

Today's Induction Melting Furnace Systems



GREEN FURNACE TECHNOLOGY



Flexible planning. Stable production. Efficient control.

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Medium-Frequency Coreless Induction Furnaces

GREEN FURNACE TECHNOLOGY



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OTTO JUNKER Group

Partner to the Metal Industries – For more than 100 Years



OTTO JUNKER Group is a world-leading supplier of industrial furnaces and thermal processing equipment for demanding applications in the metal industries. Since its creation in 1924 by Dr. Otto Junker – a pioneer of induction technology and promoter of research – the company has been synonymous of innovation, quality and process reliability.

At its headquarters site in Lammersdorf (Germany), OTTOJUNKER operates its own Technology and Test Center where new processes and solutions are continuously being developed in close cooperation with partners such as RWTH Aachen university.

Our product portfolio comprises high-performance induction melting systems, heat treatment systems, Power-to-Heat systems and a comprehensive range of services – including retrofits, maintenance services and our OTTOJUNKER Academy. This portfolio is completed by the foundry equipment supplied by our subsidiary INDUGA GmbH & Co. KG.

Our systems actively contribute to reducing the dependency on fossil energies and even permit carbon-free operations when powered with regenerative energies.

Employing a workforce of more than 700 at sites in Europe, Asia, the USA and the Near East, OTTOJUNKER remains your reliable partner for metallurgical applications – today and tomorrow.

Modular Furnace Systems

High-Performance Induction Technology with Precision Control



OTTOJUNKER's medium frequency coreless induction furnaces combine energy efficiency and metallurgical precision in one modular system that can be used for many different metals and processes. Any number of different furnace types can be connected to a common rectifier.

Furnace designs

- Monomelt
- Duomelt
- Triomelt
- Common DC systems*

Special applications

- Channel-type induction melting furnaces
- Coreless vacuum induction furnaces
- Controlled atmosphere furnaces
- Recycling furnaces
- Chip melting furnaces

Charge materials

- Cast iron and steel
- Copper and brass
- Aluminium
- Magnesium
- Cobalt
- Nickel
- Silicon
- Precious metals



**Any number of different furnaces operating on a common rectifier.*

Complete Melt Deck Equipment

Components of Medium Frequency Coreless Induction Furnace Plants

An advanced high-power medium-frequency coreless induction furnace system consists of the following components:

Melting unit comprising

- 1 Furnace
- 2 Exhaust hood
- 3 Hydraulic power unit
- 4 Pit guard
- 5 Operator desk with melt processor (JuMI MELT)

Electric power supply system comprising

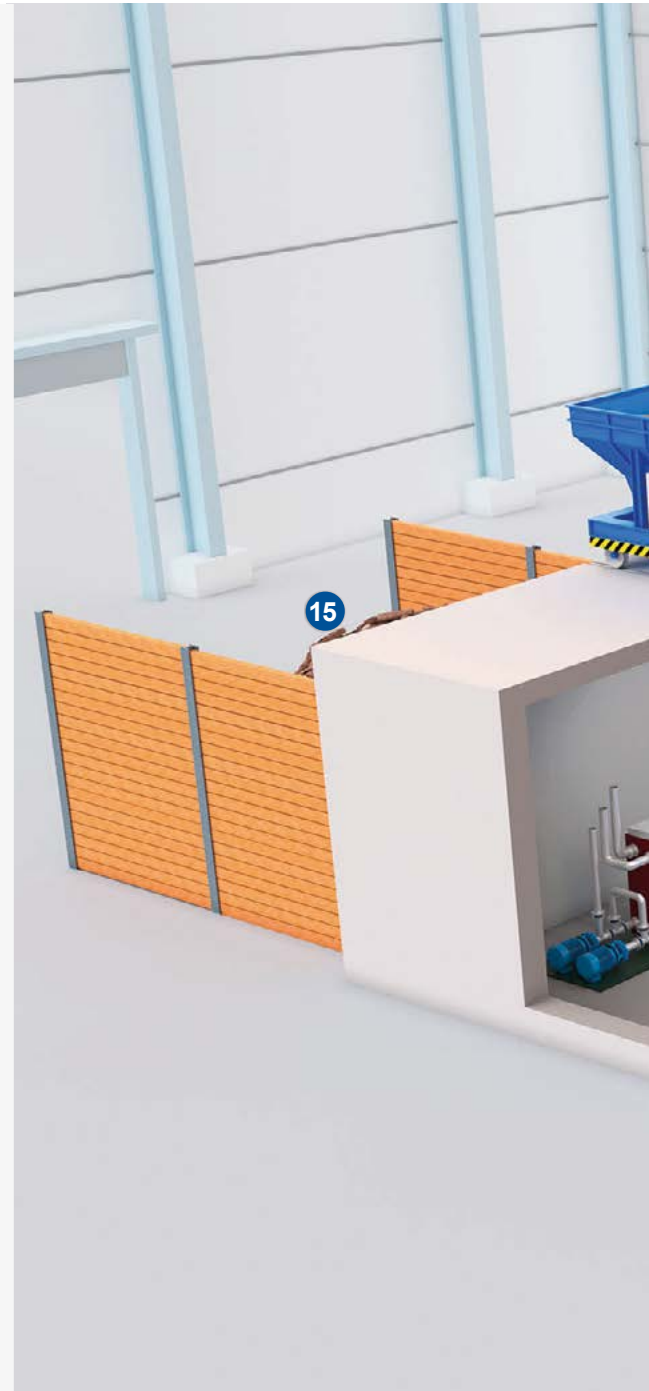
- 6 Transformer
- 7 Frequency converter
- 8 Capacitor rack

