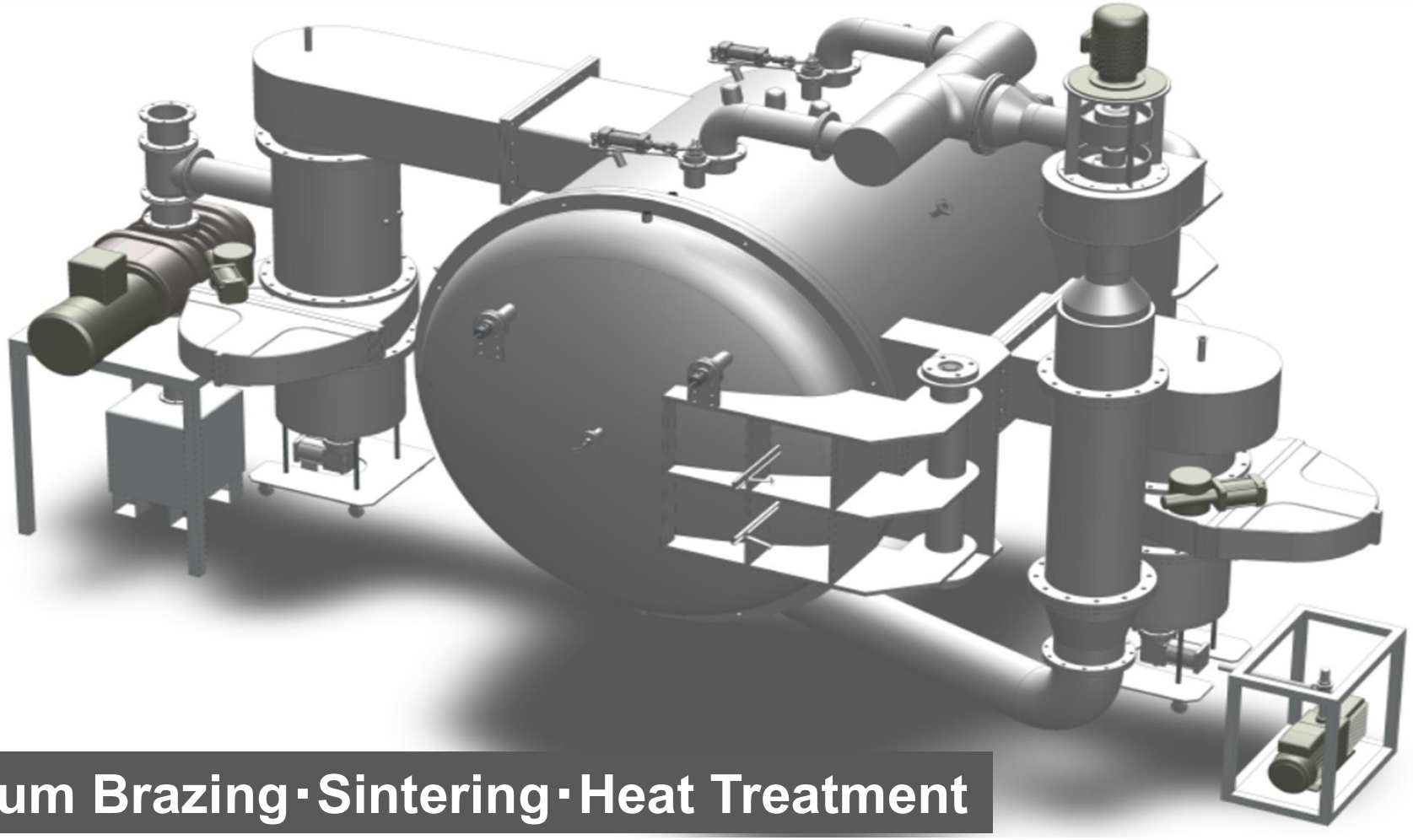
Metal Heat Treatment Vacuum Furnace



Vacuum Brazing · Sintering · Heat Treatment

PRODUCT INTRODUCTION

THERMVAC

[Applications of Metal Heat Treatment]

◆ Vacuum Brazing

Features	▷ Maintains clean luster and has no deformation, without using flux ▷ Excellent performance for bonding of ferrous/non-ferrous metals ▷ Flexible atmosphere of high vacuum ~ atmospheric ~ pressure
Steel Grade	STS, carbon steel, copper, nickel alloy, titanium, tantalum, molybdenum

◆ Vacuum Sintering

Features	▷ By applying heat and/or pressure to the powder molded body, securing a dense solid phase without melting or oxidation ▷ Accurate temperature control and uniformity is the key process parameter. Higher temperature than other heat treatment
Steel Grade	STS, 7-4PH / 15-5PH, Alloy 718, carbon steel, high tensile steel

[Applications of Metal Heat Treatment]

◆ Vacuum Annealing

Features	▷ Lower hardness and improve ductility to facilitate subsequent process ▷ Maintains luster on a clean surface without deformation
Steel Grade	STS, alloy steel, tool steel, powder sintered body, electric alloy steel, copper, brass, titanium alloy steel, nickel alloy steel

