

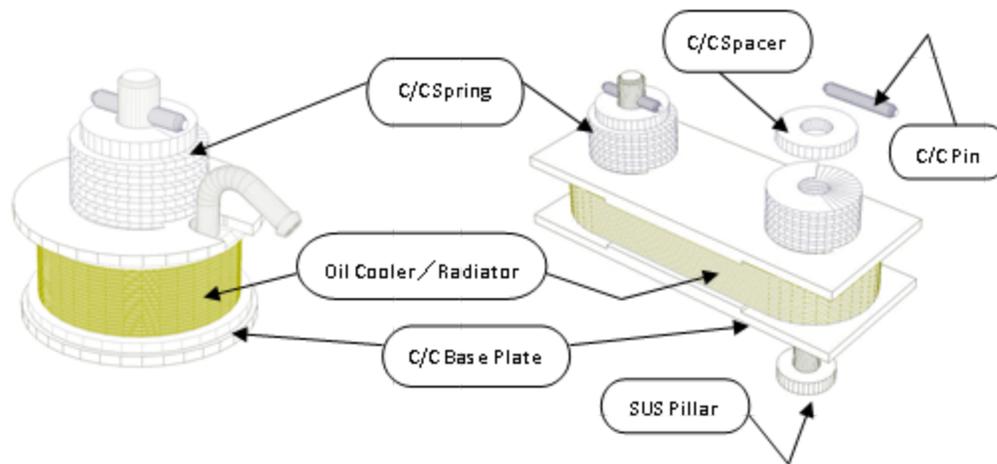
Carbon-Carbon Brazing Fixture

C/C brazing fixtures are widely used for manufacturing automotive parts, such as radiators and oil coolers, via the aluminum and copper vacuum brazing process. Their adoption is driven by the unique thermal and mechanical properties of C/C composite material.



C/C Brazing Fixture: Design, Components, Assembly

A typical carbon-carbon (C/C) brazing fixture features a layered design, utilizing two C/C plates to firmly secure the product throughout high-temperature brazing, thereby guaranteeing dimensional stability. A crucial element for achieving strong, uniform braze joints is the integrated C/C coil spring, which applies consistent load to promote optimal contact and filler material flow.

