

# Products 2011 for Inductive Heating

*eldec*

**Glowing Innovations.**



## Your part – our task

As a globally active company we develop, produce and distribute inductive heating technologies. We offer varied solutions that are highly efficient and based on a simple, tried and tested principle: electrically conductive bodies generate eddy current losses when an alternating magnetic field is passed through them. They heat themselves thanks to the alternating magnetic field. A high level of heat, which is easy to control, is created immediately upon induction from the workpiece itself, and can be used for hardening, tempering and brazing, for annealing and shrink-joining; for coating and stripping.

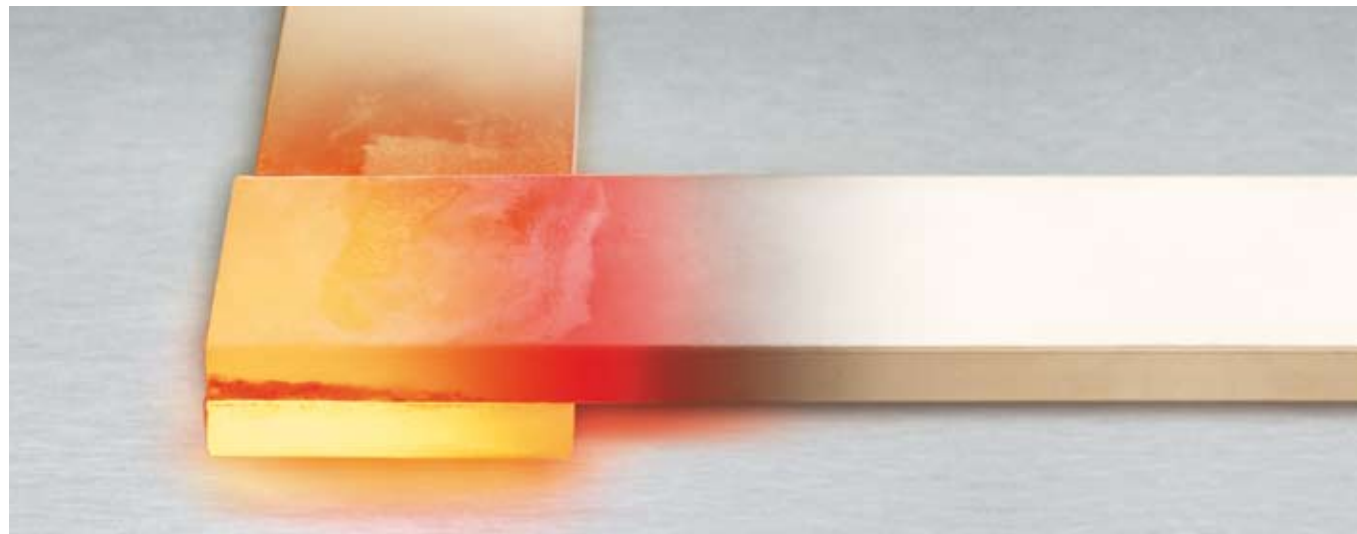
eldec products are solutions. Innovative solutions for the special tasks which you request from us.

Because every workpiece is different, every customer order involves a special feature that leads us to new solutions.

This is why everything revolves around definition of your job. We work closely with you to develop the right solution for your needs. This cooperation starts with a comprehensive consultancy review session during which we first create a precise "picture" of the situation: of your workpiece, the special requirements and the associated technological process.

You will profit, like many other renowned companies worldwide, from our long years of experience in the most varied applications of inductive heating.

Your success is our goal.



## Solutions for every sector

Our solutions are in use in the most varied of sectors, because inductive heating of electrically conductive materials is becoming more and more popular across the board.

eldec solutions are effective, efficient and economical too, particularly in terms of energy consumption. Our solutions also contribute to our green dot for energy efficiency.

As a result, there are few value added chains that can do without these technologies. Every day new application areas are opened up using eldec technologies. Worldwide. When can we help you to optimize your manufacturing process?

### The most notable eldec users of induction heating technology:

- Electrical machine construction
- Automotive
- Mechanical and systems engineering
- Tool and die construction
- Aerospace engineering
- Other special applications



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## eldec generators: powerful, precise, energy-efficient

There can be no induction without an energy source. eldec generators create the basis for efficient and reliable induction heating systems, with the necessary plant-engineering environment if required.

