THERMVAC

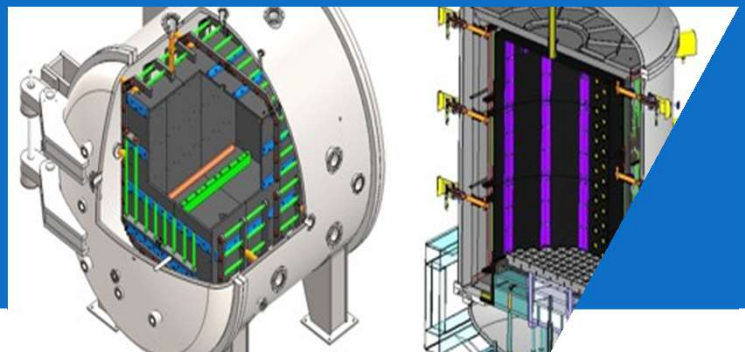
PRODUCT INTRODUCTION

Carbon Purification Furnace

Dynamic ThermVac

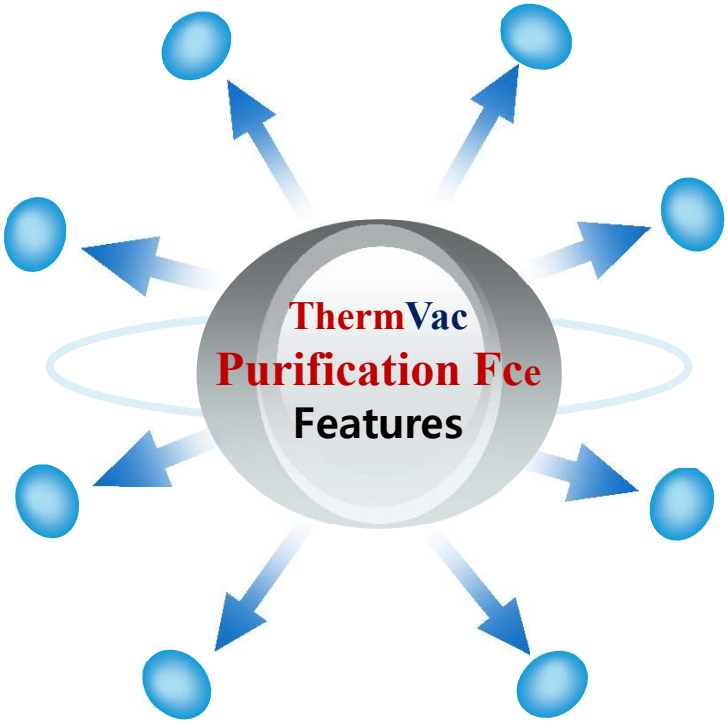
in pursuit of

the Best Vacuum Furnace



www.thermvac.co.kr

[Features of Purification Furnace]



Closed electrode structure featuring minimal radiant heat loss and the suppre-ssion of electric discharge

Triple protection of the dry pump by inlet filtration, pump's self-cleaning and prohibition of exhaust back streaming

Linked opening and closing of the muffle cover and the chamber door assuring easy sample loading

Contamination free hot zone through separate control of pressures between Cl_2 gas and N_2 protective gas

Horizontal type or vertical type all available depending on product shape or loading conditions

Securing accuracy of temp. control through optimal shift of the thermocouple and the pyrometer

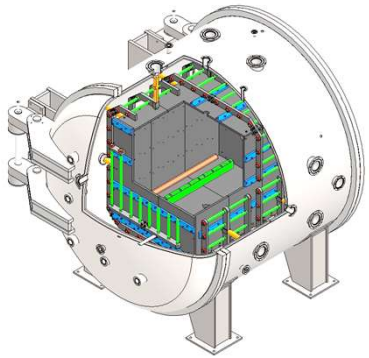
Safe design of surface load and current density for heating parts, securing prevention of electric discharge as well as life extension

DC power supply

Optional

Triple surveillance devices of abnormal power or temp. to prevent overheating accident of ultra high temp. furnaces

[Safety Devices of Purification Furnace]



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Surveillance of overheating or insulation degradation

Temperature

- Inside hot zone
- Center of insulation
- Outside insulation

Surveillance of heater safety

Heating power

- Transformer output
- SCR output
- Current & voltage

Surveillance of electric safety

Electricity

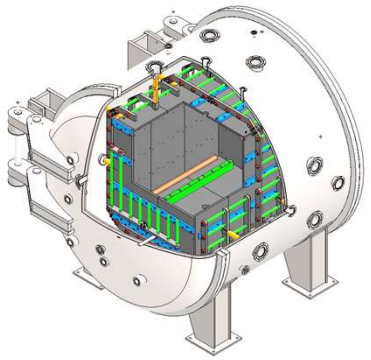
- Insulation resistance : >0.1㏁
- Leakage current : <1/2000A
- Arcing : Abnormal current

Surveillance of gas safety

Gas leakage

- Automatic leak check
- O_2 Monitor
- Cl_2 Detector

[Suppression of Electric Discharge]