◆ Vacuum Precipitation • Age Hardening

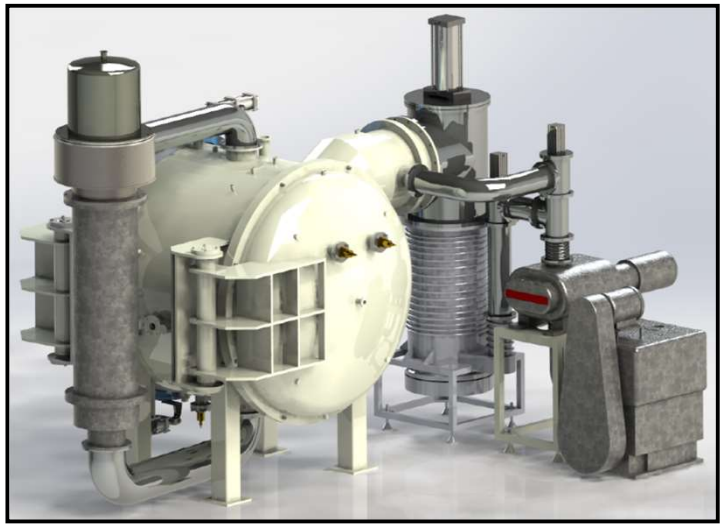
Features	▷ Clean luster without deformation at relatively low temperature ▷ Accurate temperature control in vacuum is the most important
Steel Grade	stainless steel, high alloy steel (maraging steel), inconel

[Features of Metal Heat Treatment Fce]

We fully meet the user's requirement for vacuum heat treatment process

- Eco-friendly heat treatment of high reproducibility, while minimizing thermal deformation
- Performing brightened heat treatment by preventing oxidation and contamination
- Horizontal type or vertical type all available depending on product shape, loading method or site layout conditions
- Selective adoption of hot zone materials to meet users' requirements, either graphite or molybdenum
- Precise capacity calculation of heat exchanger and cooling blower leading to optimal design of cooling circuit
- Temperature uniformity of ±4~10℃ in all standard models through optimal hot zone design
- Suggestion of optimal specifications customized to the user's special requirements through heat analysis and calculation
- Selective system control from simple touch panel GUI to remote, integrated PC HMI

[Standard Specification of Metal Heat Treatment Fce]

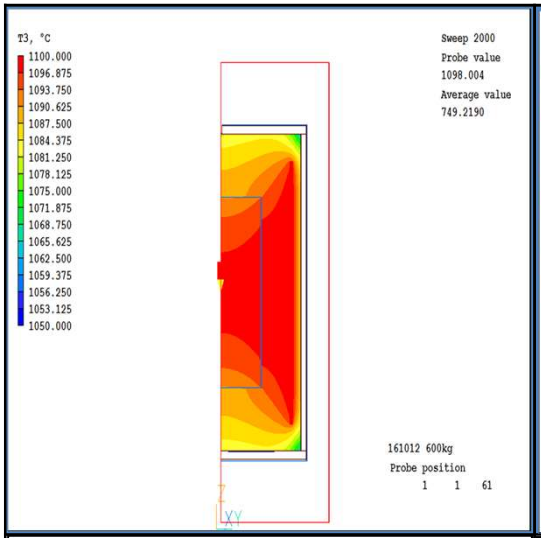


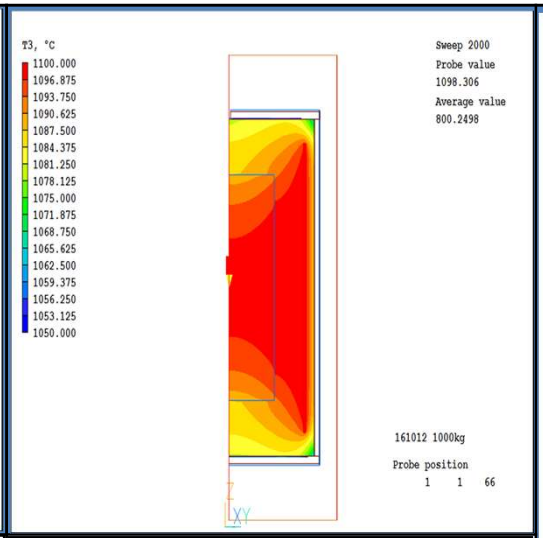
Item	Specification
Furnace type	Horizontal or vertical vacuum furnace
Application	Vacuum brazing, sintering or heat treatment
Temperature	400 ~ 1350℃
Loading volume	96L ~ 1500L
Uniformity	±4~10℃ [1000℃, no load, 9~13 points]
Heat-up rate	5 ~ 10℃/min
Heating circuit	2 ~ 6 circuits
Temp. measure	K type, J type or C type T/C
Hot zone	Graphite or Molybdenum
Atmosphere	Vacuum(partial) heating, Nitrogen cooling
Low vacuum	Mechanical booster pump + Oil rotary pump
High vacuum	Diffusion pump or Cryogenic pump
Leak rate	Below 1×10^{-3} Pa · ㎥/sec
Forced cooling	Heat exchanger & Blower, Intra or extra circulation
System control	PLC control, Touch panel or PC HMI interface
Optional items	Lift car, Closed cooling water system

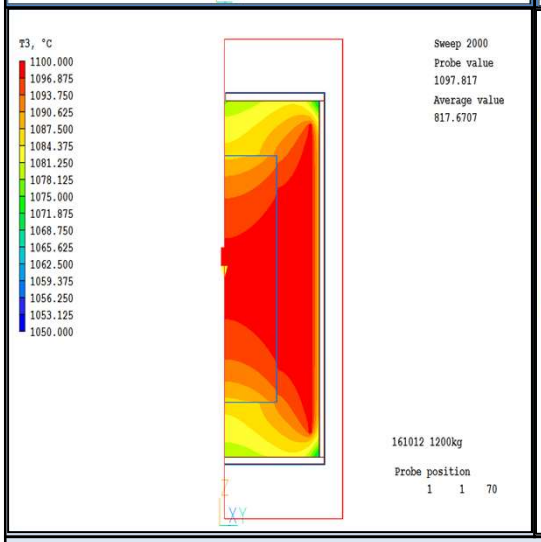
[Standard Dimension of Metal Heat Treatment Fce]

