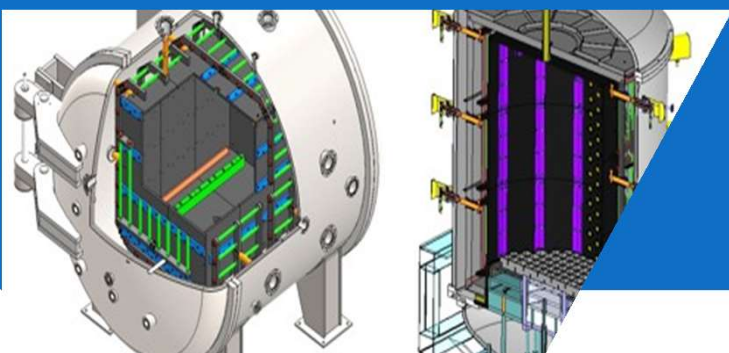


PRODUCT INTRODUCTION

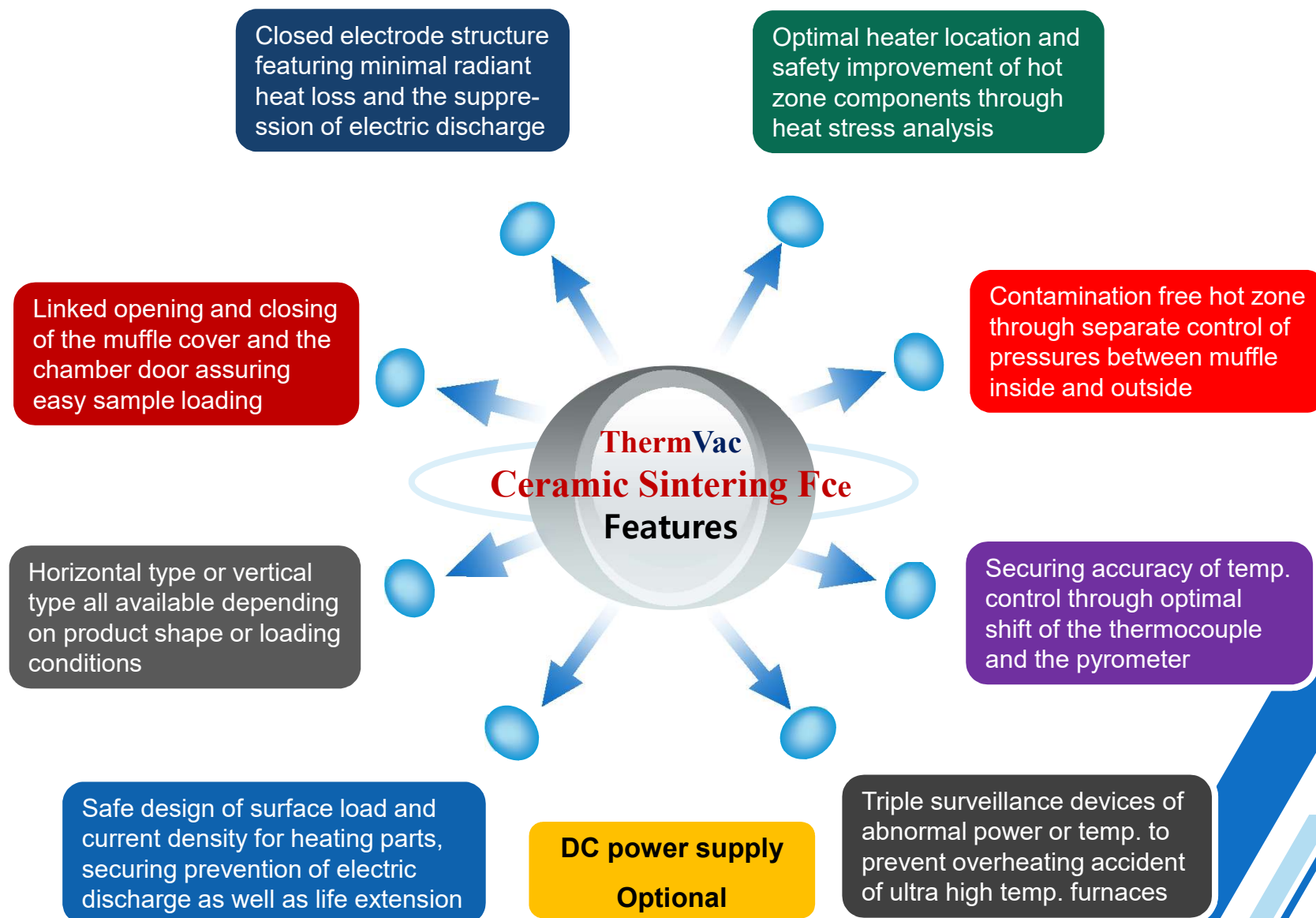
Ceramics Sintering Furnace

*Dynamic ThermVac
in pursuit of
the Best Vacuum Furnace*

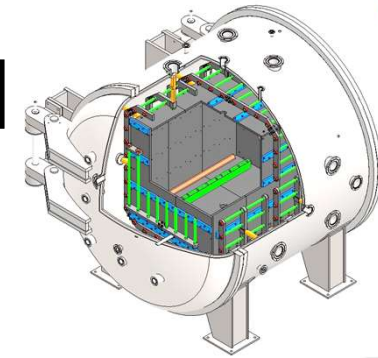


www.thermvac.co.kr

[Features of Ceramics Sintering Furnace]



[Safety Devices of **Ceramics Sintering Fce**]



THERM VAC

**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 : $>0.1\text{M}\Omega$
- Leakage current : $<1/2000\text{A}$
- Arcing : Abnormal current

**Surveillance
of
gas safety**

Gas leakage

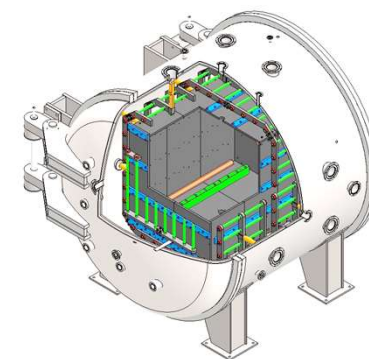
- Automatic leak check
- O_2 monitor
- Cyan gas detector