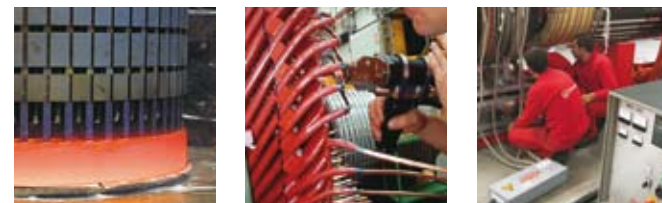
The optimally tiered range of eldec generators comprises medium-frequency and high-frequency generators from 1.5 to 1500 kW and SDF® generators from

15 to 3000 kW. Our generators are easy to use and can be optimally integrated, if required, into the most varied of manufacturing systems. They are small in size, light in weight and big on performance.

With eldec generators, the electronic power control in combination with automatic adaptation ensures optimal utilization of the available generator power.

Optimum efficiency and short, accurate heat input: for you this means short process times and high process capability as well as low energy consumption and low maintenance costs.

The generators are also short-circuit and open-circuit proof. Inadvertent workpiece contact thus has no effect. With us, safety, efficiency and precision come together: as glowing innovations.



Energy sources for inductive heating  
MF, HF, SDF® from 1.5 kW to 3000 kW

### MF (medium-frequency) and HF (high-frequency) generators Powerful energy sources for inductive heating, both stationary and mobile.

- Robust IGBT transistor technology => short-circuit and open-circuit proof
- Efficiency > 90%
- Pulse width modulation and pulse package control for automatic power regulation (including for the transition at  $T_{Curie}$ )
- Automatic adjustment to resonance frequency and thus inductor impedance
- Switch topology with output matching transformer: optimal user protection
- High speed PLC with eldec control print: short clock frequencies for the quickest control
- precise energy dosing (+/- 2%) => high process capability (reproducibility)
- Modular alternating current converter
- Compact eldec transformers and throttles => best power density
- Coaxial cables up to 15 m in length (at MF)
- Largest frequency and power range and largest adjustment range on the market
- Virtually maintenance-free

**MF (medium frequency):**  
Typical heating depths:  
approx. 1.5 mm – 5.5 mm  
Frequency: 8 kHz – 40 kHz,  
(2 kHz – 5 kHz on request)  
Power: 1.5 kW – 1500 kW

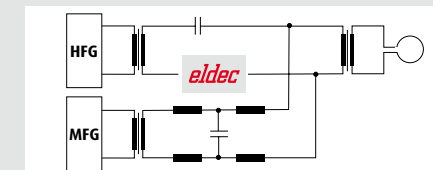
**HF (high frequency):**  
Typical heating depths:  
approx. 0.2 mm – 2.5 mm  
Frequency: 80 kHz – 450 kHz  
Power: 1.5 kW – 1500 kW

eldec generators are available with various outputs: double, threefold, fourfold, to the extend of eightfold. Twin and symmetrical solutions are also available.

### SDF® generators (Simultaneous Dual Frequency): Energy sources with maximum power density in simultaneous dual frequency technology for inductive hardening.

Opposites attract: SDF® generators heat using both medium and high frequencies – at the same time. The patented switch topology hereby enables the simultaneous superimposition of the medium and high frequency power oscillations at power outputs of up to 3000 kW.

With that the energy consumption of an SDF® system is significantly lower than the case hardness and single-frequency induction hardness methods.



- Simultaneous heating with medium and high frequencies
- True-contour edge-zone hardening of complex surface geometries
- Flexible use also as a purely MF or HF generator
- Combination of pulse width modulation and pulse package control
- High speed PLC with eldec control print: short clock frequencies for the quickest control

- Highest power density => short process times
- Short process times => in-line integration possible => low energy consumption/workpiece => no or hardly any scaling => minimized component bracings

**SDF® (Simultaneous Dual Frequency):**  
Typical effective hardening depths (true-contour): approx. 0.2 mm – 5 mm  
Frequencies: MF 8 kHz – 40 kHz,  
HF 80 kHz – 450 kHz  
Power: 15 kW – 3000 kW

eldec SDF®: patented switch topology

### Customized cooling systems Bespoke and therefore always precisely dimensioned.

Depending on the system design, eldec generators can be built with or without cooling systems. Everything is adjusted to suit the overall plant dimensions and the conditions on site, individually and

to your wishes. The generator, inductor and, if required, the quenching medium can be passively or actively cooled in this process.



