

Induction Metal Melting Furnace (DW-MF Series)

Electric induction crucible furnace · 15–160 kW · 1–20 kHz · melts tin to steel · 3–250 kg per heat · for foundries, recyclers, workshops and labs

Written by the HLQ Induction Engineering Team · Last updated October 2026 · Model power, frequency, weights and the steel, gold, silver and aluminum capacities are HLQ's published DW-MF series data. Melting points are standard reference values; theoretical energies are calculated from typical heat capacities and latent heats; practical energy use, batch-size ranges and crucible life are typical engineering values to be confirmed for your process.

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What is the Induction Metal Melting Furnace?

The HLQ induction metal melting furnace is a compact, electrically powered crucible furnace for melting almost any common metal, from tin and zinc at a few hundred degrees to carbon and stainless steel at about 1,600 °C. An IGBT generator (15–160 kW, 1–20 kHz) drives a water-cooled coil around the crucible, so heat is generated inside the metal itself, the melt is stirred electromagnetically, and a tilting furnace body pours it into moulds. Batch sizes range from about 3 kg to 250 kg depending on the model and the metal's density, with typical melting times of 20–50 minutes per heat. It is the best fit for small foundries, scrap recyclers, workshops, schools and laboratories that melt several different metals in small to medium batches and want a clean, controllable alternative to gas, oil or coke furnaces.

Key Applications

User	What they melt	Typical batch	Why they choose induction
Small jobbing foundries	Steel, iron, bronze, aluminum	20–100 kg	One furnace handles many alloys and small orders
Scrap metal recyclers	Copper, brass, aluminum, precious-metal scrap	20–250 kg	Fast turnaround from scrap to saleable ingots

User	What they melt	Typical batch	Why they choose induction
Maintenance and repair workshops	Bronze, aluminum, cast iron	10–50 kg	Cast replacement parts on site, on demand
Universities and research labs	Steel, copper, nickel and light alloys	3–20 kg	Precise, repeatable test heats for alloy development
Technical and vocational schools	Aluminum, bronze, zinc, steel	5–20 kg	Safe, clean demonstrations without fuel handling
Jewelry and precious metals	Gold, silver	5–250 kg	Low metal loss and clean melting
Master alloy and solder makers	Copper alloys, tin, zinc alloys	20–100 kg	Electromagnetic stirring mixes alloying additions evenly

Suitable Materials

Metal	Melting point	Typical pouring temperature	Recommended crucible	Suitability
Tin	232 °C	260–320 °C	Steel or graphite	Suitable; use low power
Lead	327 °C	350–450 °C	Steel	Suitable; requires fume control and health precautions
Zinc and zinc alloys	420 °C (pure zinc)	430–480 °C	Coated steel, graphite or SiC	Suitable
Magnesium alloys	About 650 °C	About 700 °C	Steel only	Specialist use with protective gas or flux
Aluminum alloys	660 °C (pure aluminum)	700–760 °C	Clay-graphite or SiC	Very suitable
Brass	About 900–940 °C	1,000–1,050 °C	Clay-graphite or SiC	Very suitable
Silver	962 °C	1,000–1,100 °C	Graphite	Very suitable
Gold	1,064 °C	1,100–1,150 °C	Graphite	Very suitable
Copper and bronze	1,085 °C (pure copper)	1,100–1,200 °C	Clay-graphite or SiC	Very suitable
Cast iron	About 1,150–1,200 °C	1,400–1,480 °C	Clay-graphite or rammed silica	Suitable
Nickel and common nickel alloys	About 1,455 °C	About 1,550 °C	Alumina or magnesia	Suitable in air; superalloys need vacuum melting
Carbon and stainless steel	About 1,400–1,520 °C	1,580–1,650 °C	Magnesia or alumina lining	Suitable; avoid graphite

Metal	Melting point	Typical pouring temperature	Recommended crucible	Suitability
Titanium	1,668 °C	—	—	Not suitable; reacts with air and crucibles, needs vacuum or cold-crucible melting
Platinum	1,768 °C	About 1,850 °C	Zirconia	Special configuration only; ask HLQ

