Specifications
SP3 Model 655 HF CVD Diamond Deposition Reactor

General

Diamond Morphology: Polycrystalline diamond structure can be controlled to produce nanocrystalline or microcrystalline films from 500nm to 50um thick

Deposition Chamber:
- Chamber size: 58.5 cm (23”) Inside Diameter
- Filament area: 38.1 cm x 35.6 cm (15” x 14”)
- Useful Deposition Area: 33 cm x 30 cm (13” x 12”)

Power consumption 35 kW max

Process Control

Recipe control:
- Automatic control via discrete recipe steps.
- Up to 59 steps.
- All parameters adjustable in each step.
- Real-time display of all parameters.
- Datalogging of all parameters.
- Manual control for maintenance and troubleshooting.
- Ethernet interface for:
  - recipe development
  - recipe management
  - data file access.

Gas control:
- 3 MFC loops
  - H2 5 SLM
  - CH4 200 SCCM
  - N2 10 SLM
- 2 additional gas loops available as options.

Pressure control:
- Operating range 6 to 50 Torr
- Cycle time – 30 minute pump down, 10 minute vent
- Leak test – recipe controlled, optional on every run
- Downstream closed loop throttle valve control.
Temperature monitoring:
- Chamber thermocouples (3 each) - 35° to 1000° C
- Filament optical pyrometer - 800° to 3000° C
- Chamber Lid thermocouple – 15° to 90° C

Filament power
- 200 Volts DC, 150 Amps max

Facilities Requirements

Footprint: 117 cm x 132 cm (48” x 54”)
Height: 190 cm (74.5”)
Weight: 750 Kg (1650 lbs)

Power input:
- Primary power: 480 VAC, 3 phase, 4 wire, 60 amp or 380 VAC, 3 phase, 4 wire, 80 amp
- Vacuum pump: 208/220 VAC, 3 phase, 4 Wire, 15 amp
- Cooling water: 10 gpm at 40 psi drop, 25° C maximum
- Requires ~25kW cooling capacity under normal operation
- Water must be treated – see separate recommendation

Access:
- 60 cm clearance all sides (24”)

Process gases:
- H2 (99.995%), CH4 (99.9%) and N2 (15 to 20 psi)

Pneumatic control
- CDA (70 psi min)

Vacuum Pump
- Required 38 CFM minimum

Vacuum Exhaust
- Dilution: Customer responsibility according to local code/regulations

Operating Environment

Temperature
- 16° C to 24° C Relative

Humidity
- 30-60% non-condensing

User Interface

Graphical User interface displays system operational status, provides system monitoring and control, data logging and recipe development and storage.
Safety – CE Compliant

Hardware interlocks: Equipment and personnel protected from hazardous situations related to flammable gas, high voltages and high temperatures. (Customer supplied external flammable gas detector required.)

<table>
<thead>
<tr>
<th>Alarm Name</th>
<th>Interlock or Function</th>
<th>Device or Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum High</td>
<td>Main Vacuum Valve Closed</td>
<td>&gt;50 Torr Nominal</td>
</tr>
<tr>
<td>Main Vacuum Valve Closed</td>
<td>No H2, CH4 flows, No Fil V.</td>
<td>Switch</td>
</tr>
<tr>
<td>Pump Dilution</td>
<td>No H2, No CH4 flows</td>
<td>Flow sensor</td>
</tr>
<tr>
<td>Vacuum Low</td>
<td>No Filament Voltage</td>
<td>&lt;5 Torr Nominal</td>
</tr>
<tr>
<td>H2 Leak Detector</td>
<td>No H2, No CH4 flows</td>
<td>External Input</td>
</tr>
<tr>
<td>Low water Flow</td>
<td>No Filament Voltage</td>
<td>Flow Sensor</td>
</tr>
<tr>
<td>Pneumatic CDA</td>
<td>No H2, CH4 flows, No Fil V.</td>
<td>CDA &lt;60 psi</td>
</tr>
<tr>
<td>Gas Cabinet Scavenge</td>
<td></td>
<td>Exhaust dilution interlock</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scavenge air &lt;150 CFM</td>
</tr>
</tbody>
</table>

Software interlocks: User controlled through Alarm/Abort Levels on analog values and status of digital alarm inputs.