1. Low secondary voltage

20 ~ 35V by process gas

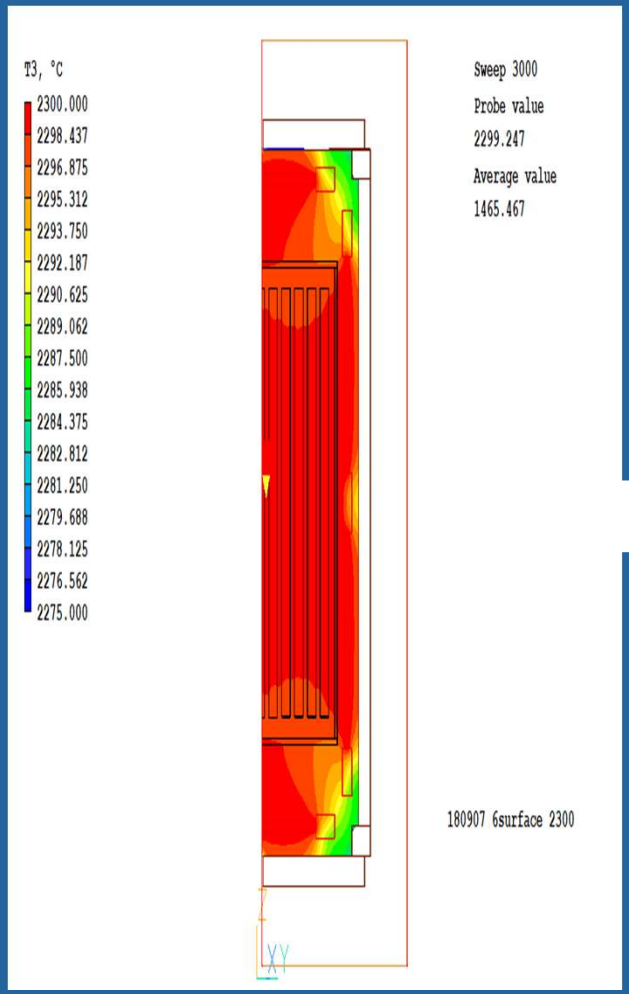
2. Design of electrode

- Closed structure for anti-convection
- Distance between electrode and insulation
- Proper location of insulators

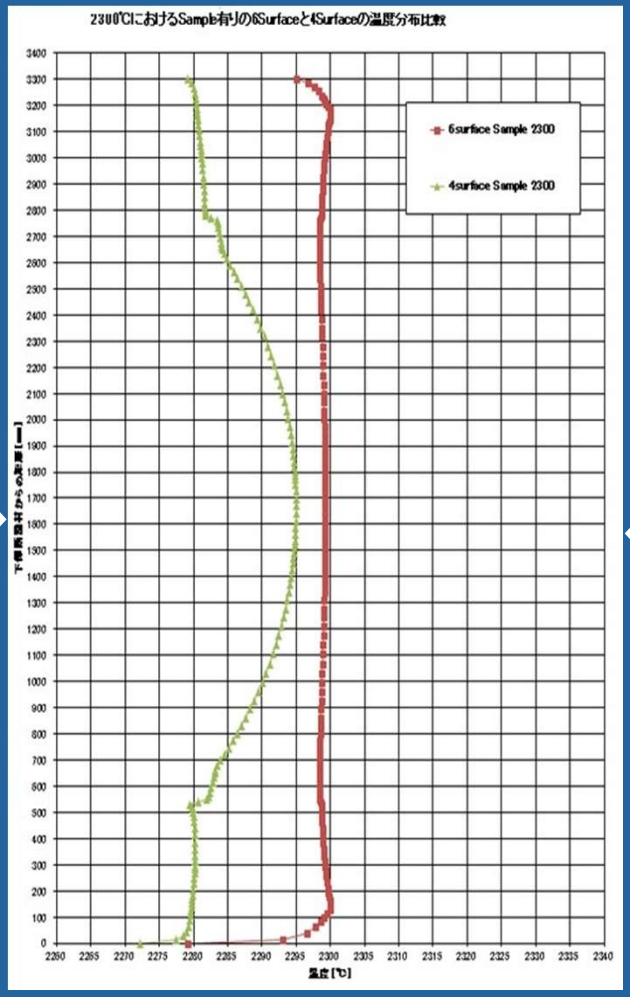
3. DC power supply

- Fundamental prevention of discharge
- Enhancement of power efficiency

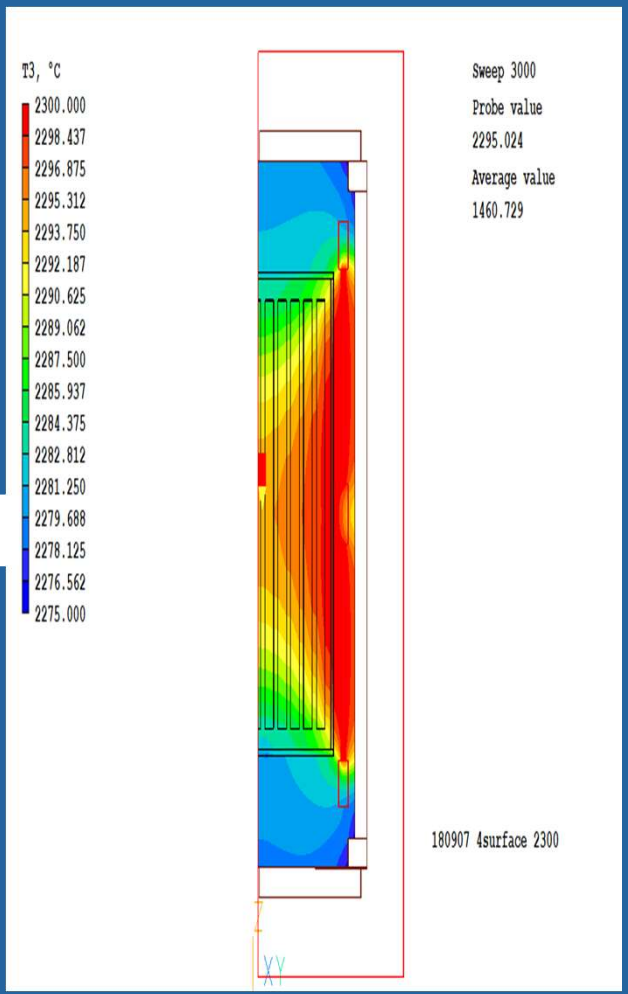
[Heat Distribution Analysis]