[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



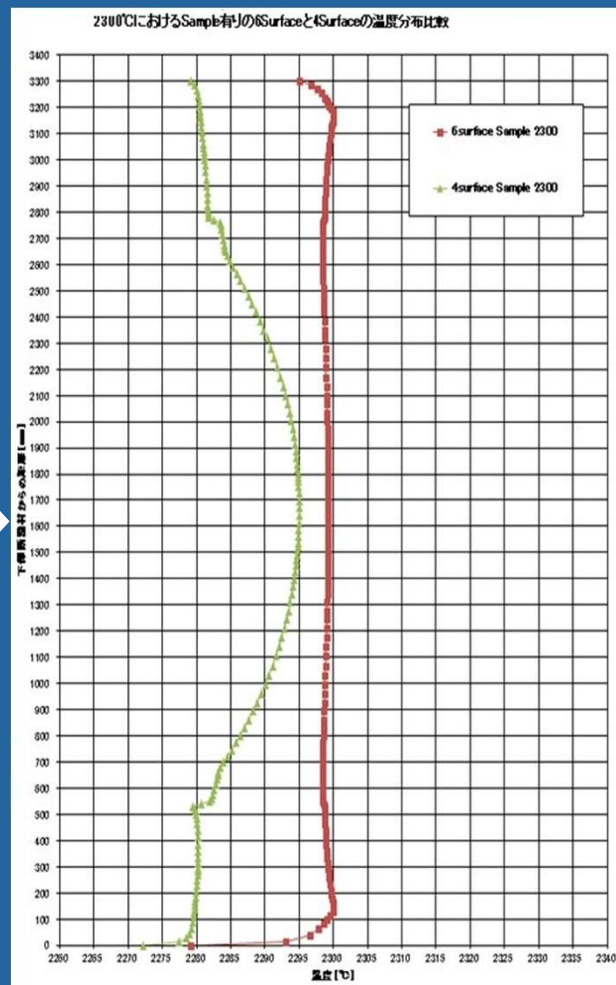
3. DC power supply

- Fundamental prevention of discharge
- Enhancement of power efficiency

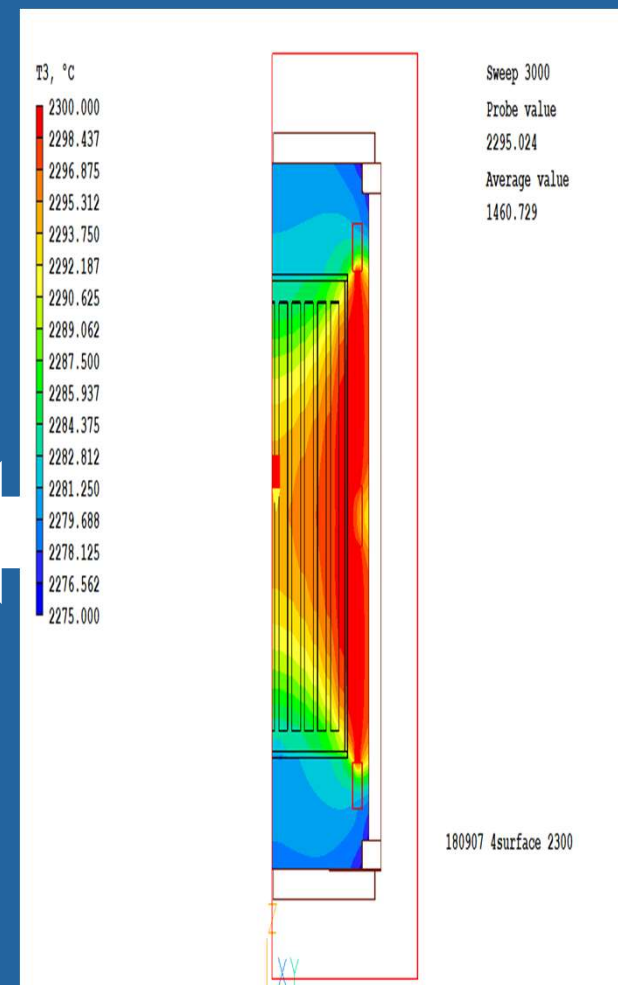