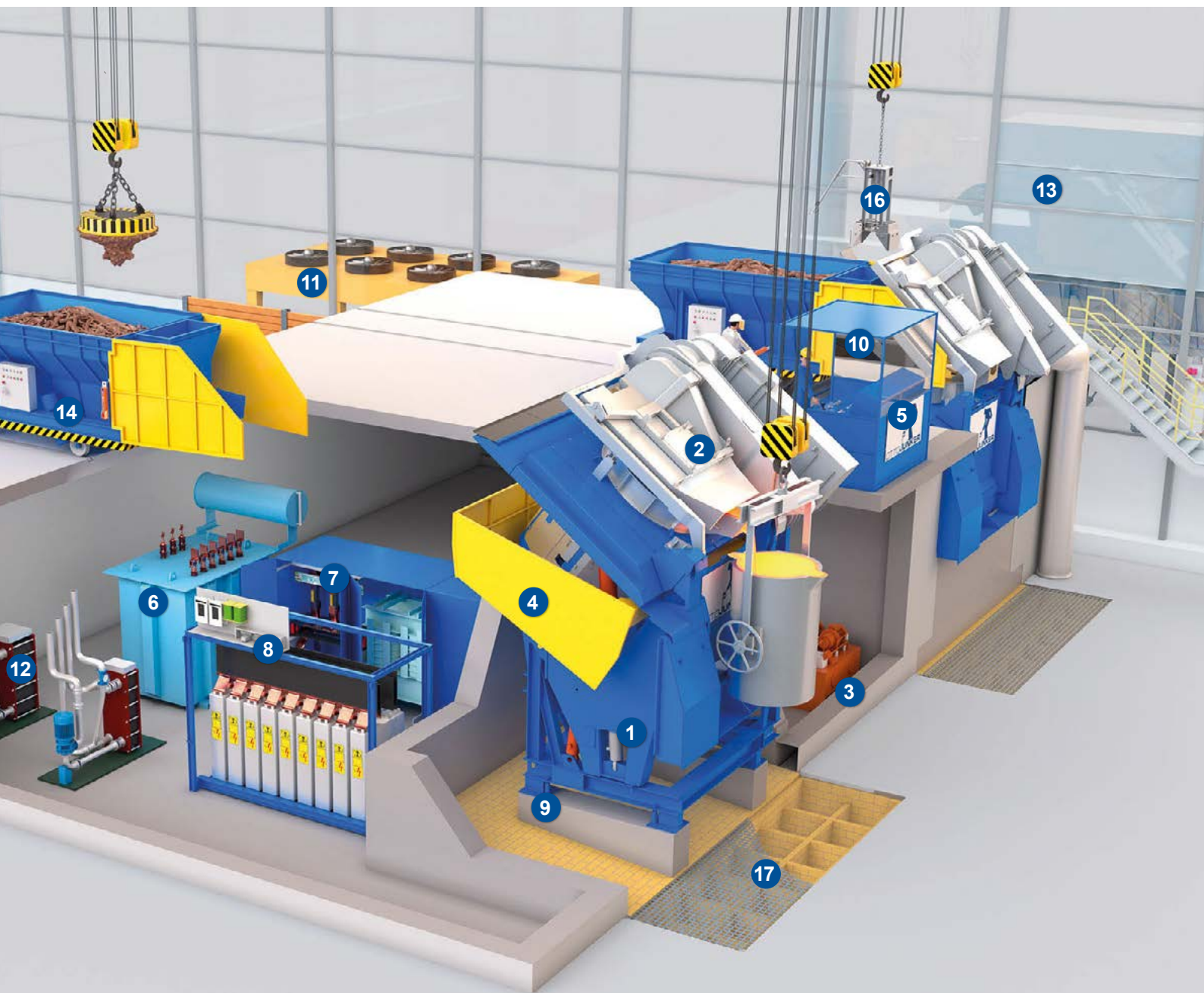
Process control system comprising

- 9 Weighing system
- 10 Splash-proof operator cabin

Auxiliary and ancillary equipment, such as

- 11 Water recooling system with air coolers
- 12 ↳ Alternatively, pump station with plate heat exchanger
- 13 Dust collection system
- 14 Charging car
- 15 Charge make-up system
- 16 Slag gripper
- 17 Emergency run-out pit

