

Induction Preheating for Welding

Structural steel · Pipes · Steel strip — flame-free, thermocouple-controlled preheat with HLQ air-cooled and inline induction systems.



3 workpieces

plate · pipe · strip

10–120 kW

MYD site systems

15–2000 kW

inline strip systems

±3 °C

multi-channel control

01 Why preheat before welding?

Preheating slows the cooling of the weld and heat-affected zone, lets hydrogen escape and reduces residual stress — the main defences against cold cracking in thick, high-carbon-equivalent and alloy steels. Induction generates that heat inside the steel, evenly and under closed-loop control, for every form of workpiece.

Workpiece	Typical welds	Typical preheat	HLQ solution	Coil
Structural steel plates, beams, columns, rails	Thick butt and fillet welds, splices, repairs	50–200 °C	MYD air-cooled 10–120 kW	Flexible cable / pancake
Pipes & tubes pipelines, process, rods	Girth welds, spools, pins and rods	80–250 °C	MYD system or HF / MF heater	Flexible cable / C-coil / solenoid
Steel strip coil joining, tube mills	Strip-end welds in continuous lines	150–400 °C (pre / post)	Inline strip heating 15–2000 kW	Solenoid (LFI) / transverse flux (TFI)



Structural: rail base preheated to 170 °C.



Pipe: flexible cable on a large-bore joint.



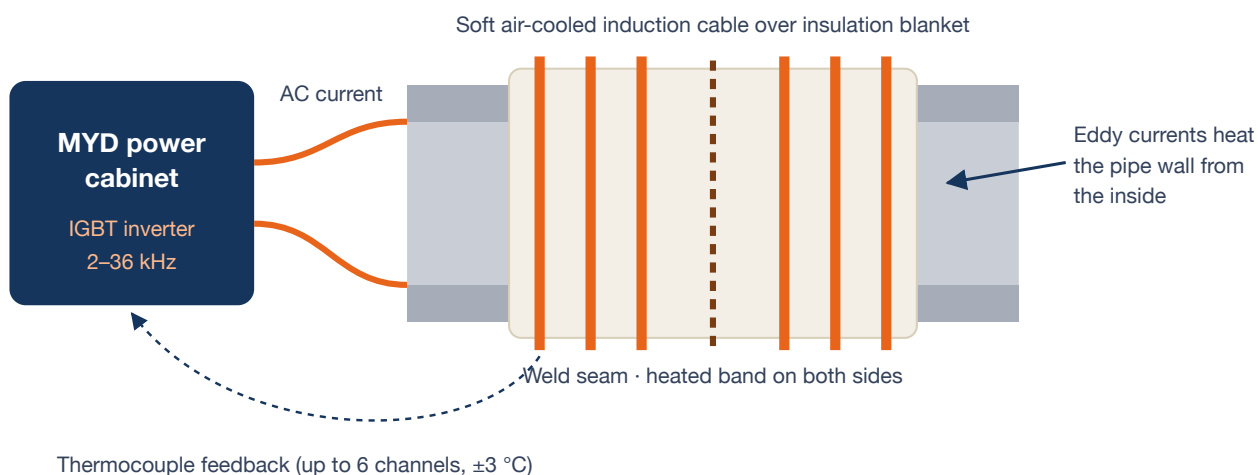
Strip: inline induction heating line.

What preheat does to the weld

Effect	Result
Slower cooling rate	Less hard martensite in the HAZ
Hydrogen diffuses out	Lower risk of delayed cold cracking
Smaller thermal gradient	Lower residual stress and distortion
Moisture removed	Less porosity, cleaner fusion

02 How induction preheating works

An IGBT inverter drives alternating current through a coil placed close to the steel. The alternating magnetic field induces eddy currents in the workpiece, which heats from within; below the Curie point (~770 °C) magnetic hysteresis adds more heat. Thermocouples or pyrometers feed a controller that holds the preheat temperature.



