

SYNTE PRODUCT TECHNICAL GUIDE

VTM Vacuum Diffusion Bonding & Brazing Furnace

Pressure-assisted high-vacuum joining data for plate stacks, cooling structures and precision alloy assemblies.

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



1200°C

Maximum temperature

$\leq 5 \times 10^{-3}$ Pa

Working vacuum

200 T

Hydraulic press

VTM-555 / 855

Published configurations

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-brazing-furnace/vacuum-diffusion-bonding-brazing-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 Titanium and stainless-steel plate stacks	Application 02 Liquid-cooling plates and internal-channel structures
Application 03 Dissimilar-metal transition joints	Application 04 Aerospace panels, laminates and precision assemblies

Typical process route

01	02	03	04	05
Prepare stack	Evacuate & heat	Apply force	Bonding dwell	Cool & inspect
Surface, interface and tooling definition	Controlled thermal expansion and vacuum	Force, stroke and flatness control	Temperature-pressure-time route	Release tooling and verify joint/dimensions

Stage	Primary control	RFQ / qualification question
Prepare stack	Surface, interface and tooling definition	Define input, control limit and evidence owner
Evacuate & heat	Controlled thermal expansion and vacuum	Define input, control limit and evidence owner
Apply force	Force, stroke and flatness control	Define input, control limit and evidence owner
Bonding dwell	Temperature-pressure-time route	Define input, control limit and evidence owner
Cool & inspect	Release tooling and verify joint/dimensions	Define input, control limit and evidence owner

Suitable when

Pressure-assisted joining is selected from interface physics and load path | Tooling is part of the qualified process, not an afterthought | Force, displacement, temperature and vacuum records should share one batch identity

Re-check the route when

Assemblies that only require filler-metal brazing may not need a press system | Uncontrolled surface preparation or contact flatness cannot be corrected by furnace force alone

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	Controlled cooling selected around filler solidification, part mass, distortion and throughput	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

Load path Contact area, tooling stiffness and press alignment	Thermal field Stack geometry, sensors and uniformity
Vacuum route Outgassing, cleanliness and pump selection	Evidence Joint strength, leak, flatness and 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

Current VTM reference data also lists ≤ 0.3 Pa/h pressure rise, $\pm 1^\circ\text{C}$ control accuracy, 100 mm press stroke, ≤ 0.1 mm plate flatness and ≤ 0.04 mm displacement precision.

Model	Uniform hot zone (mm)	Max. temp.	Working vacuum	Press force	Heating power
VTM-555	500 × 500 × 500	1200°C	$\leq 5 \times 10^{-3}$ Pa	200 T	150 kW
VTM-855	800 × 500 × 500	1200°C	$\leq 5 \times 10^{-3}$ Pa	200 T	180 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
Graphite or metal hot-zone engineering	Material chemistry or contamination requirement	Changes heater/shielding compatibility and maximum useful temperature
Direct or interlayer-assisted bonding routes	Pump-down, cleanliness or working-pressure target	Changes pump train, gauges, isolation and acceptance tests
Double-door horizontal chamber configuration	Load geometry, orientation or factory handling	Changes chamber orientation, tooling and clearances
Automatic/manual interlocked press and furnace control	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	Material grades and joint/interface drawing	Drawing, value, method or standard
Part / tooling	Loaded contact area, tooling stack and required force	Drawing, value, method or standard
Cycle / atmosphere	Temperature, pressure and vacuum cycle	Drawing, value, method or standard
Production	Part/fixture envelope and total mass	Drawing, value, method or standard
Site / utilities	Joint verification and dimensional acceptance	Drawing, value, method or standard
Quality / records	Utilities, FAT/SAT and data-record requirements	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-brazing-furnace/vacuum-diffusion-bonding-brazing-furnace/>

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