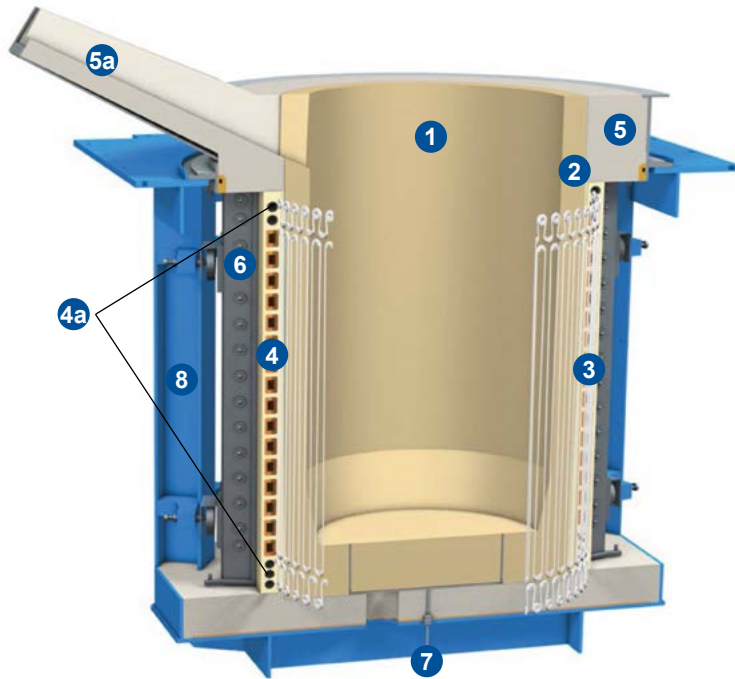




Induction Coil Technology

Powerful, Robust, Safe

Schematic of a coreless induction furnace body by OTTOJUNKER



- 1 Ceramic crucible
- 2 Insulation layer
- 3 Permanent lining with embedded OCP sensor cable
- 4 Power coil
- 4a Cooling coil
- 5 Furnace head
- 5a Pouring spout
- 6 Yoke
- 7 Earth spider
- 8 Coil cage

Both from an engineering and quality perspective, OTTOJUNKER-supplied induction coils are designed for long-term continuous duty: high efficiency, excellent mechanical stability, and effective protection against voltage arcing and thermal overloading ensure safe and efficient operation — even under demanding conditions.

Cooling coils above and below the active coil, as well as radially arranged yokes, specifically limit the magnetic stray field. As a result, the system remains well below the permissible workplace exposure limits. An additional advantage in terms of efficiency results from the targeted reduction of coil losses: depending on the metal and operating parameters, energy consumption per metric ton of melt can be noticeably reduced — for example by up to 10% in Aluminium applications (equivalent to approximately 40 kWh/t). This contributes measurably to reducing operating costs and increasing energy efficiency.



Manufacture of an OTTOJUNKER energy-saving coil at our Lammersdorf site

Digital Frequency Converters

Harnessed Power, Integrated Intelligence



Frequency converters used in induction melting applications must meet highest requirements in terms of control performance, load capability, and system integration – requirements for which OTTO**JUNKER** offers uncompromising technology.

Our IGBT converters continuously monitor current, voltage and temperature values to self-protect against peak surges and non-permissible deviations, and to guarantee stable operation even under changing load conditions. With a $\cos \varphi$ of up to 0.99 at the converter input, the power factor remains at a constantly high level across the entire power output range.

Due to their modular IGBT PowerCube design, the systems also enable continued operation at reduced power if individual modules should fail. Since the inverter, operating on the parallel resonant circuit principle, is exposed to the active current only, i.e. not to the furnace current which is several times higher, its components

are subjected to much lower loads. The open, generously dimensioned structure also provides for easy maintenance access, contributing to short maintenance times and excellent equipment availability.

Where required, the converters can also be equipped with conventional thyristor technology, provided there are no special requirements for the power grid, or if your energy supplier does not bill you for reactive power.



Thyristor-based frequency converter

JuMI MELT Process Automation

Automatic Energy Management, Temperature Control and Monitoring

The digital operator and process control system JuMI MELT (Junker Machine Interface) optimizes melting operations – from charging to reporting. At its core is a Safety PLC with touch screen-based visualisation system (WinCC) that automates critical sequences and ensures transparent and stable process control.

JuMI MELT calculates the amounts of energy needed for melting, heating and holding the metal at temperature, manages their automatic input, and provides closed-loop control to defined setpoint temperatures. Other integrated features are temperature-controlled sintering and automatic starting from cold.

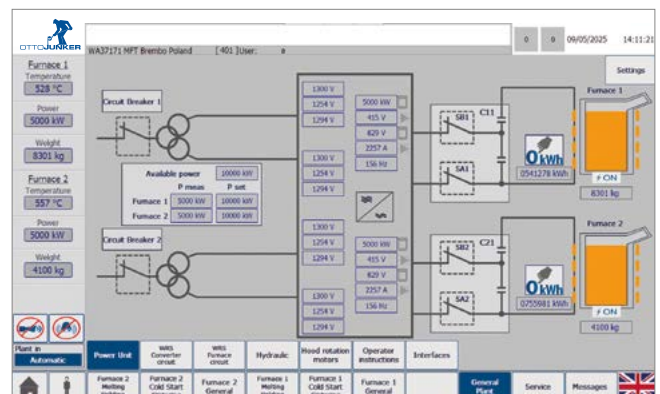
The system monitors all the relevant parameters of the water recooling system, including coolant conductivity, provides early warning of deviations, and protects the process and the components. The integrated crucible earth fault monitoring system ORIS supports predictive maintenance.

