

**HLQ**

INDUCTION HEATING EQUIPMENT

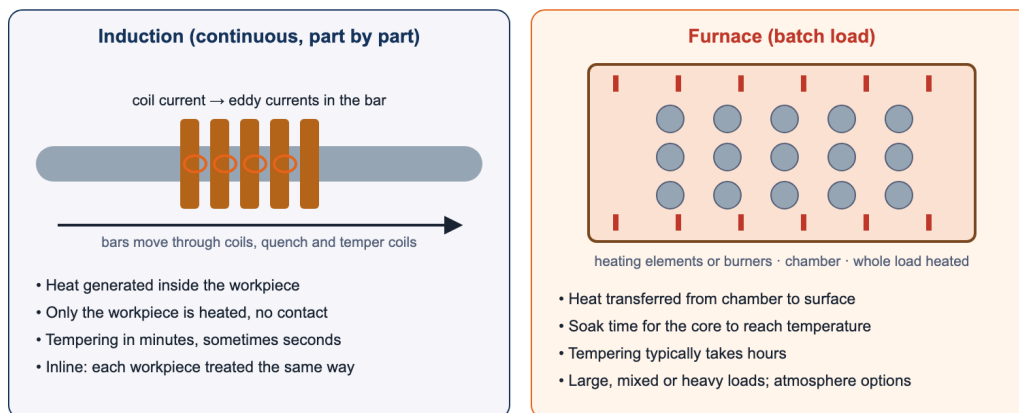
Induction vs Furnace Quenching and Tempering

An honest comparison from a supplier of both: induction Q&T lines heat bars and tubes part by part in seconds to minutes; furnaces heat batch loads with soak times of half an hour and more. Choose by part shape, batch size, atmosphere and output.

Induction vs Furnace Quenching and Tempering – Principle

HLQ

Induction generates heat inside each part; a furnace transfers heat from its chamber to the surface of a batch load.



Both routes austenitize above the upper critical temperature, quench, and temper below Ac1; they differ in how and how fast heat is applied.

Sources: HLQ induction tempering and Q&T line pages; HLQ bogie hearth and vacuum atmosphere furnace pages.

Schematic, not to scale.

9.9 s

Ø 20 mm bar to $\approx 816^{\circ}\text{C}$
(induction)

 ≥ 30 min

42CrMo4 furnace austenitize
hold

 ≥ 60 min

42CrMo4 furnace temper hold

100 kg–10 t

bogie furnace loads

01 Side-by-side comparison

Item	Induction Q&T	Furnace Q&T
Heat source	Heat generated inside the workpiece by eddy currents	Heat transferred from elements or burners to the load surface
Processing	Continuous, part by part, inline	Batch loads
Tempering time	Minutes, sometimes seconds (HLQ)	Typically hours (HLQ); 42CrMo4 data sheet: ≥ 60 min hold
What is heated	Only the workpiece	Chamber, fixtures and the whole load
Quality control	Individual workpieces; recipes per diameter and grade	Per batch
Part range	Bars, shafts, tubes Ø 15–150 mm (HLQ lines)	Heavy, large or mixed parts; bogie loads 100 kg–10 t
Atmosphere	Open air line	Vacuum / atmosphere furnaces available
Safety standards	IEC 60519 series (electroheating)	NFPA 86 for fuel-fired furnaces



HLQ medium frequency Q&T line for steel bars, and an HLQ electric resistance bogie hearth furnace.

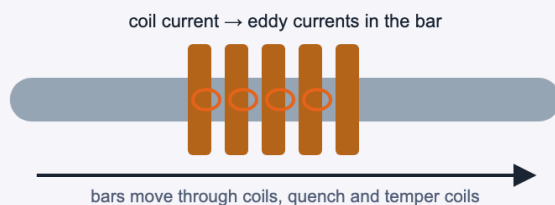
02 How each route heats

Induction vs Furnace Quenching and Tempering – Principle

HLQ

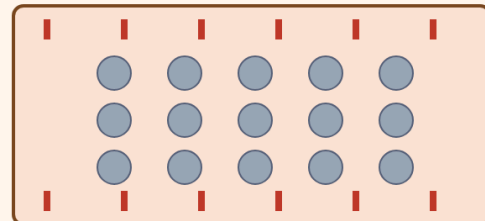
Induction generates heat inside each part; a furnace transfers heat from its chamber to the surface of a batch load.

