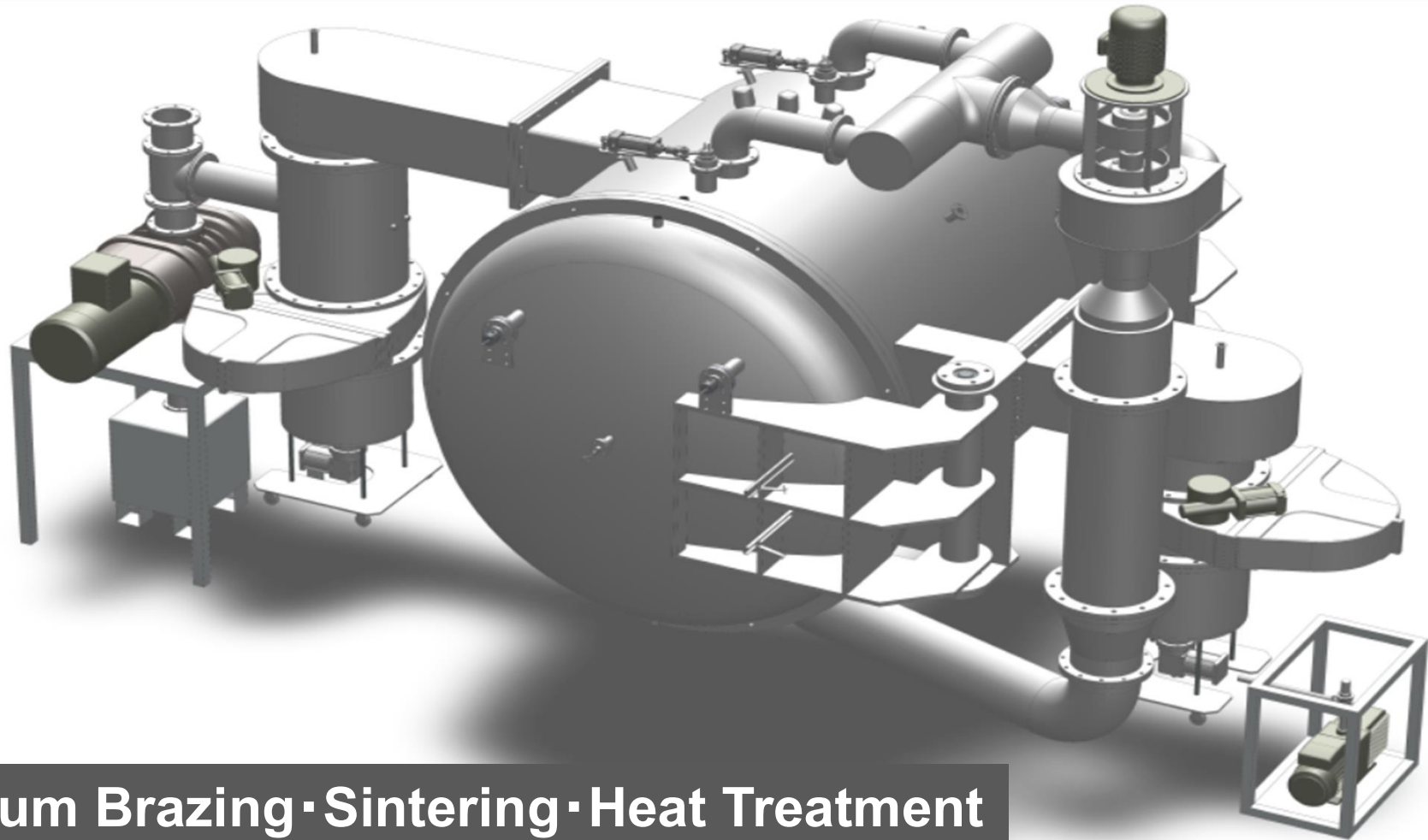


Metal Heat Treatment Vacuum Furnace



Vacuum Brazing · Sintering · Heat Treatment

▶ **PRODUCT INTRODUCTION**

THERM VAC

[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 $\pm 4 \sim 10^{\circ}\text{C}$ 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**]

