

INDUSTRIAL BRAZING / CUSTOM COILS

APPLICATION-ENGINEERED COPPER INDUCTORS

INDUCTION BRAZING COILS

Custom geometry. Controlled joint heating. Repeatable production.

Helical • Pancake • Hairpin • Split • Channel • Quick-disconnect



Illustrative studio product visualization (not an authenticated photograph of a supplied HLQ unit). See original product gallery via the QR link on page 9.

COIL + JOINT + POWER SUPPLY

FILLER FLOW & QUALITY

WATER-COOLED COPPER

01 / WHY COIL DESIGN DECIDES JOINT QUALITY

Engineering-led induction brazing

A brazing coil is a custom electromagnetic tool that heats a defined joint region so a selected filler metal melts and wets the base metals without melting them.

Decision	Engineering requirement	Verification
Joint geometry	Tube OD, wall, lap, nearby components	Part drawing and assembly
Brazing filler	Alloy liquidus + compatible base materials	Filler certificate, flux specification
Coil electrical load	Generator, matching, coil impedance	Supplier approval, loaded run
Production cycle	Heating + handling + inspection	Documented trial
Coolant and protection	Flow, pressure, coolant quality	Functional alarm test

Core principle: Coil gap, turn arrangement, fixtures, process heat, and filler selection must be designed together. No fixed coil frequency or kW rating applies to every custom coil.

Three goals

Accurate field placement
Deliver heating near the joint while limiting unwanted component heating.

Filler wetting
Ensure both sides reach the appropriate braze temperature.

Repeatable production
Validate cycle time, clamp position, and cooling performance.

02 / COIL ARCHITECTURES

Choose geometry around access, not appearance

Coil format	Typical brazing joint	Key design watchpoint
Helical / encircling	Copper tube-to-fitting, round sleeve	Axial joint centering, end effects
Pancake / flat spiral	Carbide tips, flat tooling, plates	Surface access and heating gradient
U-shaped / hairpin	Side-access tubing or confined assemblies	Field balance near return conductor
Split / quick-disconnect	Fixed assemblies or high-mix production	Electrical contact repeatability and safety
Channel / multi-station	Multiple tubes, indexed production	Same joint geometry and spacing
Flux-concentrated	Nearby steel housings and tight zones	Ferrite thermal rating and stray heating

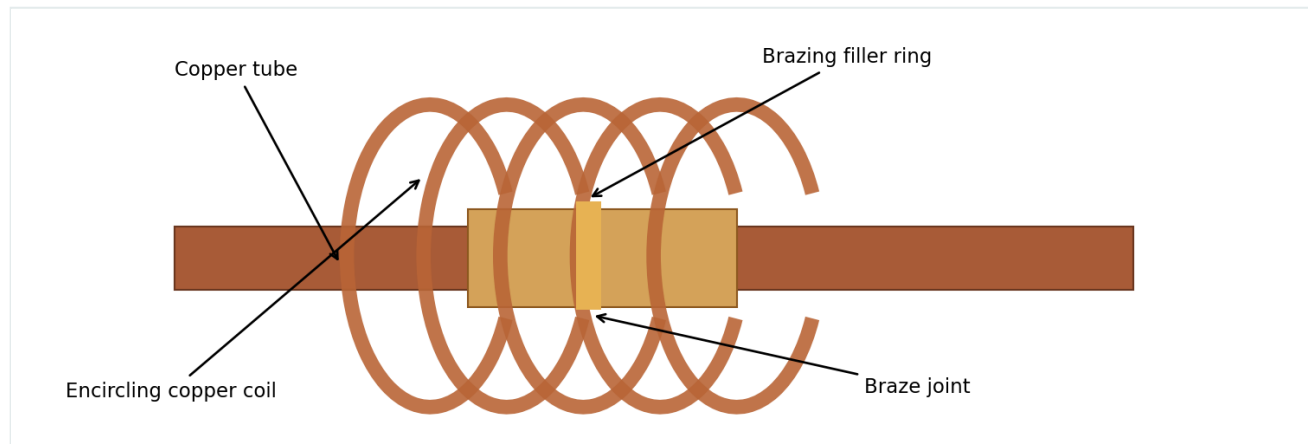
Original HLQ page documents pancake, helical, channel, quick-disconnect and other forms, but does not provide a universal part-number or frequency chart for the custom coil category.

