# Plasma Wet Scrubber
# 소개자료

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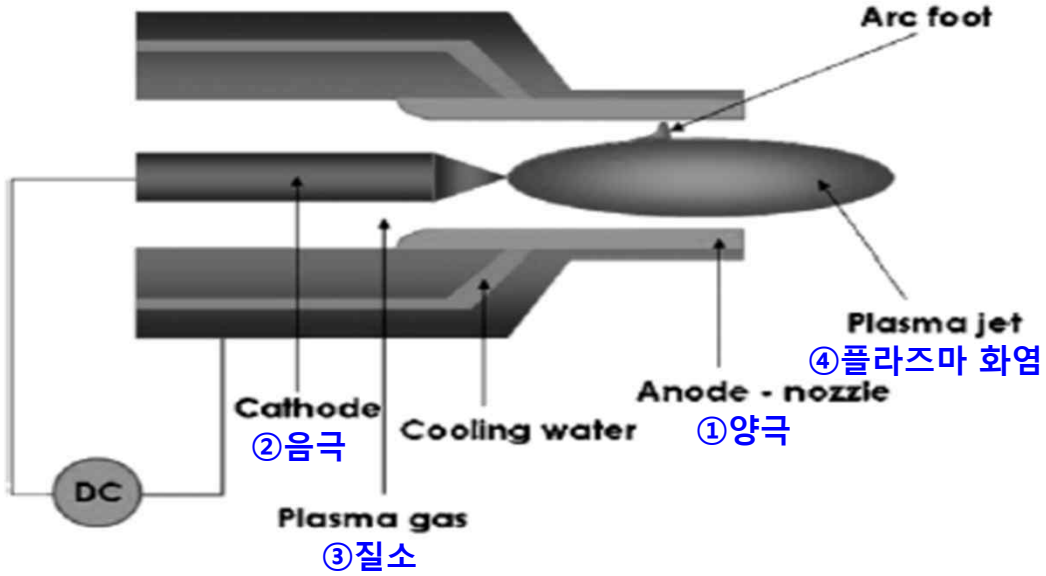
# Plasma Scrubber 원리

반도체 제조공정에 사용하는 Gas 중 **PFC Gas(CF4, C2F6, C3F8, SF6, NF3, CH2F2 등)의 처리를 위해서는 고온의 열분해가 필요합니다.**
열분해 온도는 약 1500℃입니다.
기존 Heater식 또는 연소식 Scrubber는 위의 온도까지 고온으로 운전하기에 무리가 있어 개발된 방식이 Plasma Scrubber 입니다.