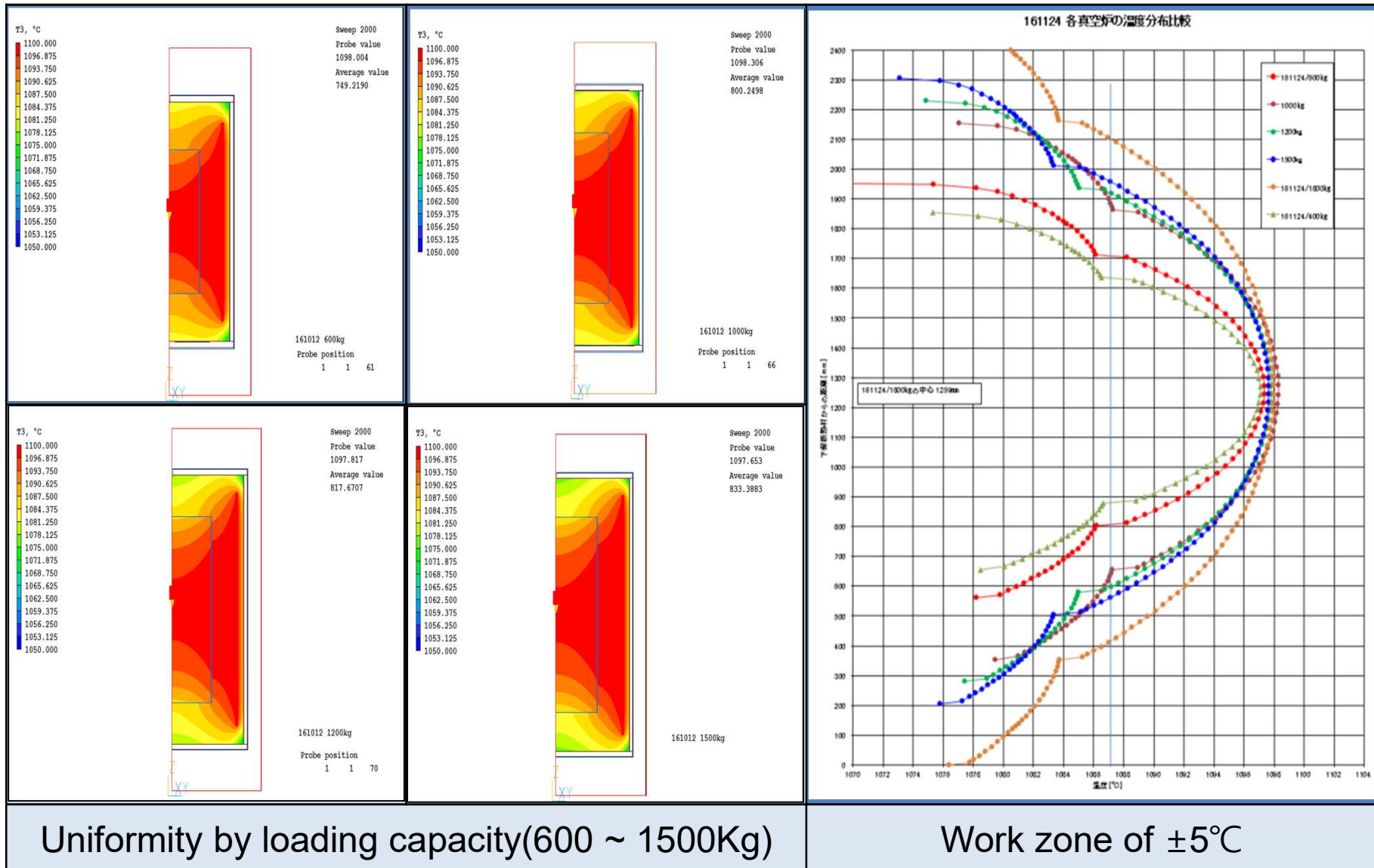


Item	Specification
Furnace type	Horizontal or vertical vacuum furnace
Application	Vacuum brazing, sintering or heat treatment
Temperature	400 ~ 1350°C
Loading volume	96L ~ 1500L
Uniformity	±4~10°C [1000°C, no load, 9~13 points]
Heat-up rate	5 ~ 10°C/min
Heating circuit	2 ~ 6 circuits
Temp. measure	K 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 $1 \times 10^{-3} \text{ Pa} \cdot \text{m}^3/\text{sec}$
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