End-to-end visualization, collection of trend data and automatic creation of batch, shift, or daily reports support full traceability. Production data can be integrated into existing supervisory control systems via OPC UA or CSV. The user administration feature enforces precisely defined access rights – ensuring controlled, safe and secure operation.

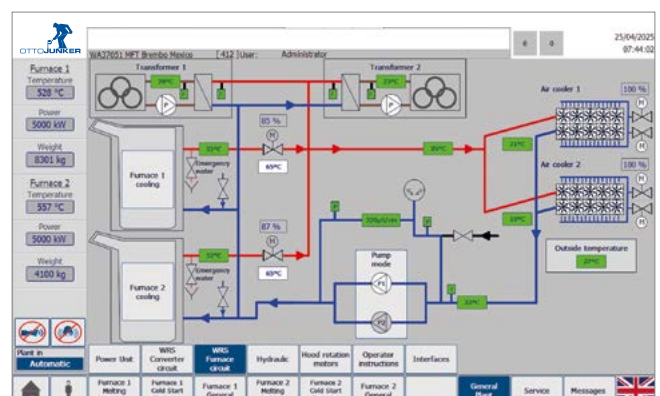
- Minimizes manual interventions
- Increases operational safety and reliability
- Supports standardization and quality assurance
- Is compatible with mobile devices (optional)
- Presents all process data in a clear layout
- Features open interfaces to accommodate future system requirements (AI-based melting optimization of melting processes)
- Industry 4.0-ready



Dashboard: Melting menu



Dashboard: Electrical schematic



Dashboard: Cooling system

Recooling Systems for Melting Operations

Controlled Heat Dissipation, Trouble-free Furnace Operation

Reliable recooling is a key factor for stable, energy-efficient melting operations. It ensures controlled dissipation of heat losses from the furnace and converter system, thus ensuring continuous and trouble-free operation of all melt deck equipment.

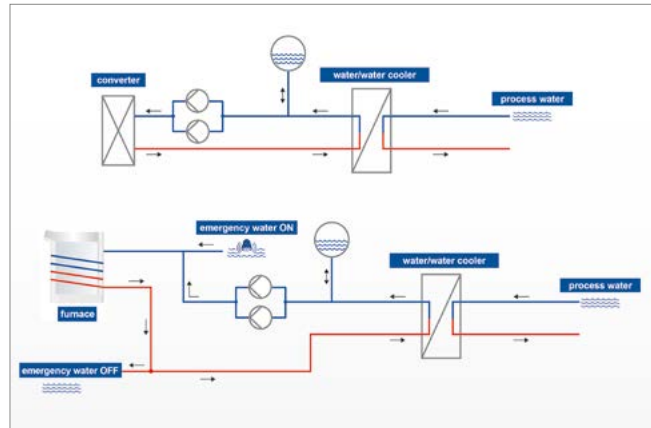
Depending on the requirements, different cooling concepts are implemented:

- Plate heat exchanger for integration into external cooling tower systems
- Closed-loop cooling tower circuits for self-contained system solutions
- Air/water coolers, e.g. in self-draining version requiring no glycol

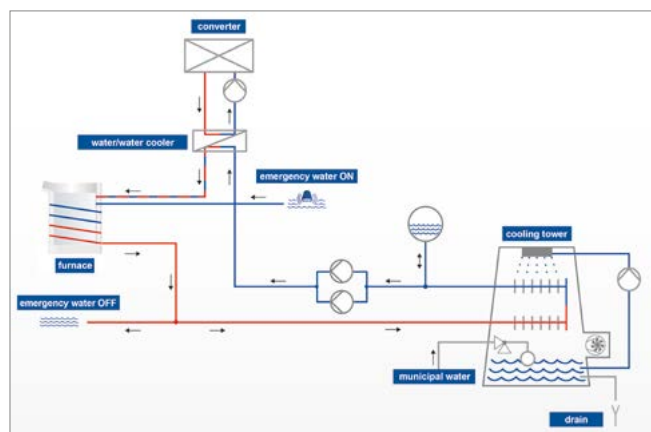
Customized system configurations are also available – for example with integrated heat recovery for continuous use of thermal energy. This not only reduces energy consumption but also contributes to the sustainable use of resources.