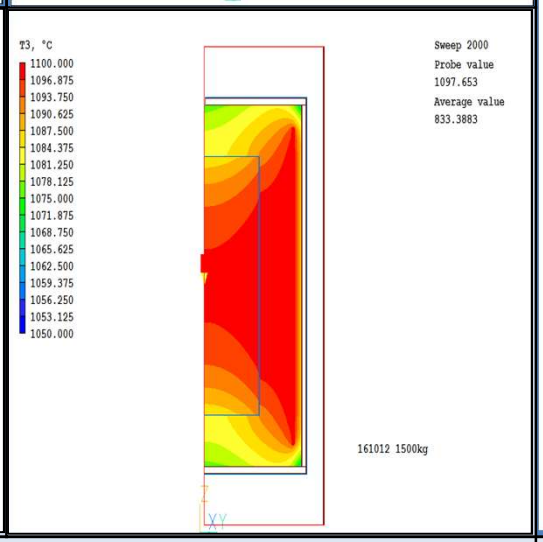
Model code	TVQHT-S400	TVQHT-S600	TVQHT-S800	TVQHT-S1000
Work zone	400*400*600	600*600*900	800*800*1200	1000*1000*1500
Capacity	300Kg	600Kg	1200Kg	2500Kg
Operating temp.	400 ~ 1350℃			
Uniformity	±4 ~ 10℃			
Vacuum level	1 Pa			
Electricity	AC 380V, 3Ph.			
Options	1. Hot zone materials : Graphite or Molybdenum 2. High vacuum pump : Diffusion oil pump or Cryogenic pump 3. Cooling system : Extra circulation or intra circulation 4. Convection heating : Circulation fan operated under 800℃ 5. Chamber type : Vertical or horizontal 6. Closed water circulation, sample loading car, gas buffer tank			

[Simulation of Heat Distribution Analysis]

