# Stand Alone Plasma Source

The PDS equipment contains lethal voltages and high frequency, therefore it is essential that all the relevant precautions are taken to safegaurd against these dangers.

**IT IS THE RESPONSIBILITY OF THE CUSTOMER TO ENSURE THAT ALL RELEVENT SAFETY PRECAUTIONS ARE UNDERTAKEN AND MAINTAINED.**

## Services Requirements

This document details the basic requirements for the installation of a Thin Film Solutions Ltd stand-alone Plasma Deposition Source.

## Input Power

| | |
|---|---|
| Voltage | 3 phase + phase neutral + earth<br>400 V ±10% / 50 - 60 Hz, ±1 Hz |
| Main breaker | 63 amps per phase |

**Customer to supply mains input cable and suitably rated step-up transformer, if required.**

## Water services

| | |
|---|---|
| Anode flow rate | > 6.0 litres/min |
| Cathode flow rate | > 4.0 litres/min |
| RF coil flow rate | > 3.5 litres/min |
| RF PSU flow rate | > 2.5 litres/min |
| Connections to entities | 10mm pushfit (anode and cathode, via brass water manifolds)<br>8mm pushfit (RF PSU)<br>10mm – 6mm brass swagelok adaptors (onto RF capacitor )<br>6mm-6mm swagelok adaptors (between RF capacitor and<br>22mm pushfit adaptor (into flow switch panel) |
| Maximum pressure | 6.0 bar |
| Particulate diameter | 150 microns (maximum) |
| Water pH | 7.8 ± 0.6 |
| Water conductivity | < 200 microsiemens |
| Inlet temperature | Maximum 18°C |
| Tubing | 10mm nylon tubing |

Water is distributed to the system via a flow switch panel which is connected into the main control tower. All the flow switches must be closed (indicating adequate flow) before the software will allow the source to be started up. For a dual source system, two such panels are supplied and fitted as part of the installation.

## Compressed air.

| | |
|---|---|
| Pressure limits | 6 bar – 14 bar |
| Tubing | 6mm nylon tubing |

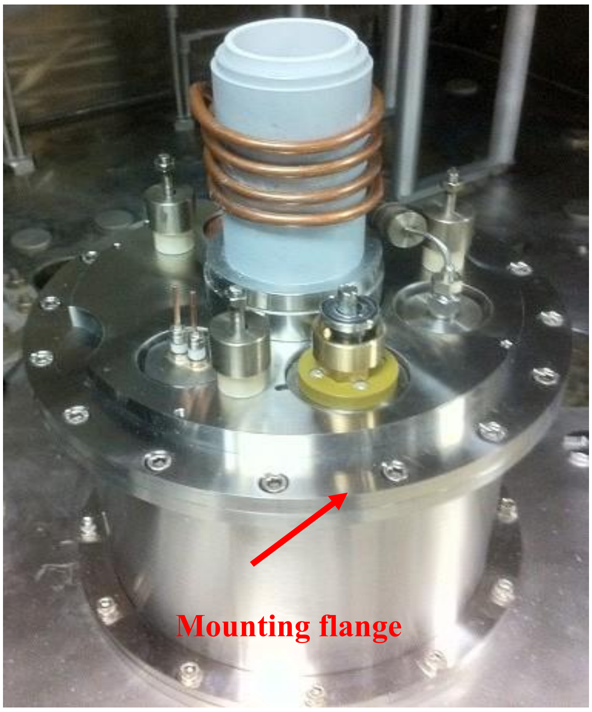
## Gas services.

| | |
|---|---|
| Source gas | Argon high purity (99.998% or greater) |
| Anode gas | Argon high purity (99.998% or greater) |
| Process gas | Oxygen |
| Inlet pressure (all gases) | Regulated to 2 bar |
| Gas connections | ¼" Swagelok stainless fittings (into gas panel)<br>6mm swagelok fittings |
| Gas tubing | 6mm pneumatic grade nylon tubing |

A gas panel (comprising mass flow controllers, 7 micron inline filters, pneumatic isolation valves, and 24VDC pneumatic solenoids) is supplied for each source. Although the source has two argon gas services (source and anode), the incoming gas is split within the panel (only one argon feed is needed).