▲ Uniformity of 6 side heating

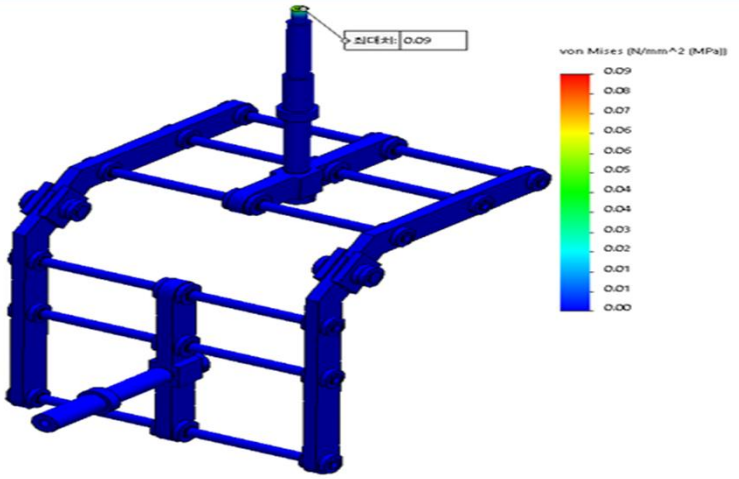
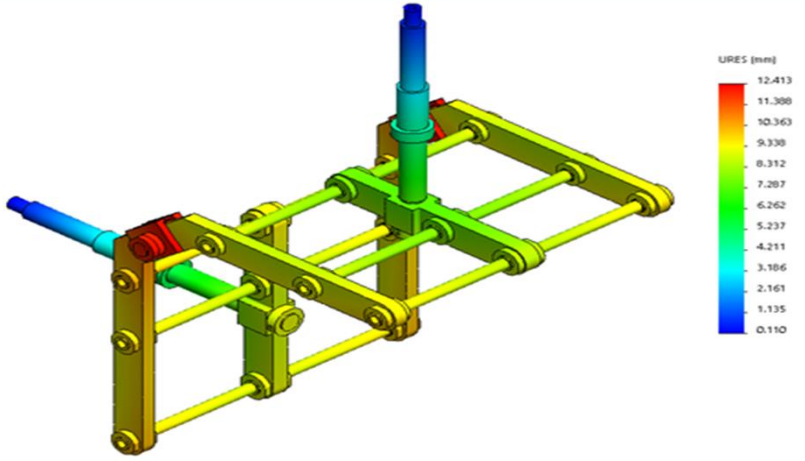
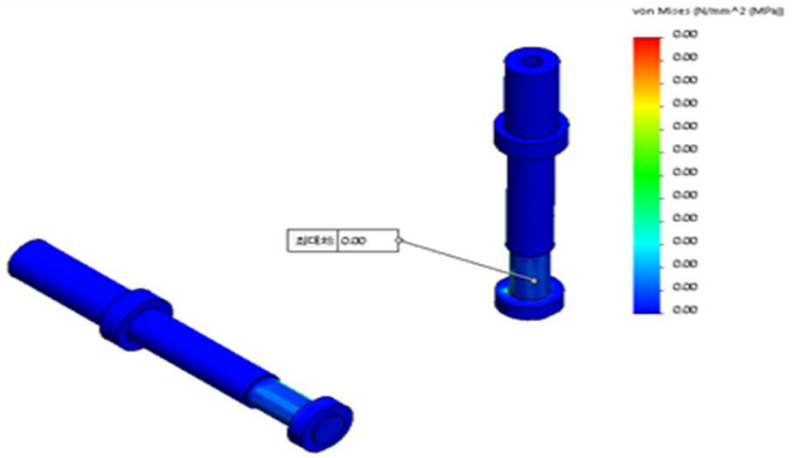
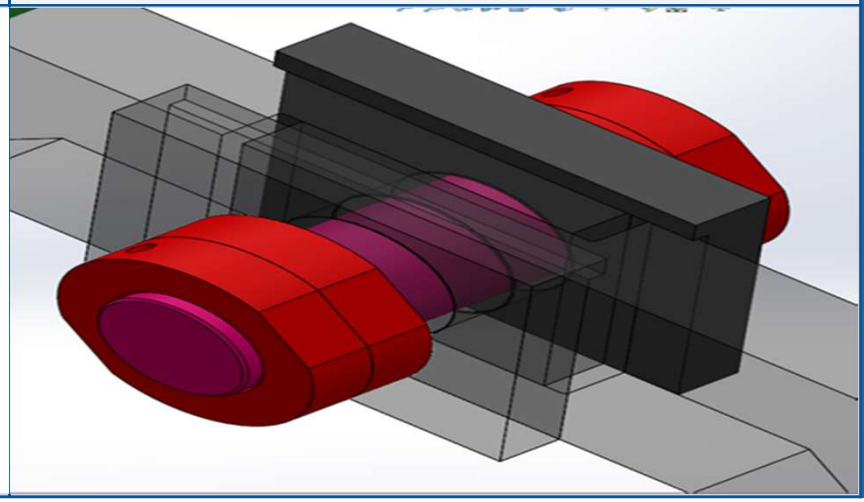


▲ 6 side heating vs. 4 side heating



▲ Uniformity of 4 side heating

[Heat Stress Analysis]