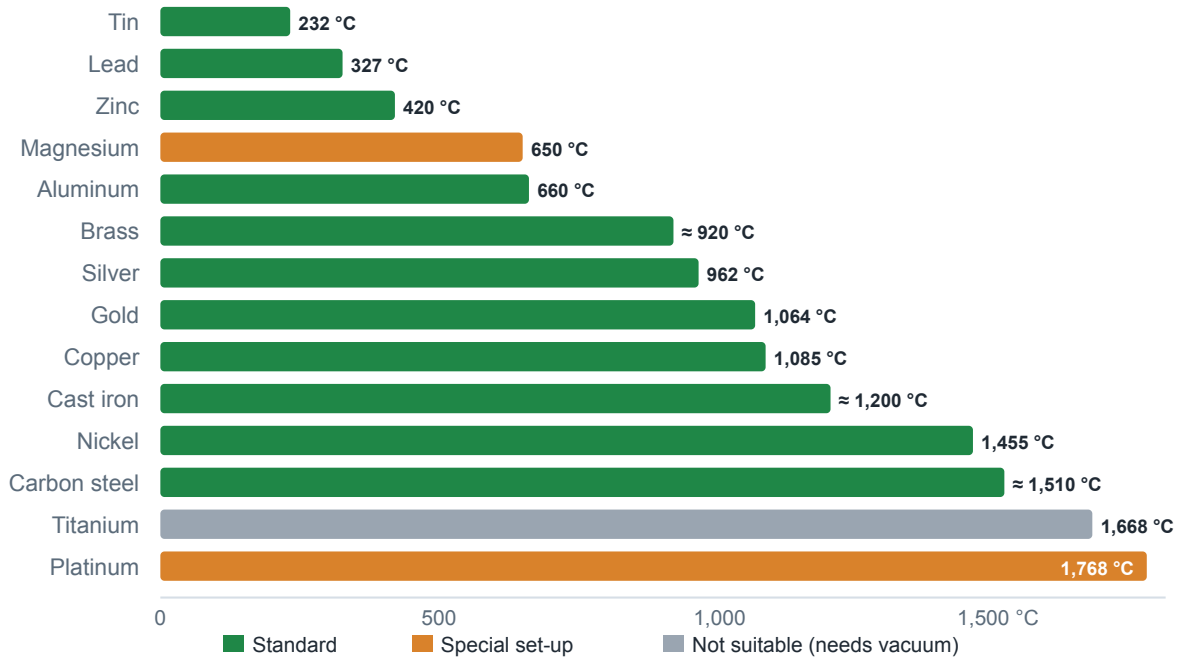


Figure 1. Melting points of common metals. Pouring temperatures are typically 50–150 °C higher.

Working Principle

The IGBT generator converts the 380 V three-phase supply into medium-frequency current (1–20 kHz). A compensation capacitor and a water-cooled copper coil form a resonant circuit around the crucible. The coil's alternating magnetic field induces eddy currents in the metal charge, or in a graphite crucible when the charge is small or a poor conductor, and the electrical resistance of the metal converts that current into heat. Once the metal melts, the same magnetic forces stir the bath, evening out temperature and composition. The finished melt is poured by tilting the furnace body.