Coil type by workpiece

Workpiece	Coil	Frequency range	Why
Plates, beams, rails	Flexible cable wound or laid in a pancake over insulation	2–40 kHz	Follows flat and irregular shapes
Large pipe girth welds	Flexible cable wound on both sides of the groove	2–36 kHz	Full 360° heating, groove left open
Production tubes, rods, pins	Fixed solenoid or C-coil	50–150 kHz	Fast, repeatable cycles
Narrow strip (< 200 mm)	Solenoid (longitudinal flux)	1–80 kHz	High efficiency for steel
Wide strip (> 200 mm)	Transverse flux (TFI)	1–30 kHz	Uniform across the width

03 Equipment and technical data

Parameter	MYD site systems	HF / MF production heaters	Inline strip heating
Power	10–20 kW portable · 40–120 kW cabinet	15–60 kW (application cases)	15–2,000 kW
Frequency	5–30 kHz (portable) · 2–36 kHz (cabinet)	50–150 kHz	1–500 kHz
Cooling	Air-cooled unit and cable	Per model	Per design
Temperature control	K-type TCs; up to 6 channels, ± 3 °C	TC or pyrometer	IR pyrometer + PID, ± 2 –15 °C
Typical use	Structural and pipe welds on site	Tubes, rods, pins in production	Strip joining, edge and line heating

MYD cabinet series (site preheat and PWHT)

Model	MYD-40	MYD-50	MYD-60	MYD-80	MYD-100	MYD-120
Output power	40 kW	50 kW	60 kW	80 kW	100 kW	120 kW
Input current (380 V)	60 A	75 A	90 A	120 A	150 A	180 A

Common data: 3 × 380 VAC (220 / 440 VAC optional), PLC touch screen, digital recorder, soft induction cable, air cooling. Portable MYD-10 (10 kW, 500 °C, 26 kg) and MYD-20 (20 kW, 800 °C, 32 kg) for pipe OD 50–500 mm.

04 Model selection

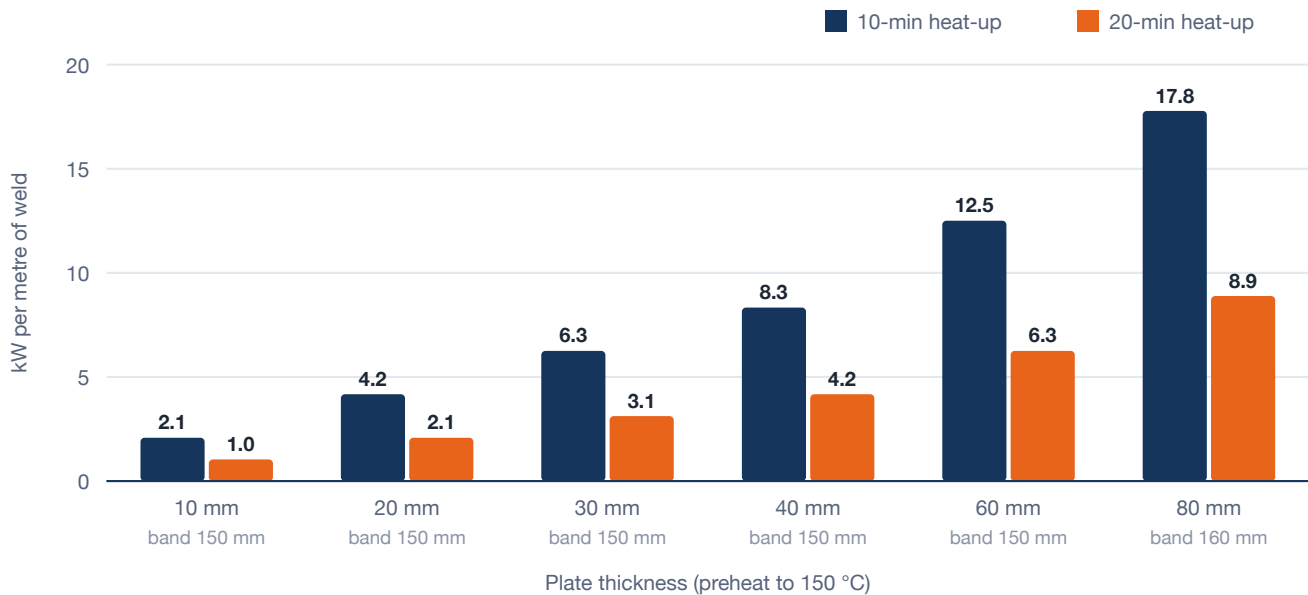
Job	Recommended
Structural welds ≤ 40 mm, up to ~3 m of weld per heat	MYD-20 / MYD-40
Heavy plates 60–80 mm, long splices or columns	MYD-60 – MYD-120
Pipe girth welds $\leq$ OD 500 mm	Portable MYD-10 / MYD-20
Large pipe $>$ OD 500 mm, thick wall	MYD-40 – MYD-120
Tubes, rods and pins in production	HF 15–60 kW with fixed coil
Strip-end welds in coil-joining lines	Inline strip heater, 15–70 kW per seam (see Chart B)