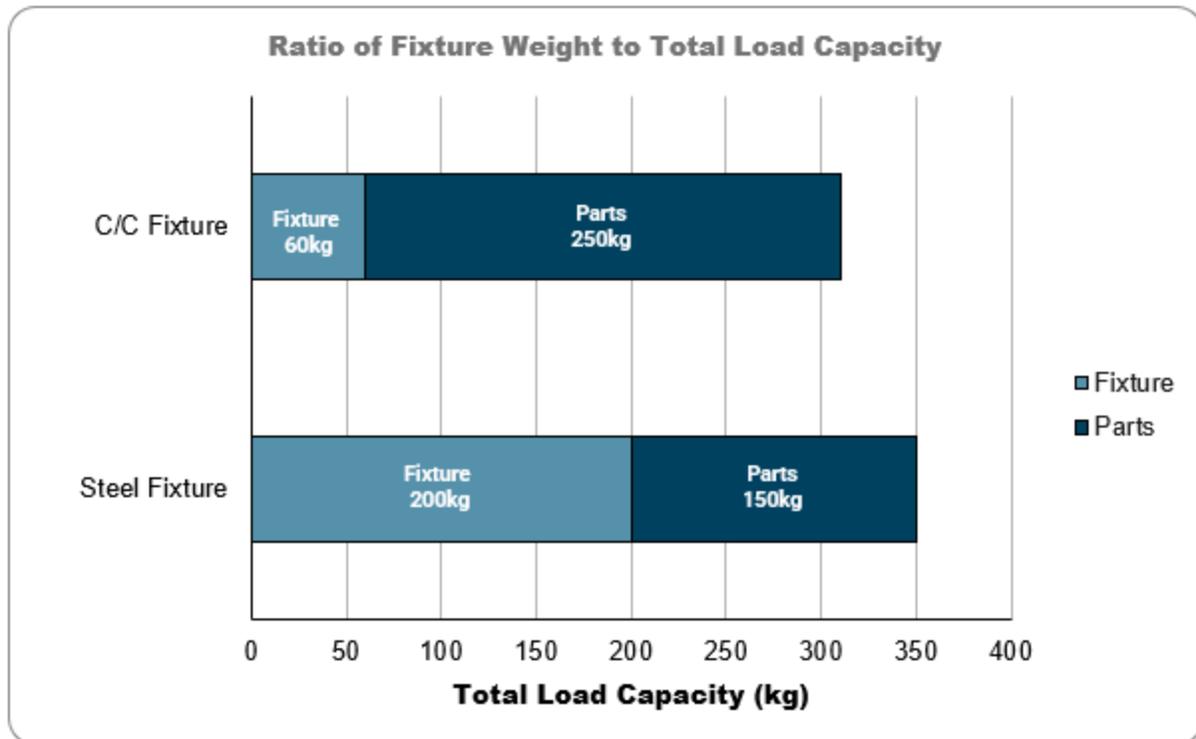


C/C composites are chosen for their exceptional high-temperature properties: high thermal stability (withstanding over 1000°C), low thermal expansion (minimizing stress and warping), and inertness in non-oxidizing atmospheres (preventing contamination). These properties ensure the fixture maintains integrity and accuracy over multiple cycles, yielding high-quality, reliable braze joints in demanding industrial applications.

