

SYNTE PRODUCT TECHNICAL GUIDE

FZSC2 Vacuum Carburizing Furnace

Low-pressure carburizing and carbonitriding configurations with gas- or oil-quench routes.

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



1320°C

Maximum temperature

300-2000 Pa

Carburizing range

6-16 bar

Gas-quench options

150-5000 kg

Published load span

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-carburizing-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 Gears, shafts and transmission components	Application 02 Tool, mould and alloy-steel parts
Application 03 Low-pressure carburizing and carbonitriding	Application 04 Clean production requiring programmed boost/diffusion stages

Typical process route

01	02	03	04	05
Load & heat Clean vacuum heating to process temperature	Boost Controlled carbon-bearing gas input	Diffuse Develop the specified carbon profile	Quench Gas or oil route matched to section	Verify Case depth, hardness, structure and distortion

Stage	Primary control	RFQ / qualification question
Load & heat	Clean vacuum heating to process temperature	Define input, control limit and evidence owner
Boost	Controlled carbon-bearing gas input	Define input, control limit and evidence owner
Diffuse	Develop the specified carbon profile	Define input, control limit and evidence owner
Quench	Gas or oil route matched to section	Define input, control limit and evidence owner
Verify	Case depth, hardness, structure and distortion	Define input, control limit and evidence owner

Suitable when	Carburizing and quenching are sized as one metallurgical route Load density changes gas access, heating and cooling behavior Acceptance needs a defined sampling location and test method
Re-check the route when	Through-hardening without a case requirement may suit VTG or VTO A nominal case-depth target without steel grade and sampling method is not enough for quotation

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

Case target Effective/total depth, surface carbon and tolerance	Steel/load Grade, geometry, density and fixture mass
Boost/diffuse Gas, pressure, stage logic and control model	Quench Cooling severity, distortion limit and inspection

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 current platform lists $\pm 5^{\circ}\text{C}$ uniformity, $\leq 4 \times 10^{-3}$ Pa ultimate-vacuum option and < 0.67 Pa/h pressure rise. Gas-quench pressure options are 6, 10, 12 or 16 bar.

Model	Quench route	Working chamber (mm)	Load	Heating
FZSC2-60	Gas or oil	600 × 400 × 400	150 kg	60 kW
FZSC2-80	Gas or oil	750 × 500 × 500	300 kg	80 kW
FZSC2-120	Gas or oil	900 × 600 × 600	500 kg	120 kW
FZSC2-220	Gas or oil	1200 × 800 × 800	1000 kg	220 kW
FZSC2-300	Oil quench	1500 × 1500 × 800	5000 kg	300 kW

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
Programmed enrichment and diffusion stages	Material chemistry or contamination requirement	Changes heater/shielding compatibility and maximum useful temperature
Gas-quench or separate oil-quench chamber route	Pump-down, cleanliness or working-pressure target	Changes pump train, gauges, isolation and acceptance tests
Automatic/manual control with recipe records	Load geometry, orientation or factory handling	Changes chamber orientation, tooling and clearances
Case-depth and quench acceptance planned as one process	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	Steel grade, starting structure and drawing	Drawing, value, method or standard
Part / tooling	Required case depth, carbon profile and hardness	Drawing, value, method or standard
Cycle / atmosphere	Part/fixture envelope and load density	Drawing, value, method or standard
Production	Carburizing gas and boost/diffusion strategy	Drawing, value, method or standard
Site / utilities	Gas or oil quench result and distortion limit	Drawing, value, method or standard
Quality / records	Metallography, hardness, records and acceptance 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-carburizing-furnace/>

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