

Pipe & Tube Heating Systems with Induction

In-line and end heating for pipe and tube production: quench and temper, annealing, upsetting, bending, coating cure and weld preheat. Fast, flame-free and recipe-controlled.



25–500 kW

MF systems per line

0.5–30 kHz

matched to wall thickness

Ø20–1500 mm

pipe diameter range

±3–5 °C

with pyrometer feedback

01 Induction heating for tubular products

Pipes and tubes are drilled, threaded, welded, formed and coated, and many of those steps need heat: to harden, to relieve stress, to soften for forming or to cure a coating. Induction heats the pipe wall directly, in a coil the pipe passes through or in a coil at the pipe end, so only the required zone is heated, at a repeatable temperature, with no furnace or flame.

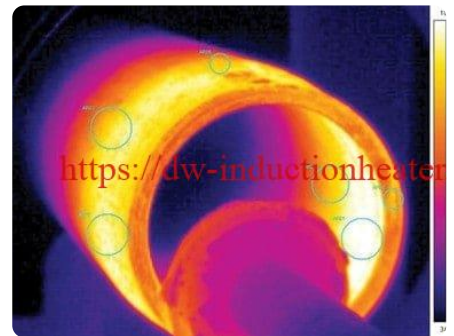
Application	Typical temperature	Heating type
Quench and temper of tubing and pipe	850–920 °C / 550–700 °C	Through heating, in-line
Pre-heating for upsetting, rod upsetting	1150–1250 °C	End heating
Swage-end stress relieving, tool-joint preheat	550–650 °C / 200–400 °C	End or zone heating
Curing and pre-heating of coatings	180–300 °C	Through heating
Pipe and swivel-joint bending	850–1050 °C	Narrow-band heating
De-bonding of rubber	150–250 °C	Zone heating
Continuous coiled-tube processing	Per process	Through heating
Seamless mill billet pre-heaters, taper re-heaters	1200–1280 °C	Through heating
Solution and bright annealing (stainless)	1040–1100 °C	Through heating, protective gas
Hot reduction, hybrid gas/induction lines	900–1250 °C	Through heating



HLQ pipe heating unit with encircling coil.



Pipe heated in a multi-turn coil.



Thermal image of a heated pipe end.

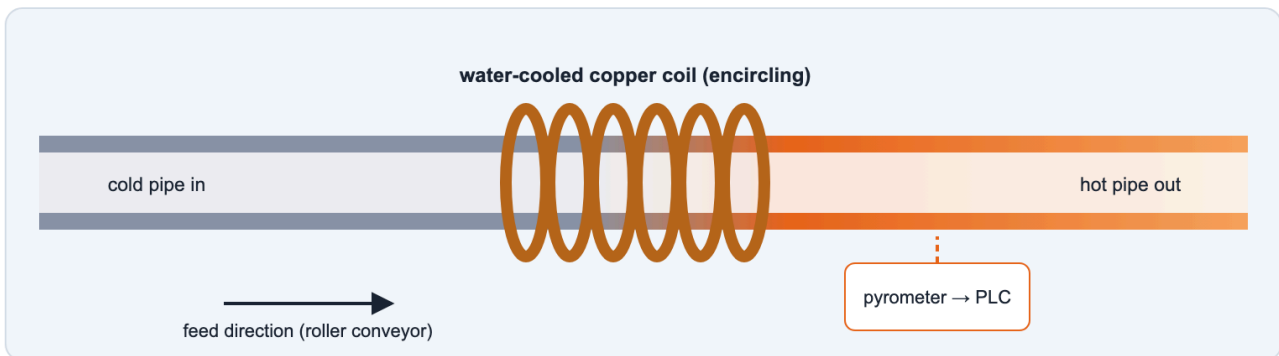
02 How it works

An IGBT power supply drives alternating current through a water-cooled copper coil around the pipe. The alternating field induces eddy currents in the pipe wall, which heat it from within. Frequency controls how deep the current flows; power and line speed control the temperature.

How Induction Pipe and Tube Heating Works

HLQ

An encircling coil induces eddy currents in the pipe wall; the pipe heats from within as it passes through.