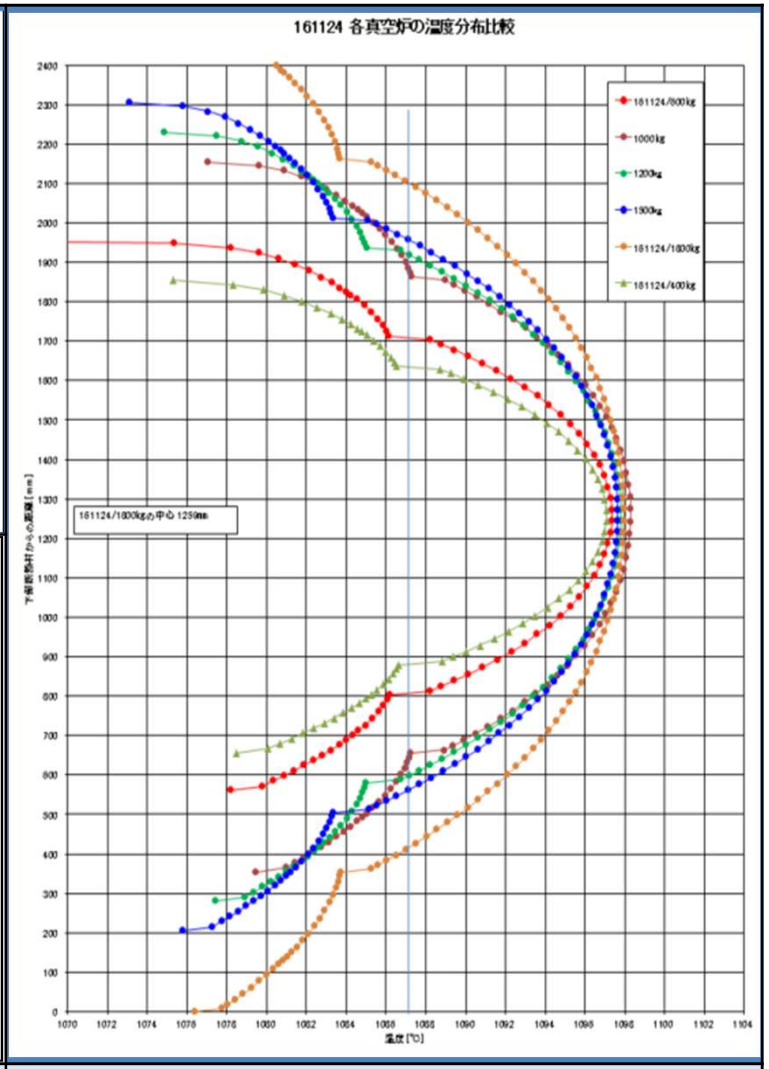






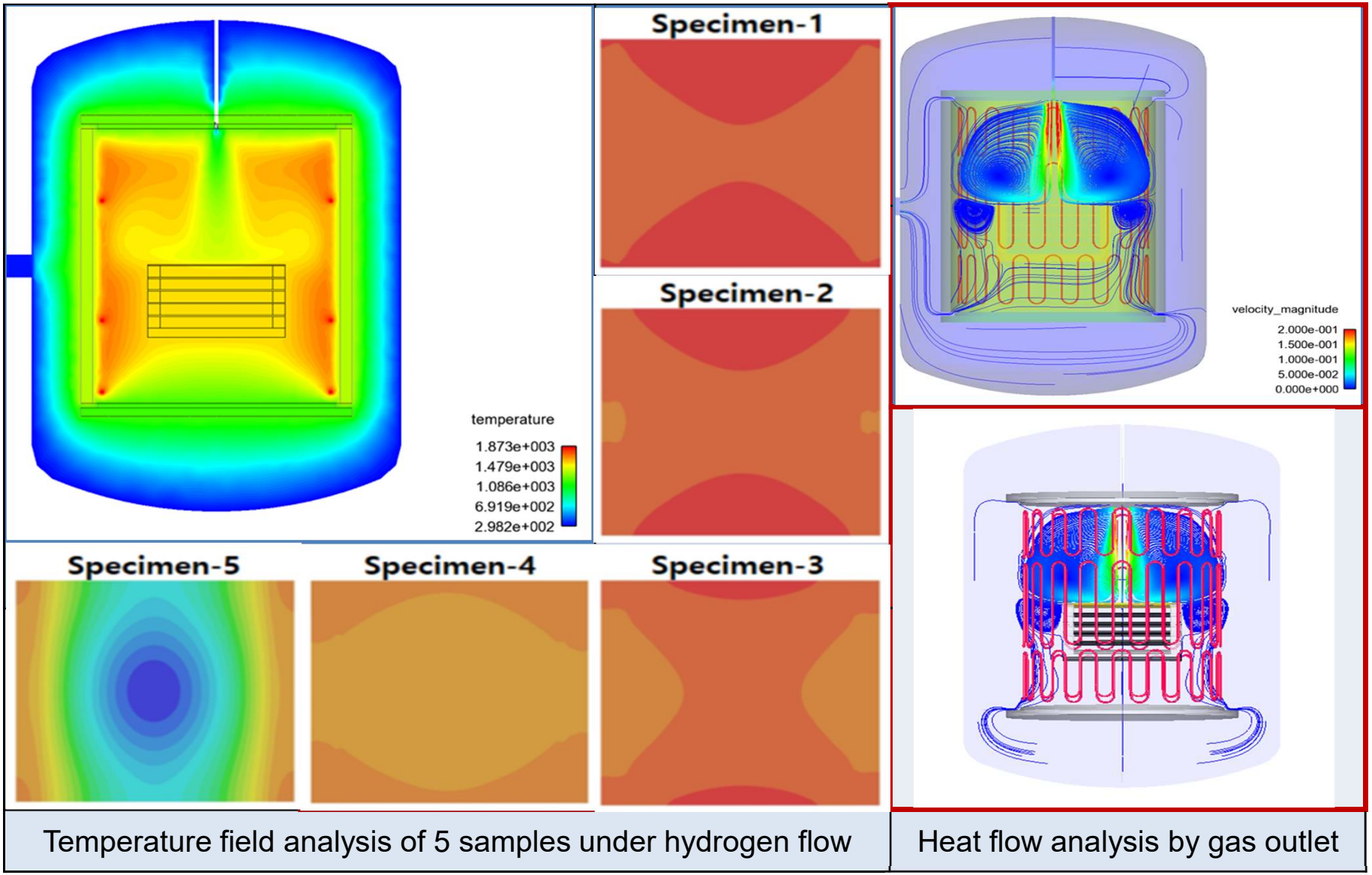


Uniformity by loading capacity(600 ~ 1500Kg)



Work zone of ±5℃

[Simulation of Heat Flow Analysis]



Temperature field analysis of 5 samples under hydrogen flow

Heat flow analysis by gas outlet

[Details _ Vacuum Chamber]

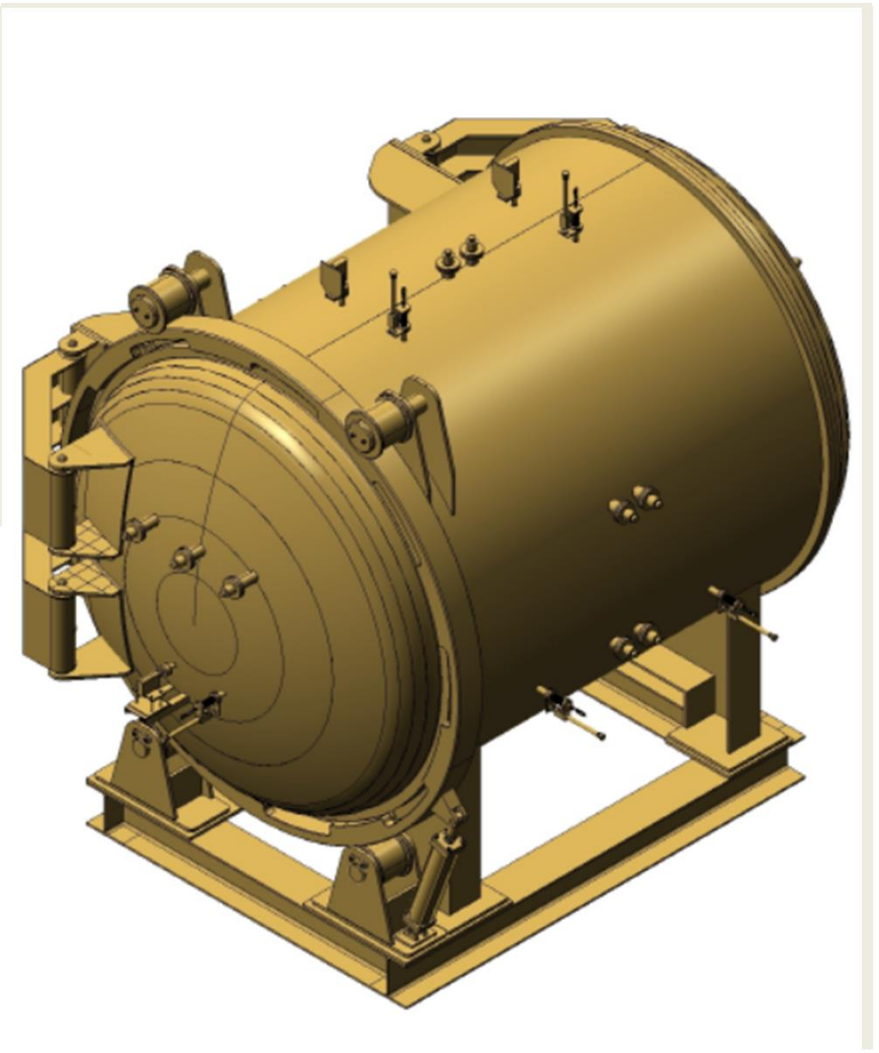
◆ Responding to product shape, loading capacity & method and installation site layout

