HLQ

INDUCTION HEATING EQUIPMENT

Induction Shrink Fitting for Production Assembly

Motor housings, rotors, gears, bearings and sleeves — fast, repeatable interference-fit assembly with HLQ high-frequency and medium-frequency induction heaters.



3.5–120 kW	Sec – min	120–300 °C	No flame
UHF / HF production heaters	heating time per part	typical fit temperatures	clean, automatable

01 Shrink fitting in production

In an interference fit the bore of the outer part is smaller than the inner part. Heating the outer part expands the bore so the parts slide together without force; on cooling they lock. In production lines — e-motor housings, rotors, gears, bearings — induction does this in seconds to minutes with a fixed coil, a timer or thermocouple, and no flame or oil.

Assembly	Heated part	Inserted part	Typical fit temperature
Stator into motor housing	Aluminium or steel housing	Stator core	≈ 150–250 °C
Rotor core onto shaft	Rotor laminations	Shaft	≈ 150–250 °C
Gear / camshaft gear onto shaft	Gear	Shaft	≈ 160–270 °C
Bearing onto shaft	Bearing inner ring	Shaft	≈ 110–120 °C (max)
Sleeve / ring onto rotor or roll	Sleeve, ring	Core, roll	≈ 150–300 °C



Motor housing heated for stator insertion.



HF coil heating a part for assembly.



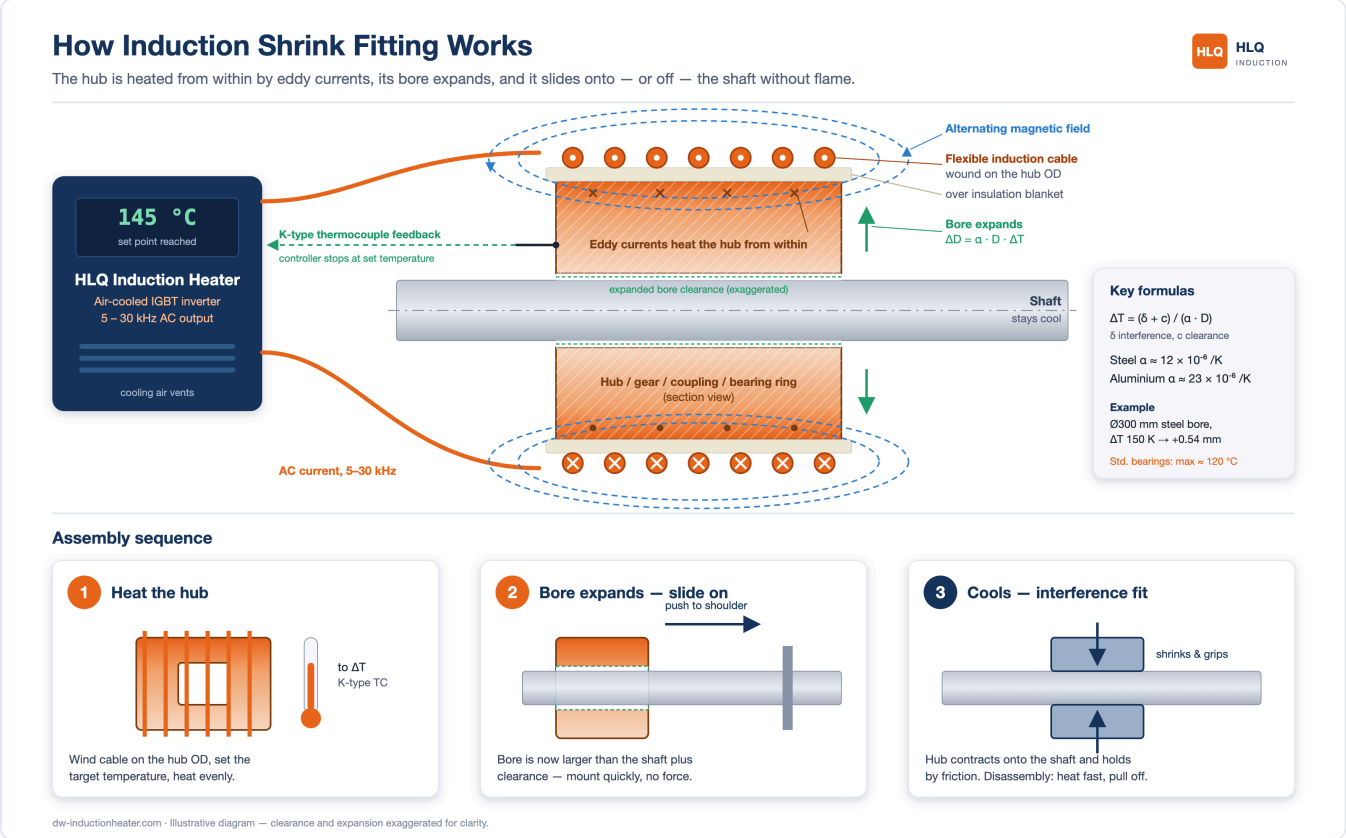
Rotor and shaft assemblies.