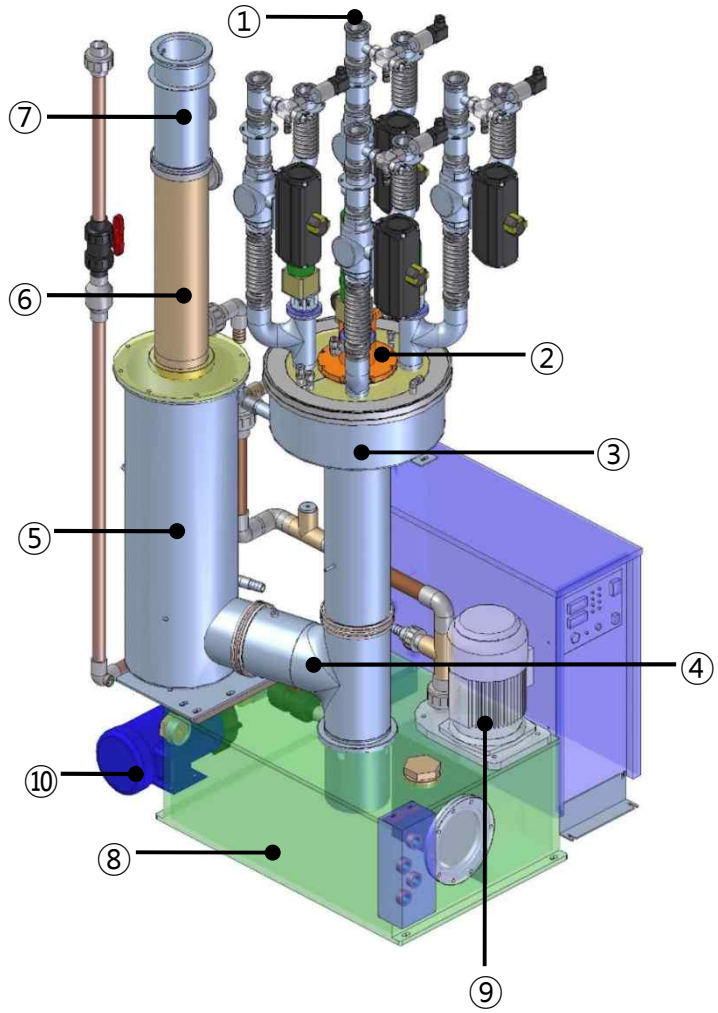
Plasma 생성 방법에는 Micro-Wave, RF, Arc 등이 있는데 당사는 Arc-Plasma 발생장치를 사용합니다.
Arc-Plasma는 직류 전원장치에서 공급되는 전원을 Plasma Torch의 양극(①)과 음극(②)에 연결되고 두 극 사이에 질소(③)를 통과시키면서 전원을 공급하면 1500℃ 이상의 고온 Plasma 화염(④)이 분출됩니다.