Induction (continuous, part by part)



- Heat generated inside the workpiece
- Only the workpiece is heated, no contact
- Tempering in minutes, sometimes seconds
- Inline: each workpiece treated the same way

Furnace (batch load)



heating elements or burners · chamber · whole load heated

- Heat transferred from chamber to surface
- Soak time for the core to reach temperature
- Tempering typically takes hours
- Large, mixed or heavy loads; atmosphere options

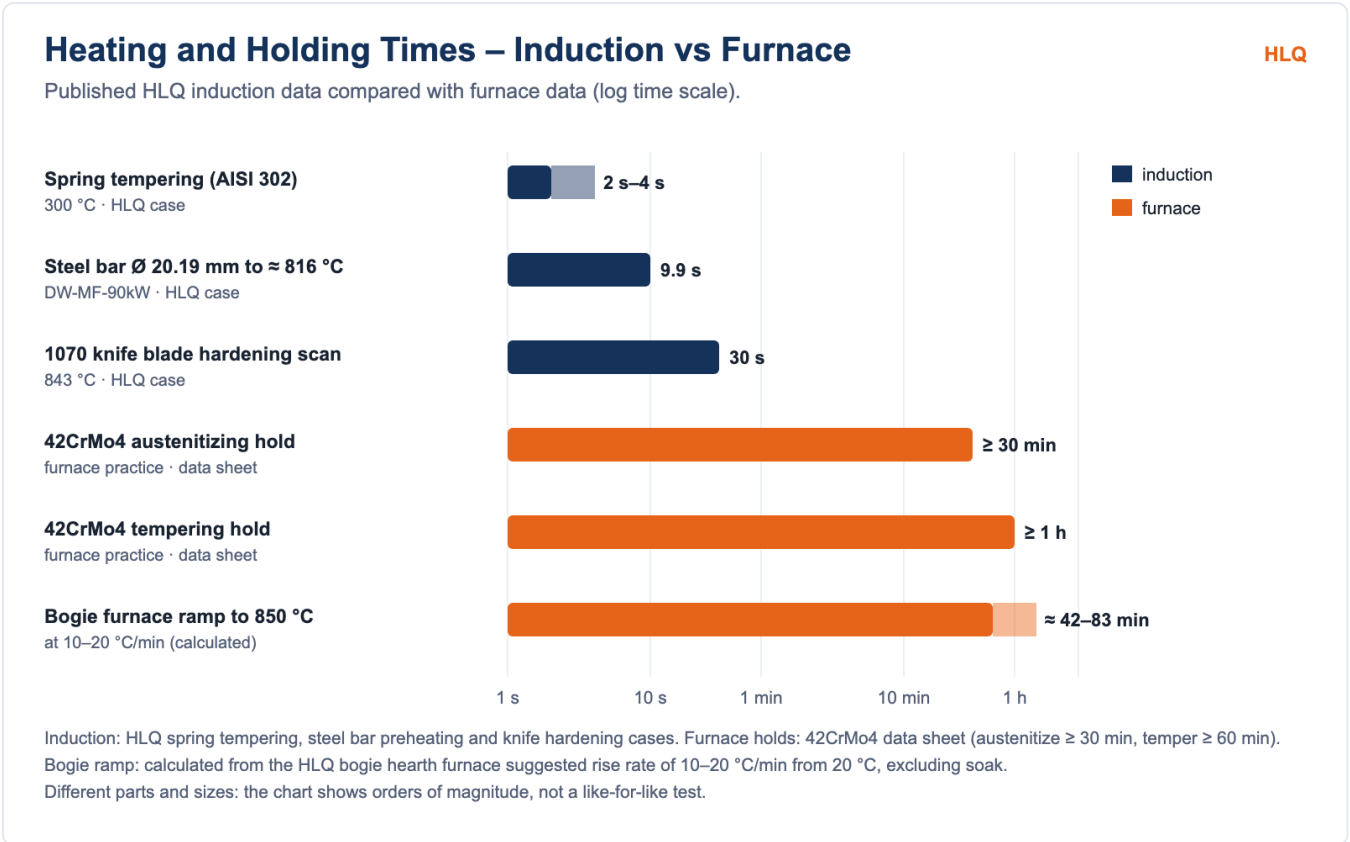
Both routes austenitize above the upper critical temperature, quench, and temper below A_{c1} ; they differ in how and how fast heat is applied.