Four ways to heat for shrink fitting

Equipment	Frequency	Best for
UHF solid-state heater + fixed coil	≈ 100–400 kHz	Small precision parts, gears, small bearings
HF solid-state heater + fixed coil	30–80 kHz	Housings, rotors, gears and couplings in production
Mains-frequency bearing heater (yoke)	50/60 Hz	Rolling bearings and rings in maintenance
MF heater + flexible cable	2–36 kHz	Large or on-site parts — couplings, hubs, wheels

02 How induction shrink fitting works

An inverter drives alternating current through a coil around (or inside) the part. Eddy currents heat the part from within; the bore expands by ΔD = α · D · ΔT. When the bore exceeds the shaft plus a small clearance, the parts are joined and left to cool into an interference fit. Frequency sets heating depth: high frequency for small and thin parts, lower frequency for large sections.



Required temperature rise

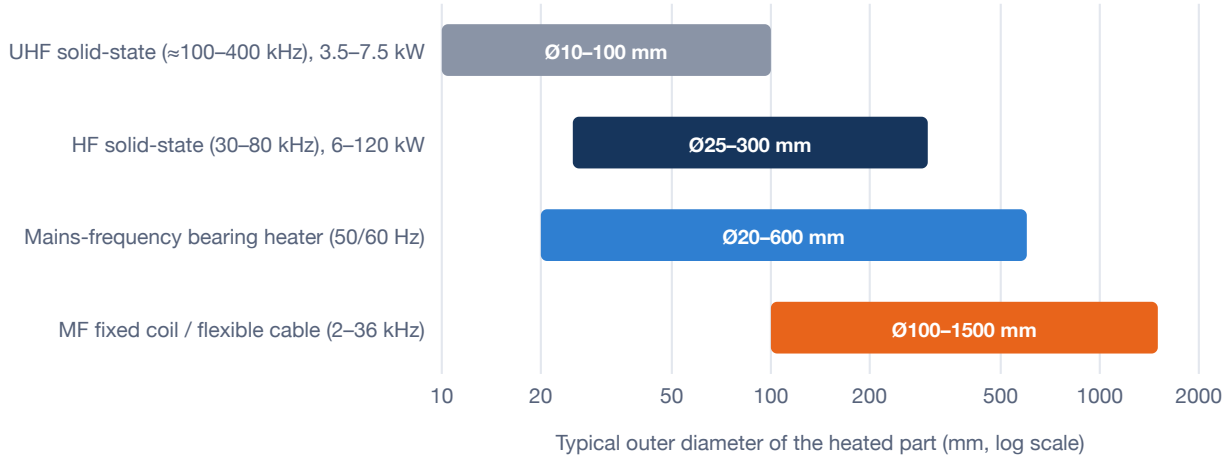
Interference + 0.05 % clearance	Steel hub ΔT (α 12)	Aluminium hub ΔT (α 23)
0.05 %	83 K	43 K
0.10 %	125 K	65 K
0.15 %	167 K	87 K
0.20 %	208 K	109 K

