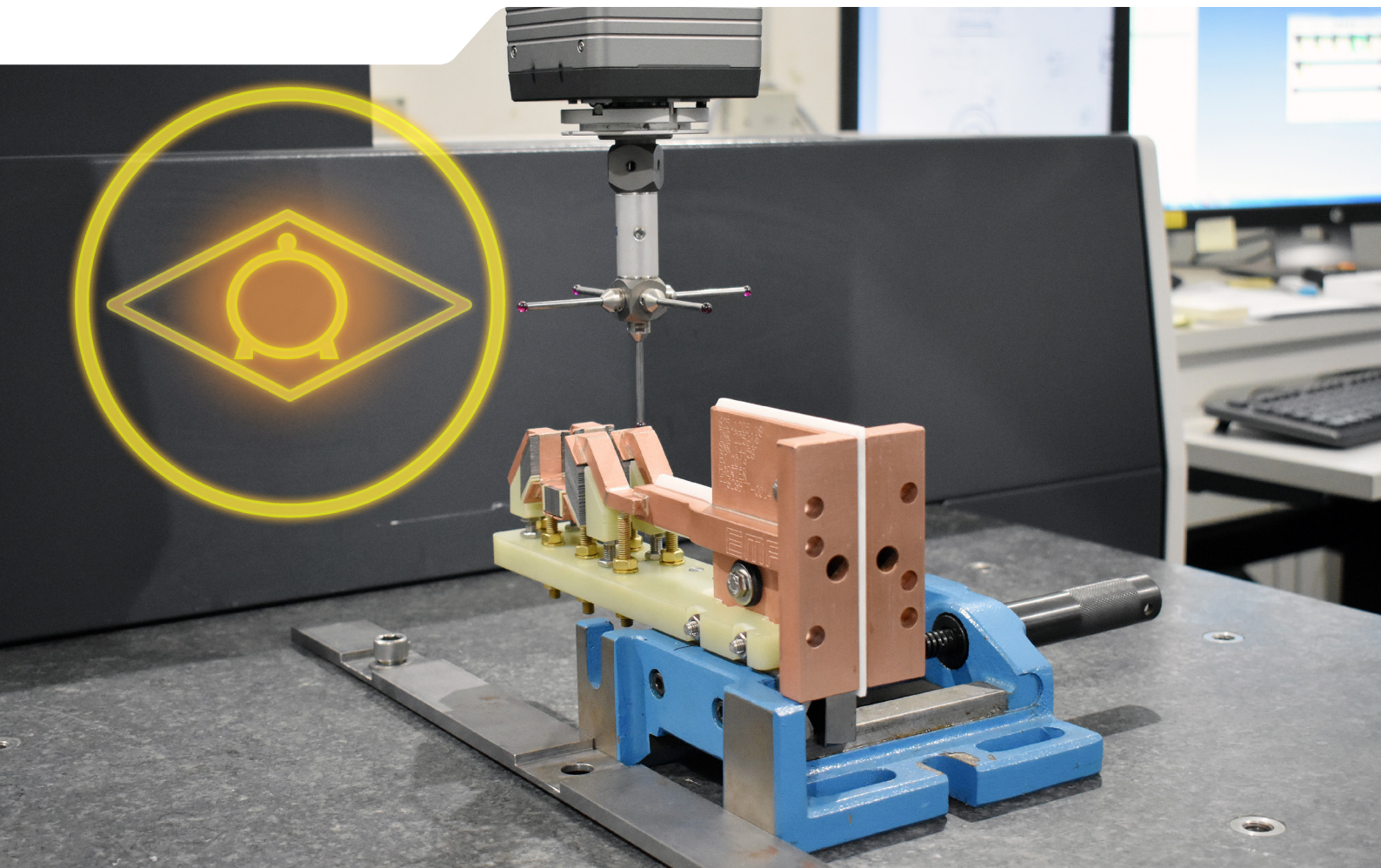


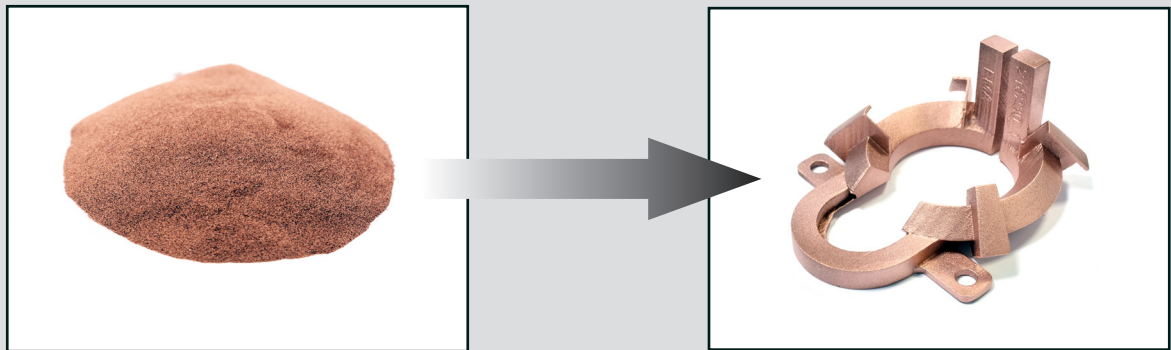
# Inductors from EMA Indutec

best quality and reliability guaranteed



# 3D printing

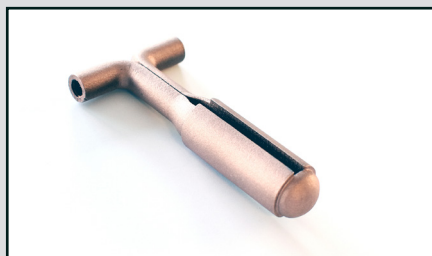
From powder to a precision tool



3D printing from EMA Indutec concentrates on the laser sintering (selective laser melting= SLM) of copper and stainless steel materials. The generative production is performed with a powder bed process. The inductors and quenches to be produced are built up from powder layer by layer and melted together using a laser.

## Realizing the impossible.

Previously impossible contours and procedures can be made. 3D printing can be used to produce complex and delicate inductors and quenches which previously were difficult and even impossible to produce using conventional methods - all within only a few days.



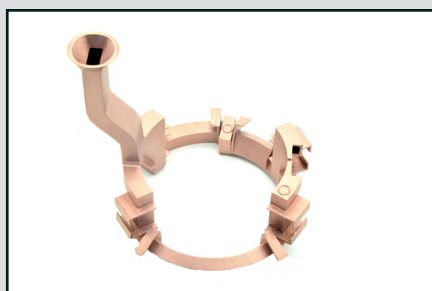
### Reproducibility

The hardening process depends on the exactness of the inductor, which covers the area of the workpiece in a targeted fashion. 3D printing guarantees the production of identical inductors.



### Longer durability and lower-cost production

The application of conventional welding and soldering processes to inductors and quenches can cause weaknesses in the material. These weak points are not produced by printing using the powder bed process with lasers. 3D components have a longer durability than conventionally-produced components. That reduces costs and saves time.



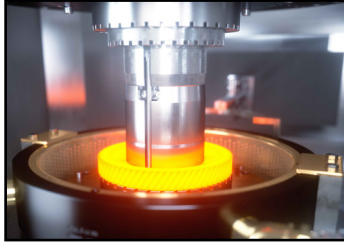
### The shortening and optimization of development times

The inside and outside inductor geometries are easier to change and thus optimize. This achieves considerable improvements to electric conductivity and cooling efficiency. Newly-developed inductors can therefore be produced in exactly the same fashion as spare inductors, but faster.

