THERMVAC

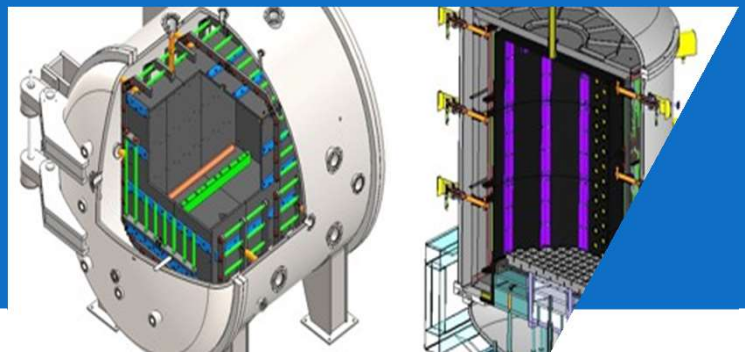
PRODUCT INTRODUCTION

Graphitization Furnace

Dynamic ThermVac

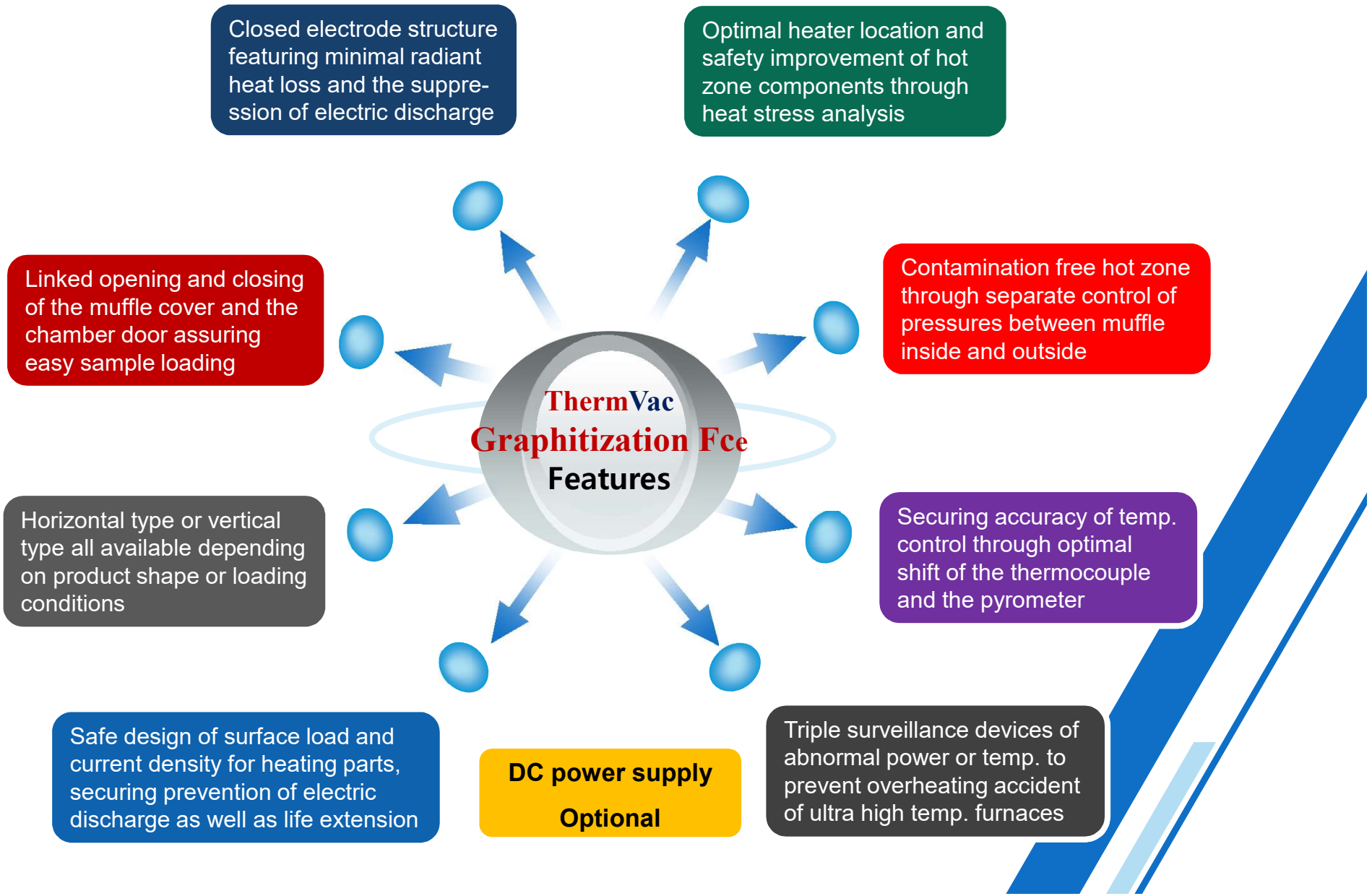
in pursuit of

the Best Vacuum Furnace

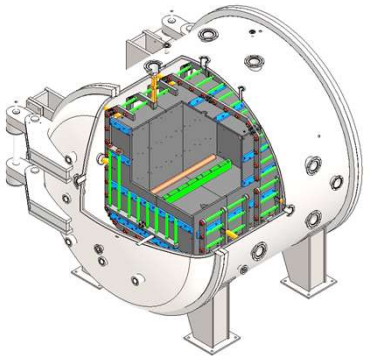


www.thermvac.co.kr

[Features of Graphitization Furnace]



[Safety Devices of Graphitization 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