Key Benefits of Carbon-Carbon Brazing Fixture

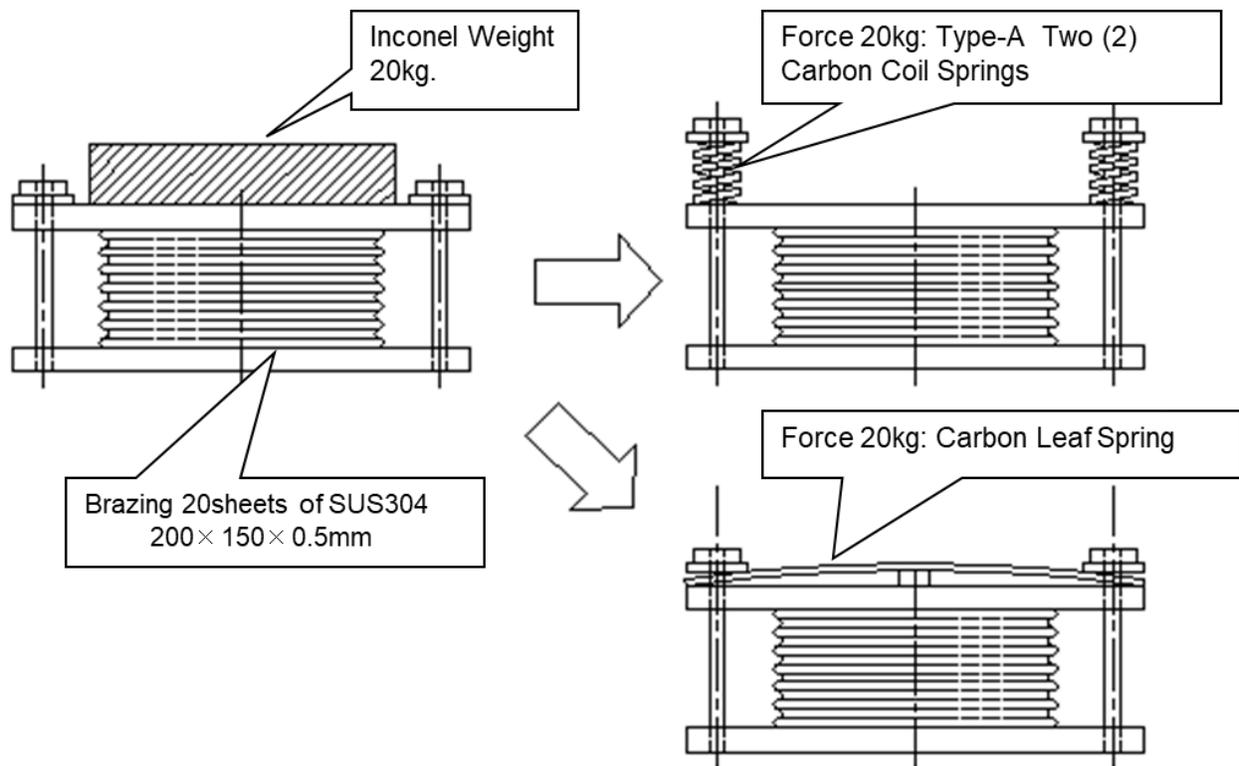
Significant Fixture Weight Reduction

In heat treating, including brazing, the furnace heating capacity and maximum load weight are two important factors that determine the total load (fixture weight + parts weight) processed in a single cycle. The figure below illustrates a case in which C/C brazing fixtures were used to increase production volume. On a furnace with a total load capacity of 350 kg, C/C brazing fixtures (66 kg) replaced stainless steel fixtures (200 kg). This change drastically reduced the ratio of fixture weight to total load capacity, making it possible to carry more parts and achieving a significant increase in the quantity of parts processed per cycle.



Improved Production Operations

Traditional metal brazing fixtures often require heavy supplementary weights to apply a constant load on a part. However, Carbon-Carbon (C/C) composite fixtures provide a modern alternative, replacing these weights with lightweight C/C springs.



For instance, a required 20 kg load, which necessitates a 20 kg metal weight, can be replicated using just two C/C coil springs that weigh only 70 grams each. This represents a massive reduction in mass. Under suitable conditions, C/C leaf springs can also be utilized.

This dramatic weight difference—20 kg of metal versus 140 g of C/C springs—directly translates to improved ergonomics, safety, and performance for production operators.

Minimized Maintenance Requirements

With metal fixture brazing, when parts are aligned too closely, the shadow from the supplementary weights has a tendency to block radiant heat. This, in addition to the heat capacity of the weights themselves, compromises heating uniformity and leads to defects in the brazed parts. To maintain uniform heating in this situation, the parts must be positioned with sufficient space between them, which limits the quantity of parts processed per cycle, even when the furnace is operating below its maximum load capacity.

In a C/C brazing setup, the fixture is very compact and does not encounter the problems mentioned above. Consequently, a decrease in the defect rate and an increase in process quantity are achieved.

Enhanced Durability and Extended Lifespan

The long-term durability of brazing fixtures is crucial for maintaining part quality. Over time, metal fixtures are prone to thermal deformation (creep) caused by repeated high-temperature cycling. This warping compromises the fixture's integrity and directly leads to dimensional distortion in the finished parts.

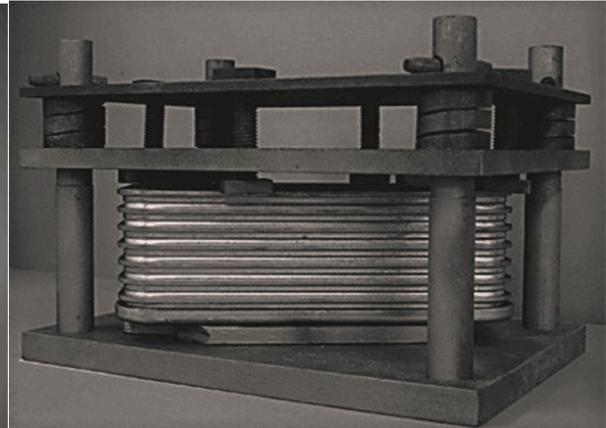
C/C composite fixtures, on the other hand, exhibit exceptional thermal stability. They maintain their structural strength and shape across a vast temperature range (room temperature to 2000°C). This inherent resistance to deformation ensures consistent part accuracy and gives C/C fixtures a significantly longer service life than their metal counterparts.

Increase in Total Production Volume

In addition to C/C brazing fixtures, the base trays used to hold the fixtures can also be made from C/C material for further improvements in production efficiency. There are reports that production volume has doubled merely from the optimized loading of C/C fixtures—all without any upgrades to the furnace or an increase in its load capacity.

In summary, adopting Carbon-Carbon (C/C) brazing fixtures delivers critical advantages for high-temperature furnace operations, leading to:

- **Lower Energy Costs:** Reduced thermal mass requires less energy to heat.
- **Greater Efficiency:** Optimized loading increases throughput per cycle.
- **Reduced Downtime:** Superior durability minimizes maintenance needs.
- **Longer Fixture Life:** High resistance to thermal deformation extends service life.
- **Higher Production Volume:** Increased capacity and lower defect rates boost overall output.



Have Questions or Ready to Order?

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