# Specifications

## sp3 Model 665 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: | Two each 58.5 cm (23") Inside Diameter |
| Filament area: | Two each 38.1 cm x 35.6 cm (15" x 14") |
| Useful Deposition Area: | Two each 33 cm x 30 cm (13" x 12") |

Power consumption: 70 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-controlled process gas loops
  - $H_2$ 10 SLM
  - $CH_4$ 200 SCCM
  - $N_2$ 20 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

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Temperature monitoring:

- Chamber thermocouples (3 each chamber) - 35° to 1000° C
- Filament optical pyrometer (1 each chamber) - 800° to 3000° C
- Chamber Lid thermocouple (1 each chamber) – 15° to 90° C

Filament power

- 200 Volts DC, 150 Amps max (each chamber)

## Facilities Requirements

Footprint: Main Frame 122 cm x 168 cm (48" x 66")
Control Rack 52 cm x 97 cm (21" x 38 ")
Power Distribution Box 18 cm x 51 cm x 61 cm (7" x 20" x 24")
Height: 190 cm (74.5") max
Weight: 1000 Kg (2200 lbs)
Power input:
Primary power: 480 VAC, 3 phase, 4 wire, 120 A or 380 VAC, 3 phase, 4 wire, 160 A
Vacuum pump: 208/220 VAC, 3 phase, 4 Wire, 15 amp
Cooling water: 20 gpm at 40 psi drop, 25° C maximum
Requires ~50kW cooling capacity under normal operation
Water must be treated – see separate recommendation
Access: 60 cm clearance all sides (24")
Process gasses: $H_2$ (99.995%), $CH_4$ (99.9%) and $N_2$ (15 to 20 psi)
Pneumatic control: CDA (70 psi min)
Vacuum Pump: Required 47 CFM minimum
Vac 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.

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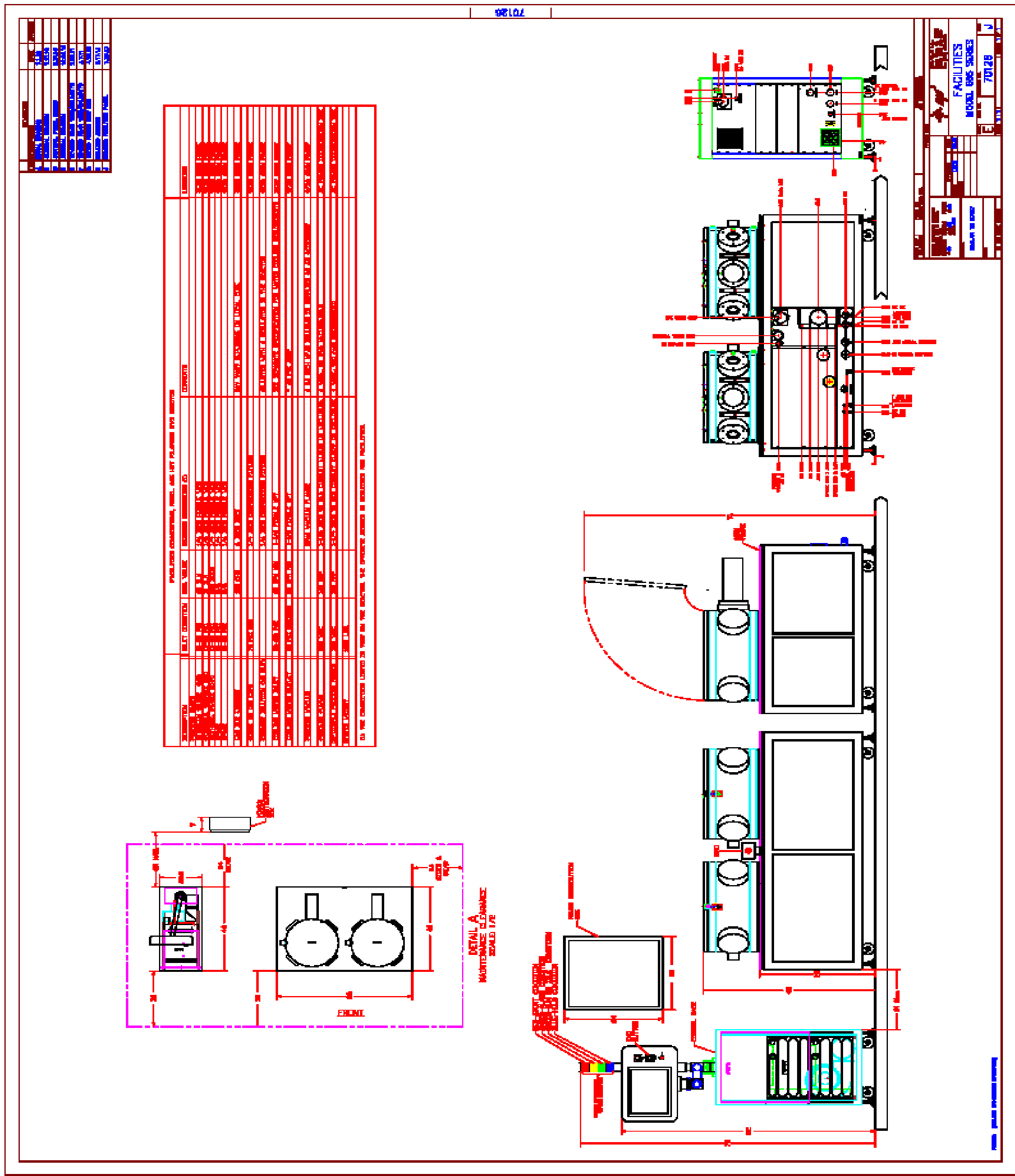
# Safety – CE Compliant

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.)

| Alarm Name | Interlock or Function | Device or Limits |
| --- | --- | --- |
| Vacuum High | Main Vacuum Valve Closed | >50 Torr Nominal |
| Main Vacuum Valve Closed | No $H_2$, $CH_4$ flows, No Fil V. | Switch |
| Pump Dilution | No $H_2$, No $CH_4$ flows | Flow sensor |
| Vacuum Low | No Filament Voltage | <5 Torr Nominal |
| $H_2$ Leak Detector | No $H_2$, No $CH_4$ flows | External Input |
| Low water Flow | No Filament Voltage | Flow Sensor |
| Pneumatic CDA<br>Gas Cabinet Scavenge | No $H_2$, $CH_4$ flows, No Fil V. | CDA <60 psi<br>Exhaust dilution interlock<br>Scavenge air <150 CFM |

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



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