Overview of recooling system versions:

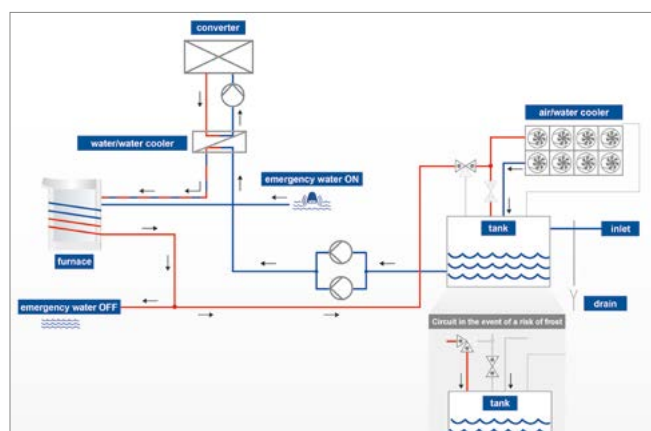
- Water/water cooler
- Air/water cooler (with glycol)
- Air/water cooler (glycol-free)
- Recooling systems with evaporative cooling towers (open/closed-loop)
- Recooling systems with chiller
- Heat recovery systems



Water/water recooling system



Water recooling system with closed-loop cooling tower



Water recooling system with glycol-free air/water cooler

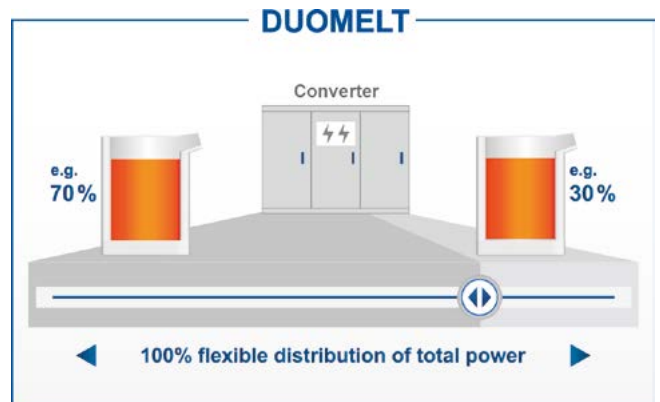
Flexible Furnace Power Distribution

MONO, DUO, TRIO and more

OTTOJUNKER MELT systems enable demand-based distribution or switchover of the converter output power to one or several connected furnaces. This allows you to combine melting, holding, pouring and sintering operations in a flexible manner – starting with conventional single-furnace systems to more complex multi-furnace systems with high demands on utilization management and process scheduling.

System variants:

- **MONOMELT**
for conventional single-furnace operation
- **DUOMELT**
for electronic power distribution to two furnaces
- **DUOCONTROL**
for computer-controlled power switching between two furnaces
- **TRIOMELT**
expands these possibilities to three furnaces with demand-based power allocation



OTTOJUNKER DUOMELT system



OTTOJUNKER TRIOMELT system



OTTOJUNKER MULTIMELT system

MULTIMELT – for multiple furnaces

For expanded configurations, it is also possible to connect multiple furnaces – and even different types – to a common power system.

Common-DC systems are designed to expand the conventional MELT configurations: the furnaces are connected to a central rectifier and operated in parallel. This creates a modular, scalable system architecture and facilitates future upgrades or process adaptations without having to include separate spare rectifiers from the beginning.

Advantages in multi-furnace operations:

- Parallel or sequential use of multiple furnaces
- Reduced idle times and set-up times
- Optimal use of installed nominal capacity
- High equipment availability
due to electronic control system
- Scalable system architecture
to accommodate future adaptations

Induction FlowForce

Controlled Melt Dynamics

Applying variable frequency control to melting operations has long been a proven approach to process adaptability. Precision-control of the frequency allows operators to influence the electromagnetic bath movement in a systematic manner - enabling them to actively steer the molten bath motion.

This is made possible by the flexible switching between several frequency levels. The melting frequency of, say, 250 Hz, can be reduced to half (125 Hz) or to a third (83 Hz) – this action being automated, monitored and documented.

High frequencies translate to a relatively calm molten bath and enable particularly efficient energy input, which is ideal for rapid heat-up. Lower frequencies promote bath movement, creating improved temperature distribution and homogeneous alloys.

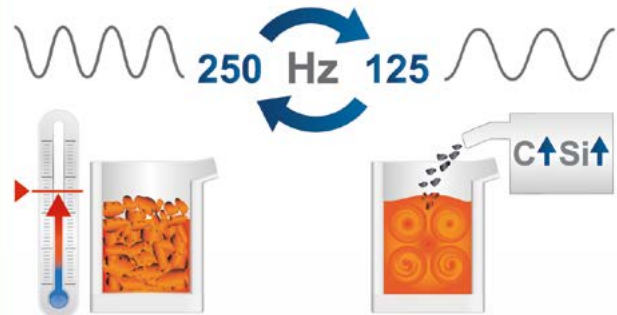
OTTOJUNKER summarizes bath movement control under the term 'Induction FlowForce'. Depending on the frequency, the benefits are different:

- Increased flow on the bath surface
- Optimized alloying and efficient homogenizing of alloys
- Efficient carburizing
- Minimal metal losses when melting chips
- Stirring down of low-grade scrap materials/ metal-bearing slag