Indicative guidance. Final sizing depends on joint geometry, preheat band, heat-up time and losses — HLQ engineers confirm every application.

05 Sizing charts

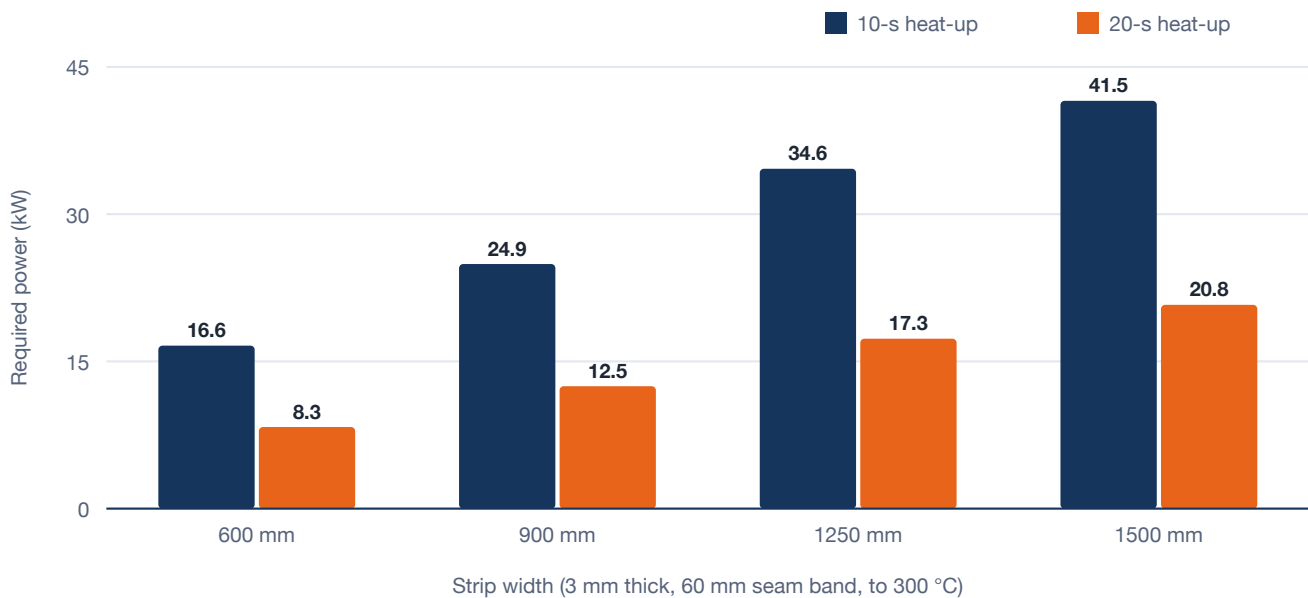
$$P = m \cdot c \cdot \Delta T / (t \cdot \eta) \cdot \text{steel } \rho = 7850 \text{ kg/m}^3, c = 0.49 \text{ kJ/kg} \cdot \text{K} \cdot \text{surface losses excluded}$$

Chart A — Structural plate: power per metre of weld (preheat to 150 °C, $\eta = 0.6$)



Preheat band = thickness on each side of the joint, at least 75 mm per side. Multiply by weld length: e.g. 3 m of 40 mm plate in 10 min $\approx$ 25 kW $\rightarrow$ MYD-40.