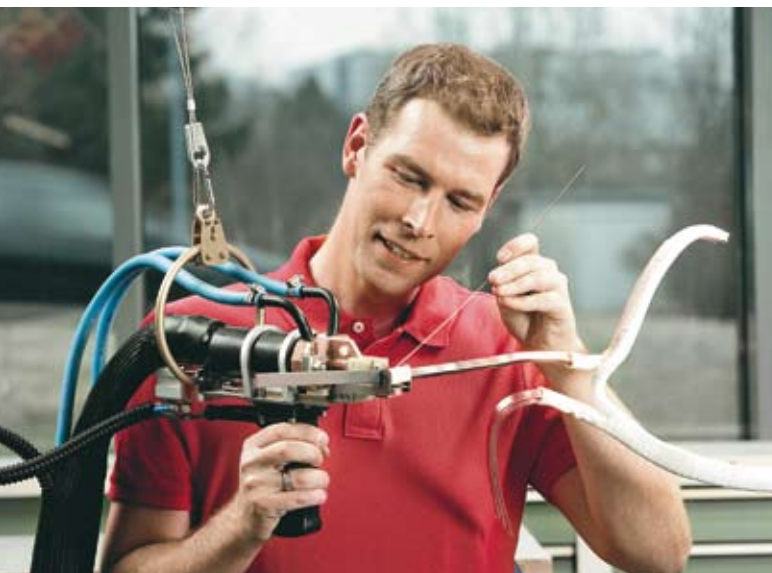
## eldec MICO: energy source and cooling system integrated in one

Small and compact, stationary or mobile. Inductive heating – re-thought and re-done. The integration of frequency converters and a cooling system in one cage creates multiple application possibilities. This means maximum flexibility for your heating task, making processes like inductive brazing, annealing and cutting-edge hardening as well as coating and stripping both practical and uncomplicated.

The MICO product line is offered in a wide range of power ratings (from 5 kW to 70 kW) and can be both stationary or mobile.

MICO can be configured with rollers, crane hooks or forklift openings as well as various work surfaces and can be equipped with a variety of tools: inductors, brazing guns or heating cables.

The choice is yours. The modular design is evident even in the superstructural: from folding cantilever arms with parallelogram kinematics, through short or long cantilever arms with special balancers, up to the connection of heating cables in a practical cable box. A small but highly effective device with enormous flexibility.



Touch screen



Cable box with heating cable



MICO-M

MICO-L

HF power: 15 kW – 30 kW  
MF power: 18 kW – 70 kW  
Tube package length: up to 15 m  
Touch screen operation  
Multiple outputs on request: DA or twin

## eldec brazing systems for power station construction: automatic brazing of pole coils and bars

Whatever the application, be it soft, hard or high-temperature brazing, accurate, automatic brazing with induction heating is enjoying increasing success in many branches of industry.

Especially in power station construction. The need for automation is particularly urgent here due to the ever increasing demand for new power stations.

eldec brazing systems offer this automation for the manufacture of pole coils and bars. They shorten the process times and increase the quality of joints. Top technology with a consistently precise result.