Frequency sets heating depth (skin depth $\delta = 503 \cdot \sqrt{\rho / (\mu \cdot f)}$)

1 kHz

δ hot ≈ 17 mm
walls > 25 mm

3 kHz

δ hot ≈ 10 mm
walls 12–25 mm

10 kHz

δ hot ≈ 5.5 mm
walls 6–12 mm

30 kHz

δ hot ≈ 3.2 mm
walls 3–6 mm

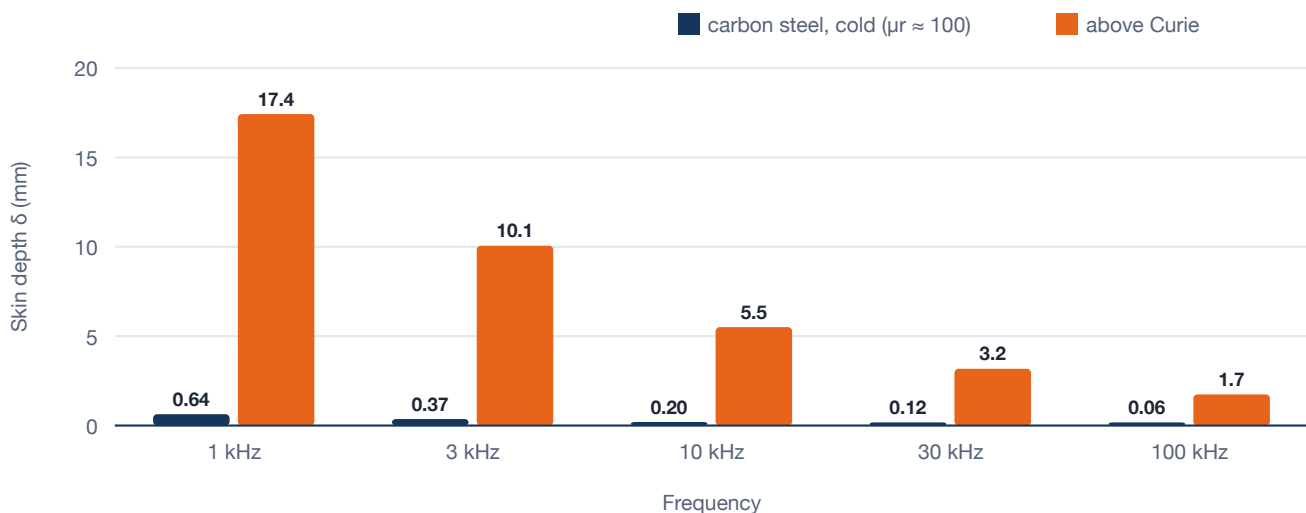
100 kHz

δ hot ≈ 1.7 mm
thin tubes ≤ 3 mm

δ hot: carbon steel above the Curie point (≈ 770 °C, $\rho \approx 1.2 \times 10^{-6} \Omega \cdot \text{m}$, $\mu \approx 1$). Below the Curie point steel is magnetic and δ is about 10× smaller, so heating starts at the surface and conducts inward. Use lower frequency for thick walls, higher for thin tubes.

Power: $P = \dot{m} \cdot \Delta h / \eta$ (steel to 1000 °C: $\Delta h \approx 0.19$ kWh/kg; to 650 °C: ≈ 0.11 kWh/kg; $\eta \approx 0.6$ –0.8)

Chart B — Skin depth of carbon steel by frequency



$\delta = 503 \cdot \sqrt{\rho / (\mu \cdot f)}$. Cold: $\rho \approx 1.6 \times 10^{-7} \Omega \cdot \text{m}$, $\mu \approx 100$. Above Curie (≈ 770 °C): $\rho \approx 1.2 \times 10^{-6} \Omega \cdot \text{m}$, $\mu \approx 1$.

03 Standard induction pipe heating systems

Model	Power	Frequency	Pipe Ø	Wall	Heating length	Temperature
MF-25	25 kW	10–30 kHz	20–100 mm	2–10 mm	100–300 mm	100–1000 °C
MF-50	50 kW	5–25 kHz	50–200 mm	3–15 mm	150–500 mm	100–1100 °C
MF-100	100 kW	3–20 kHz	100–400 mm	5–25 mm	200–800 mm	100–1150 °C
MF-200	200 kW	1–15 kHz	200–800 mm	8–40 mm	300–1200 mm	100–1200 °C
MF-500	500 kW	0.5–10 kHz	400–1500 mm	10–100 mm	500–2000 mm	100–1250 °C

All models water-cooled; 380–480 V, 3-phase, 50/60 Hz; PLC + HMI with programmable recipes.