Coupling gap

The site mentions **3.175-6.35 mm** as a typical helical-coil design range. It is historical guidance, **not a universal acceptable clearance**. Allowances depend on tube OD, heat expansion, insulation, loading motion and tolerances.

03 / HOW A BRAZE JOINT FORMS

Electrical heat meets metallurgical joining



Alternating current in the inductor produces a changing magnetic field. Eddy-current heating and thermal conduction bring both joint surfaces into the filler-metal process window. The base metals remain solid while liquid filler wets and moves through the joint by capillary action.

Joint	Filler direction	Important caution
Copper - copper	Cu-P or Cu-P-Ag may be used when approved	Observe filler specification; flux may be unnecessary on clean copper for certain alloys
Copper - brass	Compatible Ag-based filler; flux/oxide control	Consider Zn oxidation and actual brass grade
Copper - steel / stainless	Selected silver-base or qualified filler	Avoid phosphorus fillers on ferrous materials
Carbide - steel	Qualified silver-based filler, shim, flux	Limit differential expansion and thermal shock
Aluminum assemblies	Alloy-specific Al-based filler & flux/atmosphere	Narrow margin to base-metal solidus

Brazing fillers have liquidus above 450°C and below base-metal solidus; never choose an alloy from one temperature number alone.

04 / TECHNICAL SELECTION

RFQ specification matrix

Item	Requested / verified information
Coil product line	Custom copper induction brazing coil
Official fixed model / universal rating	Not published on target product page
Forms offered	Pancake, helical, channel, quick-disconnect, shaped
Conductor	Copper tube or plate, project-specific
Power / frequency	Matched to specified generator and application; not a universal figure
Coil ID / active length / pitch	Defined by joint and approved fabrication drawing
Coil-to-part clearance	Set by geometry and electrical/mechanical safety
Cooling water	Flow, pressure, inlet temperature, quality to be specified
Fixture / insulating stand	According to assembly access and repeatability
FAT	Filler flow, cycle time, visual and applicable leak tests

Comparative starting concepts

Material / application	Starting coil concept	Frequency statement
Copper HVAC tubing	Short helical or U-coil	Use HF/UHF as appropriate; validate kHz
Steel-to-carbide tool	Pancake or shaped localized coil	Depends on part and generator
Copper-to-stainless tube	Encircling / ferrite-aided	Balance unequal material heating
Aluminum tube-to-fitting	Localized spiral/pancake	Sensitive to filler/base melting margin

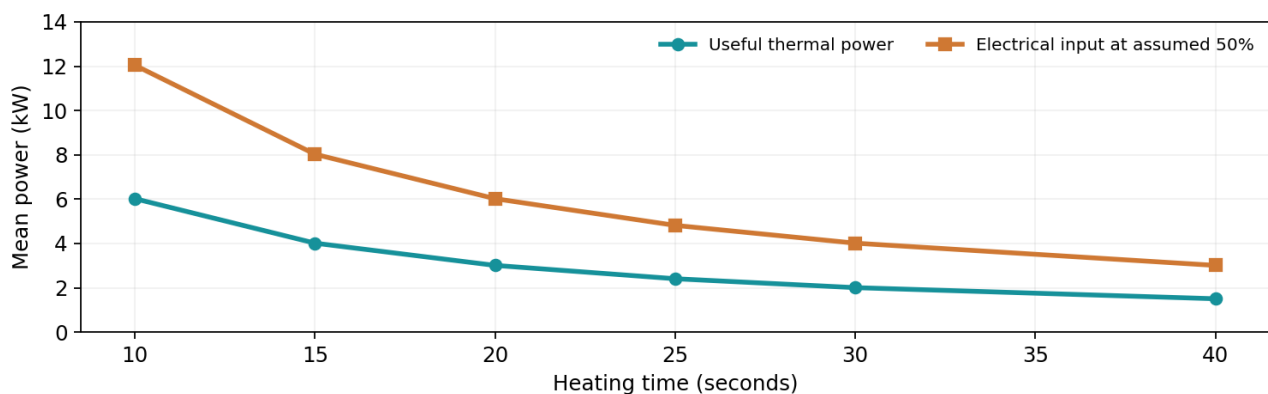
05 / THERMAL POWER CALCULATION

Illustrative copper joint heat-up

Example assumptions, NOT a published factory performance guarantee: 0.20 kg effective copper mass heated from 25°C to 725°C; average cp 0.43 kJ/kg·K.