Boundary Conditions

- Max Temp. of inner surface : 300℃
- Internal pressure : Vacuum
- External pressure : Atmospheric
- Water pressure of cooling jacket : 3Kgf/㎠

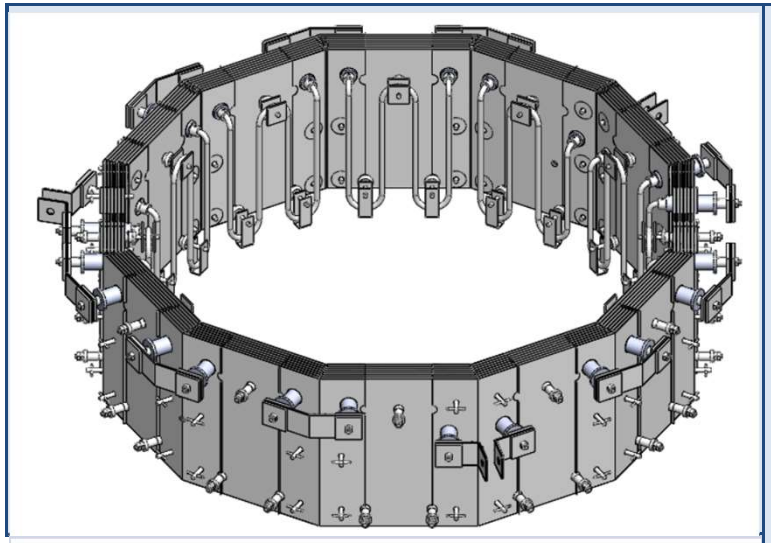
Fabrication

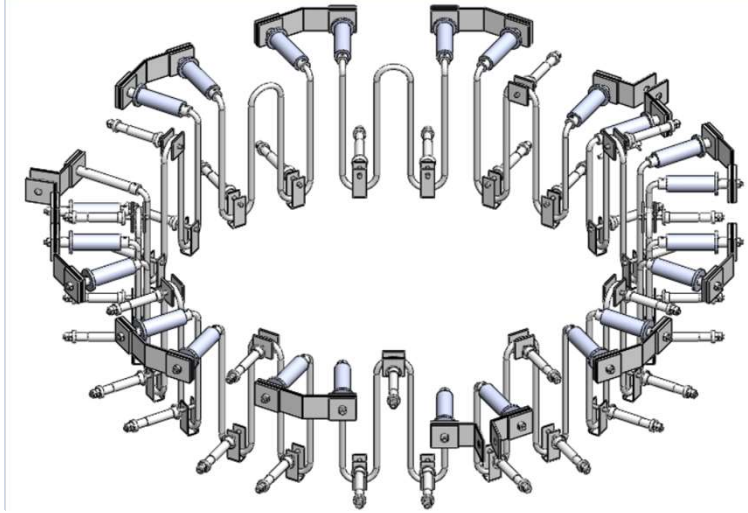
- Type : Horizontal or vertical cylinder
- Double wall water cooled jacket
- Materials : STS304(inner • outer wall)
  Mild steel(flange)
- Inside surface : Buffing #300