[Heat Distribution Analysis]



▲ Uniformity of 6 side heating



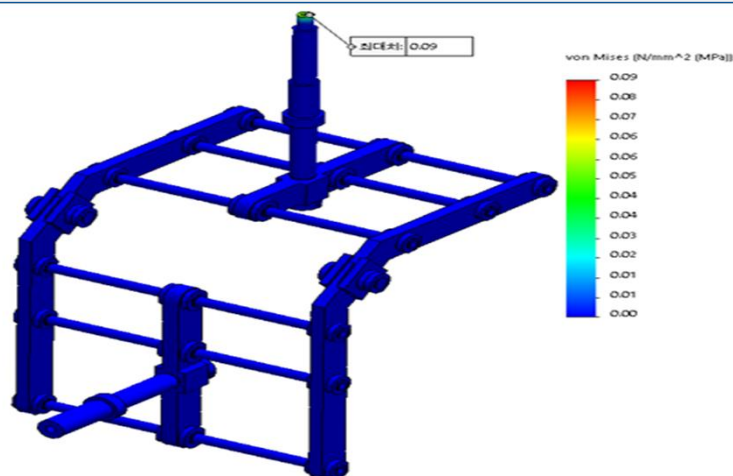
▲ 6 side heating vs. 4 side heating



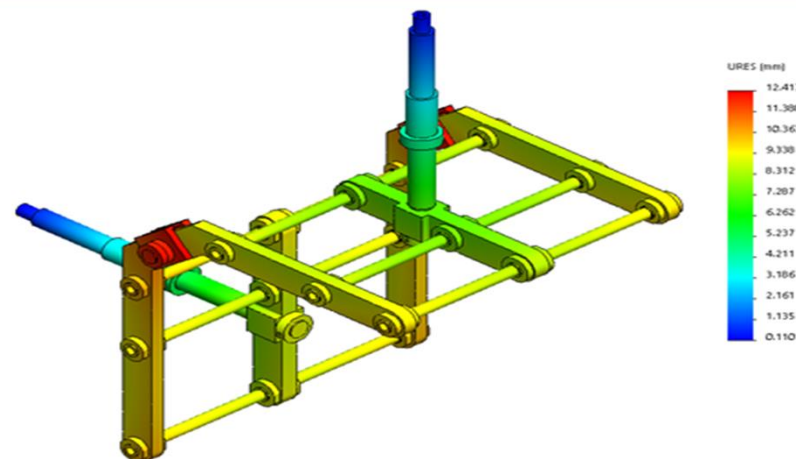
▲ Uniformity of 4 side heating

[Heat Stress Analysis]

