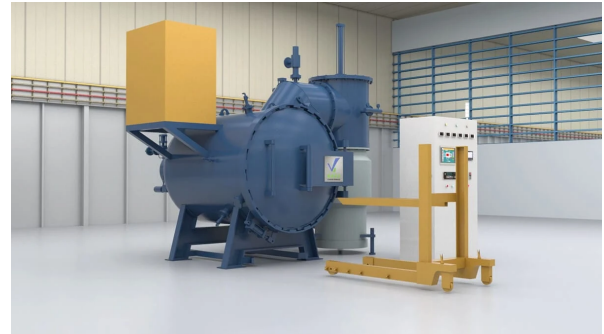


SYNTE SYSTEM SELECTION GUIDE

Vacuum Heat Treatment Furnace Systems

Route comparison for gas quenching, oil quenching, carburizing, annealing and tempering.

Compare process routes before selecting a chamber, model or quotation basis.



VTG

Gas quenching

VTO

Oil quenching

FZSC2

Carburizing

VTA / VTH

Anneal / temper

Use this document to

Screen the application, compare reference configurations, identify the engineering variables that change the proposal, and define measurable quotation and acceptance inputs.

Current online reference

<https://syn-v2.com/vacuum-furnace-systems/vacuum-heat-treatment-furnace/>

All published values are reference data for preliminary selection. Final configuration, supply scope and acceptance conditions are controlled by the project proposal and technical agreement.

SYNTE APPLICATION-LED ENGINEERING

01 / ROUTE COMPARISON

Choose the process route first

The route should be selected from the required material result and production logic. Nominal temperature or chamber size alone cannot distinguish a suitable system.

Route	Primary result	Cooling / process feature	Reference envelope
VTG	Clean hardening / solution treatment	6 or 10 bar gas cooling	1320°C; 100-1500 kg
VTO	High-severity hardening	Separate oil-quench chamber	1320°C; 100-800 kg
FZSC2	Case hardening	300-2000 Pa LPC + gas/oil quench	1320°C; 150-5000 kg
VTA	Annealing / stress relief	Vacuum or gas + controlled cooling	1300°C; 100-1500 kg
VTH	Post-quench tempering	Ni-Cr or Mo heating; 2 bar gas ref.	700/1100°C; 100-1000 kg

Route-by-route decision map

Route	Best-fit objective	Production logic	Critical input
VTG	Through hardening and solution treatment	Clean high-pressure gas cooling	Alloy, section, load density and cooling result
VTO	Higher quench severity	Vacuum heating plus oil quench	Transfer, oil, basket and post-cleaning boundary
FZSC2	Low-pressure carburizing / carbonitriding	Boost-diffuse plus gas or oil quench	Case profile, gas stages, quench and sampling
VTA	Annealing and stress relief	Controlled heat and cool under vacuum/gas	Incoming state, surface, cycle and distortion
VTH	Tempering after hardening	700°C Ni-Cr or 1100°C Mo route	Incoming hardness, toughness target and repeat cycles

Decision rule

Select the route that meets the result with the simplest controllable process boundary. Add pressure, binder management, high-pressure quenching or continuous handling only when the application evidence requires it.

02 / INPUT DEFINITION

Define the load, cycle and result

A useful selection worksheet separates part data, process data, production demand and the acceptance method.

Input block	What to define	Evidence to attach
Material / starting state	Exact grade, feedstock, binder, filler or prior heat treatment	Chemistry and incoming-state evidence
Part / assembly	Drawing, critical surfaces, section thickness and orientation	2D/3D drawing and marked inspection points
Complete load	Parts + trays/setters/fixtures/carrier; gross mass and center of gravity	Loaded arrangement drawing and bill of mass
Thermal route	Ramp, equalization, soak, cooling and unload target	Existing qualified curve or required result
Vacuum / gas	Pressure stages, gas purity, flow, dew point, exhaust and backfill	Utility data and contamination limits
Production	Good parts/batch or hour, shifts, yield, changeover and uptime	Capacity calculation assumptions
Acceptance	Test method, sample location, pass limit, records and witness points	Standard, control plan or signed method

Usable-zone rule

Size the furnace from the complete loaded envelope, not the largest loose part. Include tooling, gas-flow or radiation clearance, transfer clearances and the planned sensor arrangement.

03 / ARCHITECTURE

Connect the subsystems to one cycle

Vacuum, heating, gas, cooling, handling and controls must be evaluated against the same load and acceptance cases.

Subsystem	Configuration decision	Required project input
Chamber & loading	Orientation, usable zone, door, transfer and service access	Load drawing, handling method and site geometry
Hot zone	Heater/shielding material, zones, sensors and insulation	Peak/use temperature, chemistry and uniformity basis
Vacuum train	Pump stages, valves, gauges, isolation and pressure-rise test	Working pressure, outgassing and pump-down target
Process gas	Purge/backfill, flow/pressure control, exhaust and safety	Gas type, purity, dew point, consumption and site rules
Cooling / quench	Gas, oil, water or programmed furnace cooling	Metallurgical result, load density and cycle target
Controls / records	Recipes, interlocks, alarms, roles, trends and export	Traceability fields, protocols and retention
Utilities	Power, water, gas, air, exhaust, floor and environment	Confirmed site data at the installation point

Engineering notes

Note 01

Choose quench severity from alloy, section size and distortion limits

Note 02

Specify usable work zone and gross load including fixtures

Note 03

Surface condition depends on chamber cleanliness, hot zone and vacuum/gas route

Note 04

FAT/SAT should connect thermal, vacuum, cooling and witness-load evidence

04 / PROCUREMENT

Make quotations technically comparable

Request the same boundaries and acceptance evidence from every supplier. This prevents a low initial price from hiding missing auxiliaries, interfaces or test scope.

Comparison block	What the proposal should state
Performance basis	Empty or loaded condition, sensors, duration and allowable deviation
Supplied scope	Main furnace, pumps, chiller, gas train, tooling, loading, spares and commissioning
Utilities	Installed power, connected load, water duty, gas demand, exhaust and air
Controls	Recipe count, records, protocols, user levels, remote support and data export
Factory acceptance	Inspection points, dry run, vacuum/thermal tests, witness load and report format
Site acceptance	Installation boundary, utility responsibility, SAT, training and open-item closure
Lifecycle	Consumables, maintenance access, recommended spares and service response route

Send with the enquiry

RFQ 01 alloy and starting state	RFQ 02 target hardness/case/microstructure
RFQ 03 load drawing	RFQ 04 cooling route
RFQ 05 cycle time	RFQ 06 inspection and records

SYNHTE engineering review

Email info@synthe-corp.com or WhatsApp +86 155 3785 7393. Current system page: <https://syn-v2.com/vacuum-furnace-systems/vacuum-heat-treatment-furnace/>