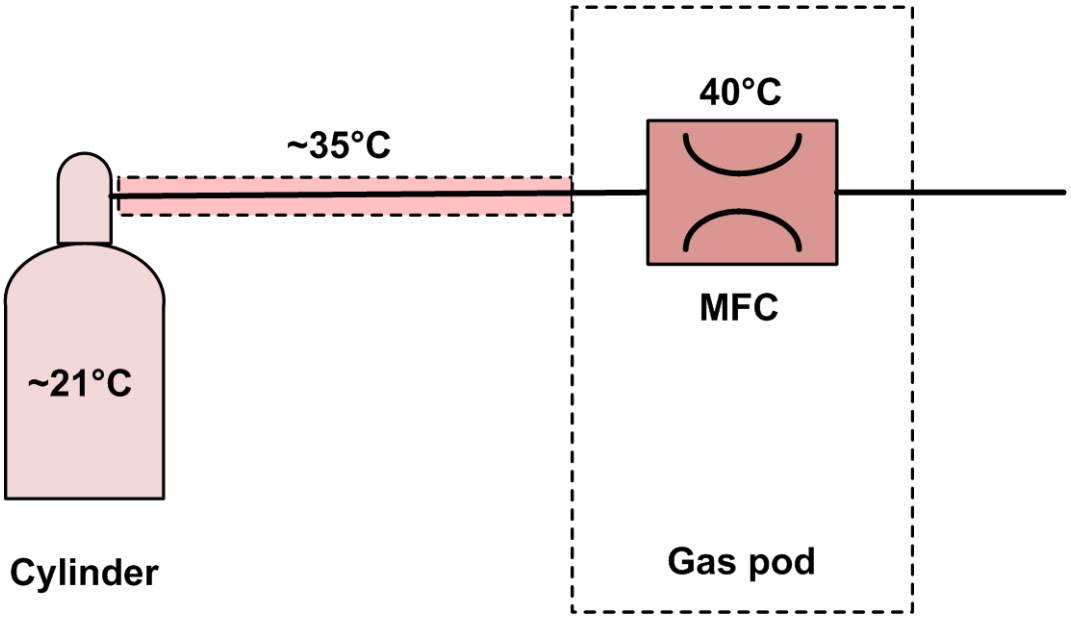

Figure 12 Typical heated gas line showing the temperature gradient

If condensation problems are suspected:

1. Pump out the gas lines completely.
2. Optimise the heater tape arrangement and temperature setpoints.
3. Refill the gas line.

Extraction requirements

The system requires air extraction for the pump exhausts and gas pods. If toxic, flammable or corrosive gases are to be used at any time, the extraction system must be designed accordingly.

The extraction system must comply with the specifications given in Table 10.

Table 10 Extraction system specification

Function	Connection	Parameter	Specification
Gas pod extraction	100 mm (4”) tube	Flow	1 m^3/hour (0.6 cfm)
Backing pump exhaust	Refer to the manufacturer’s manual		

Mandatory requirements for backing pump extraction

The installation must provide an extraction system that matches the backing pump exhaust and conforms to local safety standards. In particular, all fittings and pipework connected to the backing pump exhaust must be made from industry standard stainless steel in accordance with local safety regulations.

Specialised equipment such as scrubbers and furnaces may be needed to dispose of hazardous gases. The routing of the pump exhaust line must be arranged so that condensates cannot flow back into the pump.

NOTE: There is a risk of damage from cross-contamination if backing pumps share the same exhaust system. This applies whether the pumps are on the same system or on different systems. Damage caused by any cross-contamination is not covered by the system warranty.

Care must be taken to route mutually incompatible exhaust gases through separate exhaust ducts. In particular, oxygen enriched exhaust gases must not be mixed with exhausts from mineral oil pumps as this can cause an explosion.

Mandatory requirements for close coupled/external gas pod extraction if configured for toxic gases

The gas pods must be connected to the customer's gas extraction system via 100 mm (4”) diameter pipe collars to provide cabinet extraction with a minimum flow rate of 1 m^3/hour (0.6 cfm). An extraction vacuum of approximately 500 Pa relative to local atmospheric pressure (0.07 psig) is required.

It is the customer’s responsibility to ensure that the gas extraction system, including all necessary gas sensors, meets local safety regulations.

Liquid nitrogen requirements (if fitted)

The liquid nitrogen facilities must comply with the specifications given in Table 11.

Table 11 Liquid nitrogen facilities specification

Function	Requirement
Liquid nitrogen connection to system	3/8” Swagelok® connector.
System design	Adequate precautions must be taken to prevent pressure build-up (e.g. pressure relief valves).
	All liquid nitrogen carrying components must be thermally insulated. Components must also be covered to prevent accidental touching by personnel.
Inspection	The liquid nitrogen installation must be inspected by a specialist to confirm that it is safe to use.

System heat load

Table 12 shows the typical heat load for a clean room installation.

Table 12 Typical heat load

System State	Heat Load
Operating	3.5 kW (1.7 kcal/hr)
Passive	1.5 kW (1.3 kcal/hr)

NOTE: These heat load values do not include externally sited components such as pumps, heater/chillers or transformers, etc.

System noise emission

The maximum noise emission from the system is 75 dB, measured 500 mm above the backing pump. Noise emission from the system could be reduced by siting ancillary equipment (e.g. backing pump, heater/chiller) remotely in a service area.

Environment

Statement of intended use

This equipment is intended to be used by skilled and trained personnel for processing materials within a controlled access environment.

Mandatory specifications for the system environment

The **PlasmaPro®Estrelas100** system is rated for use in a pollution degree 1 installation category environment (laboratory or clean industrial environment).

Table 13 lists the mandatory environmental specifications.

Table 13 Mandatory environmental specifications

Item	Specification
Operating temperature	5°C to 25°C (41°F to 77°F)
Storage temperature	0°C to 50°C (32°F to 122°F)
Maximum humidity	80%[1]
Minimum humidity	10%[2]
Electrostatic build-up	Low static environment [2]
Ambient light level	300 lux minimum
Altitude	Up to 2000 m (6562 ft)
Cleanliness	Clean room class 10,000 or better

1. High humidity has a progressively significant effect on system performance. At humidity greater than 50%, the rate of chamber pump-down after venting the chamber is affected significantly, and at humidity greater than 65% the rate of chamber pump-down may not meet system specifications.

2. Low humidity introduces a risk of electrostatic build-up, with subsequent discharge to the system producing a malfunction or damage. The systems are tested to EN 61000-4-2:1995 + A1:1998, + A2:2001. OIPT recommend the use of an environment, which protects against electrostatic build-up, and extra precautions are necessary at low humidity.

Room volume and air changes

The room should have a volume of at least 9 m^3 (or more as dictated by the tool size) and should be ventilated with at least 4 air changes per hour. This is essential to keep oxygen levels high and prevent increased fume levels.

Installation Date Sheet

PlasmaPro®Estrelas100

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