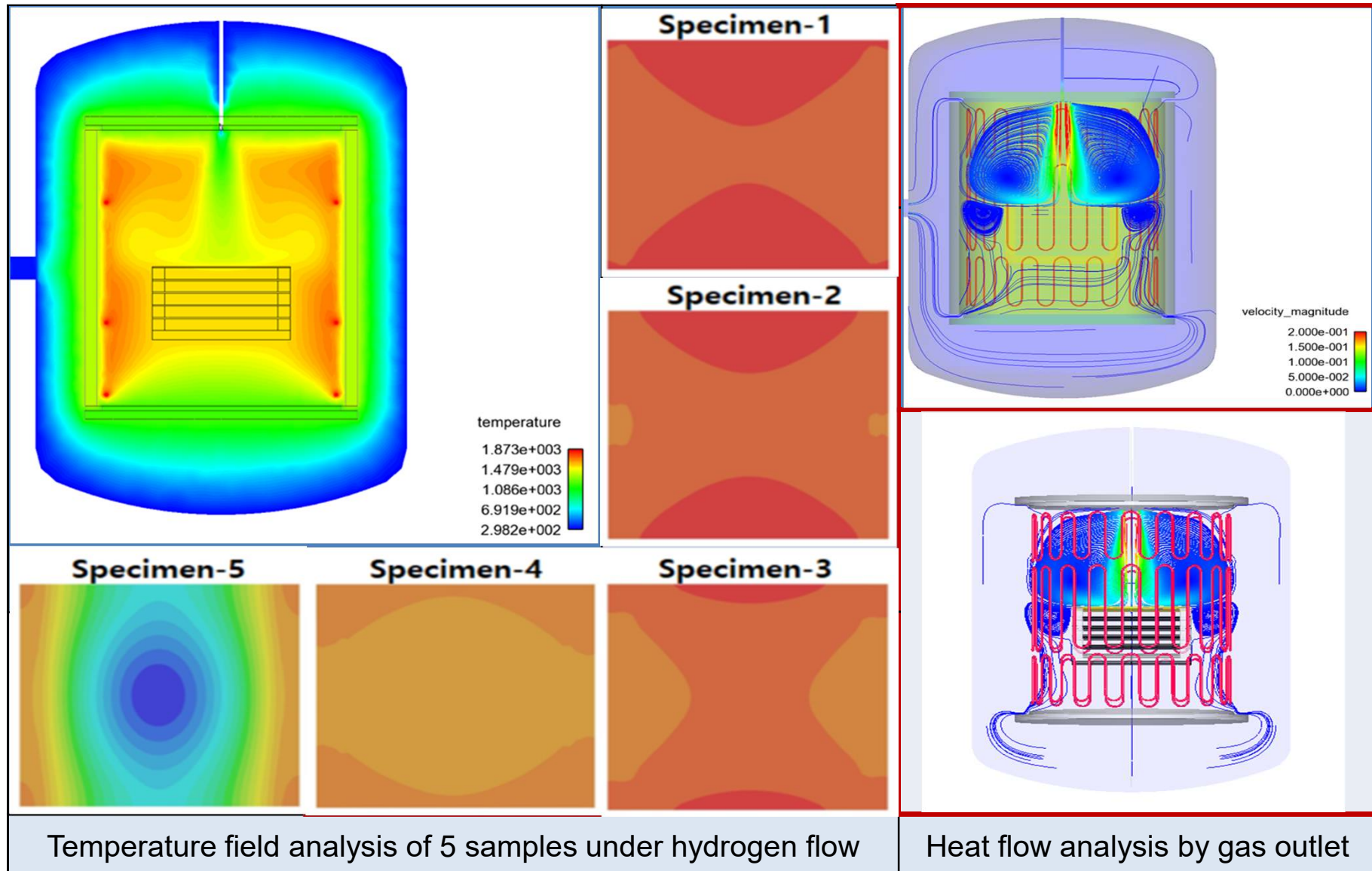
[Standard Dimension of Metal Heat Treatment Fce]

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°C			
Uniformity	±4 ~ 10°C			
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°C 5. Chamber type : Vertical or horizontal 6. Closed water circulation, sample loading car, gas buffer tank			