Sources: HLQ induction tempering and Q&T line pages; HLQ bogie hearth and vacuum atmosphere furnace pages.

Schematic, not to scale.

Both routes austenitize, quench and temper. Induction generates heat inside each part; a furnace heats the chamber, and the heat reaches the core of the load by conduction during the soak.

03 Heating and holding times



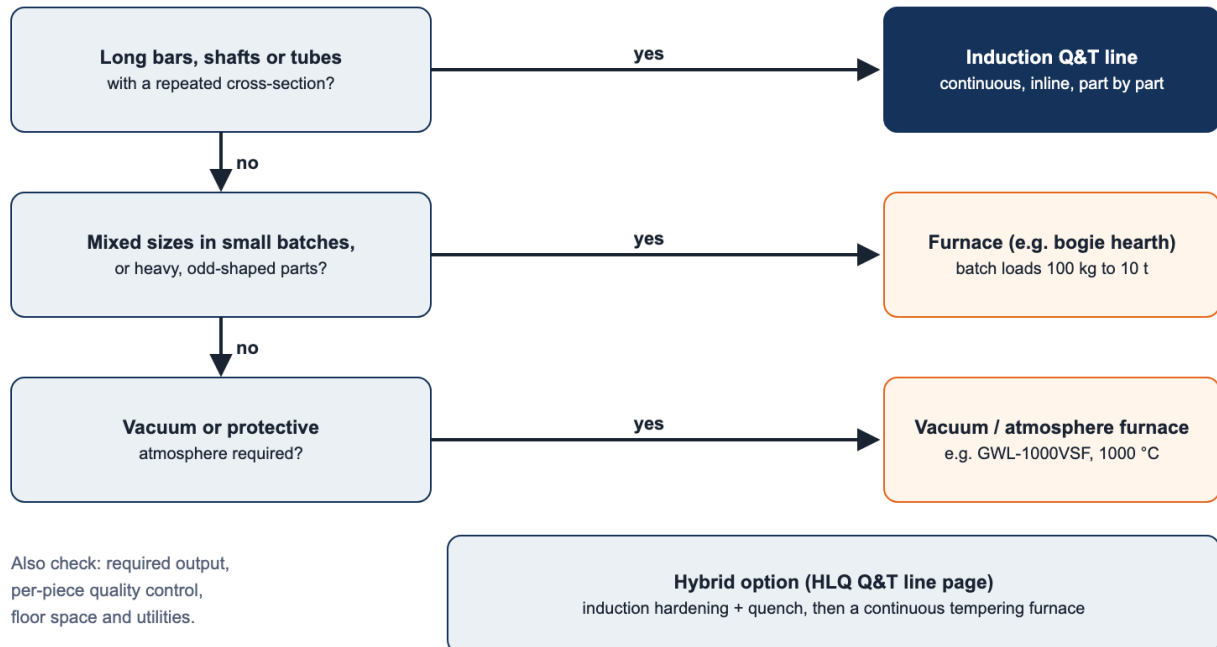
Data point	Time	Source
AISI 302 springs tempered to 300 °C	2–4 s	HLQ case
Ø 20.19 mm steel bar to ≈ 816 °C	9.90 s	HLQ case (preheating)
42CrMo4 austenitizing hold (furnace)	≥ 30 min	Steel data sheet
42CrMo4 tempering hold (furnace)	≥ 60 min	Steel data sheet
Bogie furnace ramp to 850 °C	≈ 42–83 min	Calculated from HLQ 10–20 °C/min

04 Decision flow and layouts

Induction or Furnace Q&T? – Decision Flow

HLQ

Selection logic based on HLQ induction and furnace data and HLQ engineering guidance.