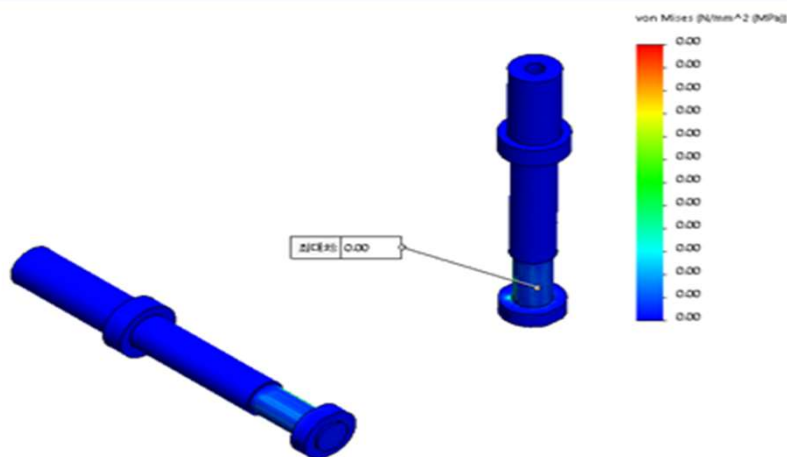
Maximum stress of heater assembly



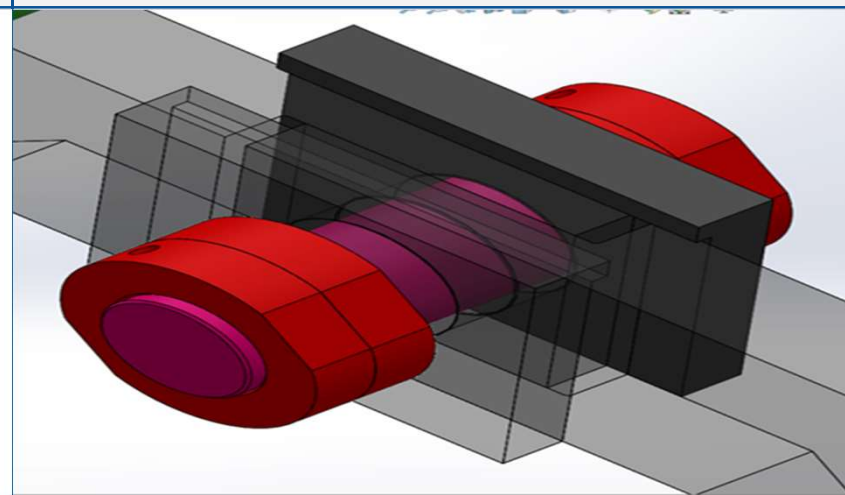
Displacement of heater assembly



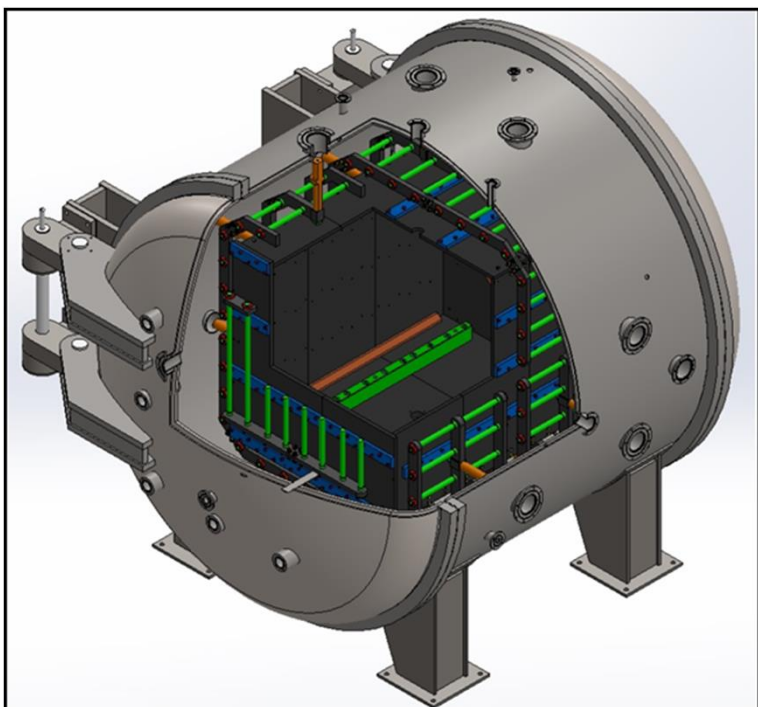
Maximum stress of electrode



Stress of heater connection part

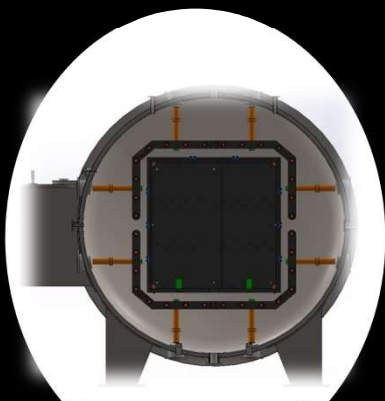


[Standard Specification]