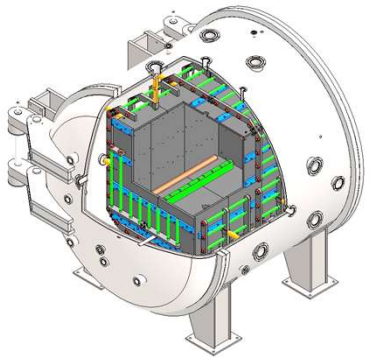
- Insulation resistance : >0.1㏁
- Leakage current : <1/2000A
- Arcing : Abnormal current

Surveillance of gas safety

Gas leakage

- Automatic leak check
- O_2 monitor
- Cyan gas detector

[Suppression of Electric Discharge]



1. Low secondary voltage

20 ~ 35V by process gas

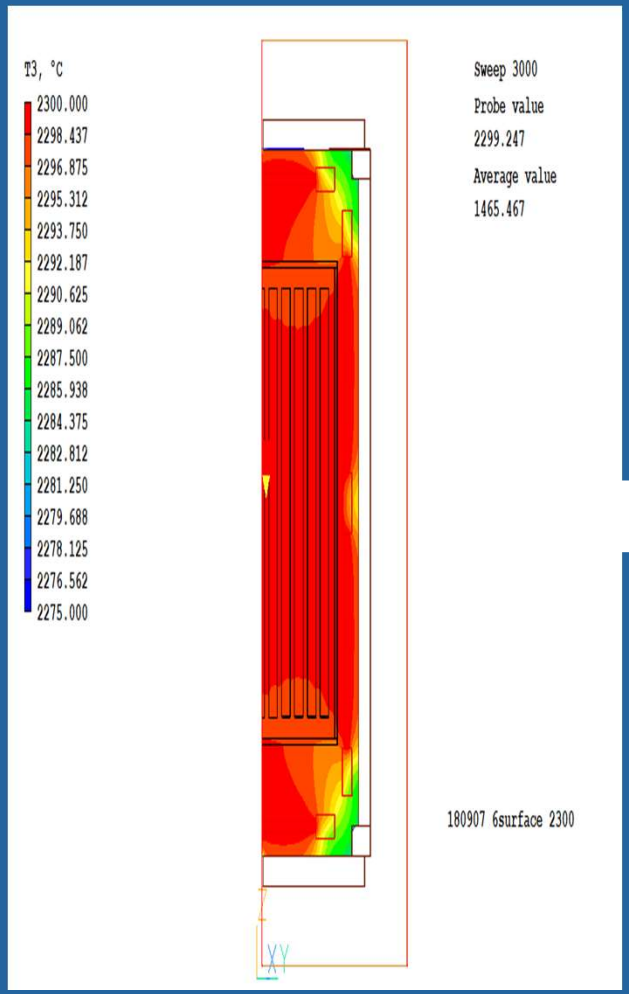
2. Design of electrode

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