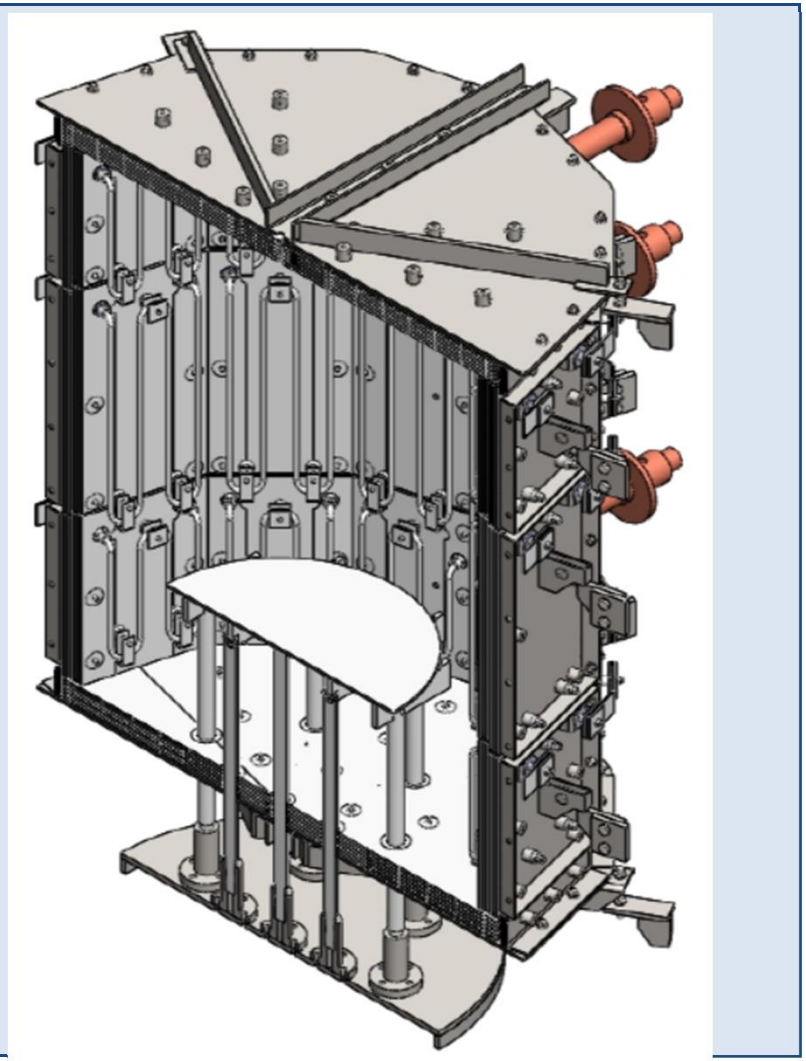


[Details _ Hot Zone _ Molybdenum]

◆ Responding to operating temperature, process atmosphere and loading conditions

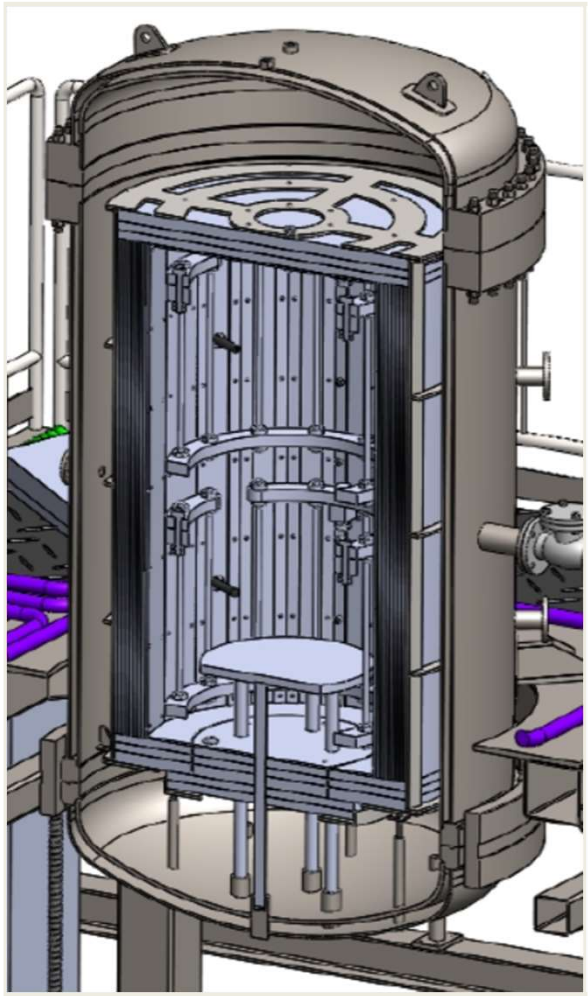


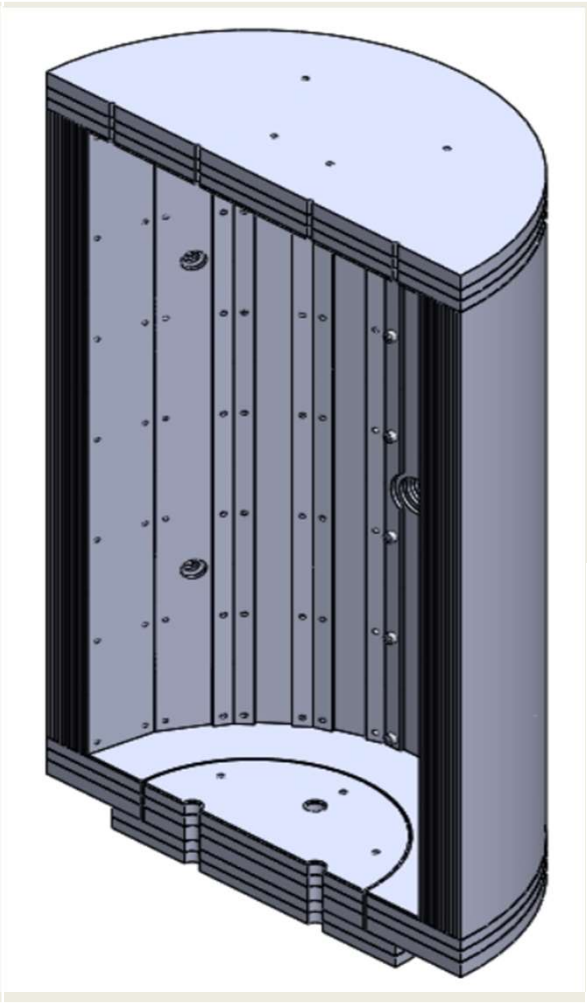


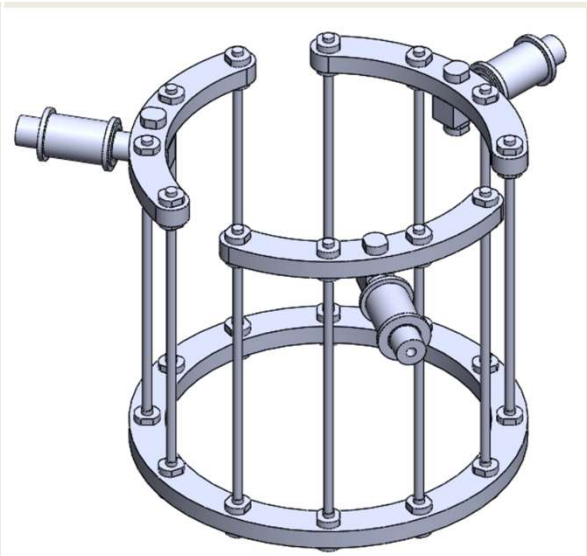


[Details _ Hot Zone _ Graphite]