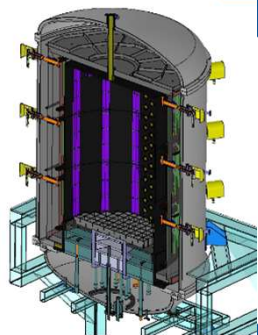
Item	Specification
Chamber type	Horizontal or vertical
Load sample	Non-oxide ceramics [SiC, AlN, B4C]
Temperature	Nor. 1900~2200°C [max. 2300°C]
Loading capacity	500 ~ 1200Kg
Uniformity	±6~12°C [2200°C, no load, 3 points]
Heat-up rate	2 ~ 10°C/min
Temp. measuring	Pyrometer [correction : C type TC]
Heating circuit	2 ~ 6 circuits
Hot zone	CIP graphite
Retort box	Rectangular box or polygonal cylinder
Process gas	Argon, Nitrogen, Helium
Pressure	100 ~ 115 KPa
Evacuation	Mechanical booster pump + Dry pump
Leak rate	Below 1×10^{-3} Pa · m ³ /sec
Forced cooling	18~30 hours from 2200°C to 200°C
Electricity	AC 3Φ or DC

[Standard Dimension]



Horizontal

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

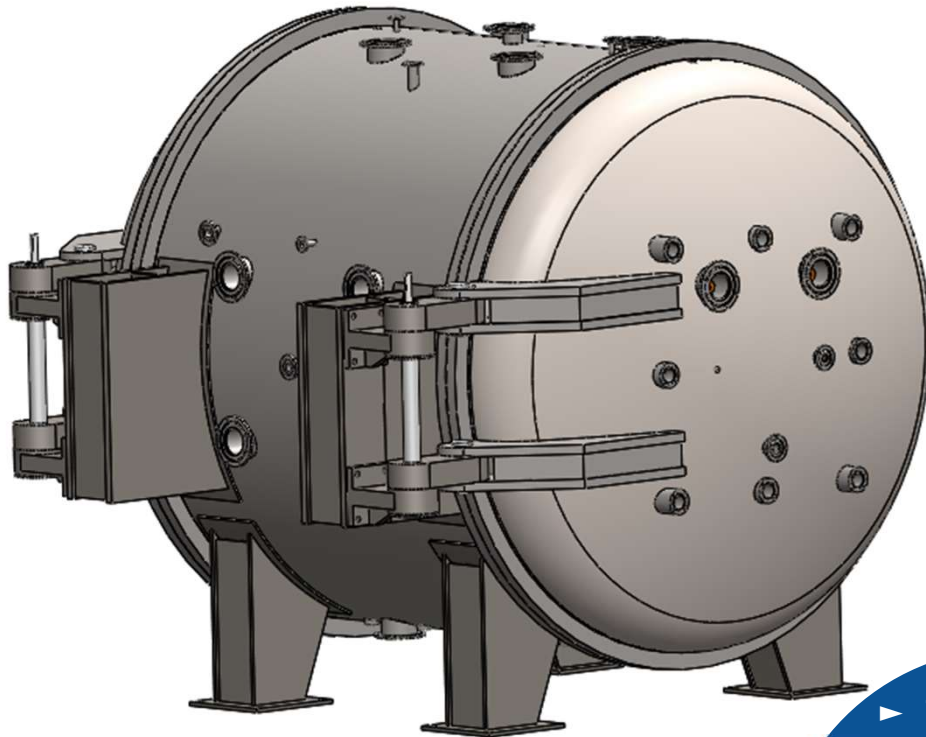


Vertical

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

[Details _ Vacuum Chamber]