**Customer to supply gas regulators and suitable connections as far as gas panel(s)**

## Source mounting hardware



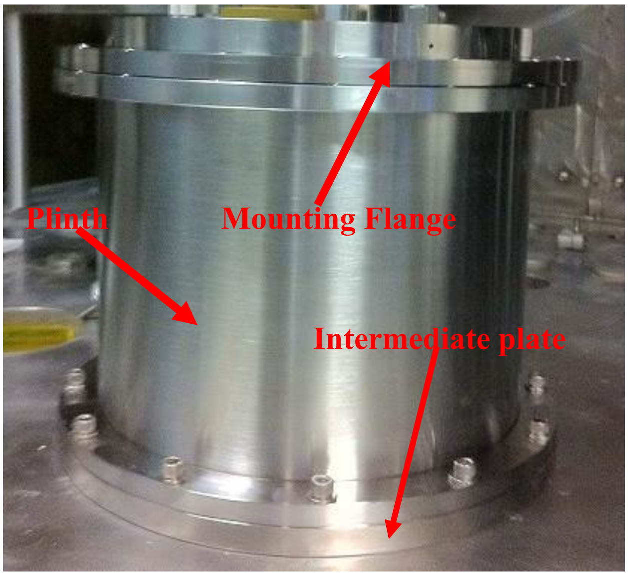


**Photo 2 Support plinth**

**Photo 1 Support plinth with plasma source**

The plasma source is supported on a plinth as shown in Photos 1 & 2. The plasma source is supported on the top side of a mounting flange as shown in Photo 1.

All electrical, water and gas services to the source enter through the bottom of the mounting flange indicated in Photo 3 below.

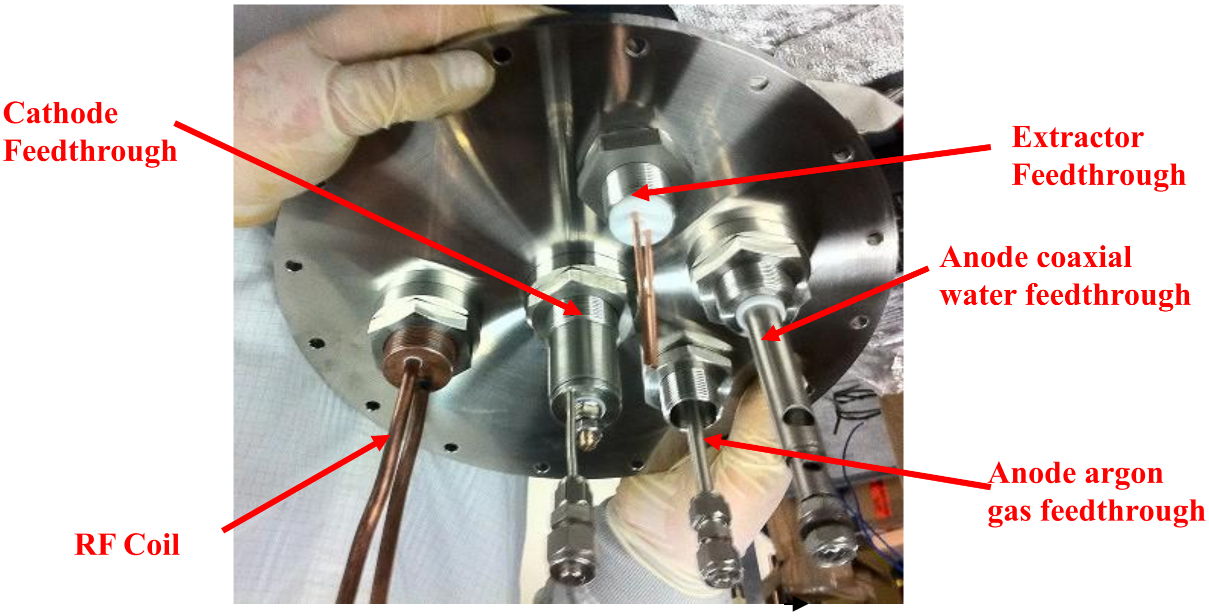
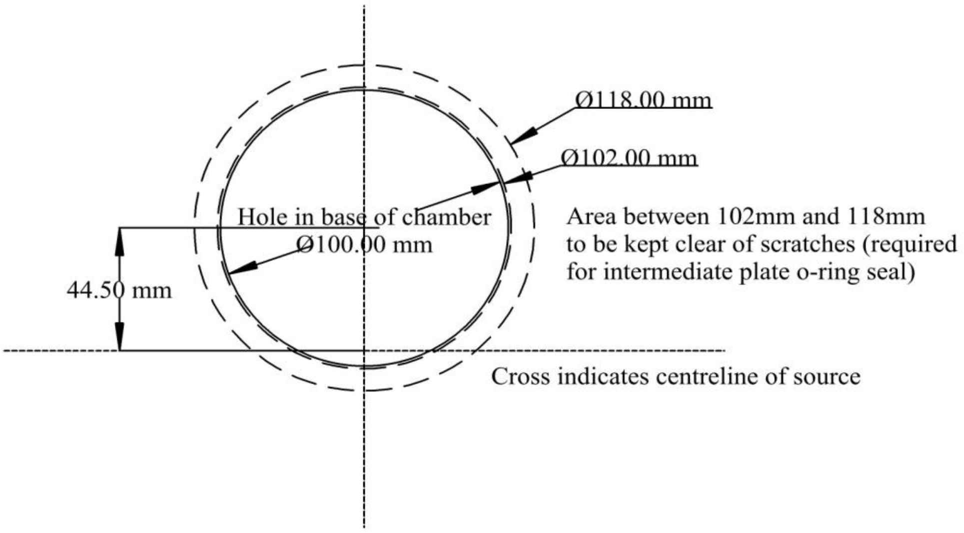