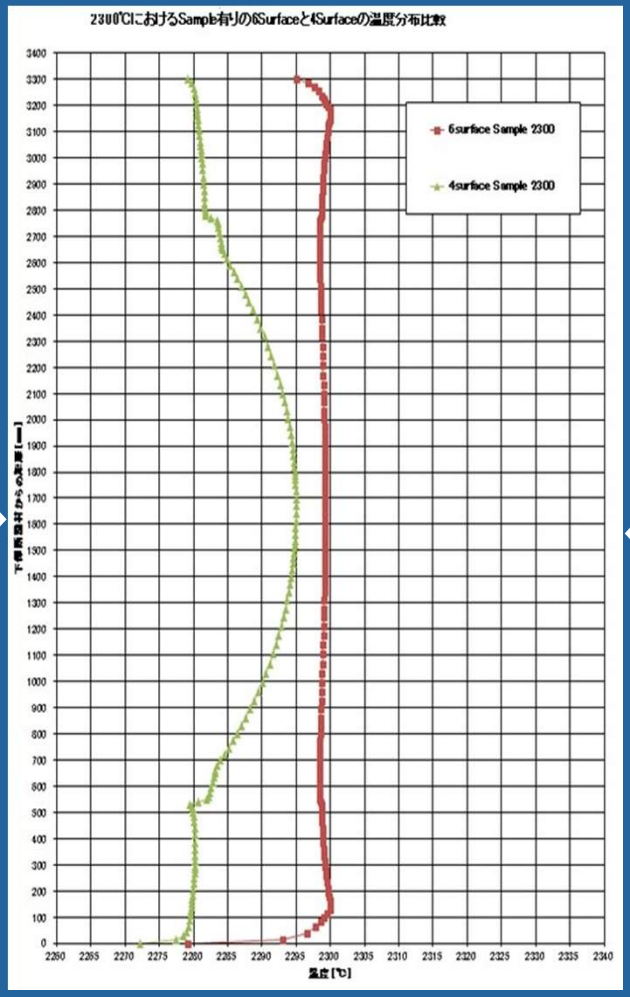
3. DC power supply

- Fundamental prevention of discharge
- Enhancement of power efficiency

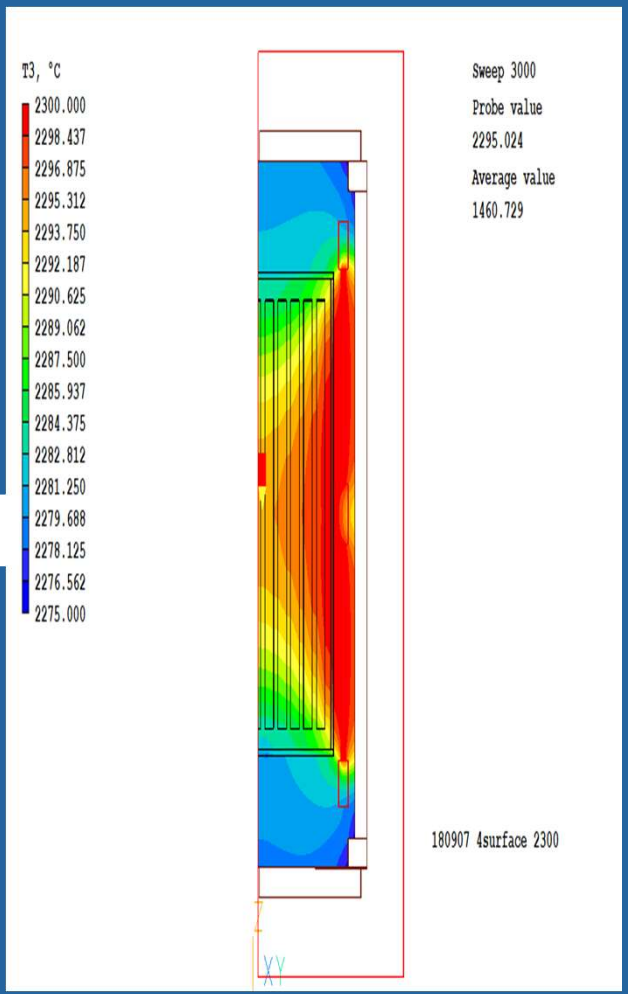
[Heat Distribution Analysis]



▲ Uniformity of 6 side heating

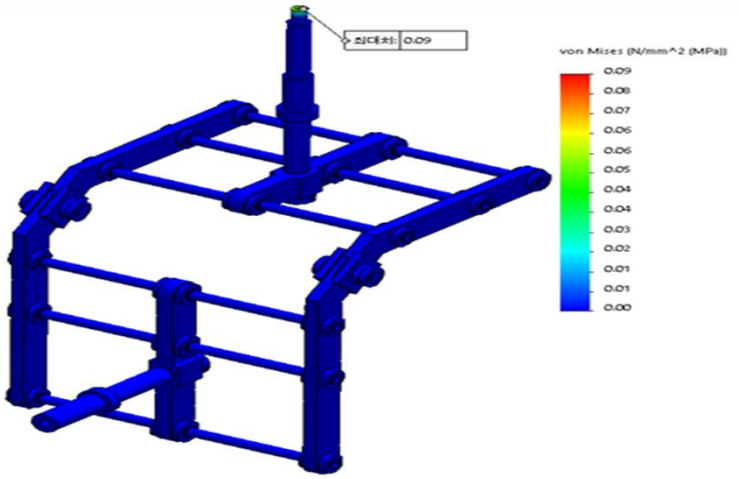
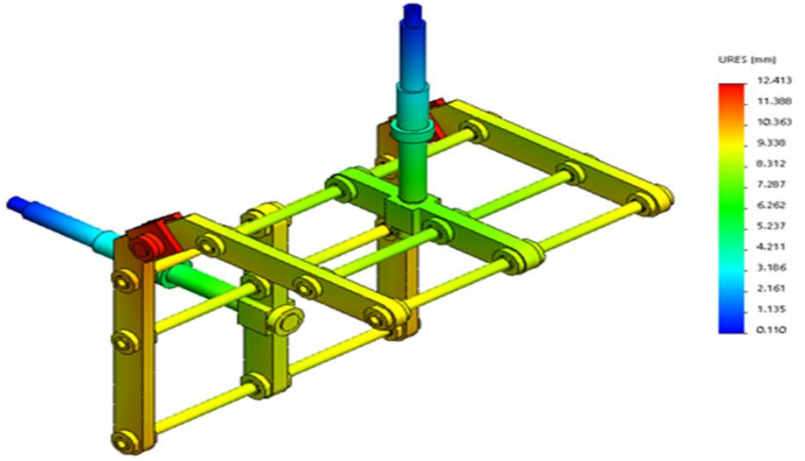
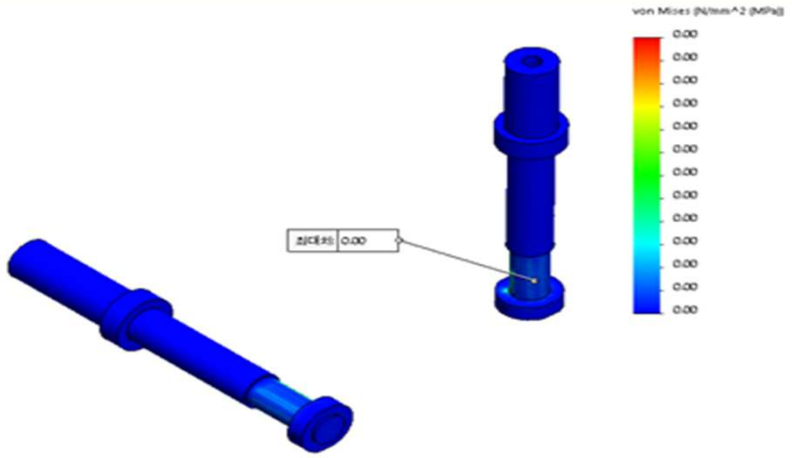
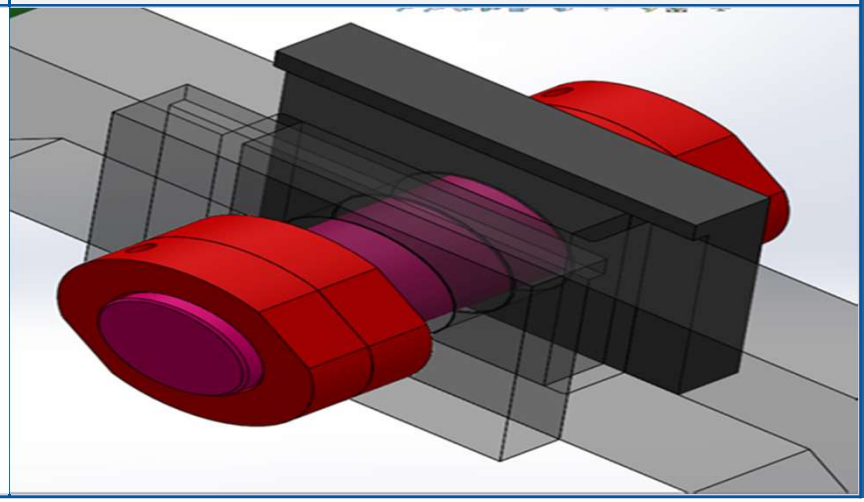