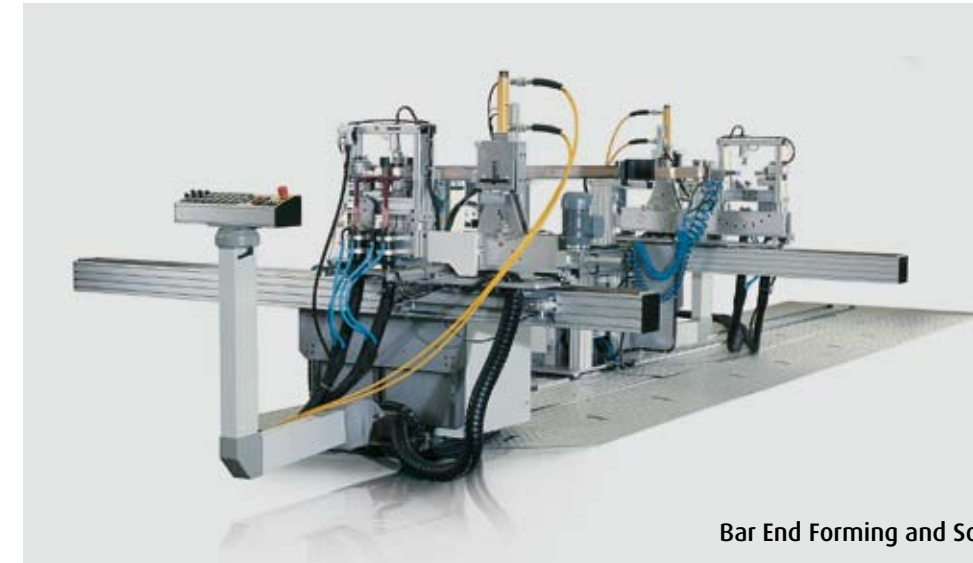
Pole Coil Brazing System



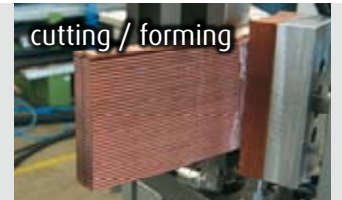
brazing



pressing



Bar End Forming and Solidification System



cutting / forming



brazing

# eldec MIND: modular systems for hardening chucked parts and shafts up to $\varnothing$ 1200 mm

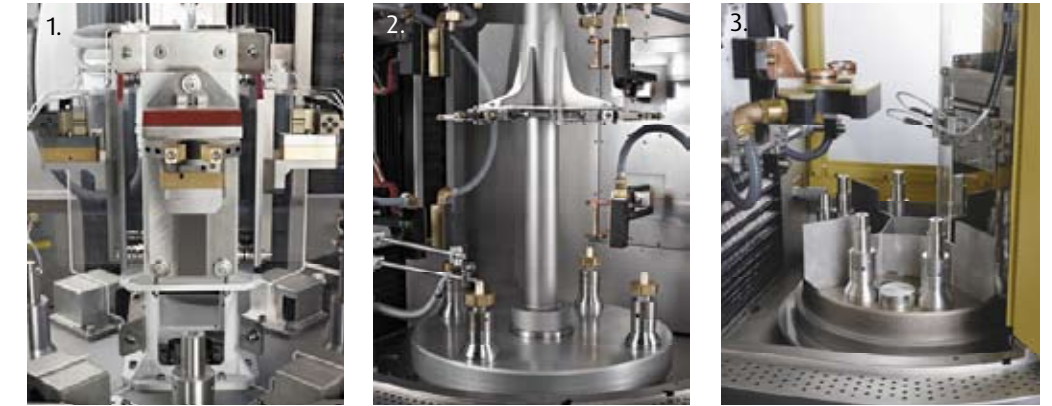
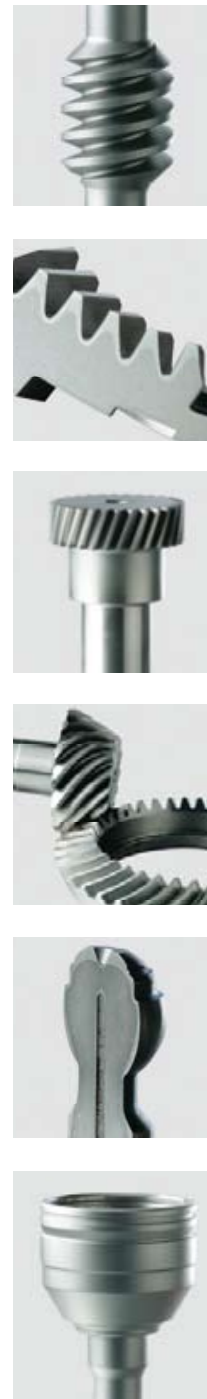
The MIND series is the result of many years of experience, which we have gained as a supplier of inductive energy sources and complete special hardening machines. This accumulated know-how has now crystallized in a new generation of modular, inductive hardening system. MIND stands for modular induction. Full modularity for optimal solutions. Efficient hardness solutions in a modular design.