$$Q = m \times c_p \times \Delta T = 0.20 \times 0.43 \times 700 = \mathbf{60.2 \text{ kJ}}$$

Useful average heating power = Q/time . At 20 s, **3.01 kW useful thermal power**. Assuming 50% overall electrical-to-useful-workpiece transfer purely for illustration, the average input would be **6.02 kW**.



These values exclude dedicated filler heat, fixturing, realistic variable specific heat, radiation, thermal distribution and inverter dynamics. The 50% value is an assumption, not an HLQ measurement.

06 / PUBLISHED APPLICATION EVIDENCE

Copper tubing - documented HLQ test

HLQ publishes a separate copper tubing brazing test using a **DW-UHF-10 kW system** and an available split laboratory coil. A **5.0-5.2 second** heat cycle produced filler flow on the described tube joint at a referenced temperature near **815°C**.

Published test field	Reported observation / status
Power supply	DW-UHF-10 kW model
Joint	Heavy-wall 5/16-inch test copper tubing, flange fit
Braze paste	505 alloy paste, per published page
Temperature reference	Approximately 1500°F / 815°C
Heat cycle	5.0-5.2 seconds, HLQ-published case
Temperature method	Tempilaque indication, not a continuous calibrated bath trace
Production coil	Final coil for the 12-joint arrangement was proposed, not proven in this test

This is a separate site-published case, NOT a test report for every coil offered on the present product page. Source: dw-inductionheater.com/product/brazing-copper-tubing-with-induction

Recommended acceptance checks

Measure joint temperature by a validated method; confirm complete braze fillet/wetting, cycle repeatability, cooling-interlock function, and the specified leak or mechanical test.

07 / OPERATIONS, QUALITY & FAQ

Operating and quality checklist

Problem / check	Action
Joint does not wet	Review filler chemistry, surface preparation, flux and joint temperature
One side overheats	Change coil position/turn geometry; reconsider dissimilar-metal coupling
Too many voids	Inspect joint fit, filler supply, cleaning and atmosphere
Generator unstable	Check load matching, coil connections and current
Coil overheats or leaks	Stop operation; verify coolant flow and repair approved assembly
Variable batch outcomes	Use fixtures and record power, time, temperature and part dimensions

FAQs

Can one coil serve several joints? Sometimes, if clearance, fit and heat demand are sufficiently similar.

Is 3-6 mm the ideal clearance? No. The website provides 3.175-6.35 mm as typical guidance for a helical design, not a universal rule.

Does the coil determine kW and kHz? No. The electrical system, material and load are engineered together.

Is copper-phosphorus filler suitable for steel? Generally avoid it; brittle phosphides can form. Select qualified fillers.

How is a coil accepted? By drawings, inspection, pressure/flow checks, and representative brazing quality tests.

08 / RFQ AND CONTACT

For an application-matched brazing coil

Send joint drawings and actual production targets so HLQ can review a suitable inductor configuration.

Please provide	Example / reason
Base materials	Copper-copper / copper-brass / steel-carbide
Drawing and joint clearance	Tube diameter, thickness, lap length, surrounding parts
Filler & flux	Grade, liquidus, preferred preform/paste
Thermal duty	Temperature, cycle, production pace
Existing power supply	Manufacturer, model, kW, permitted frequency
Coolant supply	Flow, pressure, inlet temperature
Inspection criteria	Leak, tensile, appearance, reliability

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View original product photo gallery

Scanned QR opens verified HLQ induction brazing coil product page.
Original-site product photos were not embedded because high-resolution source assets were not directly retrievable.

Sources: HLQ brazing-coils product page and copper tubing case; AWS brazing definition; Nickel Institute guidance on phosphorus fillers. Engineering examples labeled illustrative.