▲ 6 side heating vs. 4 side heating

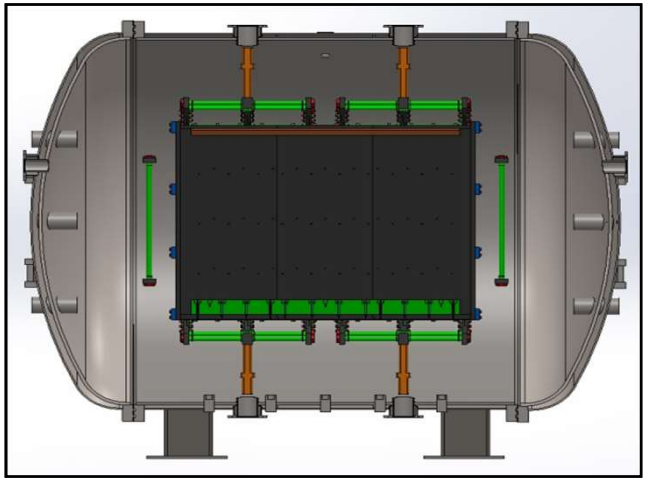


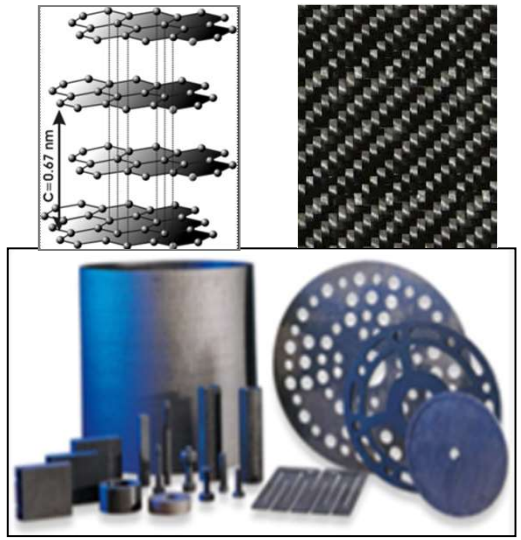
▲ Uniformity of 4 side heating

[Heat Stress Analysis]

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

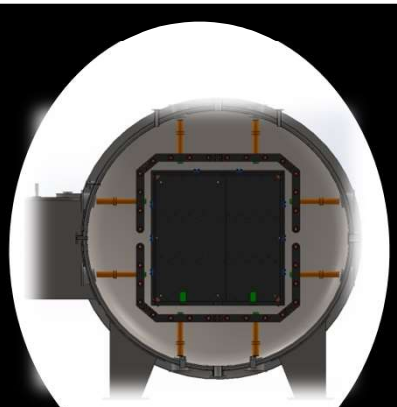
[Standard Specification]