Maximum stress of heater assembly	Displacement of heater assembly
	
Maximum stress of electrode	**Stress of heater connection part**
	

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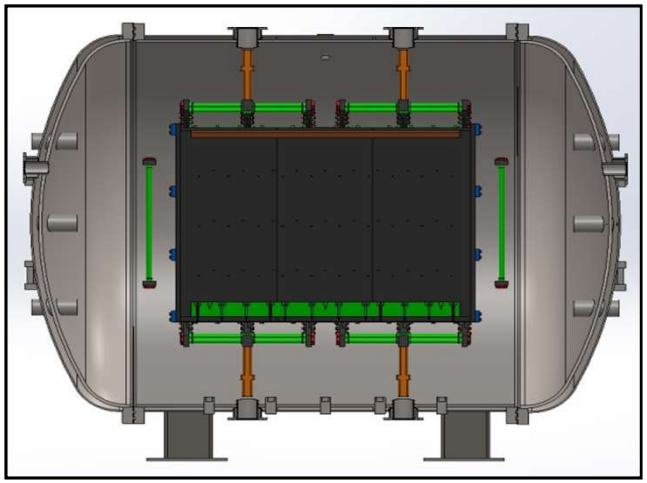
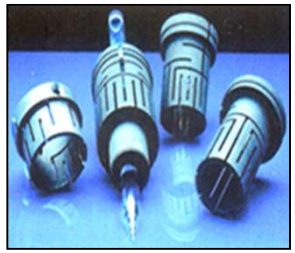
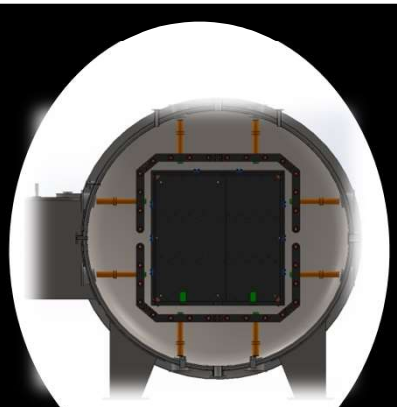
[Standard Specification]





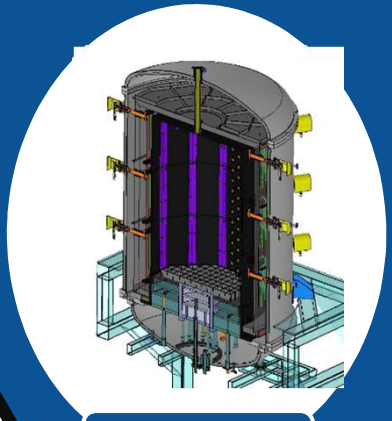
Item	Specification
Chamber type	Horizontal or vertical
Load sample	Graphite materials
Temperature	Nor. 2000~2200℃ [max. 2400℃]
Loading capacity	500 ~ 1200Kg
Uniformity	±6~12℃ [2200℃, no load, 3 points]
Heat-up rate	2 ~ 10℃/min
Temp. measure	Pyrometer [correction : C type TC]
Hot zone	CIP graphite
Retort box	Rectangular box or polygonal cylinder
Process gas	HCl or Cl_2, N2 [protection gas]
Atmosphere	Pulse cycle or partial pressure control
Pressure	1 ~ 90 KPa
Evacuation	Mechanical booster pump + Dry pump
Leak rate	Below 1×10^{-3} Pa · ㎥/sec
Forced cooling	18~30 hours from 2200℃ to 200℃
Electricity	AC 3Φ or DC

[Standard Dimension]



Horizontal

Model code	TVUTP-H500	TVUTP-H600	TVUTP-H800	TVUTP-H1200
Work zone(㎜)	1000 * 1000 * 1000	1000 * 1000 * 1500	1200 * 1200 * 1800	1500 * 1500 * 2000
Capacity(㎏)	500 Kg	600 Kg	800 Kg	1,200 Kg
Electricity(kVA)	660 kVA	800 kVA	1,000 kVA	1,200 kVA



Vertical

Model code	TVUTP-V550	TVUTP-V650	TVUTP-V700	TVUTP-V1000
Work zone(㎜)	Φ1000 * 1500H	Φ1200 * 1500H	Φ1200 * 1800H	Φ1500 * 2000H
Capacity(㎏)	530 Kg	630 Kg	700 Kg	1,000 Kg
Electricity(kVA)	640 KVA	720 KVA	780 KVA	1,020 KVA

[Details _ Vacuum Chamber]

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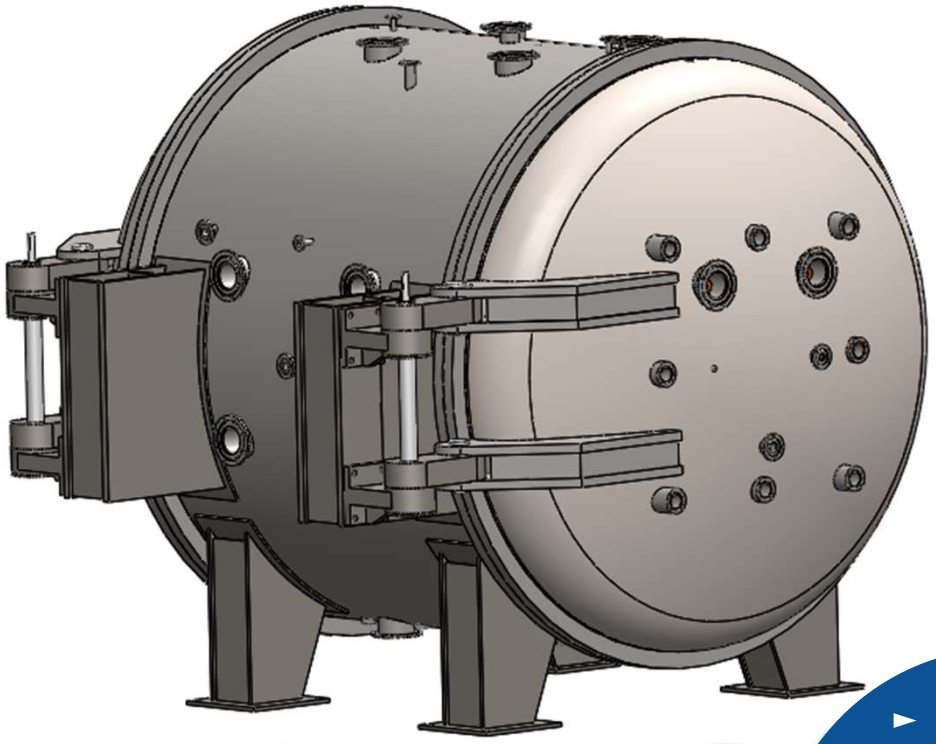