# Research development, design, production, service, repair, training



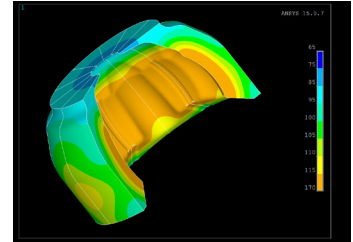
Research and  
development



Process development

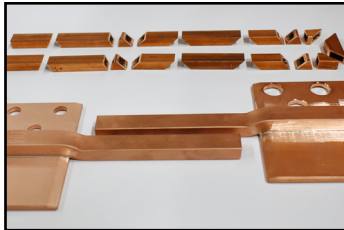


Development, design



Simulation, inductor design

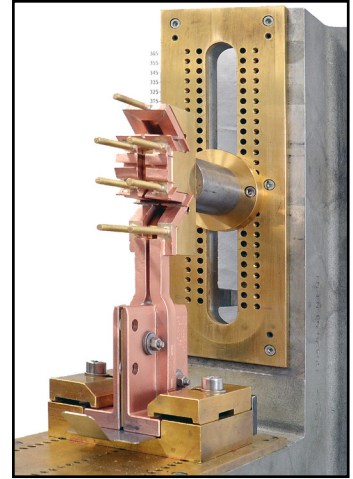
Production



Chipping production



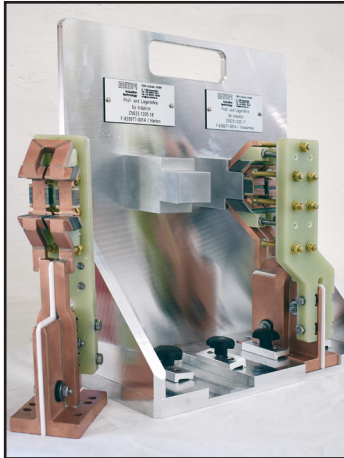
WIG welding work



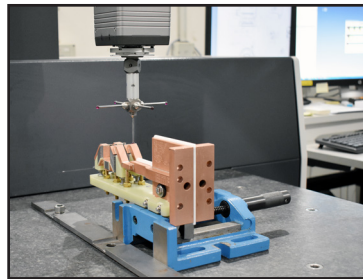
Soldering on the gauge

**A single source  
solution**

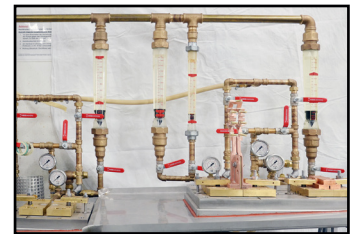
Quality assurance



Test and bearing gauge



Checking the dimensional  
accuracy



Checking for leaks and flow

After-Sales Service



Service



Repair, also of 3D printed  
inductors



Training

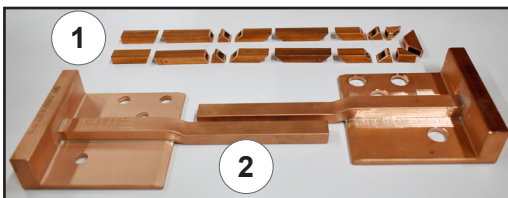
# Inductor construction to the highest of quality standards

An inductor consists of a number of components:

- Inductor brackets in designs for high-frequency (HF) or medium frequency (MF)
- Heating conductors in various wall strengths, forms and dimensions
- Magnet field concentrators made of Ferrotron®, Fluxtrol® or core plates
- Bracket and supports for the heating conductor and quenches
- Quenches for the emulsion medium
- Air nozzles for shielding the hardening zone from the quenching medium
- Protective gas feeds

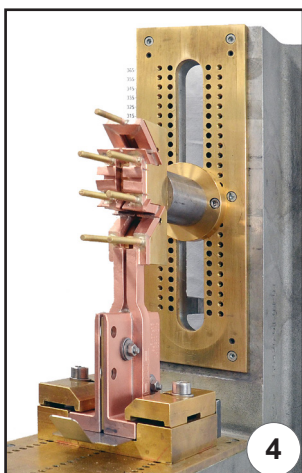
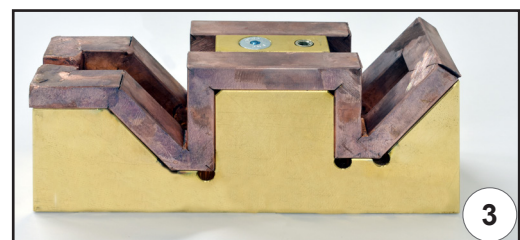
EMA Indutec produces inductors for induction heating systems (as new developments or spare parts) for our own systems and foreign systems.

Our development department is fitted with a number of workstations with state-of-the-art 3D-CAD and simulation software.



Production in our Inductor manufacture department is performed in accordance with exactly determined steps. Taking the example of the hair pin inductor, we begin with chipping processing of the required parts (1) in accordance with the drawing specifications.

The required parts (1) are joined together on the mounting (3) from EMA Indutec using a WIG welding device to produce a heating conductor. The heating conductor is then connected with the intermediate jaws (2).