03 Equipment and technical data

Family	Power	Frequency	Coil	Typical cycle
HLQ UHF heaters (e.g. DW-UHF-3.5 / 6 kW)	3.5–7.5 kW	≈ 150–180 kHz in shrink-fit cases	Multi-turn helical, custom	1–4 min small parts
HLQ HF heaters (DW-HF-6 … 120 kW)	6–120 kW	30–80 kHz	Solenoid, internal, pancake	Seconds–minutes
Induction bearing heaters	Per model	50/60 Hz	Laminated yoke	Minutes
MYD / flexible-cable heaters	10–160 kW	2–36 kHz	Flexible cable	Minutes, large parts

04 Selection by chart

Chart A — Equipment family vs part size



Typical ranges — overlap is normal; the final choice depends on mass, wall thickness, cycle time and automation.

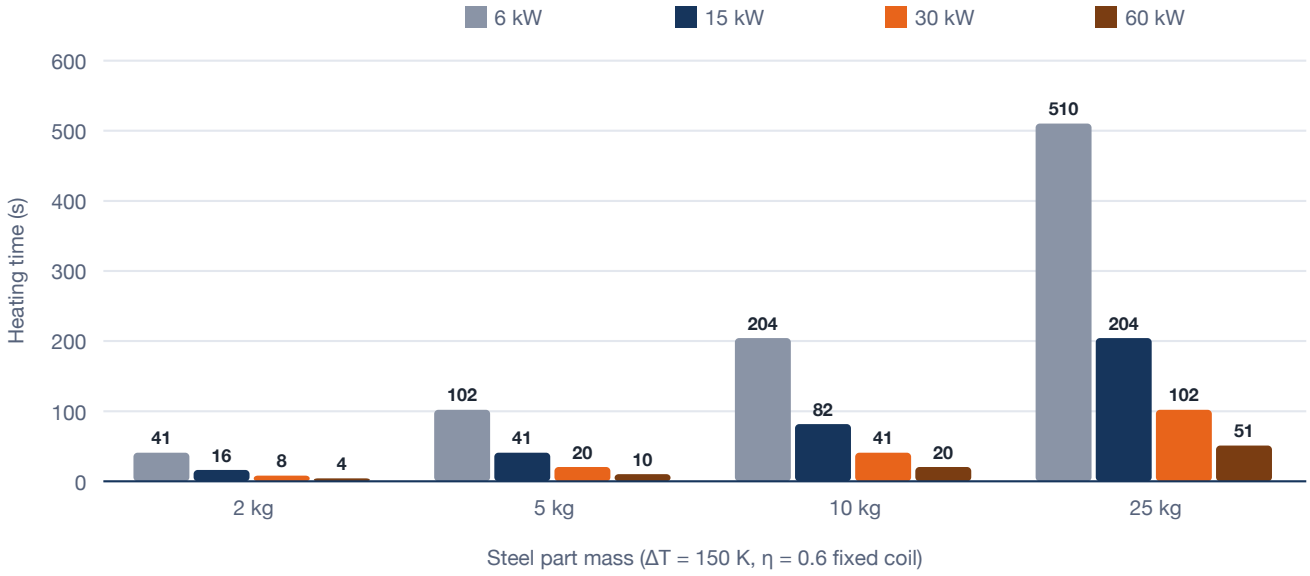
Recommended selection

Part	Recommended
Small gears, pins, bearings Ø10–100 mm, cycle ≤ 3 min	UHF 3.5–7.5 kW
Motor housings, rotors, gears Ø50–300 mm in a line	HF 15–60 kW, fixed coil
Rolling bearings in maintenance	Induction bearing heater
Parts > Ø300 mm or on site	MF flexible-cable heater

05 Cycle-time chart

t = m · c · ΔT / (P · η) · steel c = 0.49 kJ/kg·K (aluminium ≈ 0.90) · fixed-coil efficiency η ≈ 0.6

Chart B — Heating time by steel part mass and heater power (ΔT = 150 K)



For aluminium multiply by ≈ 1.8 (higher specific heat) but use about half the ΔT (higher expansion) — net heating energy is similar.