**Photo 3 Underside of top mounting flange**

To allow these services access to the underside of the flange, a 100mm hole must be made in the baseplate of the chamber (location to be agreed with the customer), as shown in the drawing and Photo 4 below:



An intermediate plate (see Photo 2) is used between the bottom of the plinth and the chamber, and seals to the area between diameters 102mm and 118 mm in the above drawing.

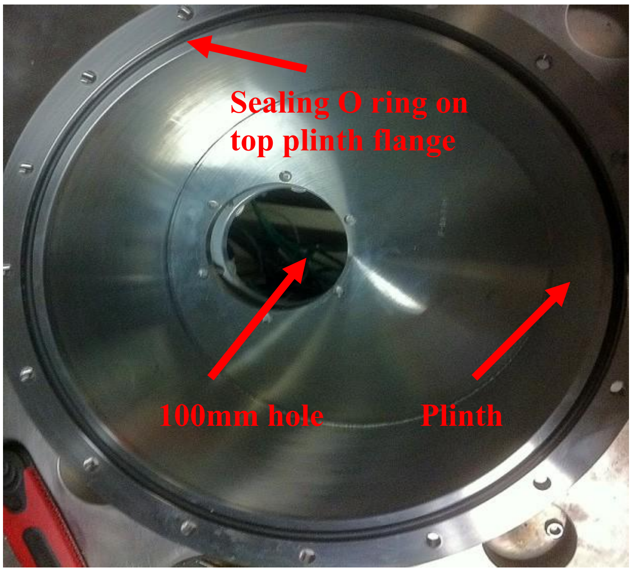


**Photo 4 100mm aperture in chamber baseplate**

The offset allows the 6mm RF lines to exit directly from the bottom of the chamber, with minimal requirement for bending. The intermediate plate is secured from under the chamber by a fixing plate and bolts, avoiding any requirement to drill and tap holes into the bottom of the vacuum chamber.

Once the intermediate plate is in place, the plinth is bolted down and sealed to it. The required gas, water and power services are then led in through the hole in the baseplate, connected to the feedthroughs in the mounting flange, and then the flange is bolted down to the top of the plinth.

A plastic insert, see Photo 5, is used to keep the RF lines separate from the other services. The insert is placed within the intermediate plate and extends past the fixing plate, thus ensuring the RF lines cannot contact ground.

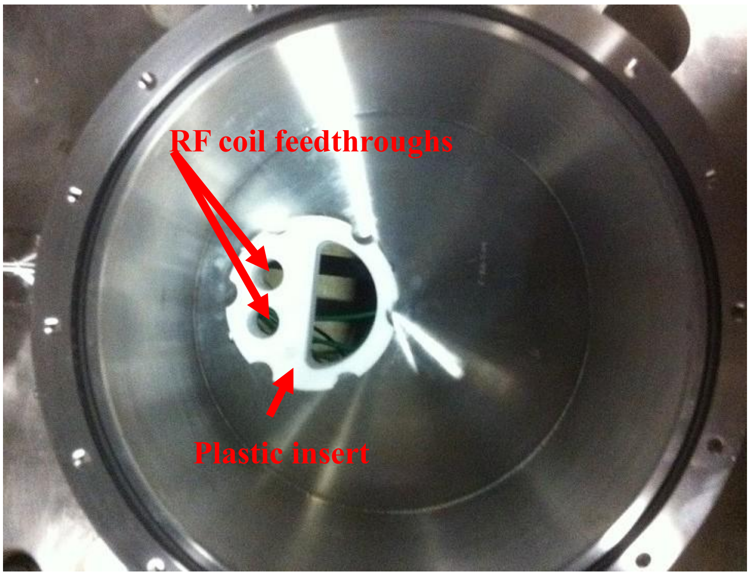


**Photo 5 Plastic insert**

**NOTE: Plinth, flanges, mounting plates and plastic insert Photos 1 through to 5 are all supplied by Thin Film Solutions Ltd**