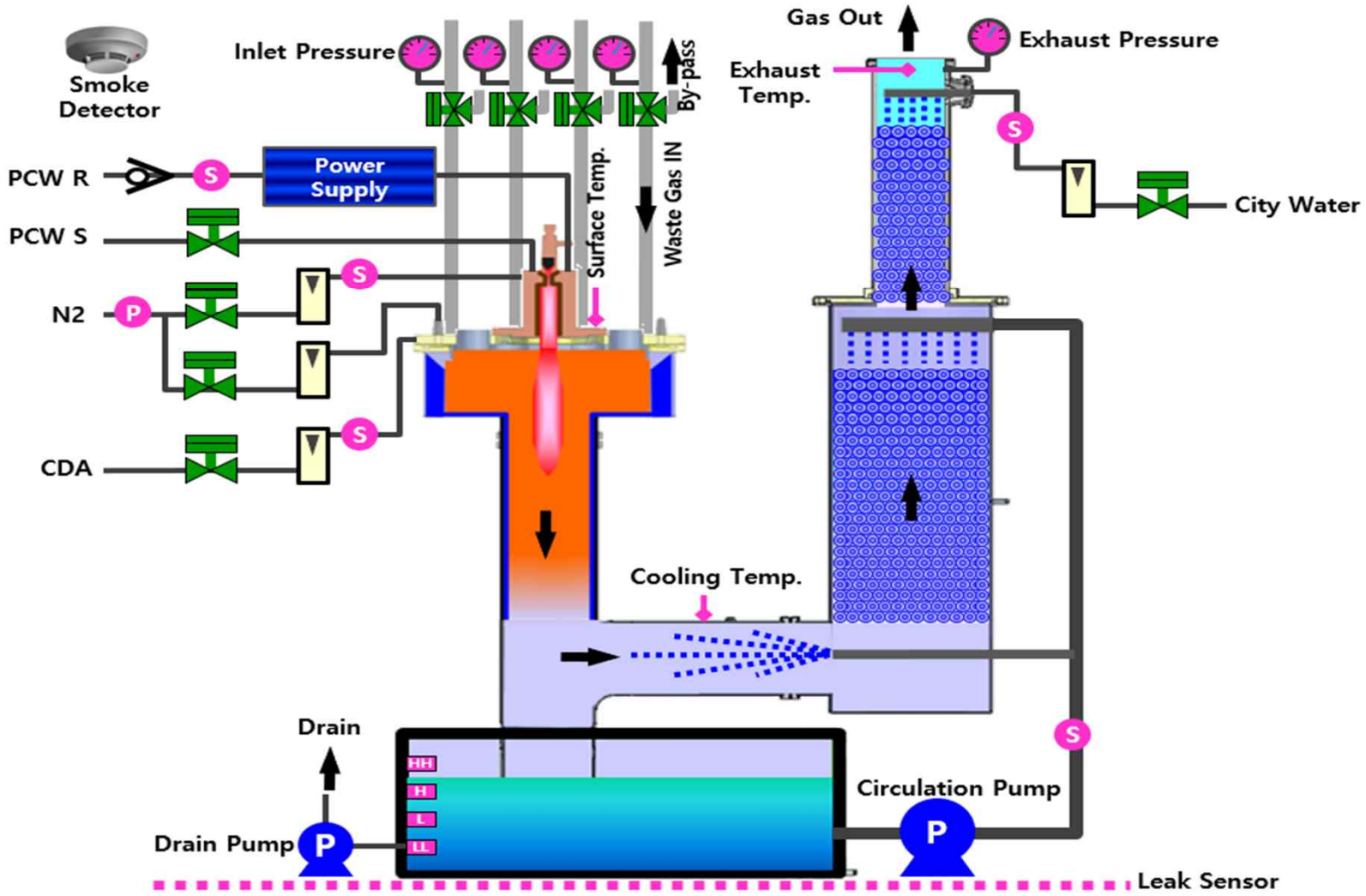
# ■ 일반사양 및 구조

| 일반 사양 | | |
|---|---|---|
| **Type** | Plasma & Wet | |
| **Capacity** | 500slm(included scrubber utility) | |
| | Inlet Capacity | 300slm |
| **Dimension(mm)** | 850(W) × 1000(D) × 2000(H) | |
| **Weight** | 600kg | |

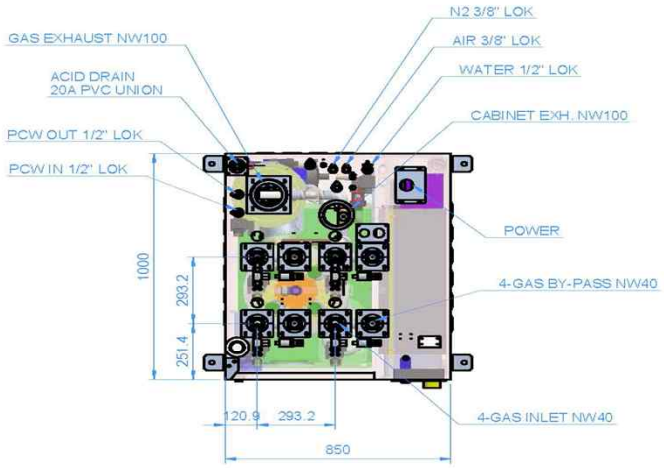
| Component | | Function |
|---|---|---|
| 1 | **Waste Gas Inlet** | Waste Gas Inflow |
| 2 | **Plasma Torch** | Plasma Generator |
| 3 | **Reactor** | Gas Mixing & Treat |
| 4 | **Cooling Chamber** | Gas Cooling |
| 5 | **1st Wet Tower** | Treat waste gases & powder |
| 6 | **2nd Wet Tower** | Gas Final Washing |
| 7 | **Exhaust** | Gas Exit |
| 8 | **Circulation Tank** | Circulating Water Storage Tank |
| 9 | **Circulation Pump** | Water Circulation |
| 10 | **Drain Pump** | Overflow Water Drain |