◆ Responding to operating temperature, process atmosphere and loading conditions

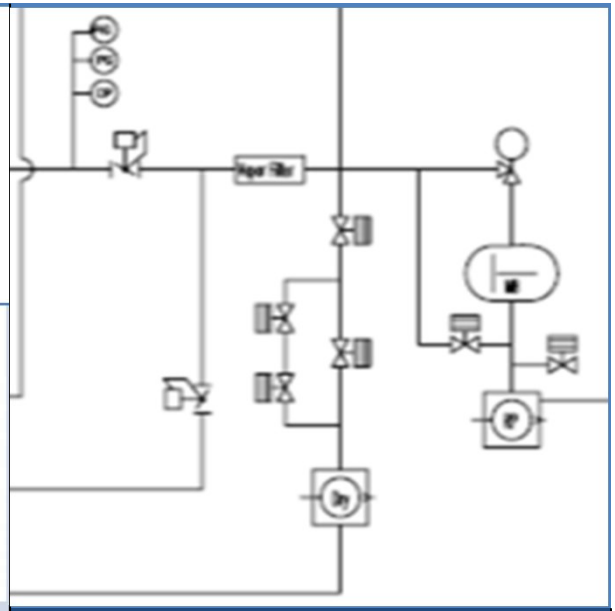






[Details _ Evacuation System]

◆ Responding to process characteristics, hot zone materials and/or loading product

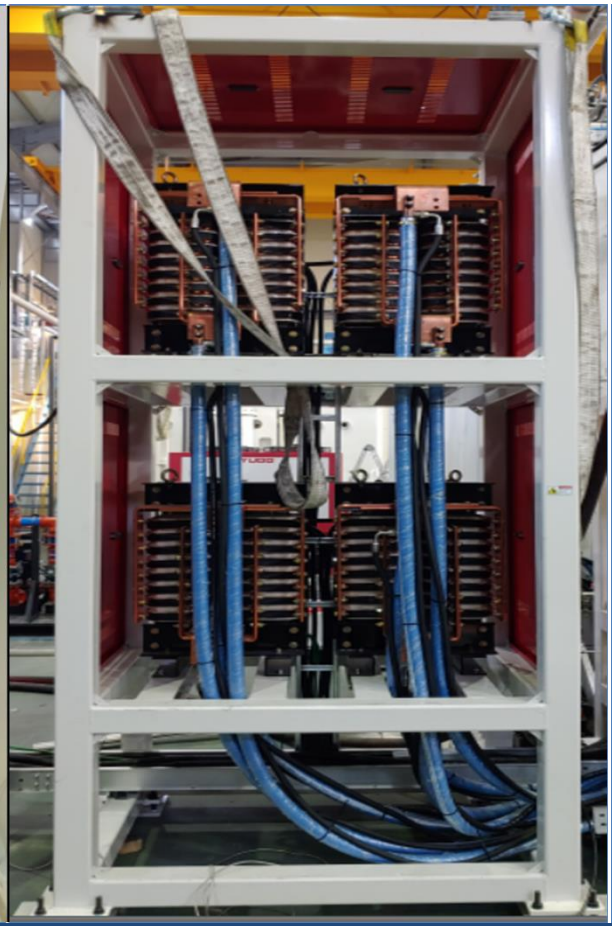


Vacuum pumps	Vacuum gauges	Suction line control
► Dry pump or Oil rotary pump ► Mechanical booster pump ► Diffusion pump or Cryogenic pump	► Low : Pirani or Diaphragm ► High : Ionization or Penning ► Points : Chamber/piping sides	► Slow pumping or normal pumping ► Vacuum or partial gas control ► Cooling gas backfilling

[Details _ Power Supply]

- Efficient response to electric property of vacuum furnace, low voltage/high ampere

Thyristor [SCR]



Step-down transformer

Power line

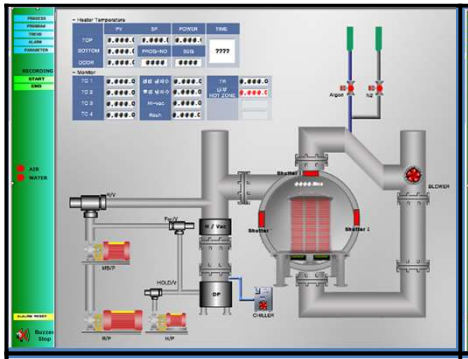
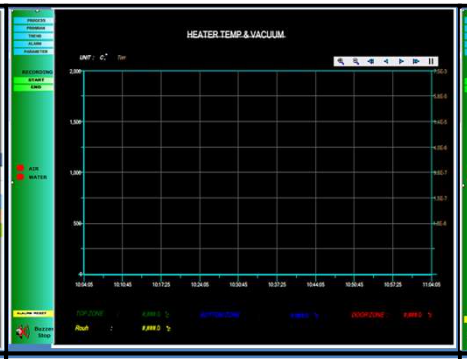
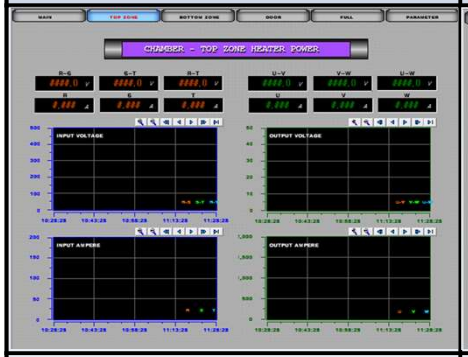
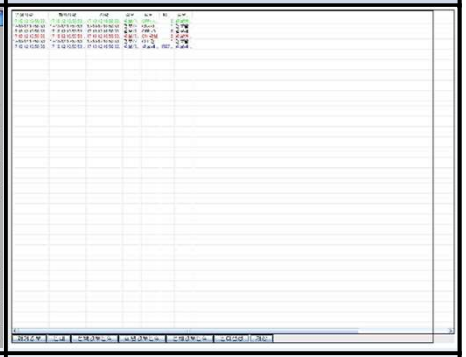
[Details _ Accessories]