Chart B — Steel strip seam: power to preheat a 60 mm band to 300 °C ($\eta = 0.7$)



Strip-end joining needs very short cycles, so power depends on width, thickness and allowed time. For 1250 mm $\times$ 3 mm: $\approx$ 35 kW in 10 s; thickness scales power linearly.

06 Pipe preheat power (to 150 °C in 15 min, $\eta = 0.75$)

Pipe	Heated band	Heated mass	Power	Typical model
Ø168 × 11 mm	150 mm	6 kg	0.6 kW	MYD-10 / 20
Ø273 × 15 mm	150 mm	14 kg	1.4 kW	MYD-10 / 20
Ø406 × 20 mm	150 mm	29 kg	2.7 kW	MYD-10 / 20
Ø610 × 25 mm	150 mm	54 kg	5.1 kW	MYD-40 +
Ø914 × 30 mm	180 mm	118 kg	11.1 kW	MYD-40 +
Ø1219 × 40 mm	240 mm	279 kg	26.3 kW	MYD-40 +

Band = 6 × wall (min. 150 mm). Real jobs add surface losses, wind and interpass holding — allow margin.

07 Application cases from HLQ



Steel pipe butt weld

Ø152.4 × 18.26 mm pipe, 30–45 mm zone each side of centre, ambient → 600 °C ±10 °C in ~300 s with an air-cooled 25–30 kW system and air-cooled coil.



Steel rods / pins

Ø≈51 mm pins to 260 °C weld preheat: 316 °C reached within 1 min with a 45 kW, 100 kHz heater; a 15 kW two-position coil does it in ~2 min.



Pipe / shaft assemblies

127–203 mm OD, 51 mm heat zone, to 260 °C in 3 min using a 60 kW, 60 kHz system with an adjustable C-coil while rotating.



Structural rail repair

Stinger rail base preheated to 170 °C before welding, with flexible cable over insulation on site.

08 Frequently asked questions

Which preheat temperature should I use?

Use the WPS. Typical minimums: 10–50 °C thin carbon steel, 80–120 °C thick carbon steel, 100–200 °C high-CE steels, 120–250 °C Cr-Mo.

Does induction preheat work on flat plate and beams?

Yes. Flexible cable is laid as a pancake or wound around the member over insulation; the band covers at least 75 mm each side of the joint.

Why preheat strip before welding?

High-carbon, alloyed and advanced high-strength strip can form brittle welds that break in rolling; local induction pre- and post-heating tempers the seam.

Is induction better than a gas torch?

It heats evenly through the thickness under thermocouple control, without flame, fumes or operator-dependent hot spots.

Do I need water cooling?

MYD site systems are air-cooled. High-power inline strip systems are engineered per line.

How much energy does it save?

Typically 30–80% compared with resistance (ceramic pad) heating on site.

Why choose HLQ

All three workpieces

Site systems for plate and pipe, production heaters for tubes and rods, inline systems for strip.

Application lab data

Real heating tests behind each recommendation.

Air-cooled site units

No chiller or water hoses on site.

Engineered sizing

Power, frequency and coil from your joint data.

Recorded control

Multi-channel thermocouples, ± 3 °C, QA records.

Full thermal cycle

Preheat, post-heat and PWHT on MYD systems.

Request a preheat proposal

Send us your joint data — our engineers will recommend power, frequency and coil, and return a quotation with an estimated heating time.

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Please include in your inquiry

- Workpiece: plate / beam, pipe (OD × wall) or strip (width × thickness)
- Material grade and WPS preheat temperature
- Weld length or preheat band, and allowed heat-up time
- Site or production line; for strip, line layout and cycle time
- Power supply and ambient conditions