Measured HLQ application cases

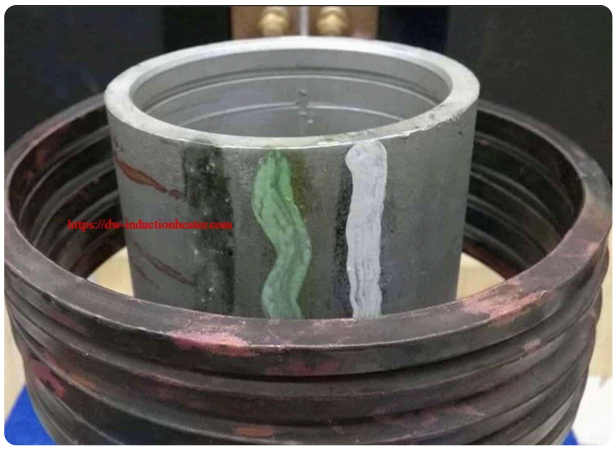
Part	Target	Equipment	Result
Steel camshaft gear, Ø152 × 51 mm	≈ 270 °C (518 °F)	DW-UHF-3.5 kW, 151 kHz	3 min, uniform expansion
Aluminium camshaft gear, Ø152 × 51 mm	≈ 160 °C (320 °F)	DW-UHF-3.5 kW, 158 kHz	4 min
Steel roller bearings, Ø25–89 mm	150 °C (300 °F)	DW-UHF-6 kW, 180 kHz, helical coil	Uniform ring growth
Aluminium pump housing, OD 73 mm (removal)	≈ 204 °C (400 °F)	DW-HF-6 kW at 5 kW	100 s; within 7-min target

06 Application examples



E-motor housings

Aluminium housings heated for stator insertion in automotive lines.



Pump housing removal

Housing expanded in 100 s to release an inserted part with minimal force.



Bearings on shafts

Rings heated to 150 °C in a helical coil.



Gears

Steel and aluminium gears expanded for shaft assembly.

Suitable materials

Material	α (×10^{-6} /K)	c (kJ/kg·K)	Notes
Carbon / alloy steel	≈ 12	≈ 0.49	Magnetic — efficient at all frequencies
Cast iron	≈ 10–11	≈ 0.46	Heat evenly to avoid cracking
Aluminium alloys	≈ 23	≈ 0.90	Low fit temperature; higher frequency or power
Stainless (austenitic)	≈ 16–17	≈ 0.50	Non-magnetic
Copper / bronze	≈ 17–19	≈ 0.39	Very conductive — needs high frequency

07 Frequently asked questions

What is induction shrink fitting?

Heating the outer part of an interference fit by induction so its bore expands, joining the parts, and letting them cool to lock together.

What temperature is used?

Typically 150–300 °C: lower for aluminium (large expansion), higher for steel; bearings ≈ 120 °C maximum.

Which frequency?

≈ 100–400 kHz for small parts, 30–80 kHz for housings, rotors and gears, 2–36 kHz flexible cable for large parts, 50/60 Hz yoke heaters for bearings.

How fast is it?

Seconds to a few minutes: a 5 kg steel part needs ≈ 41 s at 15 kW for ΔT 150 K (η 0.6).

Can it remove parts?

Yes — heat the outer part quickly; e.g. an aluminium pump housing released in 100 s at 5 kW.

Does it change material properties?

Fit temperatures are well below transformation temperatures, so properties are unchanged if limits are respected.

Why choose HLQ

Full frequency range
50 Hz to ≈ 400 kHz — the right heater for every part size.

Application testing
Coil and cycle proven on your parts in the lab.

Custom coils
Solenoid, internal, pancake and split designs.

Line integration
Timer, thermocouple or pyrometer control for automation.

Production and maintenance
Fixed-coil HF lines and flexible-cable field units.

No flame
Clean, safe and repeatable assembly.

Request an application test

Send drawings or samples — our lab will design the coil, confirm heating time and recommend the heater for your shrink-fit line.

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Please include in your inquiry

- Part drawing: material, OD, bore, width, weight
- Interference / fit class and maximum allowed temperature
- Required cycle time and parts per hour
- Manual station or automated line
- Power supply