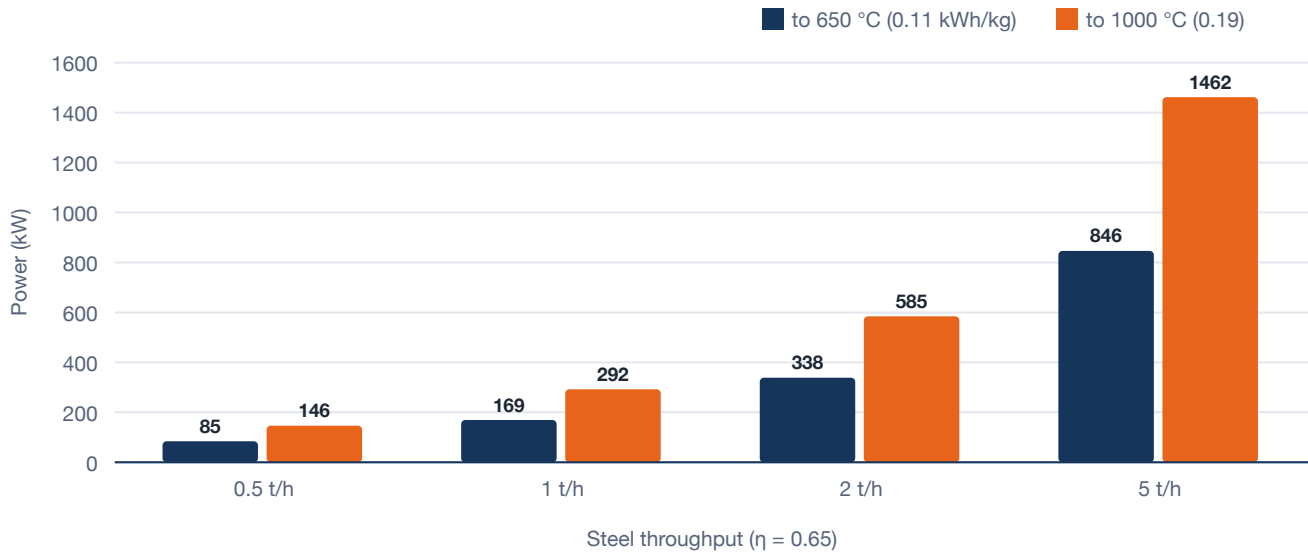
Performance

Parameter	Specification
Inverter efficiency	92–98 %
Coil-to-pipe efficiency	65–85 %
Overall efficiency	60–83 %
Temperature control	±3–5 °C with pyrometer feedback
Circumferential uniformity	±10–20 °C
Coil-to-pipe air gap	3–15 mm
Duty cycle	100 %, continuous
Cooling water	10–50 L/min, closed loop
Protection rating	IP54–IP65
Ambient temperature	–10 to +45 °C

04 Power sizing and frequency selection

$P = \dot{m} \cdot \Delta h / \eta$ · steel enthalpy from 20 °C: ≈ 0.11 kWh/kg to 650 °C, ≈ 0.19 kWh/kg to 1000 °C (includes the Curie transformation) · $\eta \approx 0.6\text{--}0.8$

Chart A — Power needed for continuous through heating



Frequency by wall thickness (through heating of steel)