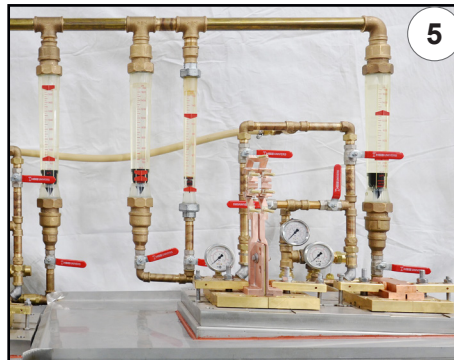


A gauge (4) developed by EMA Indutec is used for the exact production of the inductor. Then, only the workpiece storage space alignment aids are required for the installation of the inductor. This ensures a high level of precision and repeat accuracy with new parts and repairs.

The parts joined together are soldered outside the gauge. Otherwise it would become too hot.

The inductor is then ground and subject to glass bead blasting.

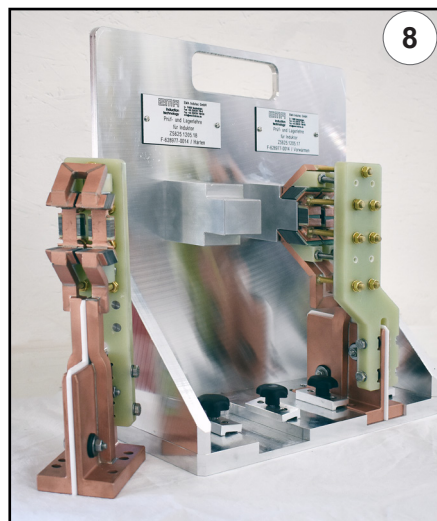
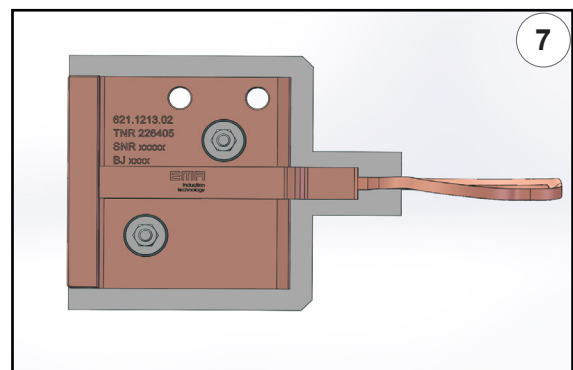
The pressure resistance and pressure-tight nature is tested on the test stand (5) in a flow of 10 bar. The flow volume is later tested under a pressure of 3 bar.



In the next step, the measurement accuracy of the inductor is checked in the 3D measurement room with a precision machine from Zeiss (6).

The inductors are labeled with the following information to ensure identification (7):

- Drawing number
- Part number
- Serial number
- Year of construction



Test and positioning gauges (8) are intended for the inductors of our customers. The gauge permits safe dispatch of the inductor. The customer can also use the gauge to check the inductor and determine whether it has become bent, e.g. after a crash. The inductor can also be stored safely and this prevents unintended deformation. The inductors are best stored in the inductor case intended for the purpose.

The use of an EMA Indutec inductor pass (9) brings a number of advantages:

- All features visible at a glance
- Quality improvement through holding time check
- Repair cycle easier to control
- Machine downtime resulting from missing replacement inductors can be avoided

**9**

**Induktorpass** EMA  
induction  
technology

Platz für Strichcode

Ausgabedatum Induktorbau: \_\_\_\_\_

Seriennummer: \_\_\_\_\_

Teilenummer: \_\_\_\_\_

Zeichnungsnummer: \_\_\_\_\_

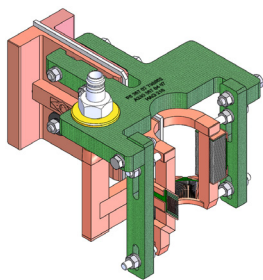
Bezeichnung / Werkstückart: \_\_\_\_\_

**Achtung: Dieser Pass verbleibt immer bei diesem Induktor!**

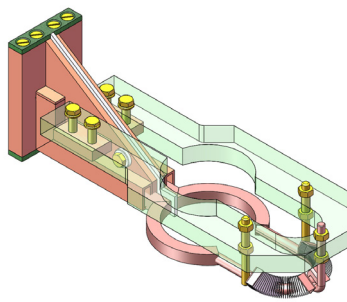
Die weißen Felder werden von EMA Indutec ausgefüllt	Einbau Datum, Name	Einbau Name	Ausbau Datum, Name	Ausbau Name	Ausberggrund und Bemerkungen
	1. Einbau				
1. Reparatur EMA Indutec Name, Datum:	2. Einbau				
2. Reparatur EMA Indutec Name, Datum:	3. Einbau				
3. Reparatur EMA Indutec Name, Datum:	4. Einbau				
4. Reparatur EMA Indutec Name, Datum:	5. Einbau				