[Simulation of Heat Distribution Analysis]



[Simulation of Heat Flow Analysis]



[Details _ Vacuum Chamber]

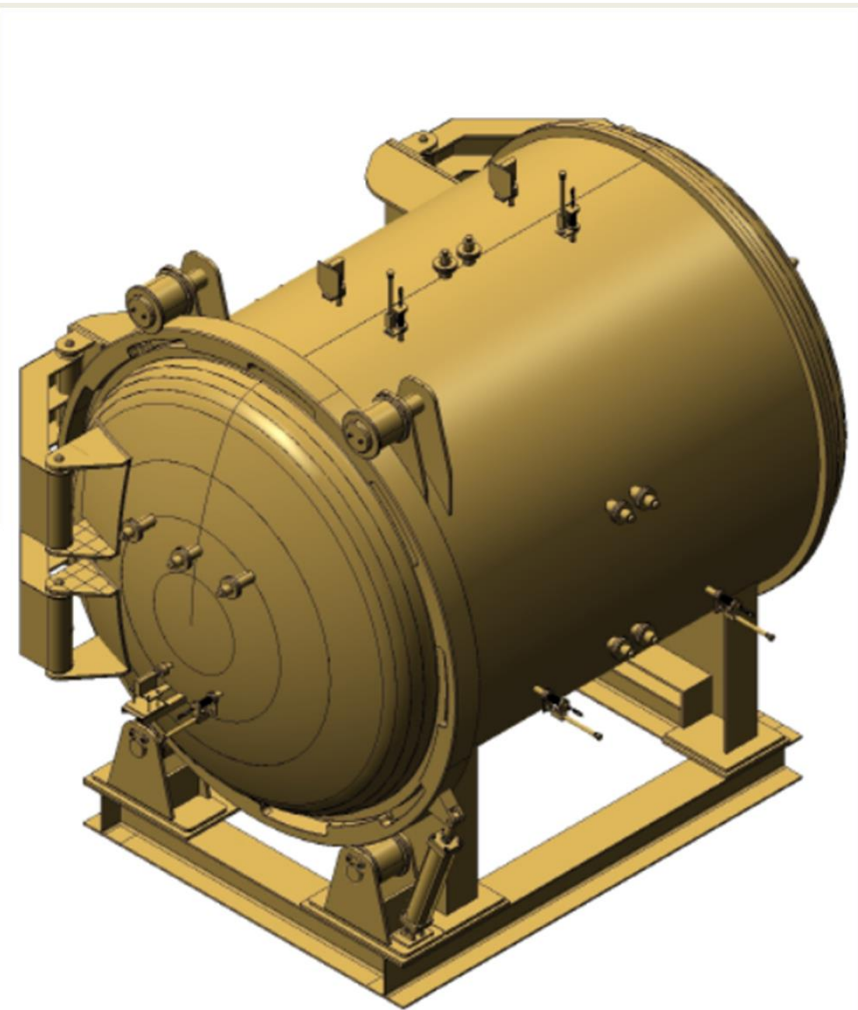
◆ Responding to product shape, loading capacity & method and installation site layout

