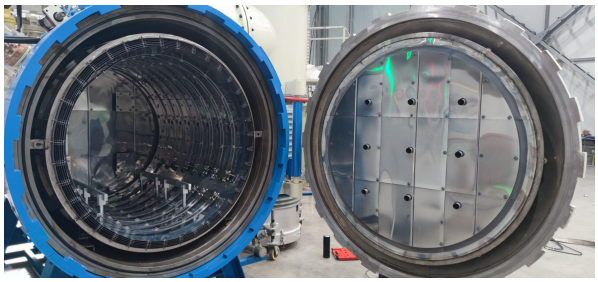
SYNHTE PRODUCT TECHNICAL GUIDE

VTG Vacuum Gas Quenching Furnace

Reference configurations for high-vacuum heating and 6 / 10 bar inert-gas cooling.

From published reference data to an application-matched furnace specification.



1320°C	6 × 10□³ Pa	6 / 10 bar	100-1500 kg
Maximum temperature	Ultimate vacuum	Cooling pressure options	Published loading range

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-heat-treatment-furnace/vacuum-gas-quenching-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.

SYNHTE APPLICATION-LED ENGINEERING

01 / APPLICATION

Application fit and process boundary

Use the furnace family as a starting point. The correct configuration is determined by material, complete loaded geometry, process result, throughput and measurable acceptance evidence.

Application 01

Tool and die steels

Application 02

High-speed and alloy steels

Application 03

Stainless-steel solution treatment

Application 04

Titanium-alloy dehydrogenation

Application 05

Precision parts requiring clean surfaces and distortion control

Typical process route

01	02	03	04	05
Load	**Evacuate & preheat**	**Austenitize / solution**	**Gas quench**	**Verify**
Fixture orientation and thermocouple strategy	Clean staged heating	Qualified temperature and soak	Pressure, flow and heat-rejection duty	Hardness, structure, distortion and records

Stage	Primary control	RFQ / qualification question
Load	Fixture orientation and thermocouple strategy	Define input, control limit and evidence owner
Evacuate & preheat	Clean staged heating	Define input, control limit and evidence owner
Austenitize / solution	Qualified temperature and soak	Define input, control limit and evidence owner

Suitable when

Clean inert-gas cooling supports bright surfaces and reduced post-cleaning | Cooling performance must be assessed on the qualified production load | Fixture and gas-flow design directly affect repeatability

Re-check the route when

Sections requiring higher quench severity may need an oil-quench assessment | A pressure value alone does not define cooling performance without the load and circulation system

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02 / ENGINEERING

System architecture and sizing logic

SYNHTE reviews the furnace as a connected process system. Each subsystem is selected against the same loaded cycle and acceptance plan.

Subsystem	Engineering scope	Input that changes the choice
Process chamber	Usable zone, orientation, door/loading route and service clearances	Largest complete production load and site access
Hot zone	Heating material, insulation/shielding, zones and sensor arrangement	Temperature, chemistry, contamination and survey basis
Vacuum / gas	Pump train, valves, gauges, purge/backfill and process-gas control	Pressure range, outgassing, gas purity and cycle time
Cooling / quench	High-pressure gas circuit, controlled oil route, programmed cooling or natural/assisted cooling as applicable	Target metallurgical result, load density and utilities
Handling / tooling	Tray, fixture, setter, basket, carrier or press interface	Drawing, mass, center of gravity and repeatability
Controls & records	PLC/HMI recipes, interlocks, alarms, trends and batch identity	User roles, data fields, protocols and retention
Installation	Electrical, water, gas, exhaust, floor/loading and maintenance boundary	Site utility data and local safety requirements

Four engineering decisions that should stay connected

Quench demand

Alloy, section size and target cooling response

Gas circuit

Pressure, gas, fan, heat exchanger and flow path

Load density

Part spacing, fixture blockage and complete mass

Quality

TUS, witness load, hardness and distortion evidence

SYNHTE project path

Application review → configuration and utility definition → technical agreement → manufacturing and assembly → FAT / documentation → installation, SAT and process handover as agreed in the project scope.

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03 / REFERENCE DATA

Published configuration envelope

The published VTG family range uses a maximum temperature of 1320°C, ±5°C temperature uniformity, 6 × 10□³ Pa ultimate vacuum and 0.5 Pa/h pressure-rise data.

Model	Effective work zone W × H × L (mm)	Reference load (kg)	Heating power (kW)	Cooling pressure (bar)
VTG-335	300 × 300 × 450	100	80	6 / 10
VTG-446	400 × 400 × 600	200	100	6 / 10
VTG-557	500 × 500 × 700	300	120	6 / 10
VTG-669	600 × 600 × 900	500	150	6 / 10
VTG-8812	800 × 800 × 1200	800	240	10
VTG-1115	1000 × 1000 × 1500	1500	550	10

How to read the table

The usable work zone must contain parts, fixtures, trays/setters, transfer clearance and the qualified sensor arrangement. Reference load is not a substitute for a gross loaded drawing. Vacuum, temperature and cooling values require an agreed test condition.

What changes the final configuration

Option / feature	Selection trigger	Engineering impact
6 or 10 bar nitrogen/argon cooling route	Material chemistry or contamination requirement	Changes heater/shielding compatibility and maximum useful temperature
Graphite or molybdenum hot zone	Pump-down, cleanliness or working-pressure target	Changes pump train, gauges, isolation and acceptance tests
High-speed circulation fan and heat exchanger	Load geometry, orientation or factory handling	Changes chamber orientation, tooling and clearances
Diffusion or molecular pumping options	Cooling result, cycle time or surface requirement	Changes gas/oil/water duty and heat-rejection design
Custom chamber orientation, fixtures and loading	Traceability, integration or quality-system need	Changes controls, I/O, records and FAT/SAT cases
PLC, touchscreen, data logging and traceability	Site utility, maintenance or safety constraint	Changes supplied auxiliaries, layout and interface scope

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04 / QUALIFICATION

RFQ, proposal and acceptance framework

A precise enquiry reduces redesign and makes supplier proposals comparable. Attach drawings and define the pass/fail method wherever possible.

Input block	Information to provide	Preferred evidence
Material / process	Alloy grade, starting condition and section thickness	Drawing, value, method or standard
Part / tooling	Target hardness, microstructure and distortion limit	Drawing, value, method or standard
Cycle / atmosphere	Part/fixture envelope, load density and batch mass	Drawing, value, method or standard
Production	Cooling gas, target cooling rate and cycle time	Drawing, value, method or standard
Site / utilities	Production volume, utilities and plant constraints	Drawing, value, method or standard
Quality / records	Required TUS, vacuum, recipe and acceptance records	Drawing, value, method or standard

Recommended acceptance evidence

Thermal

Defined survey or loaded-cycle evidence, sensor locations and allowable deviation

Vacuum / atmosphere

Pump-down, ultimate/working pressure, pressure-rise or gas condition under stated test conditions

Functional

Recipes, interlocks, alarms, manual recovery and agreed utility-loss cases

Process result

Witness-load or sample evidence using agreed hardness, leak, density, dimensional, joint or metallographic methods

Documentation

Approved drawing, utilities, manuals, component list, records and test reports in the agreed scope

Site

Installation boundary, SAT checks, training and open-item closure responsibility

Direct engineering contact

Email info@synthe-corp.com or WhatsApp +86 155 3785 7393. Include this document title and the current product page: https://syn-v2.com/vacuum-heat-treatment-furnace/vacuum-gas-quenching-furnace/

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