Boundary Conditions STEP1

- Max Temp. of inner surface : 650℃
- Internal pressure : Vacuum
- External pressure : Atmospheric
- Water pressure of cooling jacket : 3Kgf/㎠

Fabrication STEP2

- Type : Horizontal or vertical
- Double wall water cooled jacket
- Materials : STS316L(inner wall)
  STS304(outer wall·flange)
- Inside surface : Heat resistant anti-corrosion painting

[Details _ Hot Zone]

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Insulation

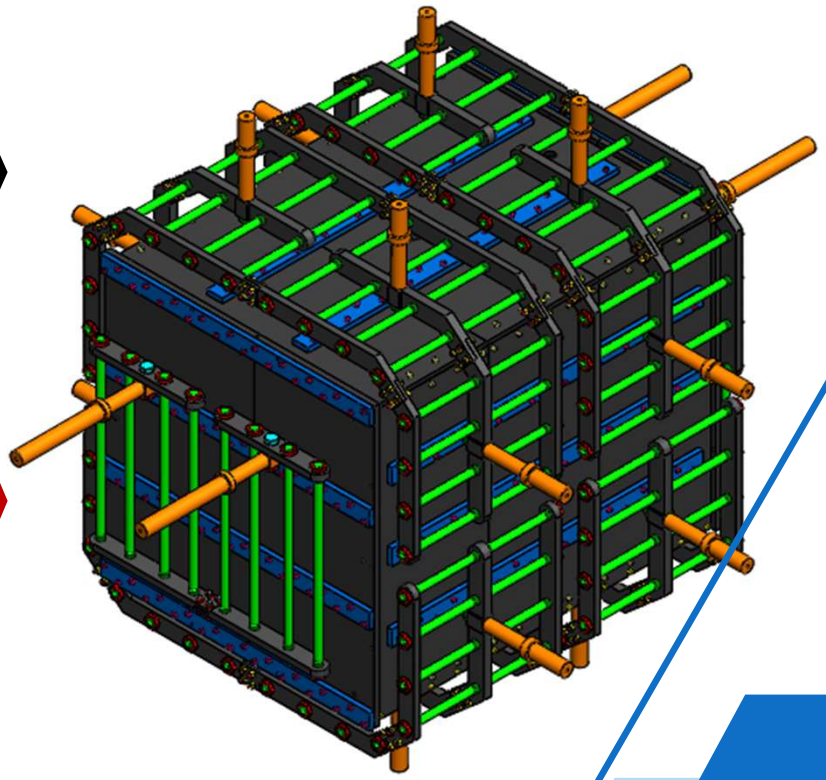
- Graphite Rigid Felt Layers
- Thickness : 150T ㎜
- Inside treatment of C/C & Foil lining

Heaters

- Materials : Graphite CIP Block
- Heater, connector and electrode
- Left, right, top, bottom (front, rear)
- 3 zone 6 circuits or 2 zone 4 circuits

Muffle

- Materials : Graphite CIP
- Rectangular box or polygonal cylinder
- Assembled by carbon composite screw
- Open/close linked with chamber door



[Details _ Evacuation System]

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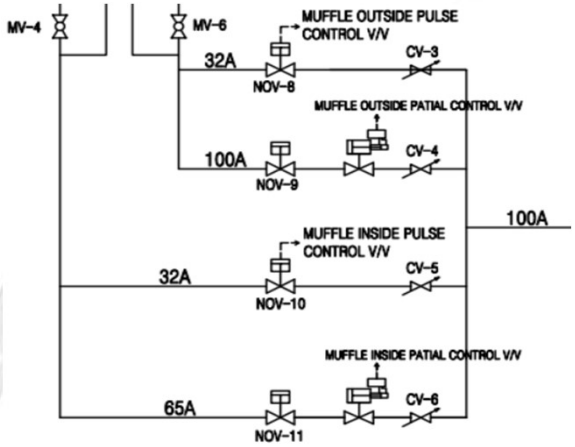
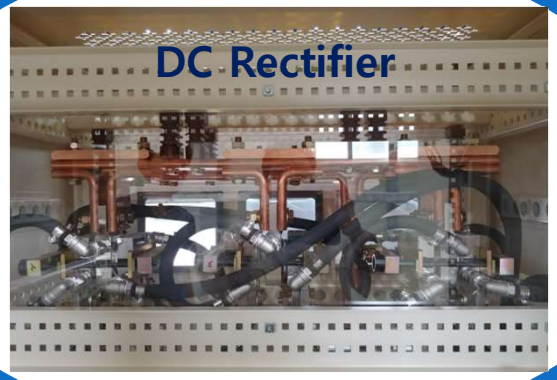


Vacuum pumps	Vacuum gauges	Suction line control
► Roots type mechanical Booster pump	► Type : Diaphragm Manometer	► Slow pumping vs. normal pumping
► Screw type dry pump	► Maker : MKS or Inficon	► Pumping of muffle inside vs. outside
► Maker : Edwards or Busch or Ulvac	► Muffle inside & outside, pumping line	► Pulse cycle vs. partial pressure control