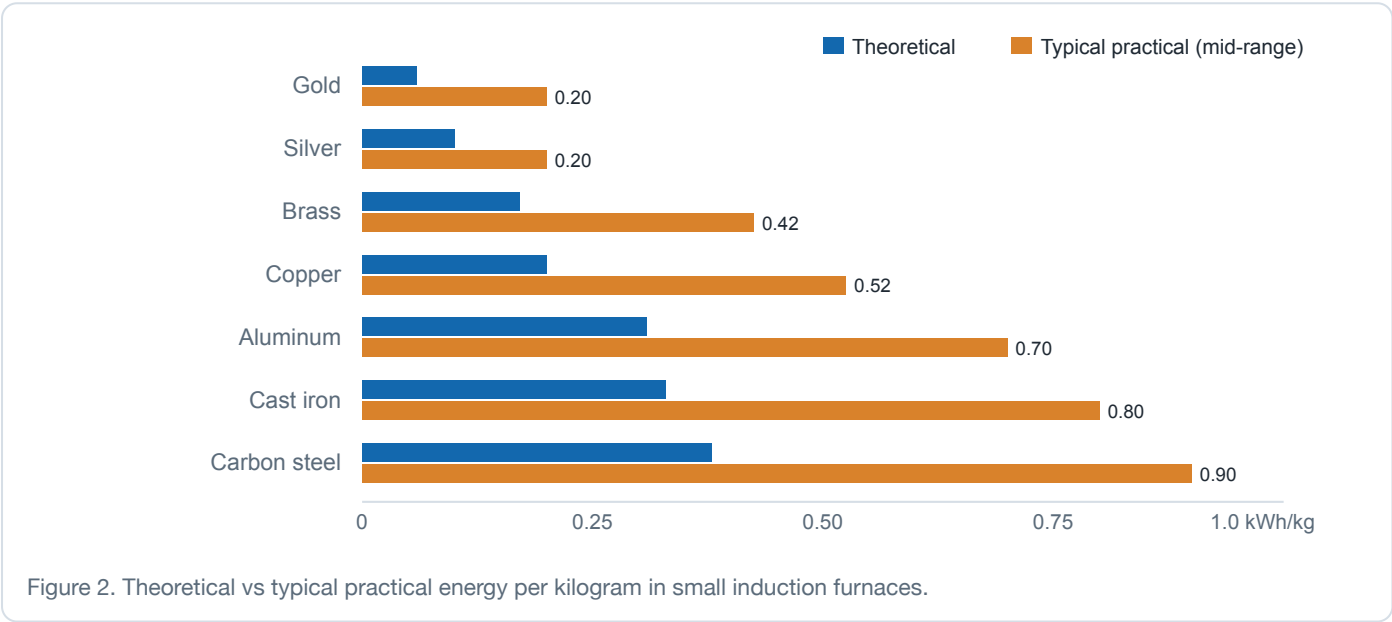
How much energy does it take to melt a metal?

The theoretical energy to melt and superheat one kilogram of metal is:

$$Q = c_{\text{solid}} \times (T_{\text{melt}} - T_{\text{start}}) + L + c_{\text{liquid}} \times (T_{\text{pour}} - T_{\text{melt}})$$

where c is the specific heat, L the latent heat of fusion, and T the temperatures. A real furnace also loses heat through the coil, crucible and open surface, so the practical energy use is two to four times the theoretical value in small batch furnaces.

Metal	Pouring temperature used	Theoretical energy (kWh/kg)	Typical practical energy, small induction furnace (kWh/kg)
Gold	1,150 °C	About 0.06	About 0.15–0.25
Silver	1,050 °C	About 0.10	About 0.15–0.25
Brass	1,050 °C	About 0.17	About 0.35–0.5
Copper	1,200 °C	About 0.20	About 0.45–0.6
Aluminum	720 °C	About 0.31	About 0.6–0.8
Cast iron	1,450 °C	About 0.33	About 0.7–0.9
Carbon steel	1,600 °C	About 0.38	About 0.8–1.0



Technical Specifications

Parameter	Specification	Notes
Series	DW-MF induction metal melting furnace	Eight models, DW-MF-15 to DW-MF-160
Generator power	15, 25, 35, 45, 70, 90, 110 or 160 kW	IGBT medium-frequency generator
Power supply	3-phase, 380 V $\pm$ 10%, 50/60 Hz	Other voltages on request
Output voltage	70–550 V	Listed as "input voltage" on older data sheets
Oscillation frequency	1–20 kHz	Usually about 4, 8, 11, 15 or 20 kHz, depending on the application
Duty cycle	100%, 24-hour operation	Continuous rated output
Melting time	About 30–50 min from cold, 20–30 min when hot	At maximum recommended charge
Maximum temperature	Sufficient for steel at about 1,600–1,650 °C	Limited in practice by the crucible or lining
Stirring	Electromagnetic	Uniform temperature and composition

Parameter	Specification	Notes
System	MF generator, tilting melting furnace, compensation capacitor	Cooling system separate or optional
Generator weight	50–145 kg	Compact cabinet, 27 × 47 × 56 cm to 40 × 88 × 76 cm

Model overview

Model	Power (kW)	Steel / stainless steel	Gold / silver	Aluminum	Weight (kg)	Typical user
DW-MF-15	15	—	5 or 10 kg	3 kg	50	Jewelers, laboratories
DW-MF-25	25	4 or 8 kg	10 or 20 kg	6 kg	50	Schools, R&D
DW-MF-35	35	10 or 14 kg	20 or 30 kg	12 kg	65	Workshops, small casting
DW-MF-45	45	18 or 22 kg	40 or 50 kg	21 kg	70	Workshops, art foundries
DW-MF-70	70	28 kg	60 or 80 kg	30 kg	80	Small foundries
DW-MF-90	90	50 kg	80 or 100 kg	40 kg	94	Foundries, recyclers
DW-MF-110	110	75 kg	100 or 150 kg	50 kg	114	Foundries, recyclers
DW-MF-160	160	100 kg	150 or 250 kg	75 kg	145	Production foundries, refiners

Where two values are given, the larger one applies to a larger crucible with a longer melting time.