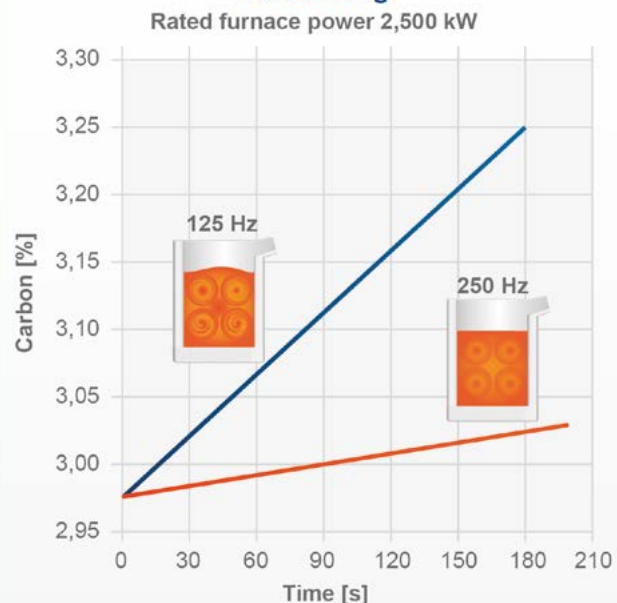
For special applications such as grain refinement, the **phase shifting feature** is used.

- Maximum bath movement
- No energy input during exothermal reactions

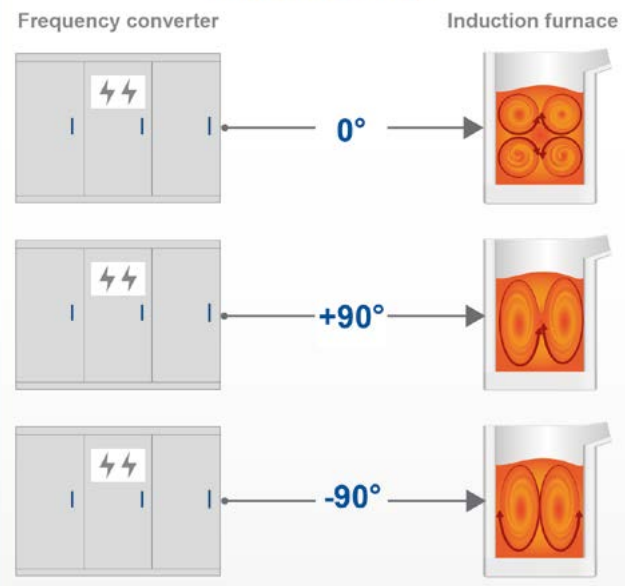
Multi-frequency technology



Carburizing



Phase shifting



Charging Solutions for all Requirements

Precise Feeding and Optimized Interfaces



The material to be melted, such as cast iron, steel, copper or aluminium, is composed of returns, alloying additives, scrap or recycled materials. The charging system ensures metered feeding of the charge materials into the coreless induction furnace, allowing operators to perfectly adjust the feed rate with the melting rate.

The system's robust design and its automatic control ensure fast cycle times, high process reliability and trouble-free operation.

The mobile charging cars consist of a moving gear, a hopper, unbalance-type vibration chute, and an electrical control system. These machines are used to charge furnaces of various sizes and configurations. They can be flexibly adapted to furnace geometry, space constraints, and production conditions.

Charging machine and furnace from a single source:

The coordination between furnace, charging machine, and control system ensures consistently safe and reliable material feeding. Precision-controlled motion sequences prevent collisions and ensure reproducible positioning at the furnace. At the same time, the geometry of the charging system is designed to closely fit the exhaust hood so that dust and fume emissions are reliably captured during charging and melting cycles.

Thanks to their low operating costs, high operational reliability and small footprint, these systems are particularly well-suited for varying charge materials and increasing performance requirements.

DustControl Exhaust Hoods

For Reliable Capturing of Emissions

The DustControl extraction hood system designed by OTTOJUNKER ensures that all fumes and dust are effectively caught during the melting and pouring phases, regardless of furnace position or operating position.

The mobile hood covers all process phases – from charging to slag removal to pouring. The captured emissions are taken directly to the filter system. In this manner, DustControl not only helps to comply with legal emission standards, but also supports sustainable foundry operations.

Use of DustControl extraction hoods in following furnace and operating positions:



Charging / melting



Melting / holding



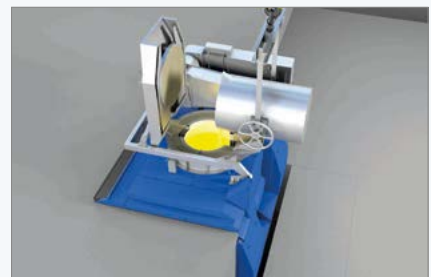
Crucible push-out*



Pouring



Slag removal



Liquid-filling*

**(hood tiltable in two directions)*

Hood tiltable in one direction:

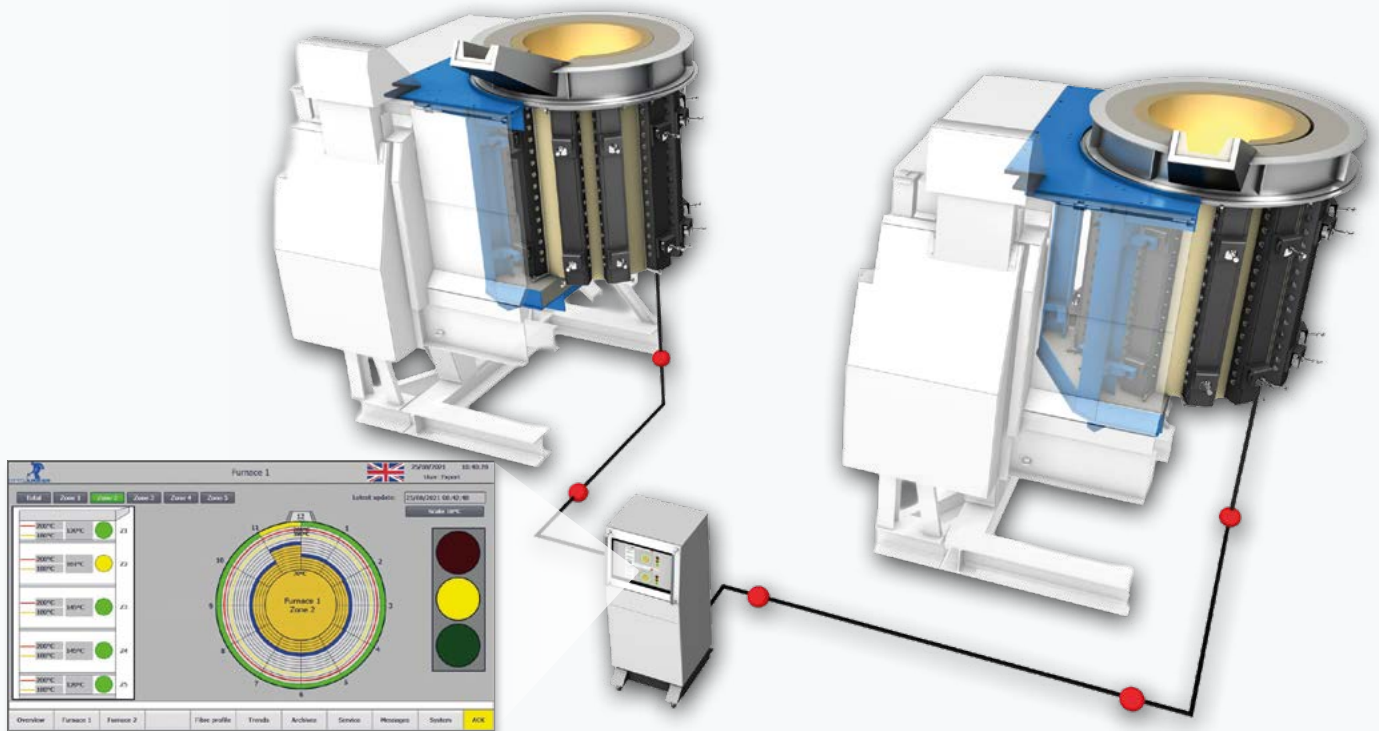
- Exhaust hood with integrated cover and hydraulic tilting
- Mobile connecting flange in furnace tilting axis
- Extraction opening above the spout to catch fumes during pouring
- Refractory lining of the hood
- Hydraulic cylinder with counterbalance valve and splash guard
- Limit switches for hood position monitoring

Hood tiltable in two directions:

- Second tilting axis for flexible positioning
- Exhaust during crucible push-out
- Opening of hood for pouring
- Preventing heat radiation from the hood during slag removal

Optical Coil Protection Plus

Intelligent Predictive Crucible Monitoring



OCP+ is a laser-optical temperature measurement system patented by OTTOJUNKER. It provides precise and full-coverage monitoring of the inner coil face – regardless of the type and condition of the lining.

The laser-optical method functions reliable even in strong electromagnetic fields, which represents a clear advantage over conventional resistance-type measuring systems. For the first time, temperature distributions can be measured directly on the surface, and monitored continuously. OCP+ operates with absolute stability even with a moist, newly lined crucible. The system enables early detection of potential damage such as erosions, cracks, or metal fins as well as anomalies in the sintering process.

Intuitive visualisation screens – using traffic light-style LED status indications, among other features – provides operators with a clear overview at all times. When critical values are exceeded, OCP+ can automatically trigger shutdown sequences.

OCP+ reliably detects:

- Temperature spikes due to cracks
- Erosions in the refractory lining
- Formation of metal fins
- Anomalies in sintering process



Animation

Furnace Systems for Cast Iron and Steel

Sizes and Designs

The coreless medium frequency furnace is now the predominant melting unit, having proven its excellent suitability for metallurgical tasks thanks to special techniques. High power densities of up to 1,000 kW per metric tonne of iron ensure high melting rates from a compact-sized installation. Even high-performance moulding lines can be supplied with high-grade metal on a continuous basis.