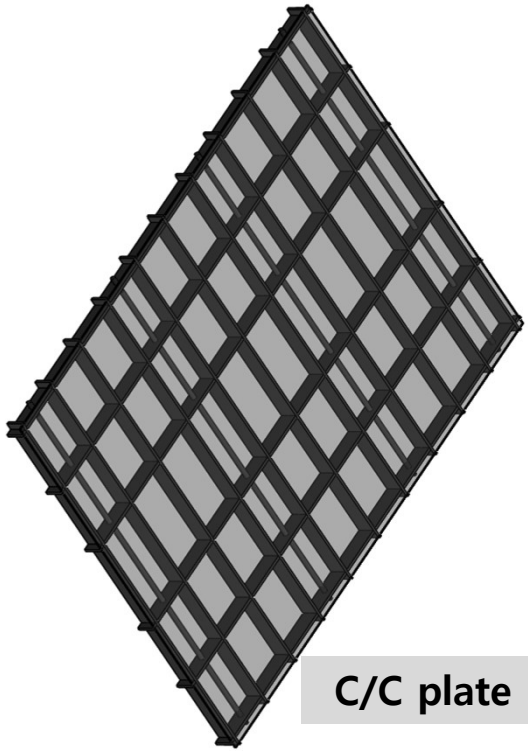
[Details _ Power Supply]



- Heating side : Left, right, top, bottom (front, rear)
- Zone : Upper 2 zones, Lower 2 zones, Door 2 zones
- Configuration : Thyristor + Transformer + DC Rectifier
  ※ 6 phases half wave rectifying type
- Merits of DC power : Suppression of discharge,
  Heater vibration free, Low impedance loss
- Power line : Buss bar & flexible cable

[Details _ Accessories]


Lift Car


C/C plate

Sample Plate

Low thermal mass

- Carbon composite
- Lattice structure
- Light but strong

Dry Pump Protection

Long life overhaul

- Dust filter of special fiber
- Pump's self cleaning
- N2 buffer on pump exhaust

Forced Cooling

Short process cycle

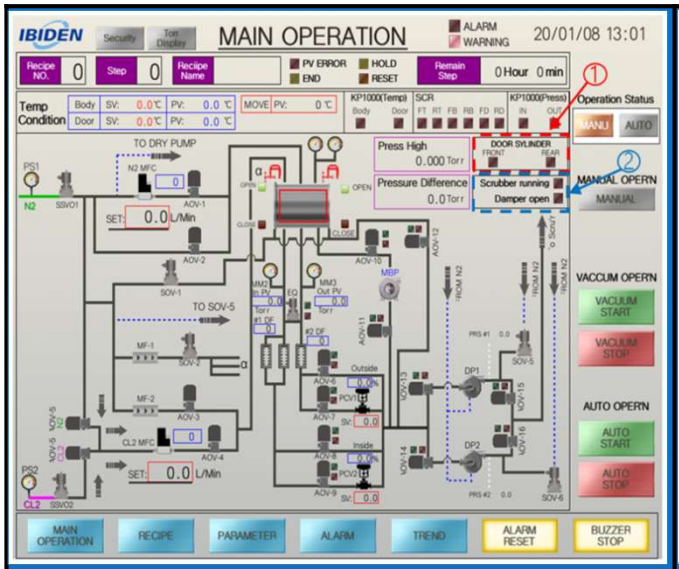
- Insulation opening
- N2 gas circulation
- 2200℃→200℃/18~30hr