THERMVAC



Boundary Conditions

STEP1

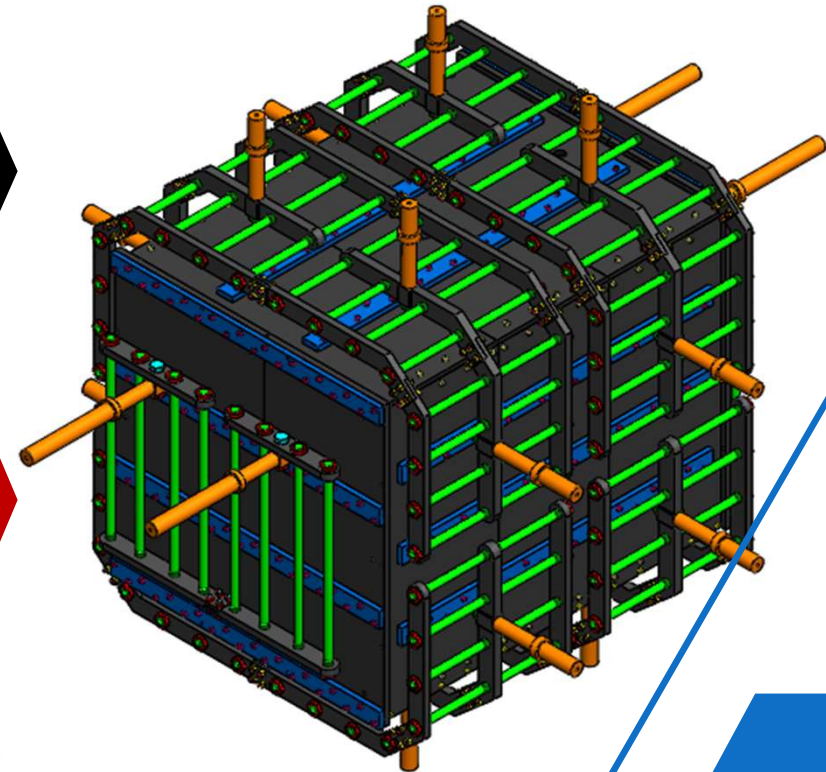
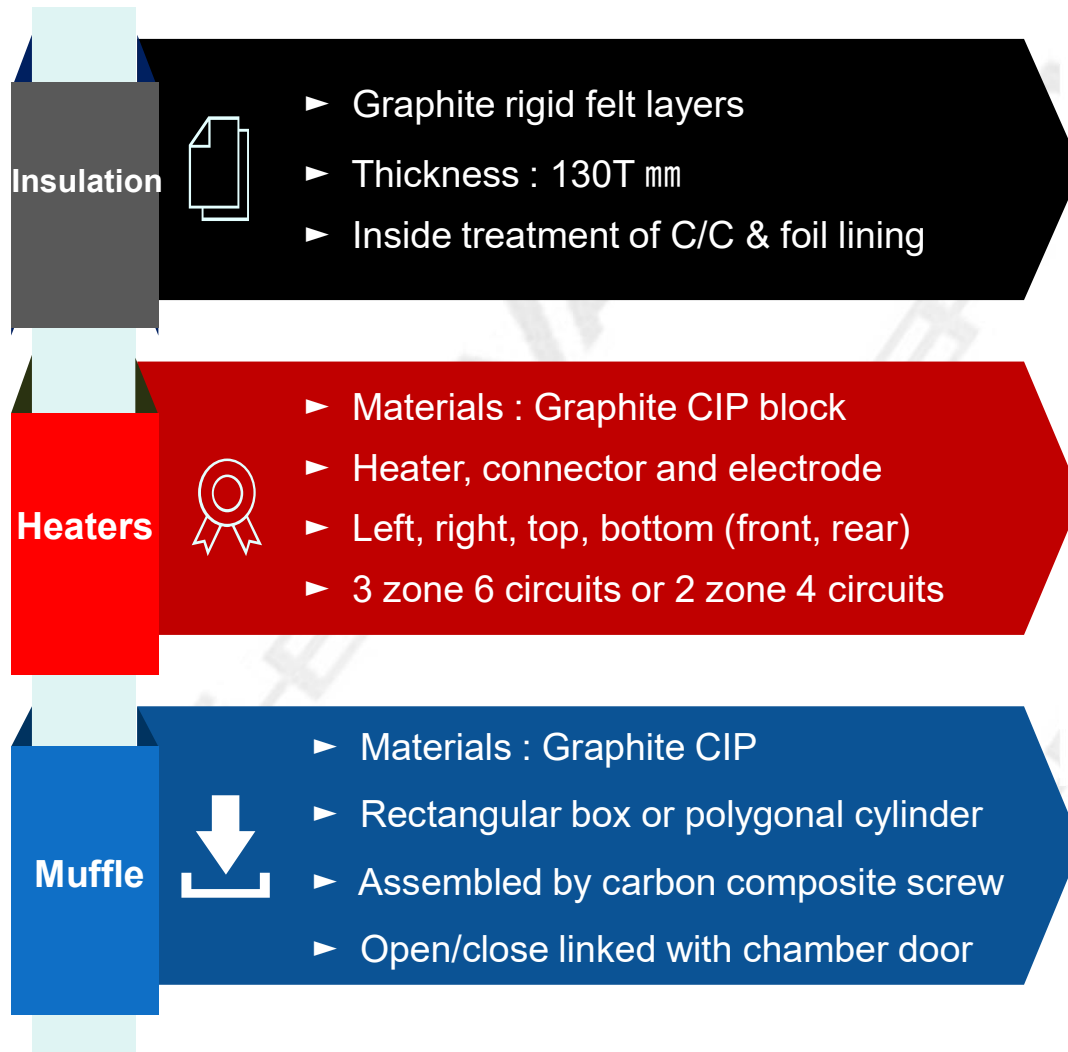
- ▶ Max Temp. of inner surface : 650°C
- ▶ Internal pressure : Vacuum
- ▶ External pressure : Atmospheric
- ▶ Water pressure of cooling jacket : 3Kgf/cm²