Depending on the workpiece dimensions, desired hardness profile and requirements in terms of flexibility and lot size, an eldec MIND system is configured from the main components of base machine, energy source, automation components, cooling system, workholding and tooling. A well thought-out modular system which can handle your very particular task quickly and cost-effective.

eldec MIND hardening machines can be supplied as a manually operated stand-alone solution, as heat treatment systems with a customized level of automation or also as in-line hardening cells, completely integrated in the process chain of soft and hard machining.



eldec MIND is suitable for the following workpieces:  
 Workpiece geometry: chucked parts and shafts  
 Workpiece diameter: up to 1200 mm  
 Workpiece length: up to 1500 mm



- 1. Work area for camshafts
- 2. Work area for drive shafts
- 3. Work area for sprockets made of powder metal



**eldec MIND modular system: a selection of modules and options**


## eldec Mini-MIND: compact integrated system

The eldec Mini-MIND is the compact, "smaller sibling" of our full-featured MIND hardening machine series. A complete, integrated system for your induction hardening application or any other induction heat treating of small parts.

The energy source with active coolant and quench system (if needed) is integrated into the machine base. The Mini-MIND can be transported "as is," featuring the smallest foot print of any complete system.



Floor space (L x W):  
1500 x 750 mm (60" x 30")

One of many possibilities: Z-axis slide unit with 250 mm stroke and coaxial output transformer, inductor coil and quench head in "lower" position.\*

Highly flexible in work area utilization. The spacious working area allows for different modules and work holding devices to be freely positioned.

Partholding device designed for connecting rods of small motors to be loaded and unloaded manually.\*

Light curtain

Stainless steel basin



Operating and programming through a touch screen panel.



All-in-one and easily accessible: energy source, coolant system, quench system and electrical controls.

eldec Mini-MIND allows high efficiency in terms of low, medium and high volume production for hardening, tempering, brazing, fitting or melting in the smallest possible space.

\* Technical changes possible; configuration modules shown for example only.

## eldec VL-H: hardening machine with gripping function for self-chucking

The eldec VL-H is a joint venture development between eldec Schwenk Induction GmbH and EMAG Maschinenfabrik GmbH. It is the first pick-up hardening machine in the world.

Pick-up refers to the fact that the inductor tool is stationary and the workpiece is

moved on two axes. The machine is thus automated and loads itself.

The advantage for our customers: all processes, from soft machining through hardening and up to hard machining, can be easily integrated in an automated line.



eldec VL-H



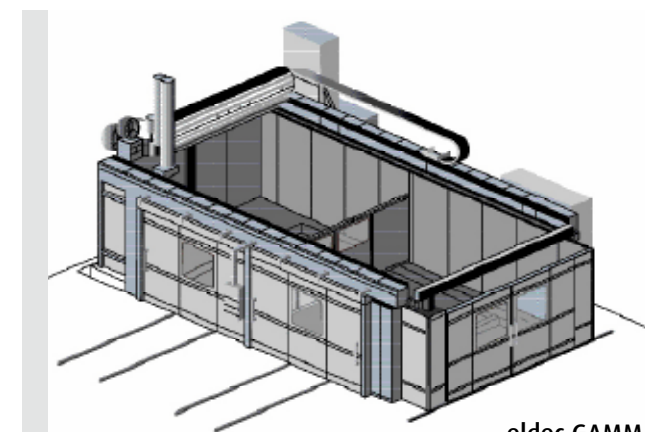
eldec VL-H is suitable for the following workpieces:  
Workpiece geometry: chucking components  
Workpiece diameter: up to 170 mm  
Workpiece length: up to 110 mm

## eldec GAMMA: automated hardening of large tools and dies

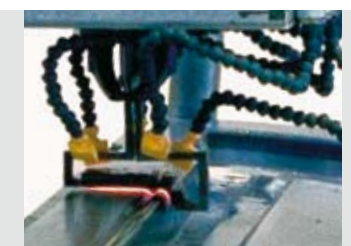
This machine is designed to harden cutting edges and wearing surfaces on large tools for sheet metal forming. Using our SDF® generators, effective hardening depths between 0.5 mm and

5 mm are possible, with adapted rate of feed, constant temperature and no intermediate stops. All this is due to the integrated online temperature regulation, rotating and swiveling hardening head

and automatic control along the teach coordinates. So that you always get precisely the result you want.



eldec GAMMA portal hardening machine



eldec GAMMA is suitable for workpieces up to the following size:  
3000 mm x 7000 mm x 2000 mm

## eldec services: all-round service for smooth processes

A product is only as good as the service that follows it. That's why with us a perfect solution comes hand in hand with an excellent all-round service that we can offer worldwide thanks to our service network.

Our services include technological consultancy, a comprehensive range of training programs and reliable after-sales service.