Boundary Conditions

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

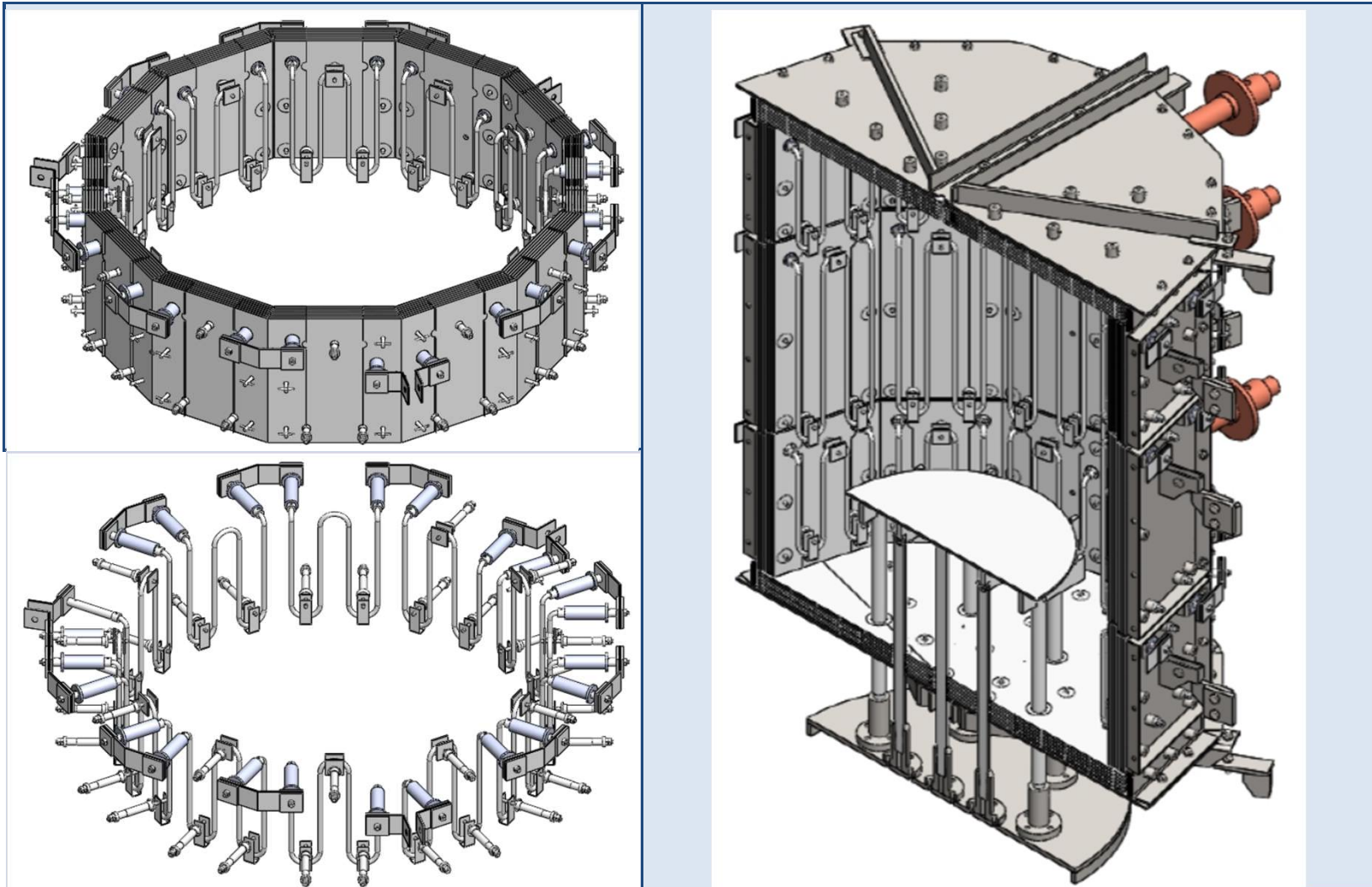
Fabrication

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