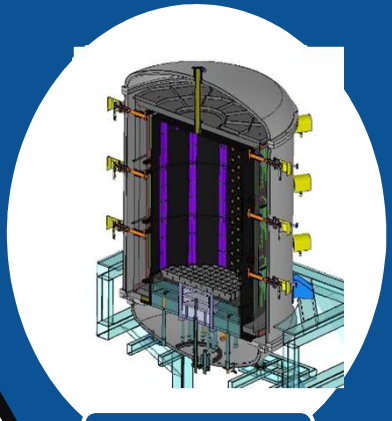
Item	Specification
Chamber type	Horizontal or vertical
Load sample	Graphite, Carbon composite
Temperature	Nor. 2000~2500℃ [max. 2700℃]
Loading capacity	500 ~ 1200Kg
Uniformity	±6~12℃ [2500℃, no load, 3 points]
Heat-up rate	2 ~ 10℃/min
Temp. measure	Pyrometer [correction : C type TC]
Heating circuit	2 ~ 6 circuits
Hot zone	CIP graphite
Retort box	Rectangular box or polygonal cylinder
Process gas	Argon, Nitrogen, Helium
Pressure	30 ~ 115 KPa
Evacuation	Mechanical booster pump + Dry pump
Leak rate	Below 1×10^{-3} Pa · ㎥/sec
Forced cooling	18~30 hours from 2500℃ 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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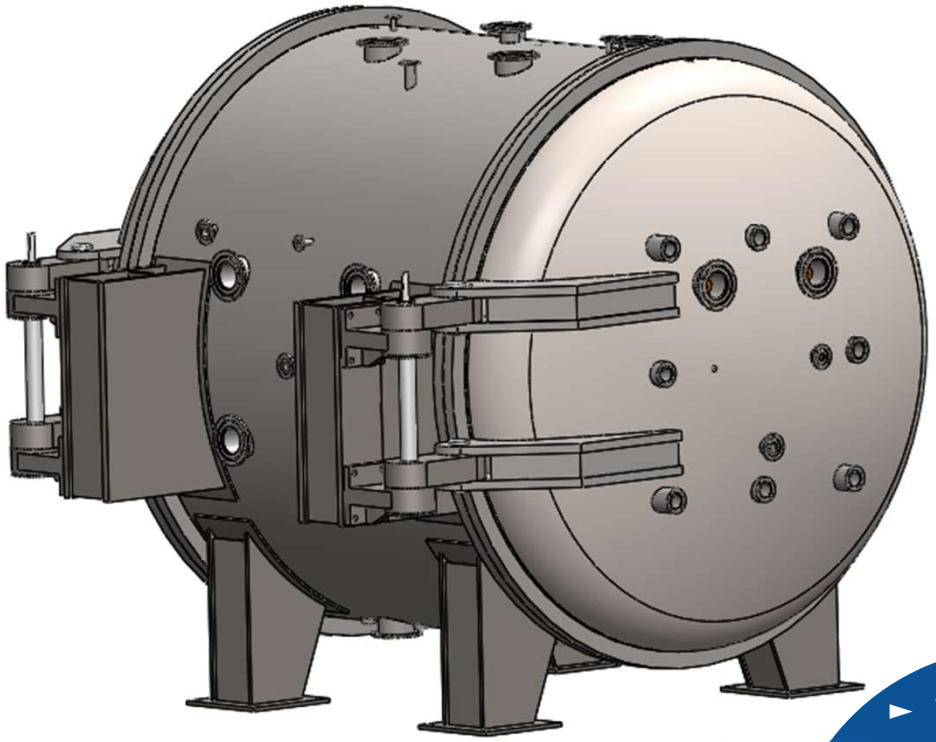

Boundary Conditions STEP1

- 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

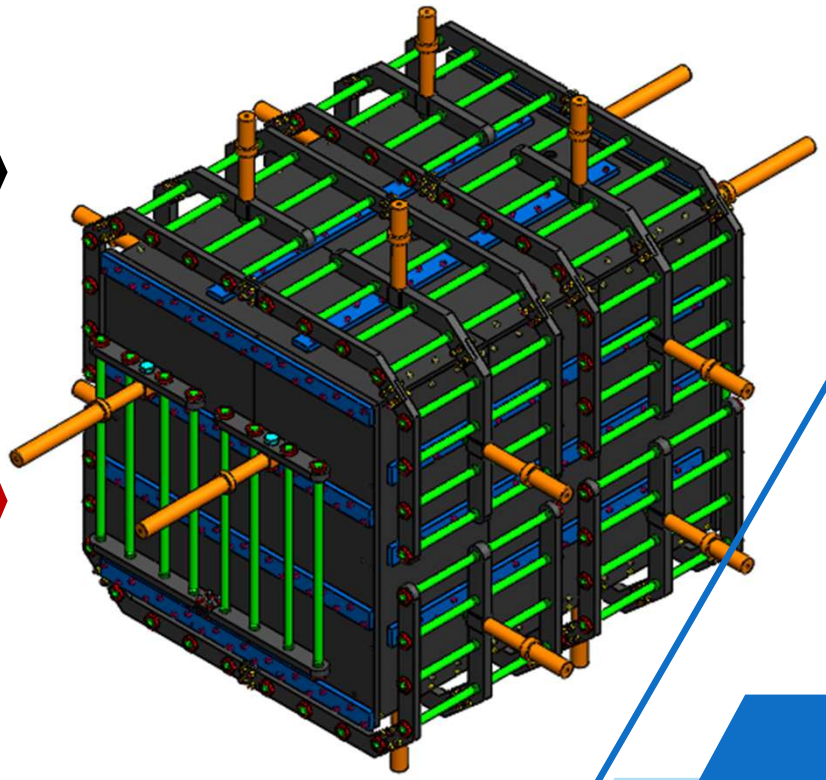
- Graphite Rigid Felt Layers
- Thickness : 150T ㎜
- Inside treatment of C/C & Foil lining

Heaters

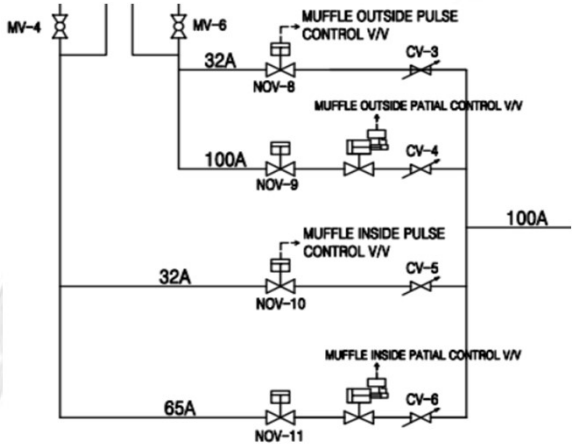
- Materials : Graphite CIP Block
- Heater, connector and electrode
- Left, right, top, bottom (front, rear)
- 3 zone 6 circuits or 2 zone 4 circuits

Muffle

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

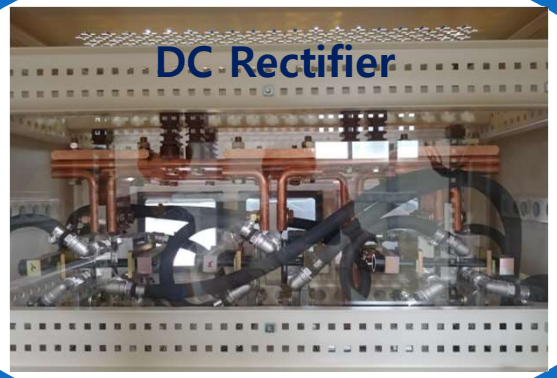


[Details _ Evacuation System]