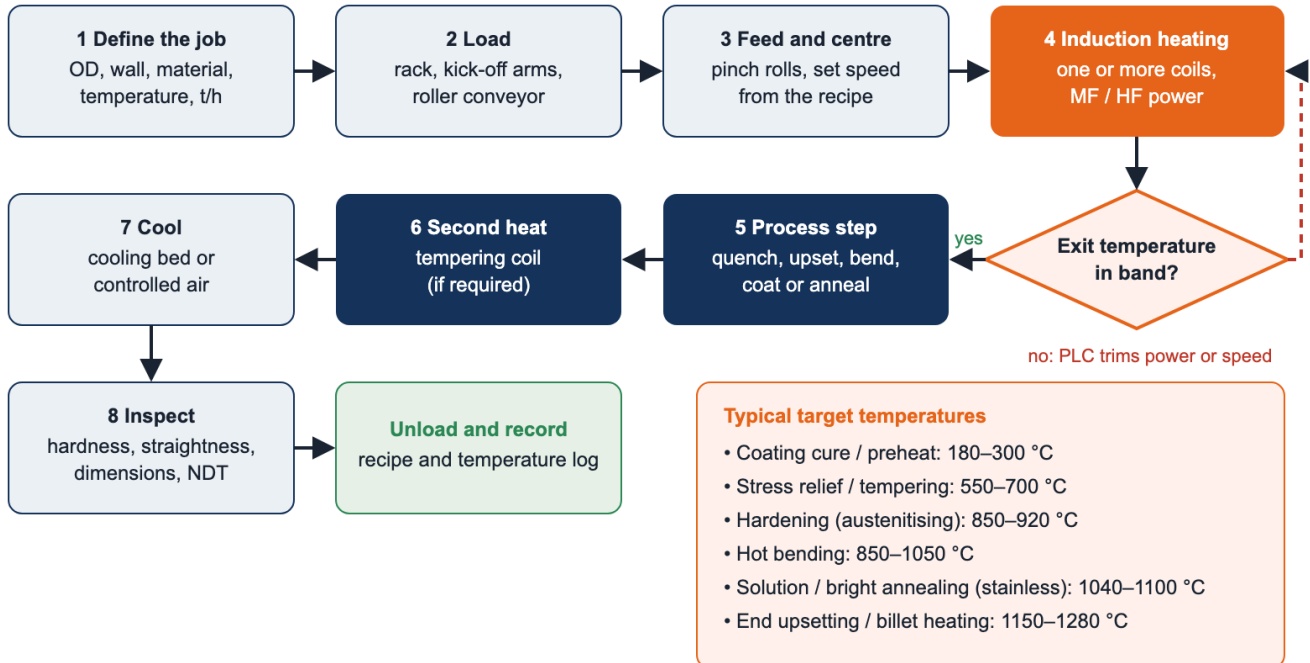
Wall thickness	Typical frequency	Typical system
≤ 3 mm	30–100 kHz	HF / MF-25
3–6 mm	10–30 kHz	MF-25 / MF-50
6–12 mm	3–10 kHz	MF-50 / MF-100
12–25 mm	1–3 kHz	MF-100 / MF-200
> 25 mm	0.5–1 kHz	MF-200 / MF-500

05 Process workflow and line layout

Induction Pipe and Tube Heating Process Flow

HLQ

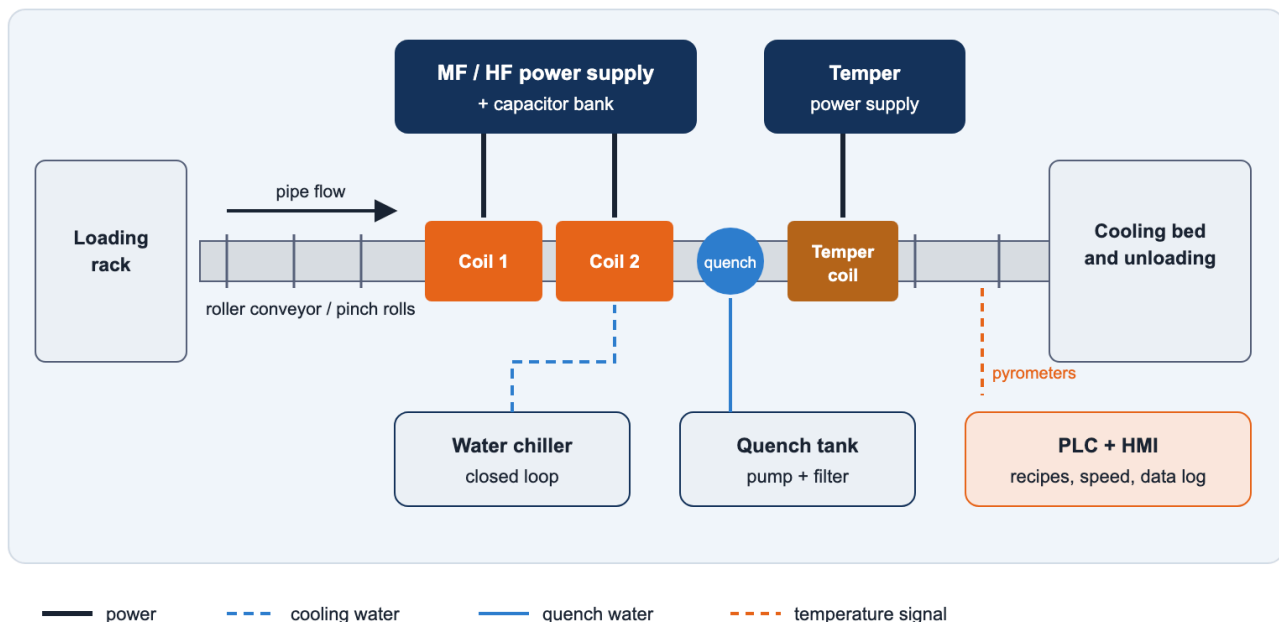
Typical in-line sequence for heat treatment, end heating and forming lines.