Fabrication

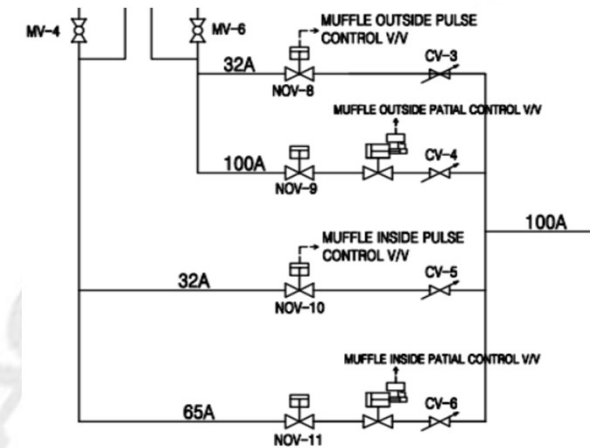
STEP2

- ▶ 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]



[Details _ Evacuation System]



Vacuum pumps

- ▶ Roots type mechanical Booster pump
- ▶ Screw type dry pump
- ▶ Maker : Edwards or Busch or Ulvac

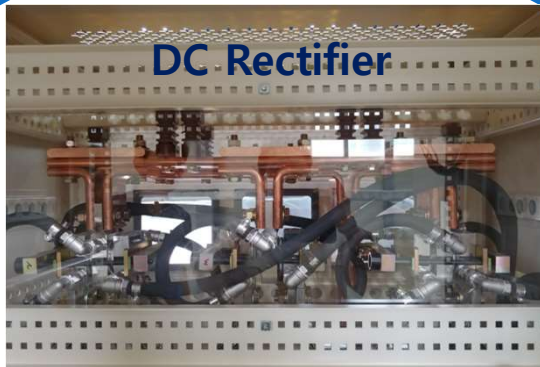
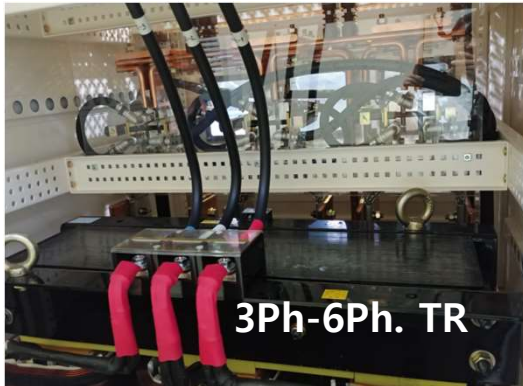
Vacuum gauges

- ▶ Type : Diaphragm Manometer
- ▶ Maker : MKS or Inficon
- ▶ Muffle inside & outside, pumping line

Suction line control

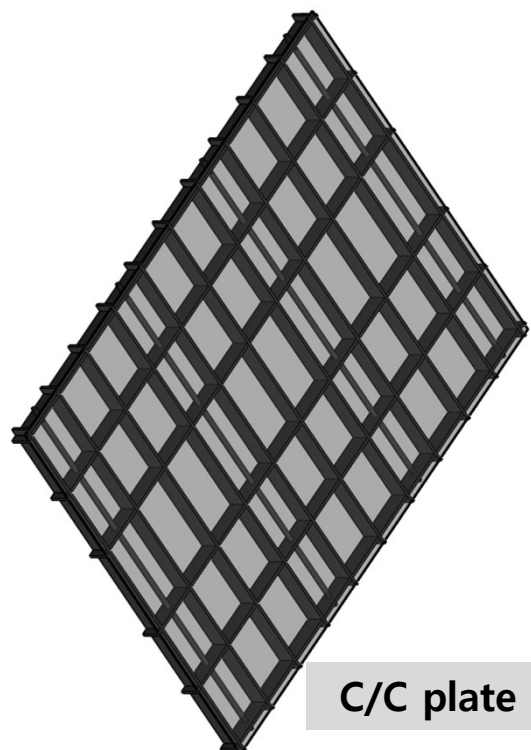
- ▶ Slow pumping vs. normal pumping
- ▶ Pumping of muffle inside vs. outside
- ▶ Atmospheric vs. partial pressure

[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]