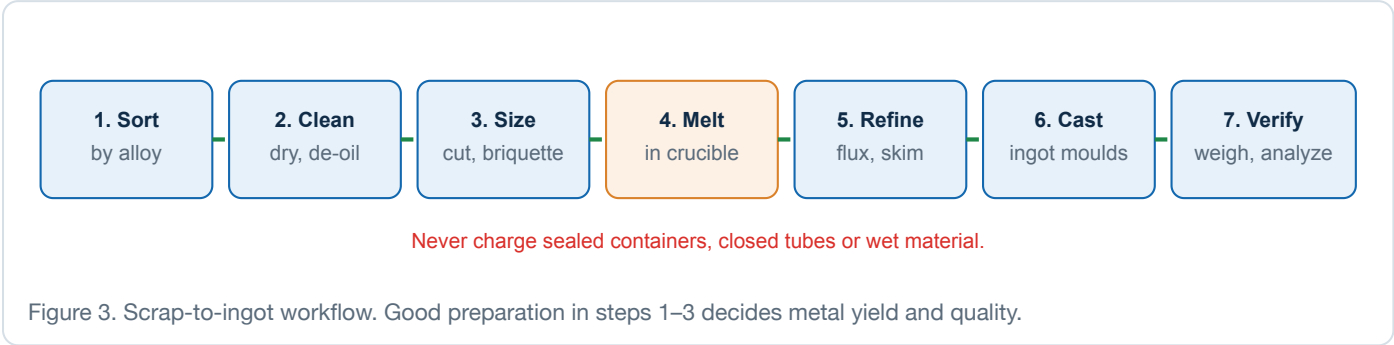
Recommended Model Selection

Application	Material	Recommended Power	Frequency
Laboratory test heats, 3–5 kg	Copper alloys, precious metals	DW-MF-15 (15 kW)	15–20 kHz
School foundry training, 4–8 kg	Steel, aluminum, bronze	DW-MF-25 (25 kW)	15–20 kHz
Low-melting alloys and solders, 10–20 kg	Tin, zinc alloys	DW-MF-25 to DW-MF-35 at reduced power	11–20 kHz
Aluminum parts in a workshop, about 12 kg	Aluminum alloys	DW-MF-35 (35 kW)	11–15 kHz
Bronze bushings and repair castings, about 20 kg	Tin bronze	DW-MF-45 (45 kW)	11–15 kHz
Cast iron and steel spare parts, about 28 kg	Cast iron, carbon steel	DW-MF-70 (70 kW)	8–11 kHz
Aluminum scrap to ingots, about 40 kg	Aluminum	DW-MF-90 (90 kW)	8–11 kHz
Stainless steel castings, about 50 kg	304, 316 stainless steel	DW-MF-90 (90 kW)	8–11 kHz
Steel foundry heats, about 75–100 kg	Carbon steel, low-alloy steel	DW-MF-110 to DW-MF-160	1–4 kHz
Aluminum recycling, about 75 kg	Aluminum	DW-MF-160 (160 kW)	1–4 kHz

For larger single-metal operations, compare our dedicated [induction aluminum melting furnace](#), the [induction furnace for melting iron and steel](#), and the [electric induction melting furnace for copper and precious metals](#).