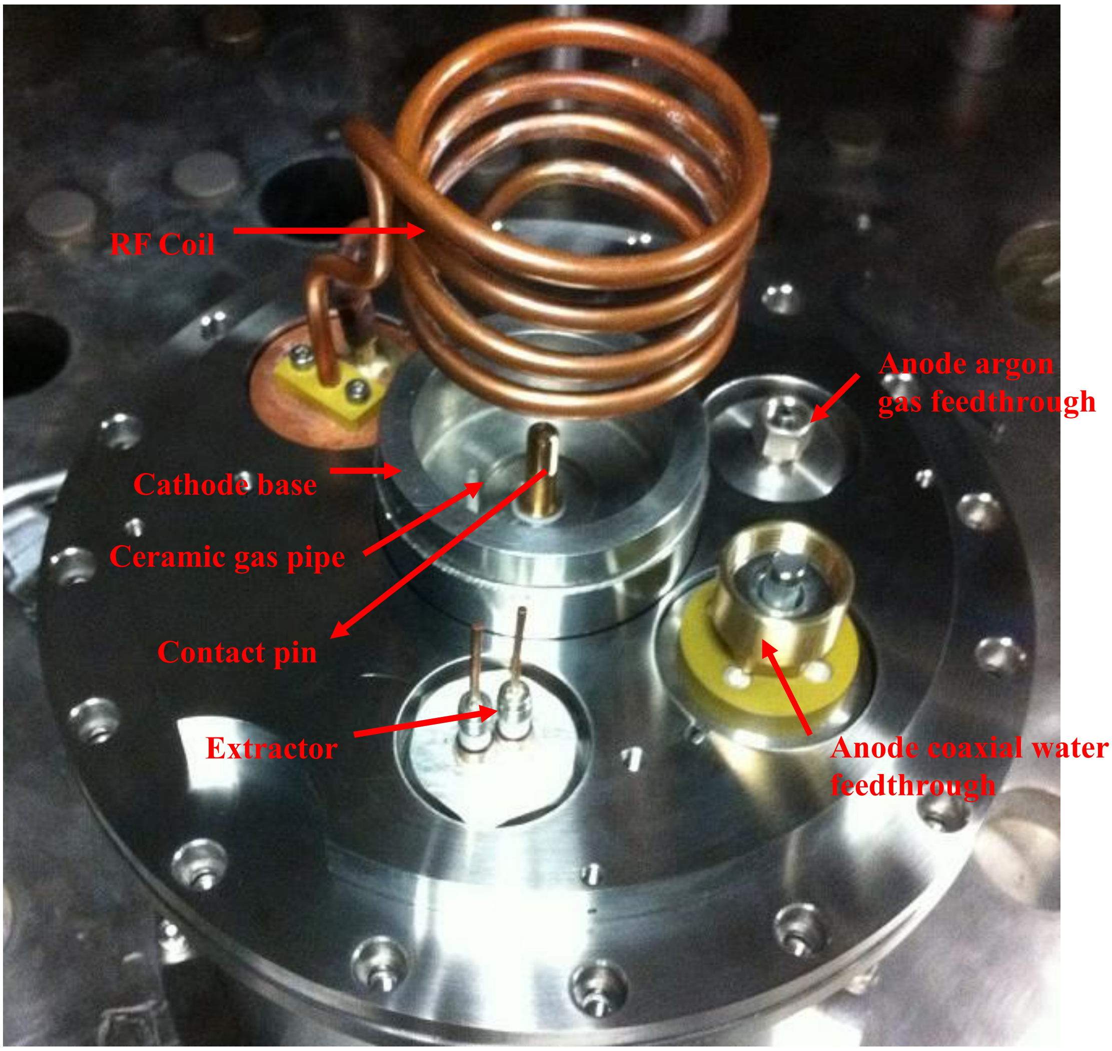


**Photo 6 Vacuum side of top mounting flange**

**Photo 7 Vacuum side of mounting flange with boron nitride tube added**

Assembly of the anode liner (part number P33140-210A) and base insulator (part number P3314212) are shown in photo 8 and Figure 1.