Where two furnaces are combined with one common frequency converter (DUOMELT / DUOCONTROL) or three-furnaces with one or two converters (TRIOMELT), a medium-frequency coreless induction furnace can also serve as a holding furnace.



Pouring from a MFT Ge 16,000

MFT furnace sizes for cast iron and steel		
Capacity [kg]	Max. power [kW]	Max. melting rate [kg/h]
100	100	145
250	250	400
500	390	655
750	700	1,230
1,000	800	1,430
1,500	1,000	1,860
2,000	1,600	3,000
3,000	2,800	5,800
4,000	3,200	6,300
5,000	4,800	9,600
6,000	5,800	11,800
8,000	6,400	13,000
10,000	8,000	16,300
12,000	9,600	19,600
16,000	12,400	25,300
18,000	14,000	28,600
25,000	15,000	30,600
30,000	20,000	40,800
35,000	20,800	42,450
40,000	22,000	44,900
50,000	25,000	51,000

Other sizes available on request.

Furnace Systems for Copper and Brass

Sizes and Designs

The specific benefits of inductive transfer of energy and the metallurgically neutral process performance are of particular importance in melting, alloying, refining and casting, as well as in holding the various copper materials at temperature.

Coreless furnace systems are used with:

- Horizontal and vertical continuous casters
- Sand-casting and centrifugal casting machines
- Chip recycling equipment
- Remelting and alloying plants

Specific design features of the coreless furnace, such as the arrangement of pouring and filling systems in the furnace's pivot bearing, are key to the success of this furnace type for demanding high-grade copper melting applications.



50-ton MFT-type furnace serving a vertical continuous caster

Furnace sizes for copper and brass		
Capacity [kg]	Max. power [kW]	Max. melting rate [kg/h]
120	70	125
300	180	375
600	270	600
900	450	1,050
1,250	500	1,200
1,850	650	1,640
2,400	1,200	2,900
3,600	1,400	3,600
4,800	1,600	4,100
6,000	1,800	4,600
7,200	2,000	5,100
9,600	2,500	6,400
12,000	3,000	7,700
14,400	3,500	9,000
16,000	4,000	10,300
20,000	5,000	12,800
30,000	6,000	15,400
50,000	8,000	19,800

For the melting down of chips it is recommended to use a reduced power density.

The melting rate for Ms60 brass is approx. 40% higher.

Other sizes available on request.

Furnace Systems for Aluminium

Sizes and Designs

Extremely low melting losses, precise temperature and process control and adjustable bath movement are key advantages of medium-frequency coreless induction furnaces when melting Aluminium materials.

These high-performance furnaces are used especially for the production of high-grade alloys and in chip recycling applications.

Fields of application:

- Horizontal and vertical continuous casting
- Mould casting
- Chip and foil recycling plants
- Remelting and alloying plants



DUOMELT melting plant

MFT furnace type for aluminium		
Capacity [kg]	Max. power [kW]	Max. melting rate [kg/h]
40	40	40
90	80	95
180	150	200
250	200	280
350	300	455
500	400	650
750	480	900
1,000	650	1,200
1,500	980	1,800
2,100	1,400	2,600
2,750	1,800	3,350
3,500	2,300	4,300
4,500	2,900	5,450
5,500	3,600	6,750
7,500	3,000	5,640
10,000	4,000	7,520
14,000	4,500	8,370
16,000	6,000	11,510
25,000	8,000	14,540
30,000	10,000	19,190

Other sizes available on request.

Service and Support

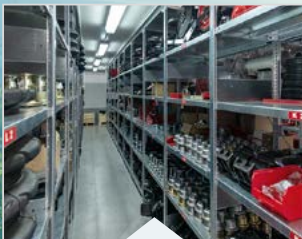
For Reliable, Economical and Trouble-free Operation

Reliable support throughout the equipment's entire life-cycle is a part of OTTOJUNKER's scope of services. This includes technical support, modernization of existing systems, as well as guaranteed availability of spare parts.

The 24/7 Service Hotline is manned by qualified system and equipment support experts.

Phone: +49 2473 601-555

Email: service@otto-junker.com



Genuine spare parts



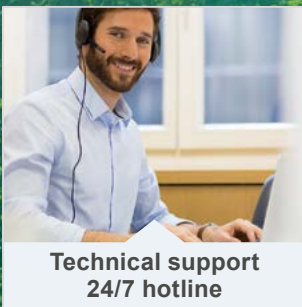
Monitoring / analysis



Maintenance / repairs



Process optimization



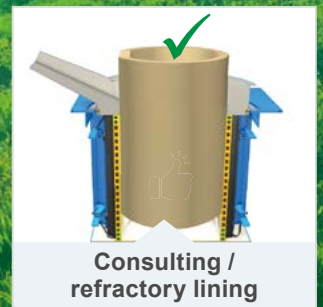
**Technical support
24/7 hotline**



Upgrades / retrofits



Training



**Consulting /
refractory lining**

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