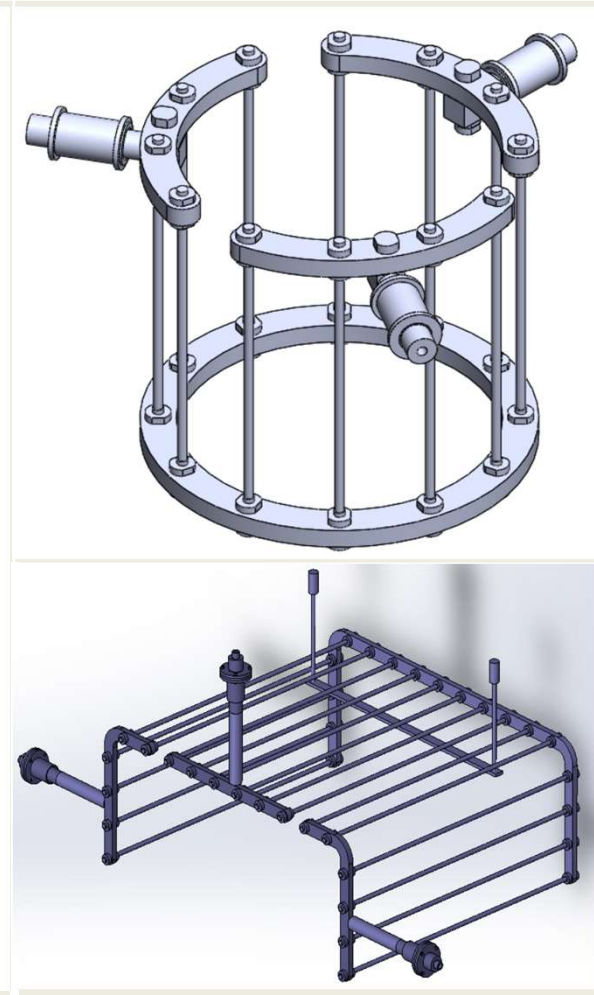
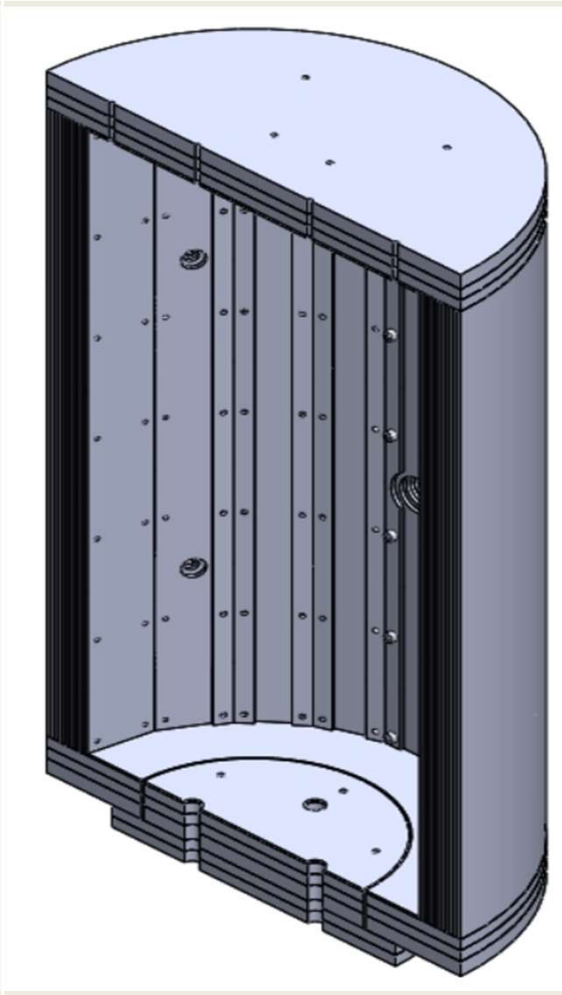
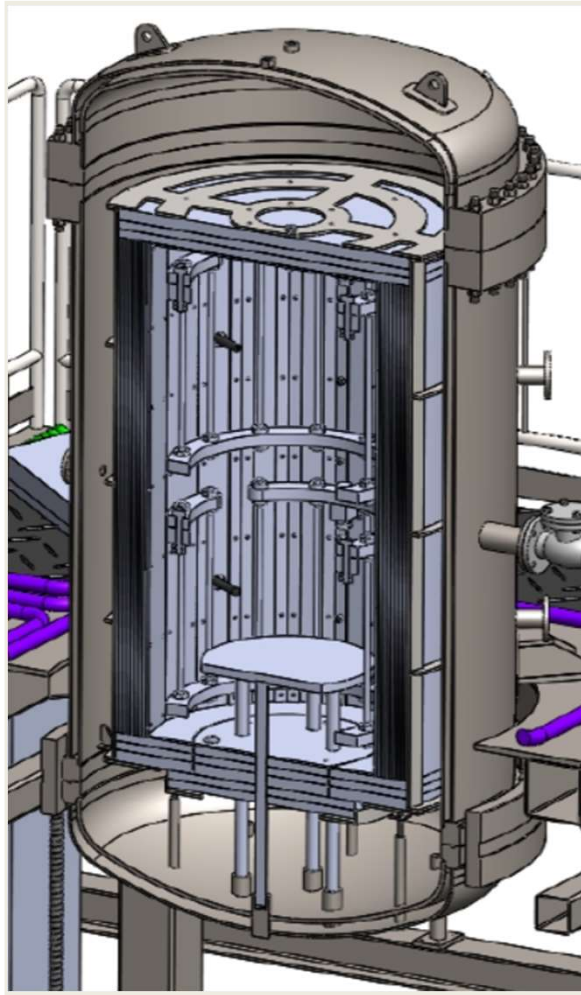
[Details _ Hot Zone _ Molybdenum]