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	► Atmospheric vs. partial pressure

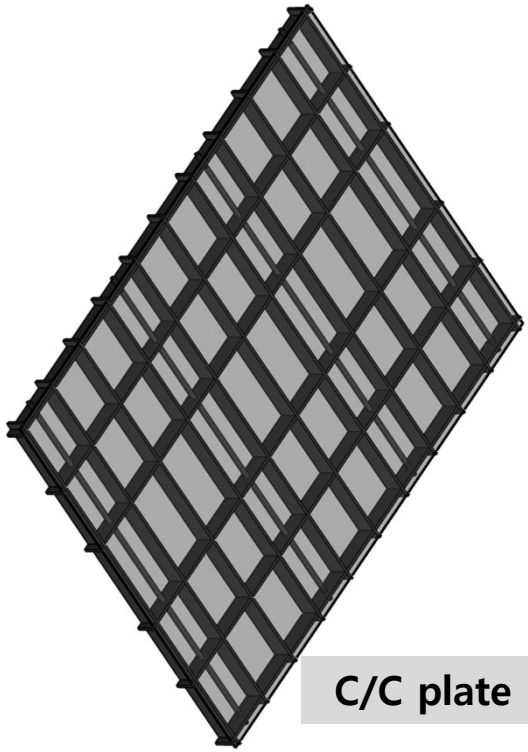
[Details _ Power Supply]



- 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

Forced Cooling

Short process cycle

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

Dry Pump Protection

Long life overhaul

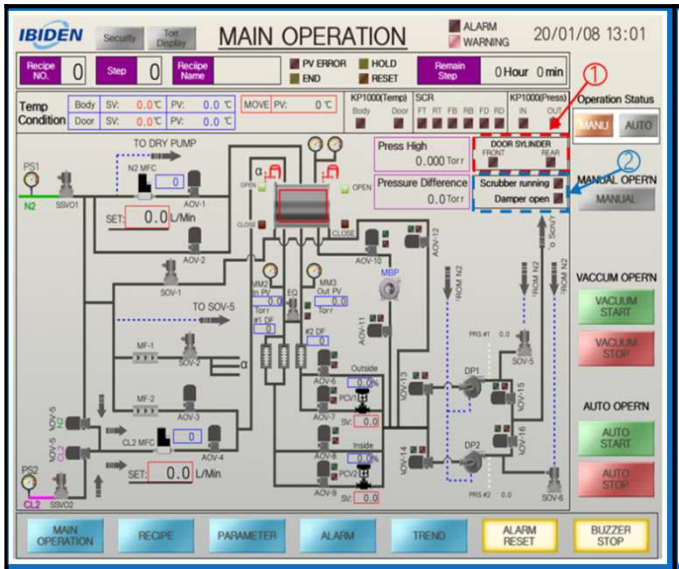
- Dust filter of special fiber
- Pump's self cleaning
- N2 buffer on pump exhaust