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

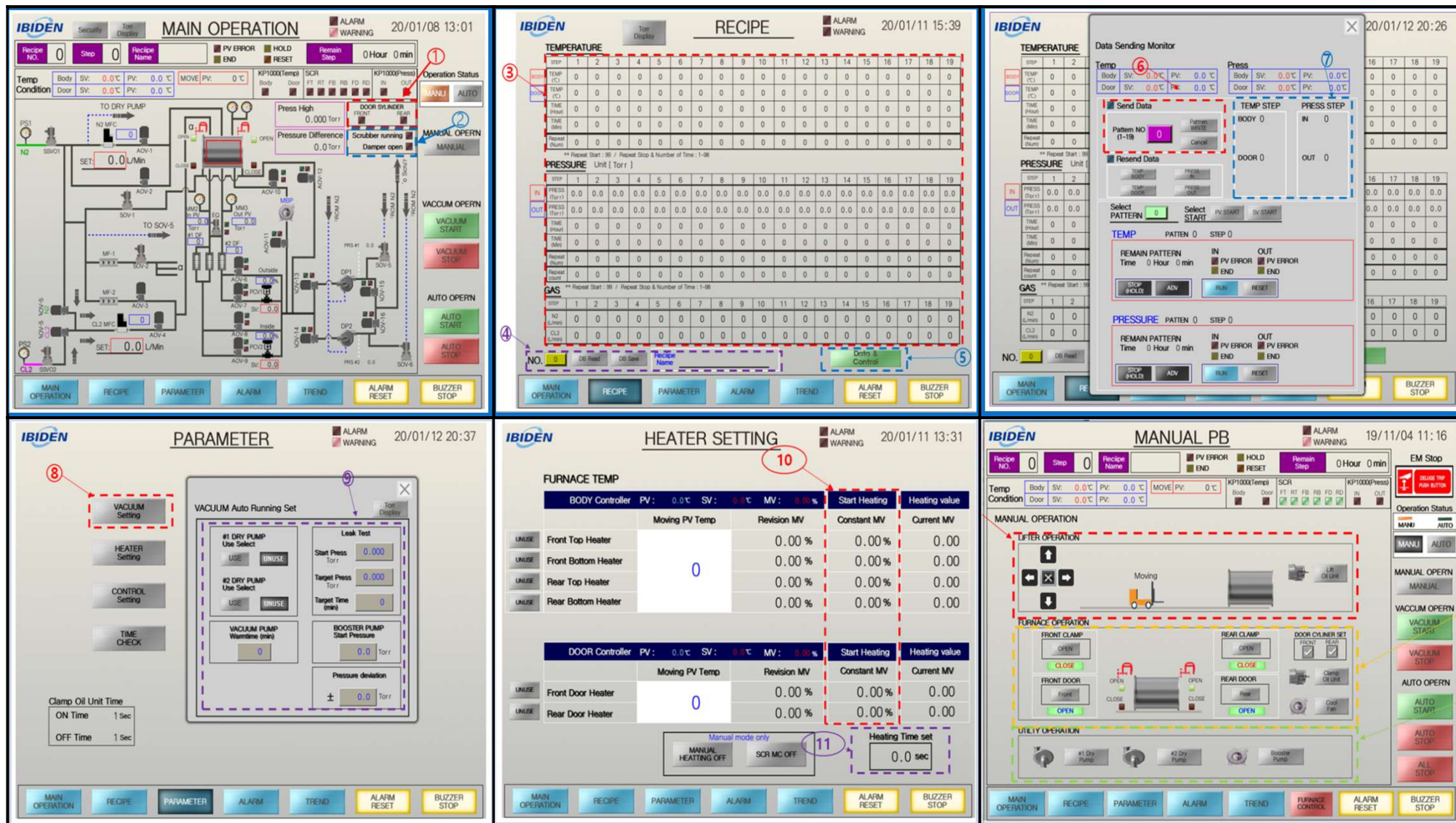


Loading Lift Car

Single person operated

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

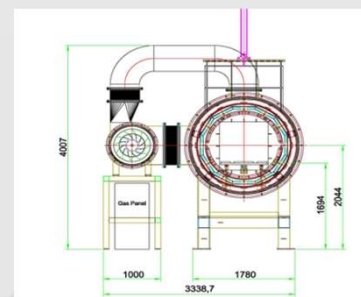
[Details _ Control Panel]



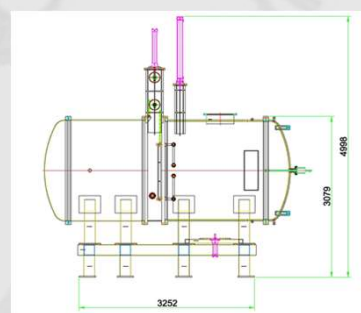
[Other _ Double Room Type]



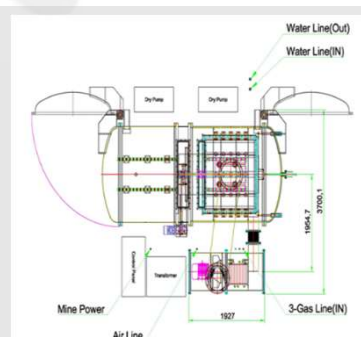
Front



Side



Layout



[Furnace Line-up for Non-oxide Ceramics]