EMA Indutec GmbH • Petersbergstraße 9 • D-74090 Meckesheim • www.ema-indutec.com • Tel. +49 (0)6226 788-0

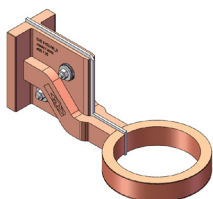
# Inductor and quench designs



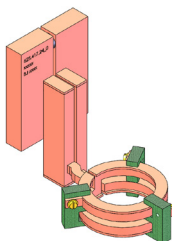
Shot or semi-ring inductor



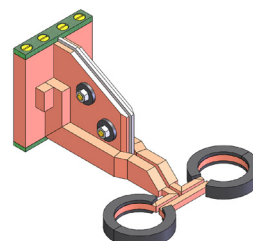
Keyhole or snowman inductor



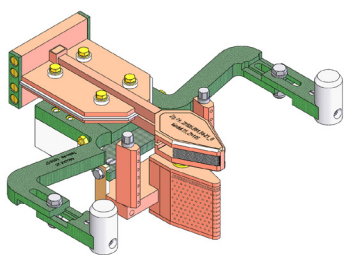
Ring inductor single wind



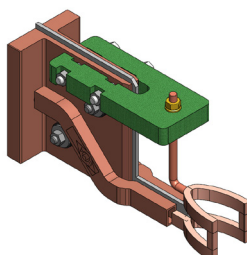
Ring inductor multiple-winds



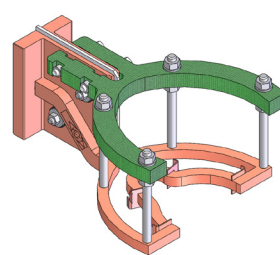
Double ring inductor



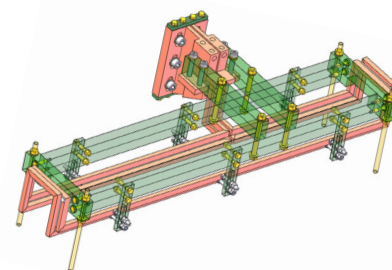
Tooth-by-tooth inductor



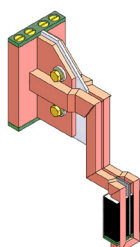
Tooth flank inductor



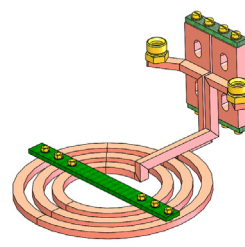
Shape inductor



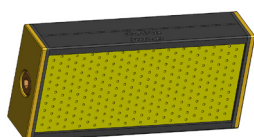
Line inductor



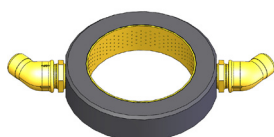
Hairpin inductor



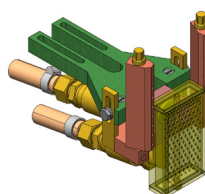
Surface inductor



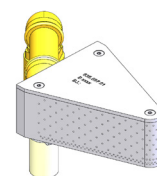
Box quench



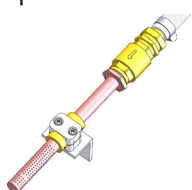
Ring quench



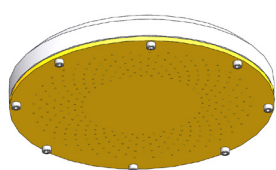
Tooth flank quench



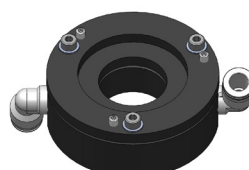
Form quench



Interior quench



Finishing quench



Slit quench



Axial quench

# Our trainings



## The fundamentals of induction technology

How do I reduce reluctance to engage with inductor technology? What is induction and how does induction hardening work? What do I need to comply with during inductive hardening?