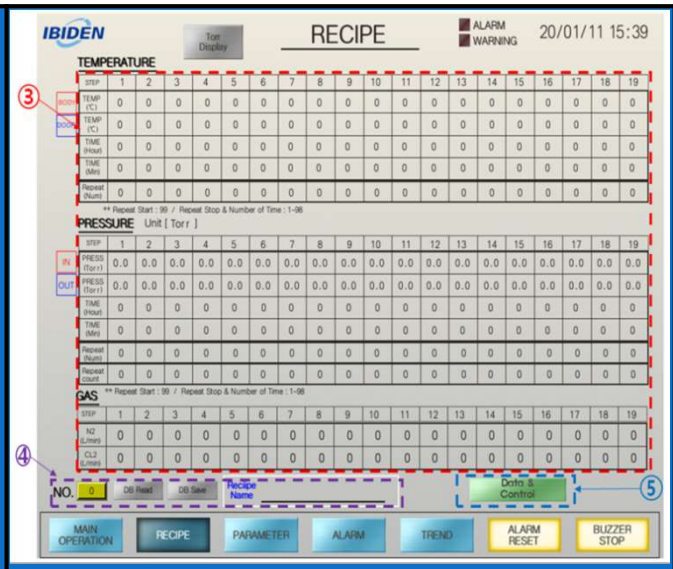
Loading Lift Car

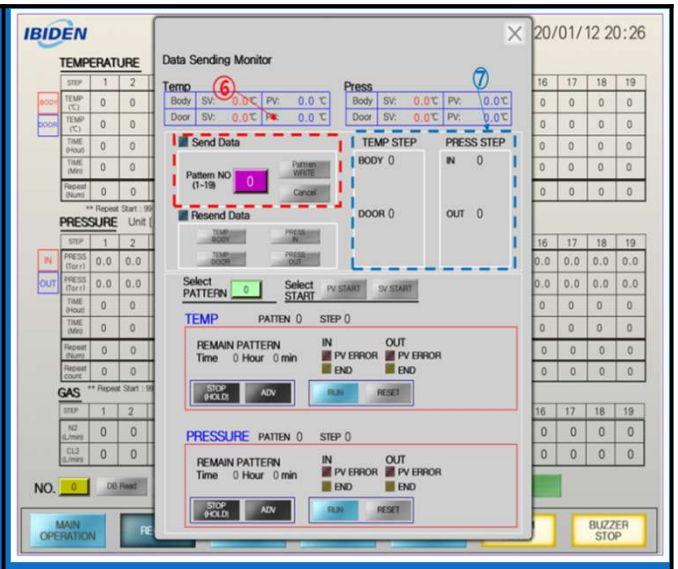
Single person operated

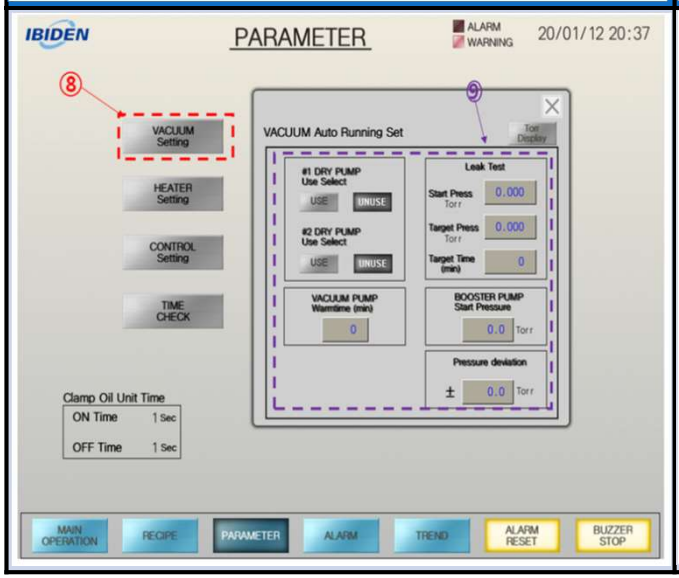
- 700~1500Kg capacity
- Product loading/unloading
- Muffle loading/unloading

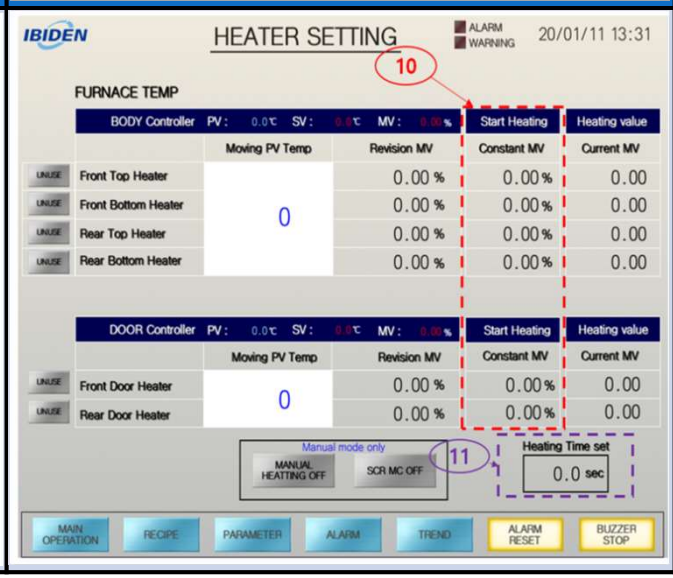
[Details _ Control Panel]

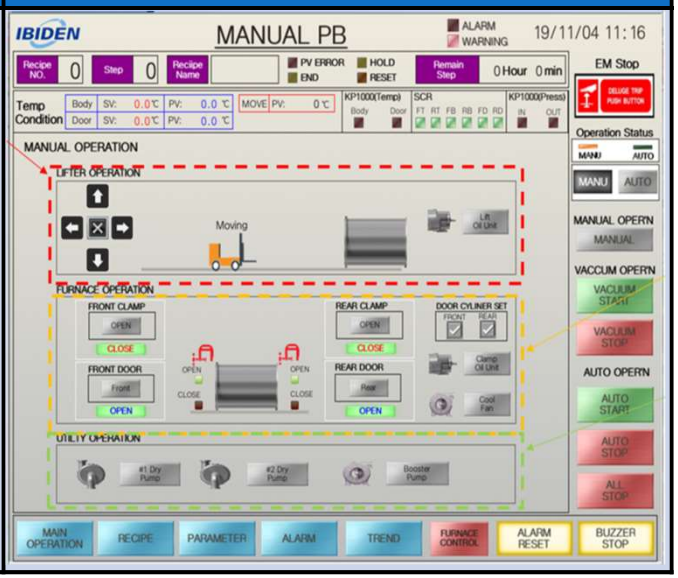












[Others _ Vertical Type]