### Technological consultancy

We seek out the right solution for your tasks. To do this we provide support from the very start with sound technological consultancy. We discuss technical solution approaches with you and determine the relevant advantages and disadvantages. Our employees pride themselves on their networked thinking, they are always in demand as speakers at technology conferences and specialist forums and are constantly exchanging ideas and information with their colleagues in the sciences.

### After-sales service

From the eldec locations or in conjunction with our global sales and service partners, we ensure that everything runs smoothly for you and that the complete scope of services of your system is always available to you, now and for many years to come. Full spare part availability and a competent service team ensure a reliable service and a swift response. Because if anything does not work the way you want it to, we will be there to help without delay.



### Process development

Innovative products require innovative processes. We are here to advise you on this. Our broad, technical and application know-how, our deep understanding of complete manufacturing process chains and our well established knowledge of metallurgy, together with comprehensive test and analysis capacities, form the foundations of our solutions-oriented work.



### Commissioning / acceptance

The way in which we designed your eldec solution to your needs is precisely the way we deliver it too. We will commission it together with you, personally and professionally. System solutions will be set up at one of the eldec locations, Dornstetten (D), Auburn Hills (USA), or Xiamen (China), for pre-acceptance. Final acceptance is done at the customer's facility.



### Inductor design and inductor manufacturing training

The inductor forms the core of every eldec system. We therefore also dedicate special trainings to inductor manufacturing, which are subdivided into theoretical and practical parts. Here, the participants are first taught the theoretical principles before the practical exercises, where they learn how to build a suitable coil based on frequency, material and power density.

### Basic training in induction technology

This training will teach you everything you need to know about induction heating. We will provide brief, concise and memorable answers to your questions about induction: How does this technology work and what are its possible applications? We naturally also address your special requests in the training.



### Start up and back-up manufacturing

An emergency or a breakdown? Short-term peak loads or quantities that are too low to warrant investing in a new, in-house system? For such, often unforeseeable events, we offer you a practical solution: we will manufacture your workpieces temporarily for you on our demonstration and pilot machines.

### Equipment rental service

You have just received a large order and you have to start production quickly? Your system is malfunctioning or you need a test device immediately? We would be delighted to help by providing a plant hire service. It's quick and easy, giving you the flexibility you need, when you need it.

### Range of training programs:

#### User training

Our sophisticated training concept gives you the opportunity to have your eldec system operators comprehensively trained. Individually or in small groups, the participants learn how to get the best productivity levels from your system.

#### Maintenance training

The service life of every machine is increased significantly through maintenance and care. To maintain your production levels, we offer maintenance training courses, during which your maintenance operatives will learn about all the opportunities for preventive maintenance. So that your manufacturing system always runs smoothly.

#### Technological and metallurgical training

Our technicians and engineers will provide you with the knowledge you need to competently make any decisions that arise. In our metallurgy training courses, we teach both the basics and also more detailed topics for specialists. Because regardless of whether hardening or brazing – the material to be heated determines the process. You will obtain detailed insights into the broad range of applications of our technologies, in a practical setting and a manner that is tailored to your needs.