Process Workflow

From scrap to ingot



Step	What to do	Why it matters
1. Sort	Separate scrap by alloy family (for example brass, bronze, copper, aluminum grades)	Mixed alloys produce off-specification ingots
2. Clean	Remove oil, paint, plastic and moisture; dry damp material	Contaminants cause smoke, gas porosity and dross
3. Size	Cut large pieces to fit the crucible; briquette turnings and fine chips	Loose fines oxidize quickly and couple poorly
4. Melt	Start with heavy pieces, then add the rest as the pool forms	A molten pool melts additions fastest
5. Refine	Add flux, skim dross, degas aluminum, adjust the alloy	Clean metal and correct composition
6. Cast	Pour into preheated, coated ingot moulds	Avoids cold shuts and moisture reactions
7. Verify	Weigh ingots and dross; check chemistry with a spectrometer or XRF	Yield control and traceable quality

Melt shop set-up checklist

Item	Recommendation
Floor	Dry, non-combustible floor; a sand bed or spill pit under the furnace and pouring area
Ventilation	Fume hood or extraction above the furnace, essential for brass, zinc and lead
Cooling water	Closed-loop chiller or cooling tower with soft water
Power	Dedicated three-phase 380 V supply with a correctly rated breaker
Personal protective equipment	Face shield, heat-resistant jacket, gloves, spats and safety boots
Tools	Dry, preheated skimmers, stirring rods and thermocouple lances

Coil and Fixture Design

The coil delivers the power; the crucible and moulds decide what you can melt and how clean the result is.

Crucible selection matrix

Crucible type	Steel and nickel	Cast iron	Copper alloys	Gold and silver	Aluminum	Zinc, tin, lead
Magnesia or alumina (ceramic or rammed)	Yes	Yes	Possible	Possible	Possible	Not needed
Clay-graphite	No (carbon pick-up)	Yes	Yes	Yes	Yes	Yes
Silicon carbide (SiC)	No	Yes	Yes	Yes	Yes	Yes
High-purity graphite	No	Possible	Yes	Best	Possible	Yes
Steel crucible	No	No	No	No	No (iron pick-up), unless coated	Yes; required for magnesium

Design element	Guideline
Induction coil	Water-cooled copper tube; coil height matched to the usual charge height
Crucible size	Choose for the usual batch, not only the maximum; a half-empty crucible melts slowly
Ingot moulds	Cast iron, steel or graphite; preheated and coated before pouring
Furnace lid	Reduces heat loss, oxidation and fumes
Separate crucibles per alloy family	Prevents cross-contamination between metals

Control System and Automation

Function	Description	Benefit
Adjustable power	From full melting power down to holding power	One furnace serves both high- and low-melting metals
Automatic frequency tracking	Follows the load from solid charge to liquid metal	Stable operation without retuning
100% duty cycle	Rated for continuous operation	Back-to-back heats through a full shift
Protections	Over-current, over-voltage, over-heat, phase loss, water shortage	Protects the generator and coil
Remote control box (option)	Power control at the pouring position	Safer operation

Temperature measurement options

Method	Range	Best for	Note
Type K thermocouple with protection sheath	Up to about 1,100 °C	Aluminum, zinc, tin	Can stay in the melt for holding

Method	Range	Best for	Note
Type S or B dip thermocouple	Up to about 1,700 °C	Copper alloys, iron, steel	Quick immersion readings
Optical or infrared pyrometer	Wide	Quick checks without contact	Reads the surface; slag and emissivity affect accuracy

Common Problems and Solutions

Problem	Likely cause	Solution
Steel will not reach pouring temperature	Charge too large for the model, heat loss from an open crucible	Stay within the published capacity; use a lid; check the frequency setting
Metal freezes in the mould or ladle	Pouring temperature too low, cold moulds	Measure the temperature before pouring; preheat moulds and ladles
Heavy smoke at the start of melting	Oil, paint or plastic on the scrap	Clean scrap before charging; improve extraction
Excessive dross and metal loss	Fine, oxidized or wet scrap; overheating	Briquette fines, dry the charge, avoid superheat, use flux
Inconsistent alloy composition	Mixed scrap, no analysis	Sort scrap by alloy and check each heat with a spectrometer
Crucible cracks or wears quickly	Thermal shock, wrong crucible type, aggressive flux	Preheat, use the crucible matrix above, use the minimum flux
Violent reaction when adding scrap	Moisture or a sealed container in the charge	Stop and inspect; only add dry, open material, preheated if possible
Water-shortage alarm	Blocked hose, scale in the coil, pump fault	Clean filters, descale, use soft water in a closed loop