**NOTE ANODE LINER [PART NUMBER P3314-210A] SHOWN IN PHOTO 8 AND BASE INSULATOR [PART NUMBER P3314-211 SHOWN IN FIGURE 1] MUST BE**

**FITTED PRIOR TO OPERATION OF THE PLASMA SOURCE AS SERIOUS DAMAGE CAN BE CAUSED TO THE ANODE IF PART NUMBER P3314-211 IS OMITTED**

**NOTE DAMAGE CAUSED IN THIS WAY THROUGH INCORRECT OR NON-FITMENT OF PART NUMBERS P3314-210A & P3314-210 ARE NOT COVERED BY WARRANTY**

**NOTE STAINLESS STEEL ANODE LINER (PART NUMBER P3314-210A) MUST BE ORIENTATED CORRECTLY WHEN PLACED INTO THE ANODE OTHERWISE SERIOUS DAMAGE CAN OCCUR TO THE ANODE. THE ANODE LINER MUST BE PLACED**

**Photo 8 Anode liner.**

Reach down into source and remove the base insulator & cathode chamber liner. These must fit tightly as per the following Figure 1 diagram, otherwise the plasma will damage the anode.

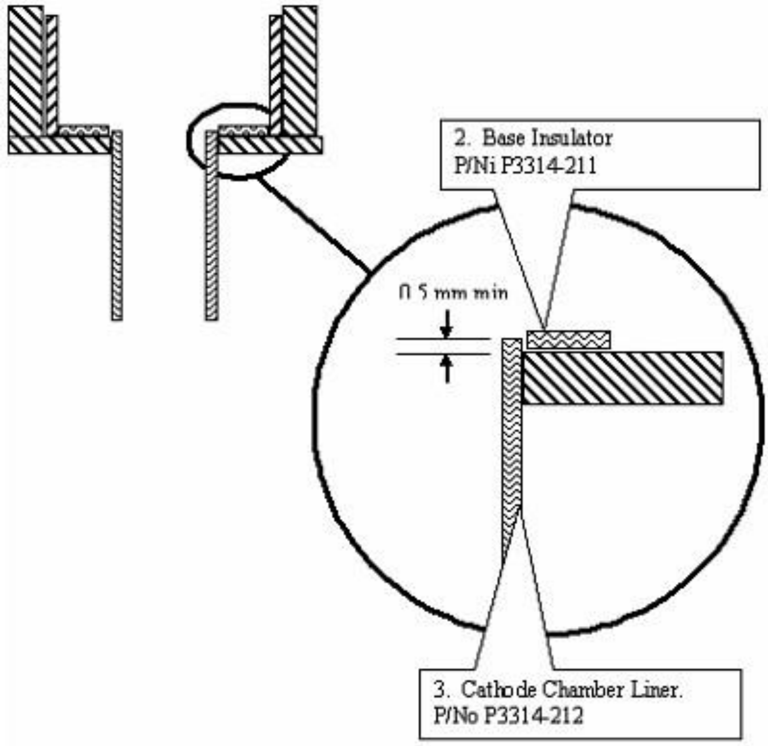


**Figure 1 Base insulator / chamber liner relationship.**

## Electromagnetic shielding.

The running of the plasma source  can be affected if it is positioned close to electron beam guns. If such a configuration is unavoidable, the customer will have to provide adequate magnetic shielding for the plasma source.  Consideration should also be given to the height of plasma soucre once mounted on a support plinth (see Photo 1) and any possible masking effects in relation to the evaporation material(s).

## 19” rack unit – Item heights

| Entity | Height (rack units) | Height (cm) | Height (inches) |
|---|---|---|---|
| DC anode PSU | 3U | 13.35 | 4.25” |
| RF heater PSU | 3U | 13.35 | 4.25” |
| Extractor DC power | 2U | 8.9 | 3.5” |
| Keyboard tray | 2U | 8.9 | 3.5” |
| 19” rack PC | 1U | 4.45 | 1.75” |
| Water / MFC interface box | 3U | 13.35 | 4.25” |
| 19” LCD monitor | 8U | 35.6 | 14” |

**Technical details are subject to change without prior notice**