

SYNTE PRODUCT TECHNICAL GUIDE

VTH Vacuum Tempering Furnace

Configuration guide for post-quench tempering, stress relief and bright heat treatment.

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



700°C

Ni-Cr package

1100°C

Molybdenum package

100-1000 kg

Reference load

2 bar

Gas cooling reference

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-tempering-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 / 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, mould and high-speed steels after hardening	Application 02 Alloy steels requiring controlled toughness and stress relief
Application 03 Bright tempering under vacuum or protective gas	Application 04 Long, tubular or thin-wall parts needing vertical loading

Typical process route

01	02	03	04	05
Define incoming state Grade, prior process and target result	Load & protect Fixture, vacuum or gas route	Heat Ramp and equalization	Soak & cool Qualified time-temperature-cooling path	Verify Hardness, structure, stress or dimensions

Stage	Primary control	RFQ / qualification question
Define incoming state	Grade, prior process and target result	Define input, control limit and evidence owner
Load & protect	Fixture, vacuum or gas route	Define input, control limit and evidence owner
Heat	Ramp and equalization	Define input, control limit and evidence owner
Soak & cool	Qualified time-temperature-cooling path	Define input, control limit and evidence owner
Verify	Hardness, structure, stress or dimensions	Define input, control limit and evidence owner

Suitable when	The tempering route starts with the incoming metallurgical state Hot-zone, pumping and cooling options are selected together Loaded acceptance conditions should be agreed before equipment release
Re-check the route when	A furnace temperature rating alone does not establish cycle capability Unspecified incoming hardness or prior heat treatment makes result guarantees unreliable

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

Thermal duty Tempering temperature, load mass and cycle time	Surface result Vacuum/gas, hot-zone cleanliness and contamination limits
Cooling Rate, unload temperature and distortion risk	Qualification Survey condition, witness load and batch records

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.

03 / REFERENCE DATA

Published configuration envelope

The VTH package is selected from the hardened condition, target hardness/toughness, complete load, operating temperature, vacuum level, cooling target and acceptance plan.

Selection parameter	Current published envelope
Usable work zone	300 × 300 × 500 to 800 × 800 × 1200 mm
Reference loading	100-1000 kg
Ni-Cr heating route	Up to 700°C
Molybdenum heating route	Up to 1100°C
Vacuum options	Better than 4×10^{-4} Pa or 4×10^{-3} Pa
Gas cooling	2 bar reference; qualify with load and target

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
Horizontal or vertical loading	Material chemistry or contamination requirement	Changes heater/shielding compatibility and maximum useful temperature
Two-stage or three-stage pumping packages	Pump-down, cleanliness or working-pressure target	Changes pump train, gauges, isolation and acceptance tests
Optional engineered convection for suitable lower-temperature loads	Load geometry, orientation or factory handling	Changes chamber orientation, tooling and clearances
Recipe control, batch data and safety interlocks	Cooling result, cycle time or surface requirement	Changes gas/oil/water duty and heat-rejection design

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	Grade, incoming heat-treatment state and drawing	Drawing, value, method or standard
Part / tooling	Final hardness/stress-relief objective	Drawing, value, method or standard
Cycle / atmosphere	Setpoint, ramp, soak and repeat cycles	Drawing, value, method or standard
Production	Complete part and fixture load	Drawing, value, method or standard
Site / utilities	Vacuum, gas and unload-temperature target	Drawing, value, method or standard
Quality / records	TUS, witness load, records and FAT/SAT scope	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-tempering-furnace/>

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