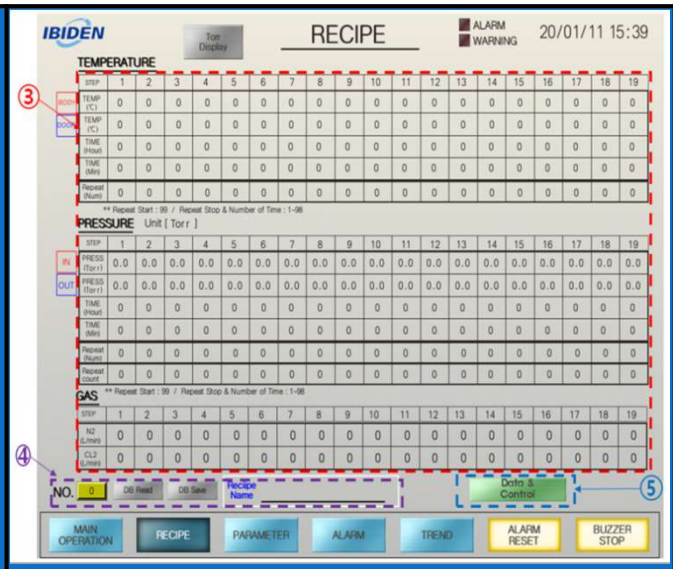
Loading Lift Car

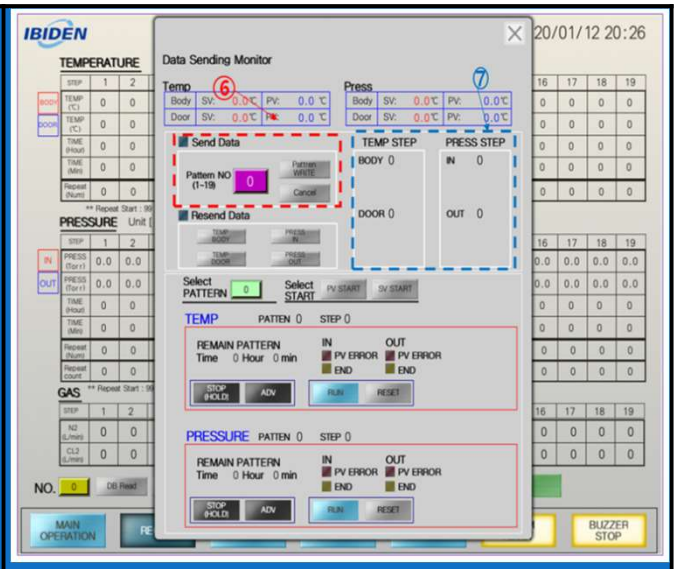
Single person operated

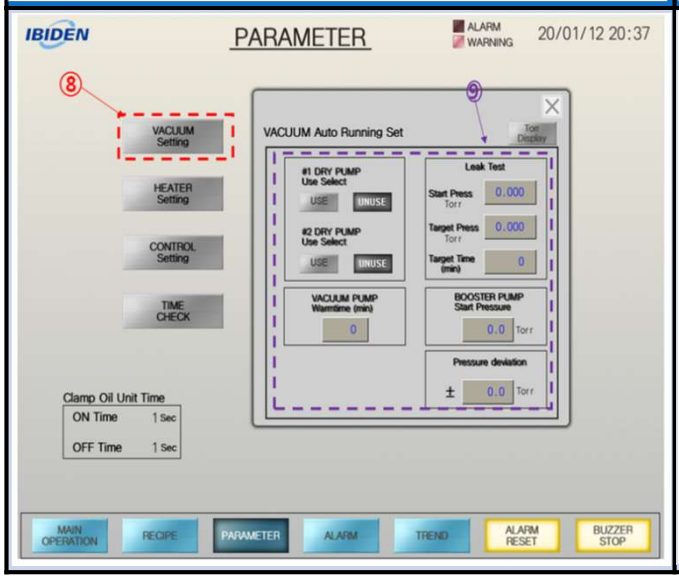
- 700~1500Kg capacity
- Product loading/unloading
- Muffle loading/unloading

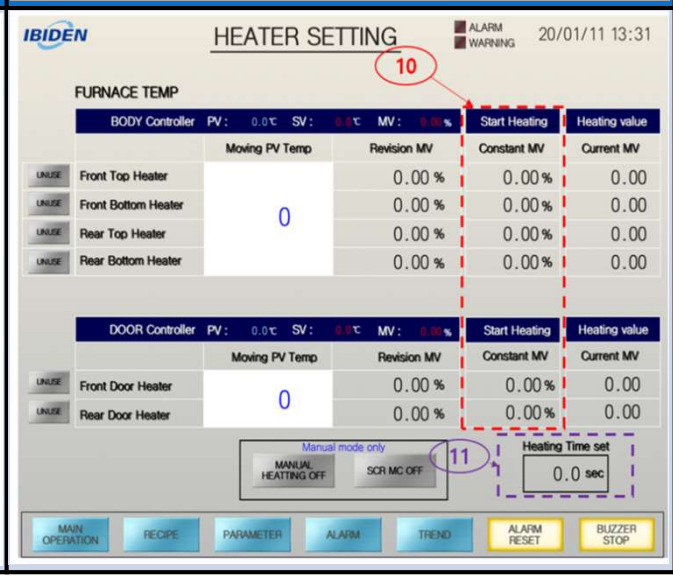
[Details _ Control Panel]

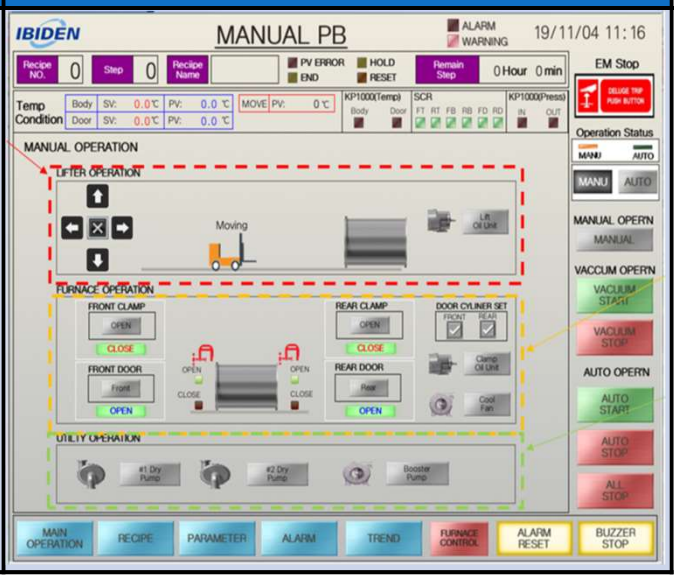












[Others _ Vertical Type]