Engineering Selection Guide

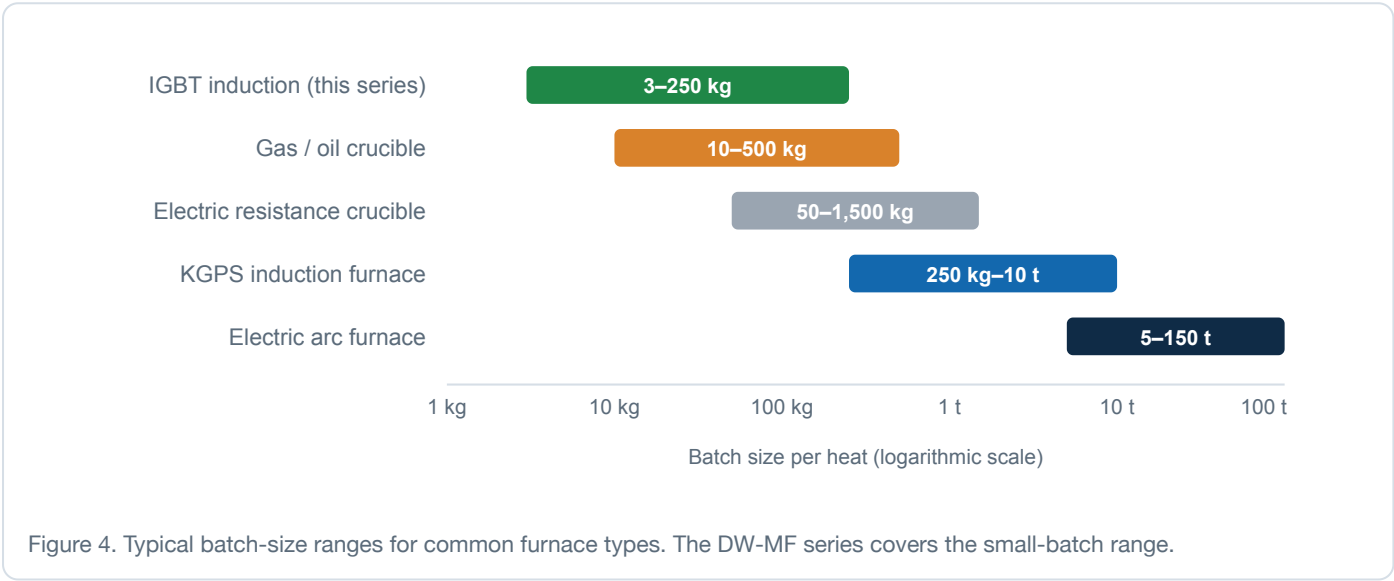
Worked example: sizing by energy

Step	Calculation	Example: 40 kg of aluminum per heat
1. Energy per heat	Batch (kg) × practical energy (kWh/kg)	40 × 0.7 = 28 kWh
2. Target melting time	Choose the time you want per heat	About 25 minutes (0.42 h)
3. Power needed	Energy ÷ time	28 ÷ 0.42 ≈ 67 kW
4. Model	Next model with enough power and capacity	DW-MF-90 (90 kW, 40 kg aluminum)

Which type of metal melting furnace?

Furnace type	Typical batch size	Metals	Strengths	Weaknesses
IGBT induction crucible furnace (this series)	About 3–250 kg	Almost all common metals	Fast, clean, stirring, many metals in one furnace	Batch size limit, needs cooling water

Furnace type	Typical batch size	Metals	Strengths	Weaknesses
Thyristor (KGPS) induction furnace	About 250 kg to several tonnes	Steel, iron, copper, aluminum	High output, low cost per tonne	Larger investment and infrastructure
Gas or oil crucible furnace	About 10–500 kg	Non-ferrous metals	Low purchase cost, no large power supply	Slower, higher metal loss, emissions
Electric resistance crucible furnace	About 50–1,500 kg	Aluminum, zinc, tin	Very quiet, gentle holding	Slow melting, limited to lower temperatures
Electric arc furnace	About 5–150 t	Steel	Very high output, refines scrap	Very high investment, only for large steel plants
Cupola	Continuous, tonnes per hour	Cast iron	Continuous iron supply	Coke fuel, emissions, iron only



Buyer's checklist

Question	Why it matters
Which metals, and how many different alloys?	Decides crucible types and how many spare crucibles you need
Largest single pour, including gating?	Sets the minimum furnace capacity
How many heats per shift?	Confirms the power needed for your melting time
What three-phase power is available?	Models need about 23–250 A at 380 V
Is clean cooling water available?	A chiller or cooling tower may need to be added
Who will operate and maintain it?	Training and spare parts planning

Advantages

- **One furnace for many metals:** from tin and zinc to copper, precious metals and steel, by changing the crucible.
- **Fast heats:** about 20–30 minutes per heat once the furnace is hot.
- **Clean melting:** no combustion gases, lower oxidation and lower metal loss.