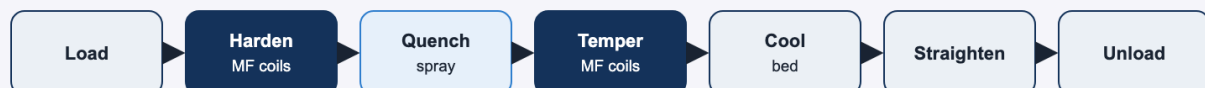


Induction Line vs Furnace Route – Typical Layouts

HLQ

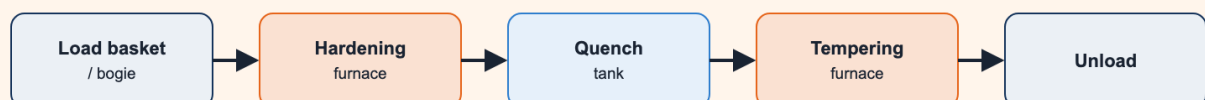
Schematic, not to scale. Material flow for continuous induction Q&T compared with a batch furnace route.

Induction Q&T line – continuous



One bar after another; less waiting and handling between quenching and tempering (HLQ Q&T line page).
Integrated temper stations save floor space (HLQ induction tempering page).

Furnace route – batch



The whole load moves as a batch between hardening furnace, quench tank and tempering furnace.
Suits heavy, large or mixed loads; HLQ bogie hearth loading platforms 100 kg to 10 t.
Vacuum / atmosphere furnaces add surface protection (HLQ GWL-1000VSF: 600 × 600 × 900 mm chamber).

Sources: HLQ medium frequency Q&T line, induction tempering, bogie hearth furnace and vacuum atmosphere furnace pages.

05 HLQ supplies both routes

Induction Q&T line	Power	Frequency	Diameter	Output
MF-Q&T-150	150 kW	8–15 kHz	Ø 15–40 mm	0.3–0.8 t/h
MF-Q&T-500	500 kW	3–8 kHz	Ø 30–80 mm	1.0–2.5 t/h
MF-Q&T-1000	1000 kW	2–4 kHz	Ø 50–150 mm	3.0–5.0 t/h

HLQ furnace	Key data
Electric bogie hearth GWL-STCS	Working temperature 1200–1800 °C by version; loading platform 100 kg–10 t; suggested rise 10–20 °C/min; control accuracy ± 1 °C
Vacuum atmosphere GWL-1000VSF	1000 °C; chamber 600 × 600 × 900 mm; 45 kW; max rise 15 °C/min; uniformity ± 5 °C



HLQ vacuum atmosphere tempering furnace.

06 Frequently asked questions

Which is faster?

Induction: HLQ tempers in seconds to minutes; furnace data sheets call for holds of 30–60 min and more.

Which suits long bars and tubes?

Induction Q&T lines, Ø 15–150 mm, continuous and inline.

Which suits heavy or mixed parts?

Furnaces, e.g. bogie hearth furnaces with 100 kg–10 t loads.

Can they be combined?

Yes: induction hardening and quench, then a continuous tempering furnace.

Which gives per-piece control?

Induction: each workpiece is treated and recorded individually.

When is a vacuum / atmosphere furnace needed?

When the surface must be protected by vacuum or atmosphere.

Why choose HLQ

Both routes

Induction lines and furnaces.

Honest selection

Process decides, not product.

Hybrid lines

Induction + tempering furnace.

Bars Ø 15–150 mm

MF-Q&T lines.

Heavy loads

Bogie 100 kg–10 t.

Atmosphere

Vacuum furnaces.

Not sure which route fits?

Send us the parts, sizes, steel grades, batch sizes and output. We will compare induction, furnace and hybrid options for your process.

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Factory address

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Dongguan City, Guangdong Province, China
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Please include in your inquiry

- Part type, size and weight
- Steel grades and targets
- Batch sizes and output
- Atmosphere requirements
- Power, water and floor space