◆ Responding to operating temperature, process atmosphere and loading conditions



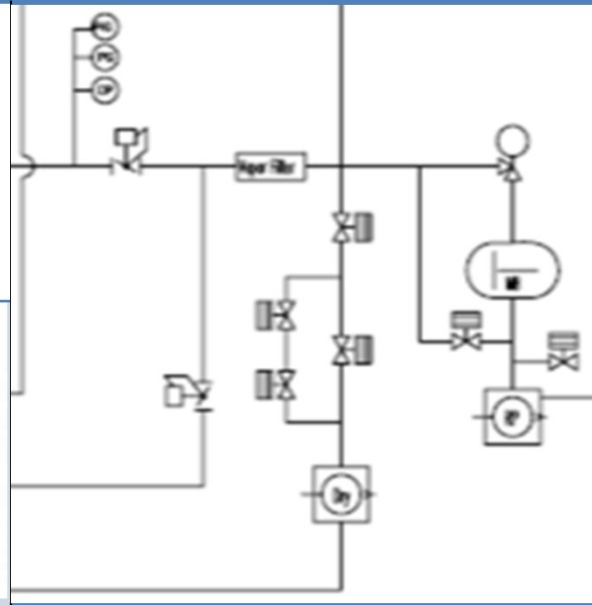
[Details _ Hot Zone _ Graphite]

◆ Responding to operating temperature, process atmosphere and loading conditions



[Details _ Evacuation System]

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

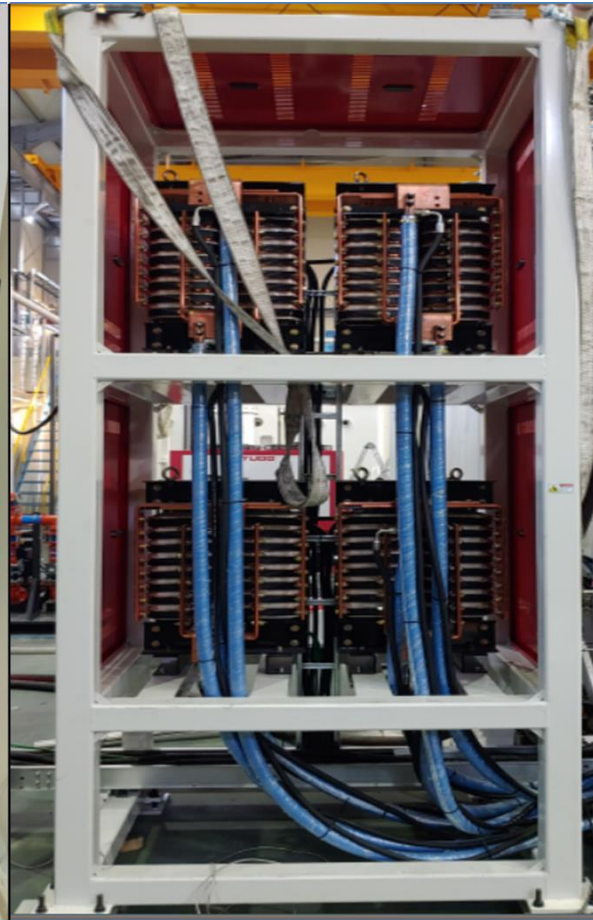
		
Vacuum pumps	Vacuum gauges	Suction line control
▶ Dry pump or Oil rotary pump ▶ Mechanical booster pump ▶ Diffusion pump or Cryogenic pump	▶ Low : Pirani or Diaphragm ▶ High : Ionization or Penning ▶ Points : Chamber/piping sides	▶ Slow pumping or normal pumping ▶ Vacuum or partial gas control ▶ Cooling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