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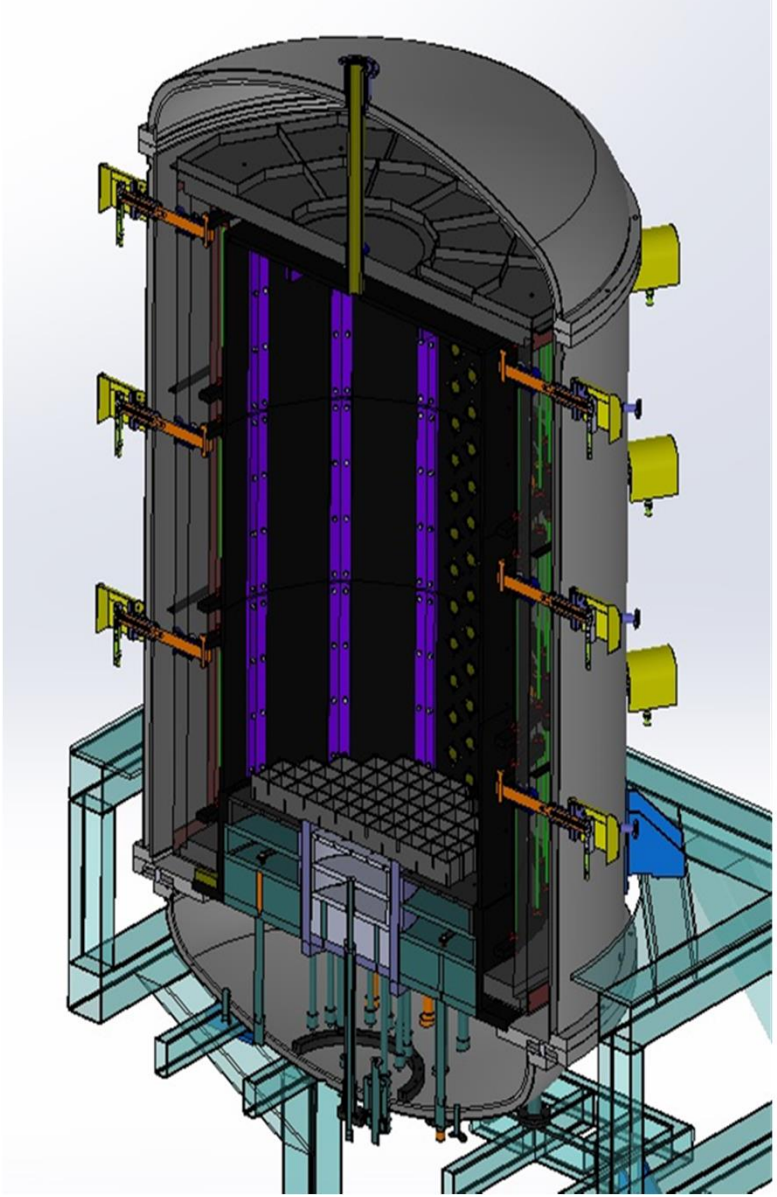
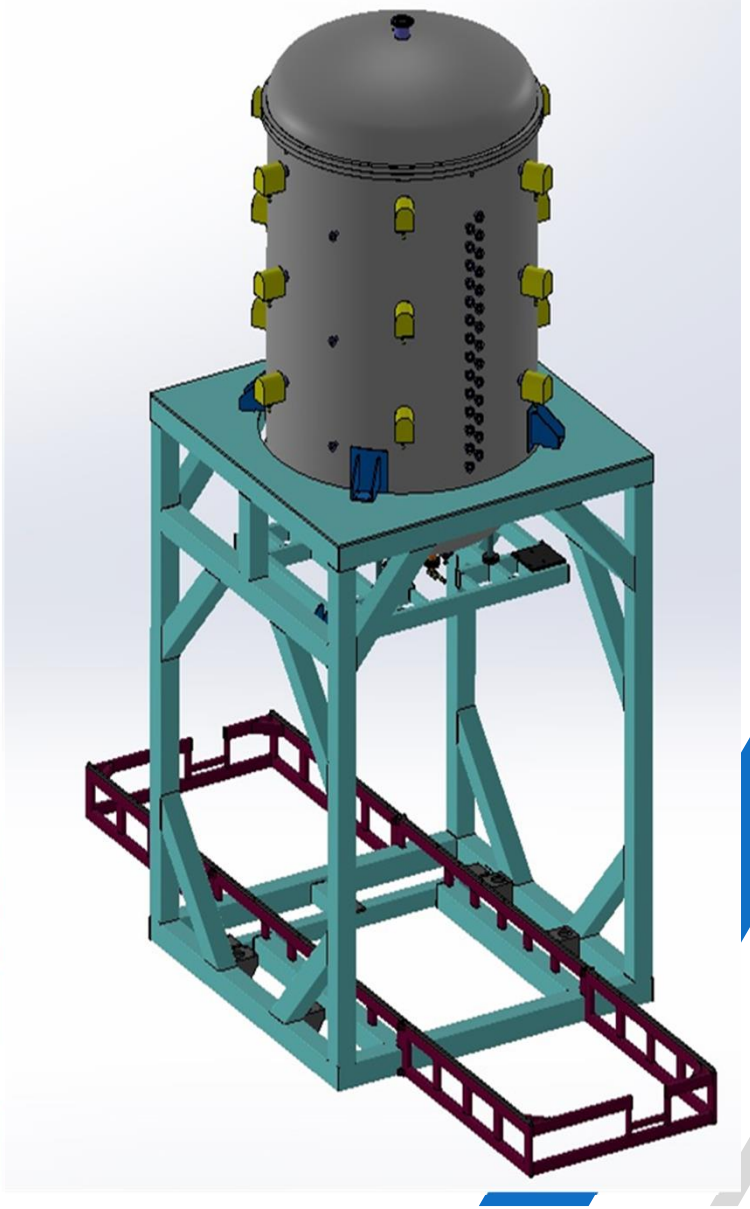
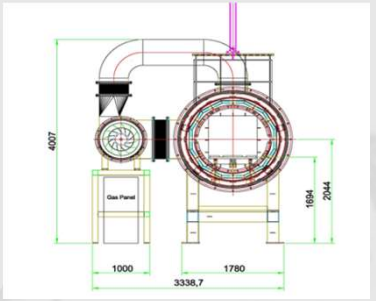


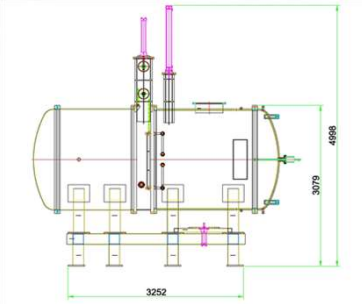


[Others _ Double Room Type]

Front



Side



Layout