Basis training in induction technology - theory in a one-day training course

Theory:

- Induction theory
- Electromagnetic characteristics
- Materials science
- Inductive hardening
- Inductor types
- Inductive tempering
- Inductor realization – field guiding elements
- Maintenance and handling of the inductors

Extended training – theory and practice in a 2-day training

Theory:

- Induction theory
- Electromagnetic characteristics
- Materials science
- Inductive hardening
- Inductor types
- Inductive tempering
- Inductor realization – field guiding elements
- Maintenance and handling of the inductors

Practice:

- Experiments with various inductor concepts (feed, shot, steel sheeting) on one of our laboratory machines
- Evaluation of the experiments in the laboratory
- Discussion of the results

Previous knowledge:

- Basic understanding of electrical technology
- Basic understanding of hardening technology

## The fundamentals of inductor construction

How do I reduce reluctance to engage with inductors? How can I perform minor repairs to inductors independently? What must I be aware of with inductors?

Basis training - theory and practice in a 3-day training program

Theory:

- Induction theory
- Inductive hardening
- Field development
- Inductor types
- Concentrators and their effect
- Fundamentals of inductor construction

Practice:

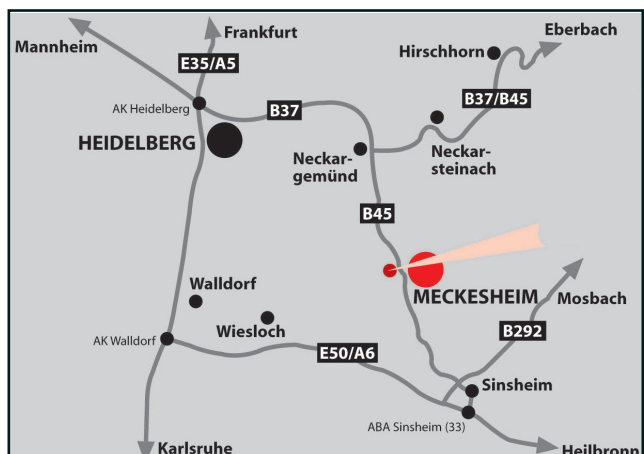
- Cutting copper components
- Bending pipes
- Soldering
- Welding
- Drilling
- Installation

Previous knowledge:

- Basic understanding of the mechanical processing of metals
- Knowledge of welding (WIG), hard soldering, soldering of metals and the bending and cutting of pipes

Training centers

- EMA Indutec GmbH in Meckesheim, Germany
- On-site at the customer's premises



## Ideal Solutions for Heat Treatment

### Induction heating and hardening systems

- Economical and highly reliable systems
- Low energy consumption per workpiece
- Accurately reproducible hardening results
- High throughputs
- Heating zones and times can be determined precisely
- Heat treatment processes with low distortion
- Scale-free hardness zones due to heat treatment with protective gas
- Simple to integrate into production lines
- Lower expenses for production parts
- Tailor-made induction systems from a single source
- User-friendly adjustment, retrofitting and maintenance
- Modern engineering supported by FEM simulation
- Areas of application: surface hardening, annealing and tempering, heat shrinking, fixture hardening

### IGBT converters

- Digital converter control
- Power range from 10 kW up to several Megawatt
- Frequencies from 5 Hz to 400 kHz
- Heating and melting
- Hardening, annealing and tempering
- Forging and forming
- High energy efficiency
- Easy integration into production lines
- Customized solutions and special systems
- Replacement of old and external devices

### After Sales Service

- Qualified and knowledgeable Service Centre
- Service hotline for troubleshooting
- Preventive maintenance
- Smart remote control solutions
- Efficient spare part concepts
- Customized plant-retrofit
- Inductor development, construction and repair service
- Training for operators, maintenance personnel and induction experts (also on site)

### Top quality from one source

- More than 80 years of experience in heat treatment
- Over 10,000 induction systems in long-term operation worldwide
- Development and manufacture from a single source
- DIN EN ISO 9001:2015 certified
- Efficient project and quality management from the first question to subsequent service



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