- ▶ Heat resistant blower
- ▶ Heat exchangers
- ▶ Intra vs. extra circulation

Sample loading

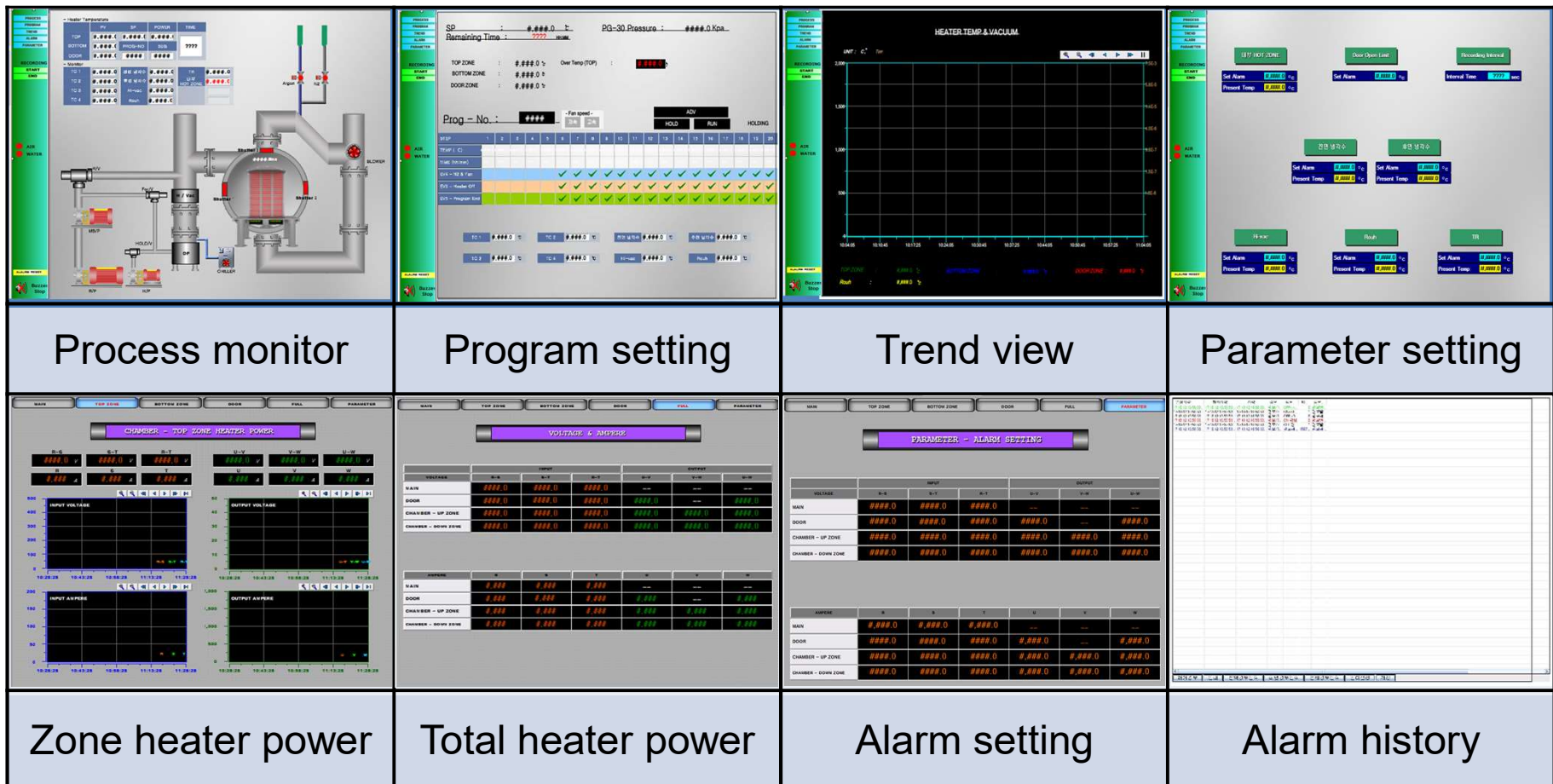
- ▶ Electric drive, hydraulic power
- ▶ Up/down, back and forth
- ▶ Single operator, Remote control

By-product trapping

- ▶ 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



[Site View of Metal Heat Treatment Furnaces]

◆ Molybdenum fce for Cu+Al₂O₃ brazing, carbon fce for oxygen-free copper sintering