- **Homogeneous metal:** electromagnetic stirring mixes temperature and alloy evenly.
- **Instant start and stop:** no warm-up and no idle fuel consumption between heats.
- **Compact and mobile:** 50–145 kg generator cabinets suit workshops and labs.
- **Precise control:** adjustable power for melting, holding and low-melting metals.

Limitations

- **Batch size:** up to about 100 kg of steel or 250 kg of gold per heat; larger operations need KGPS furnaces.
- **Not for reactive metals:** titanium and similar metals need vacuum or cold-crucible melting.
- **Little refining:** induction melting does not remove much sulfur, phosphorus or other contaminants, so scrap quality matters.
- **Infrastructure:** needs a three-phase supply and a closed cooling-water loop.
- **Consumable crucibles:** crucible life ranges from tens of heats to well over a hundred, depending on the metal and practice.
- **Strict safety discipline:** wet or sealed scrap is dangerous in any molten-metal process.

Why Choose HLQ Induction Equipment?

- **The right furnace for the job:** from small DW-MF crucible furnaces to tonne-scale furnaces built on our [KGPS induction power supply](#).
- **Recycling know-how:** beyond melting, we supply equipment such as the [copper-zinc separation furnace](#) for brass scrap recovery.
- **Complete set-up advice:** crucibles, moulds, cooling and melt-shop layout, not just the generator.
- **Export support:** custom voltages, English manuals, commissioning guidance and spare parts.

Core FAQs

1. What is the best furnace for melting metal in small batches?

For batches of about 3–250 kg and more than one metal, an induction crucible furnace is usually the best choice. It melts quickly, stirs the metal, starts instantly and produces no combustion gases. Gas crucible furnaces cost less to buy but are slower and lose more metal.

2. How hot can the induction metal melting furnace get?

Hot enough to melt and pour carbon and stainless steel at about 1,600–1,650 °C. In practice, the maximum temperature is limited by the crucible or lining rather than the generator.

3. How much electricity does it take to melt 1 kg of metal?

In small induction furnaces, typically about 0.15–0.25 kWh for gold or silver, 0.45–0.6 kWh for copper, 0.6–0.8 kWh for aluminum and 0.8–1.0 kWh for steel. The theoretical minimum is roughly two to four times lower; the rest is lost through the coil, crucible and melt surface.

4. Which metals can it melt?

Tin, lead, zinc, aluminum, magnesium (with special precautions), brass, bronze, copper, silver, gold, cast iron, nickel alloys and carbon and stainless steel. Titanium is not suitable, and platinum needs a special configuration.

5. Can I melt scrap metal directly?

Yes, if it is sorted by alloy, clean and completely dry. Remove oil, paint and plastic, cut or briquette fine material, and never charge sealed containers or closed tubes, which can explode when heated.

6. Does it need three-phase power?

Yes. All models use a three-phase 380 V $\pm 10\%$, 50/60 Hz supply, drawing roughly 23 A for the DW-MF-15 up to about 250 A for the DW-MF-160 at full power. Other three-phase voltages can be supplied on request.

7. How long does a crucible last?

It depends on the metal, the crucible type and the practice. Graphite-based crucibles in aluminum or copper service often last well over a hundred heats when preheated and handled carefully, while steel linings and crucibles used with aggressive fluxes wear faster.

8. Can it melt titanium or platinum?

Not titanium: it reacts with air and crucible materials at melting temperature and needs vacuum or cold-crucible melting. Platinum melts at 1,768 °C and needs a zirconia crucible and a special set-up, so please ask HLQ before planning platinum melting.

Not sure which furnace size you need? Send the metals, batch weight, heats per shift and your power supply to sales@dw-inductionheater.com or WhatsApp +86-13155965571, and our engineers will recommend the right model, crucibles and cooling.