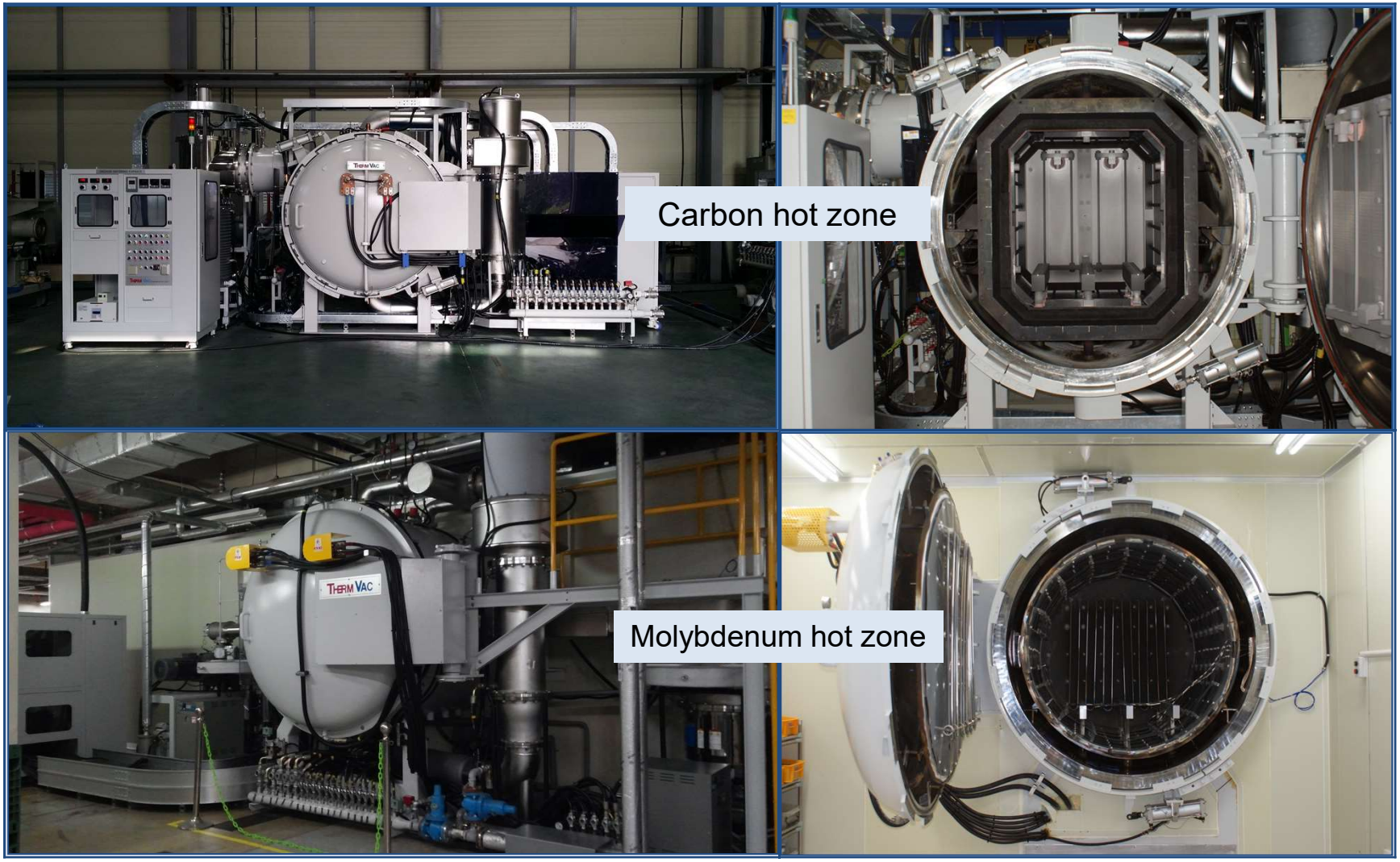
◆ Improving efficiency of vacuum furnace production line and ease of its maintenance

Forced cooling	Sample loading	By-product trapping
► Heat resistant blower ► Heat exchangers ► Intra vs. extra circulation	► Electric drive, hydraulic power ► Up/down, back and forth ► Single operator, Remote control	► Vapor condenser, particle filter ► 2~3 stage parallel or straight ► Saturation monitoring by pressure

[Details _ Control Panel]

◆ PLC sequence control, Touch panel GUI or PC base integrated HMI interface

			
Process monitor	Program setting	Trend view	Parameter setting
			
Zone heater power	Total heater power	Alarm setting	Alarm history

[Site View of Metal Heat Treatment Furnaces]

◆ Molybdenum fce for $Cu+Al_2O_3$ brazing, carbon fce for oxygen-free copper sintering