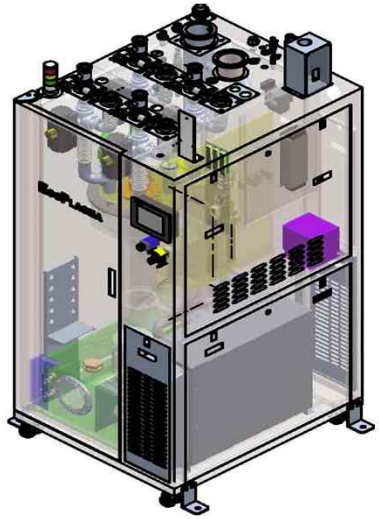


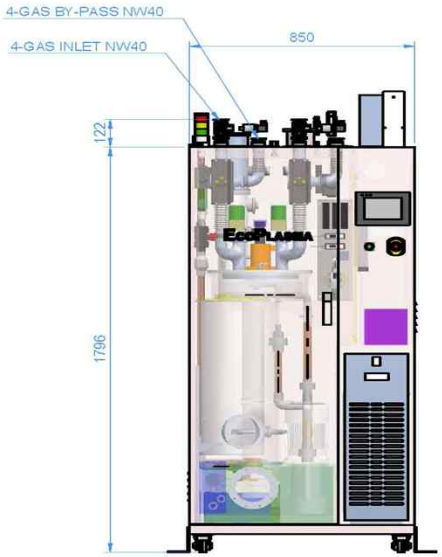
# ■ Scrubber 공정도

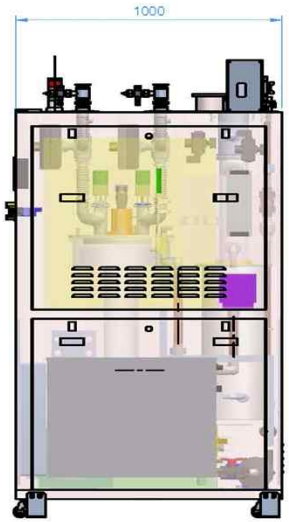


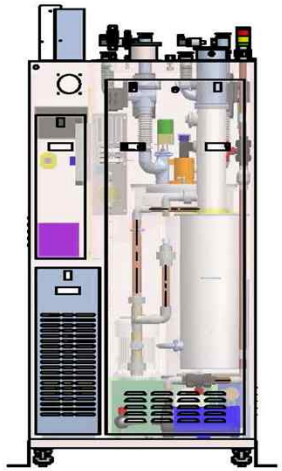
# Scrubber External Dimension



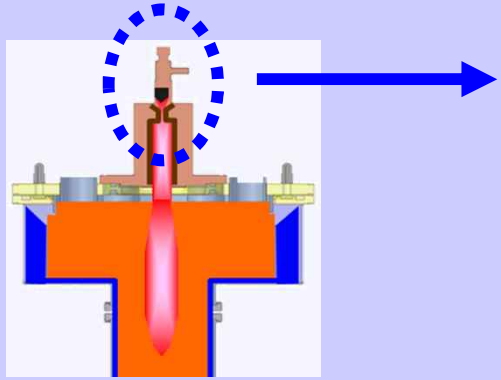


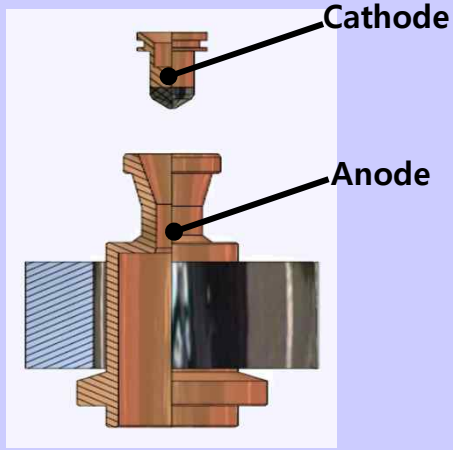



# ■ 특 징

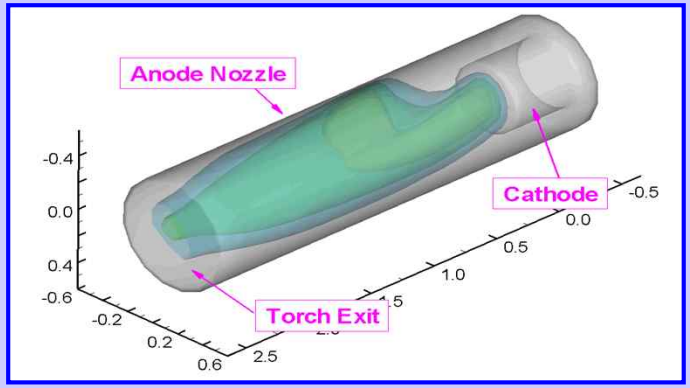
| Swirling Plasma | |
|---|---|
| Plasma Torch | -. **Swirling Plasma:** 플라즈마가 고석으로 회전하여 폐가스와의 혼합을 증대시켜 처리 효율이 높음 |