In-line Pipe and Tube Induction Heating Line Layout

HLQ

Top view of a typical quench-and-temper or through-heating line.



End-heating lines (upsetting, threading, coating ends) use the same blocks with a single coil and a pneumatic pipe pusher instead of a through conveyor.

06 Application examples



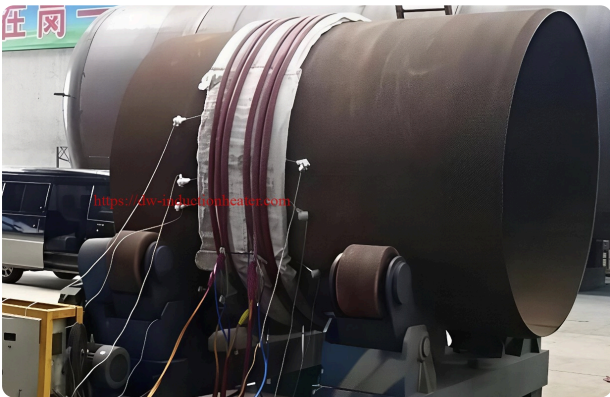
Pipe heating station

MF power supply with encircling coil and roller feed.



Induction pipe bending

Narrow-band heating to 850–1050 °C for hot bends.



Weld preheat on large pipe

Flexible cable coil for 100–300 °C preheat.



150-200KW Induction Welding Tube Generator

HF tube welding

Solid-state generators for ERW tube mills.

Application parameters

Application	Temperature	Typical cycle	Typical power
Weld preheating	100–300 °C	3–10 min	15–50 kW
Coating cure	180–250 °C	1–5 min	20–100 kW
Stress relieving	550–650 °C	1–4 h (with soak)	25–100 kW
Hardening	820–920 °C	1–3 min	50–200 kW
Pipe bending	850–1050 °C	Continuous	50–200 kW
End upsetting	1150–1250 °C	Seconds–minutes	100–500 kW

07 Frequently asked questions

Which frequency should I use?

Match it to the wall: 30–100 kHz for ≤ 3 mm, 10–30 kHz for 3–6 mm, 3–10 kHz for 6–12 mm, 1–3 kHz for 12–25 mm, 0.5–1 kHz for thicker walls.

How much power do I need?

$P = \text{throughput} \times \text{enthalpy} / \eta$. 1 t/h of steel to 1000 °C needs about 290 kW at η 0.65.

Can one system heat different pipe sizes?

Yes, within a range, by changing coils and recipes; each coil covers a band of diameters.

How accurate is temperature control?

± 3 –5 °C with pyrometer feedback and closed-loop power or speed control.

Can it heat only the pipe end?

Yes. End-heating coils heat a set length for upsetting, threading or coating ends.

Is protective gas needed?

Only for bright annealing of stainless steel; most other processes run in air.

Why choose HLQ

25–500 kW MF range

Plus HF systems and flexible-cable heaters.

Engineered coils

Encircling, end-heating and narrow-band designs.

Line integration

PLC recipes, pyrometers, conveyors, quench.

Energy efficient

60–83 % overall efficiency, no furnace losses.

Continuous duty

100 % duty cycle, closed-loop cooling.

Application testing

Process proven on your pipe before delivery.

Request a heating proposal

Send your pipe sizes, material and process. We will size the power, frequency and coil and propose a complete heating line.

Email

sales@dw-inductionheater.com

Tel / WhatsApp / Telegram

+86 131 5596 5571

Website

dw-inductionheater.com

Factory address

Jiangbei Village, Wusha Area, Chang'an Town,
Dongguan City, Guangdong Province, China
523859

Please include in your inquiry

- Pipe OD, wall thickness, length and material
- Process: Q&T, annealing, upsetting, bending, coating, preheat
- Target temperature and heated length
- Throughput (t/h or pieces per hour)
- Power supply and line layout