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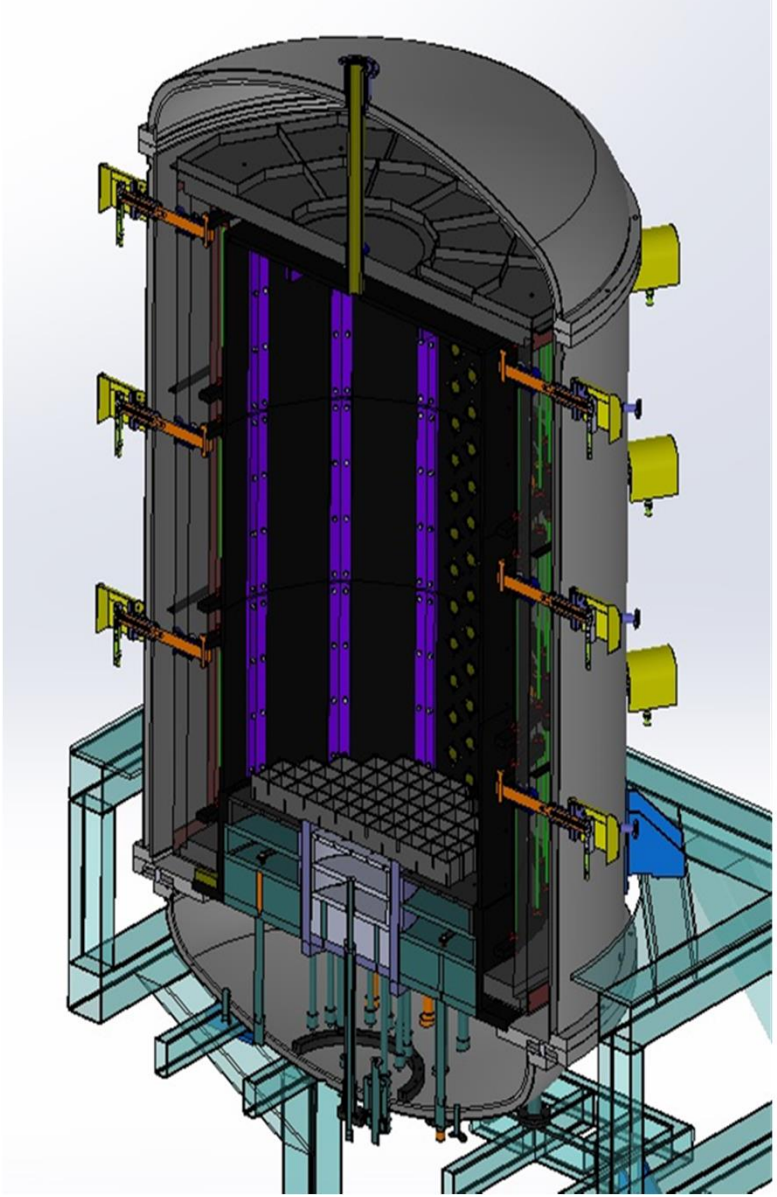
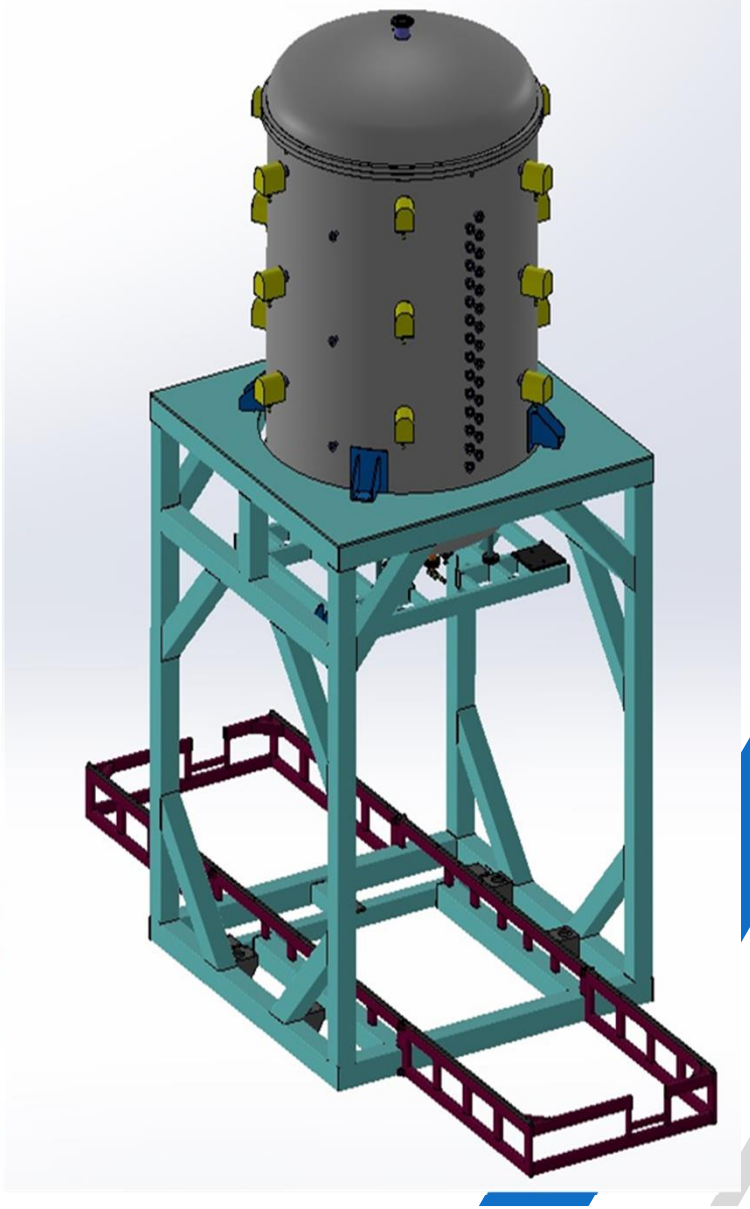
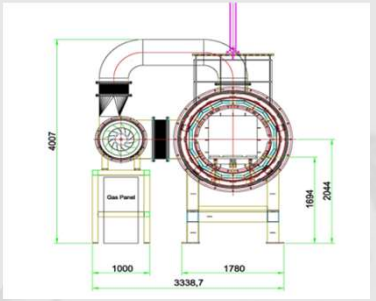


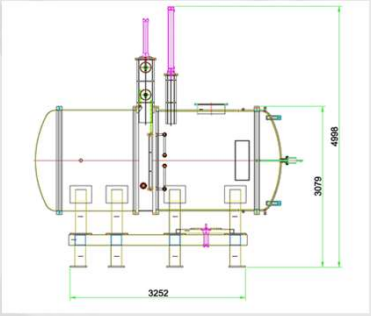


[Others _ Double Room Type]

Front



Side



Layout