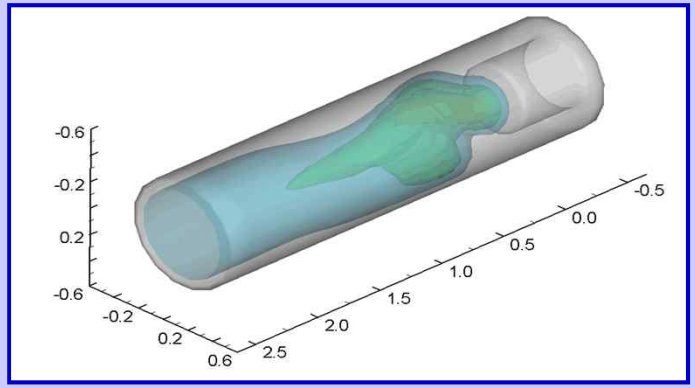




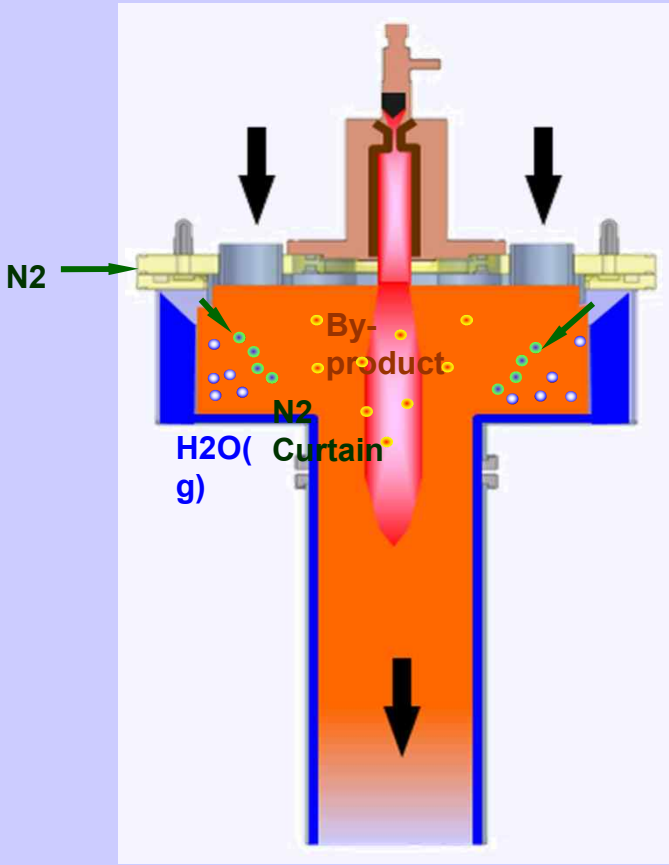

<General Torch: Non-Swirling Torch>

< STC Torch: Swirling Torch>

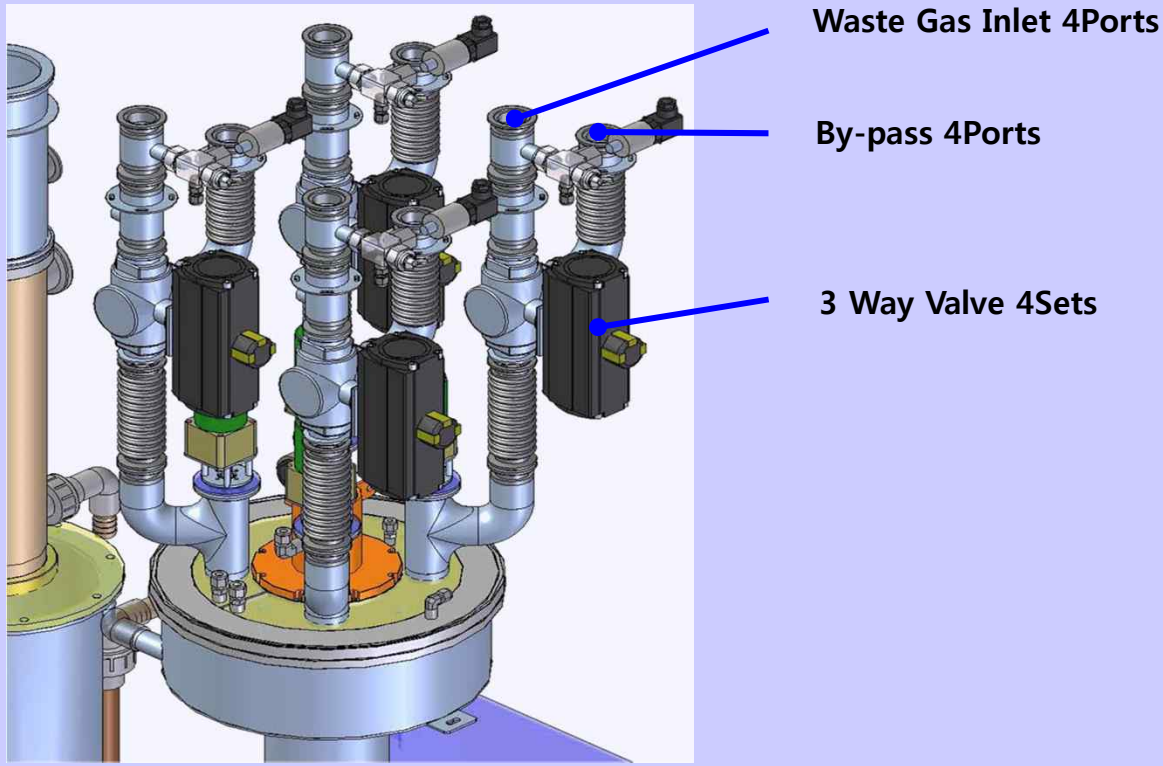


| N2 Curtain과 Swirling Water 반응기 | |
|---|---|
| Reactor | -. **N2 Curtain :** Gas Inlet부에 N2 Curtain을 형성하여 Powder 적체에 강한 구조<br>-. **Swirl Cooling Water :** Reactor 내벽에 물이 흘러내리는 구조로서 Powder 적체에 강함 |



| 3-Way Valve 적용 | |
|---|---|
| Waste Gas Inlet | -. **3Way Valve :** 비상시 By-pass됨<br>-. **Inlet Pressure Sensor :** 4개의 Inlet에 각각 설치됨 |



# Gas 반응 Mechanism

| Gas | Reaction | DRE Efficiency |
|---|---|---|
| SiH4 | $SiH_4 + 2O_2 \rightarrow SiO_2 + 2H_2O$ | ≥99% |
| H2 | $2H_2 + O_2 \rightarrow 2H_2O$ | ≥ 99% |
| PH3 | $2PH_3 + 3O_2 \rightarrow P_2O_5 + 3H_2O$ | ≥ 99% |
| DCS(SiH2Cl2) | $SiH_2Cl_2 + 3/2O_2 \rightarrow SiO_2 + H_2O + Cl_2$ | ≥ 99% |
| TEOS | $(C_2H_5O)_4Si + 12O_2 \rightarrow 8CO_2 + SiO_2 + 10H_2O$ | ≥ 99% |
| WF6 | $2WF_6 + 3/2O_2 \rightarrow W_2O_3 + 6F_2$ | ≥ 99% |
| B2H6 | $B_2H_6 + 3O_2 \rightarrow B_2O_3 + 3H_2O$ | ≥ 99% |
| NF3 | $2NF_3 \rightarrow N_2 + 3F_2$ | ≥ 99% |
| SF6 | $SF_6 + O_2 \rightarrow SO_2 + 3F_2$ | ≥ 98% |
| CF4 | $CF_4 + O_2 \rightarrow CO_2 + 2F_2$ | ≥ 95% |
| NH3 | Water Soluble | ≥ 99% |
| HF | Water Soluble | ≥ 99% |
| ClF3 | Water Soluble | ≥ 99% |

# ■ Safety 설계 및 사양

| Component | Safety Issue | Safety Design |
|---|---|---|
| Torch | Over-heat | -. PCW Cooling System:<br>PCW Flow Sensor ▶ Plasma Power Interlock |
| Power Supply | Over-heat | -. PCW Cooling System:<br>PCW Flow Sensor ▶ Plasma Power Interlock<br>-. Power 장치 내부에 Thermister가 설치됨<br>▶ Power 내부 온도가 85℃ 이상이 되면 자동 Trip됨 |
| Reactor | Over-heat | -. 온도가 센서가 Reactor 표면에 설치됨<br>▶ Plasma Power Interlock(at 250℃ or more) |
| Exhaust | Over-heat | -. 온도가 센서가 Exhaust 내부에 설치됨<br>▶ Plasma Power Interlock(at 50℃ or more)<br>-. Supply Water Flow Sensor<br>▶ Plasma Power Interlock |
| Wet Chamber | Over-heat | -. Circulation Water Flow Sensor<br>▶ Plasma Power Interlock |
| Electrical Parts | Fire | -. 모든 전기부품은 SEMI-S2 규격품을 사용함 |
| Breaker | Over-current<br>(Fire) | -. 과전류 차단기가 설치됨 |

# ■ Utility 사양

| Utility | Specification | Maximum Requirement | Average Consumption | Connection | etc |
|---|---|---|---|---|---|
| **Power** | A/C 220V/380V, 50/60Hz 3 Phase, 100A/50A | 20KW | 10KW | 16㎟-4Wires | Include Neutral Wire |
| **CDA** | 4 ~ 7kg/cm$^2$ | 100 SLM | 40 SLM | 3/8" Tube | Burning Air Sleeve Air |
| **N2** | 4 ~ 7kg/cm$^2$ | 100 SLM | 50 SLM | 3/8" Tube | |
| **PCW** | 3 ~ 5kg/cm$^2$ | 15L/min | 10L/min | 3/4" Tube | |
| **City Water** | 3 ~ 5kg/cm$^2$ | 8L/min | 6L/min | 3/4" Tube | |
| **Drain** | Acid Drain | 8L/min | 6L/min | 20A PVC Pipe | Power Drain |
| **Gas Exhaust** | -50mmH2O ~ -100mmH2O | 2m$^3$/min | 1m$^3$/min | NW100 Flange | |
| **Cabinet Exhaust** | -20mmH2O ~ -50mmH2O | 2m$^3$/min | 1m$^3$/min | NW100 Flange | |

# 감사합니다