eldec locations

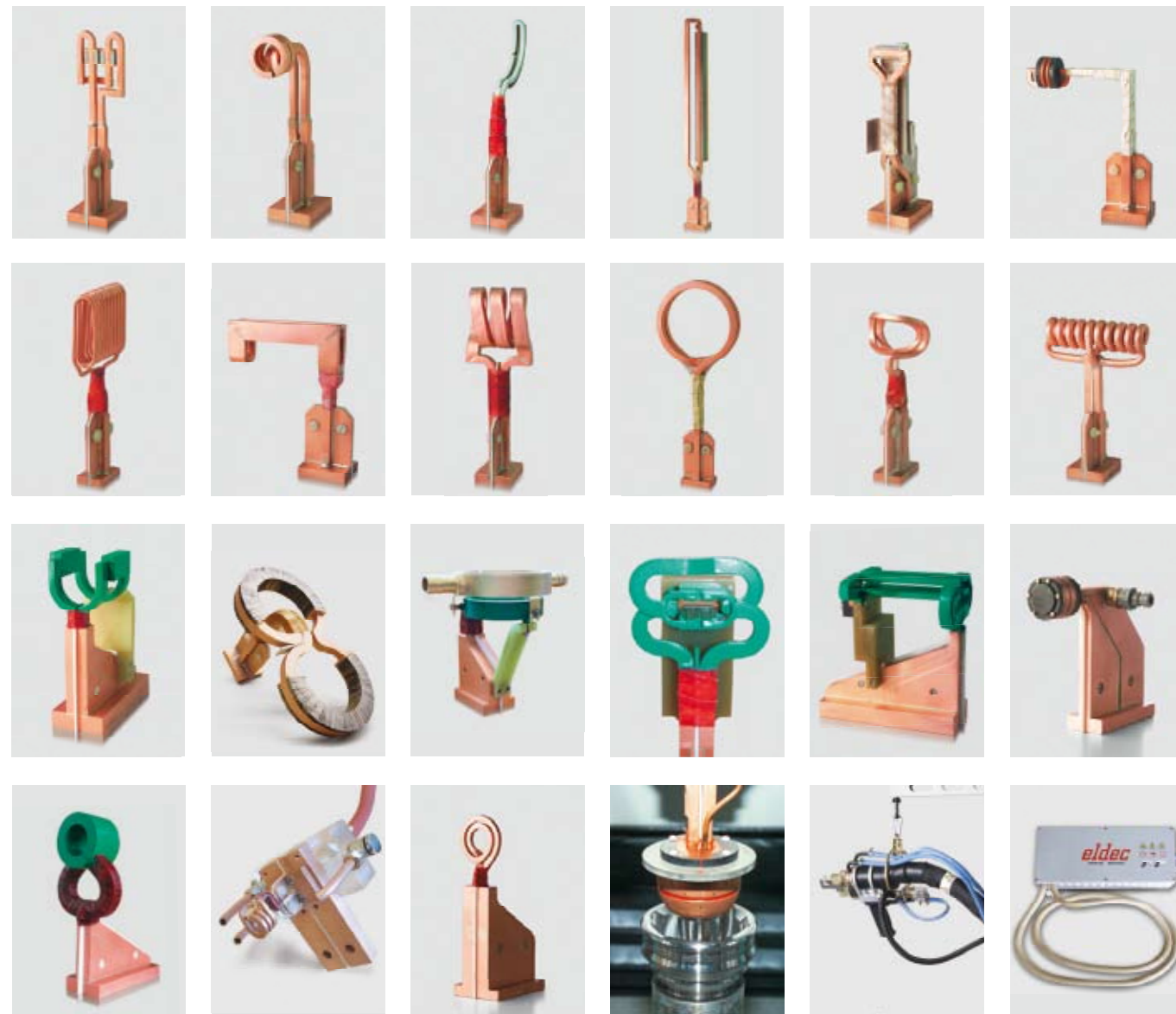
eldec sales and service partners

## eldec tools: tried and tested a thousand times

eldec was founded in 1982 as Schwenk Induktorbau GmbH. To this day, inductor design and manufacture continues to be one of our core competences. It forms the basis for all our solutions. The tool on every inductive heating system is the inductor, which specifically encompasses precisely the workpiece

area to be heated depending on the frequency, material and power density. It is precise in both target and duration. Therefore, the inductor's shape and its construction style are determined principally by the geometry of the workpiece section to be heated. eldec inductors are designed using

state-of-the-art 3D CAD software, manufactured on CNC tool machines and built by the best qualified specialists in Germany and the USA. Innovation with induction. The result is that thousands of inductors fulfill their intended purpose precisely and reliably for our customers.



## Innovative specialists for your heating task

Our customers drive us onward. Progress defines us. Solutions move us. That is eldec. As a globally active company we develop, produce and distribute technologies for inductive heating. For curing and tempering, brazing, annealing and shrink-joining, for coating and stripping. Innovative solutions with a multitude of applications – few value added processes can do without eldec.

Every workpiece is different – and thus every customer order involves a special feature that leads us to new solutions. That is why we owe a debt of gratitude to our customers and partners; for their long years of confidence in us and the exciting tasks they set us. They spur us on every day to new heights.



- 1982  
Schwenk GmbH Induktorbau is founded by Dipl.-Ing. Wolfgang Schwenk.
- 1993  
Delivery of the first high-frequency and medium-frequency IGBT generators developed by eldec.
- 1998  
eldec Induction USA is founded.
- 2000  
Delivery of the first eldec SDF® generators.
- 2004  
Delivery of the first hardening system with a 1 MW SDF® generator.
- 2006  
Completion of a pilot hardening system with a 3 MW SDF® generator.
- 2008  
Introduction of the MIND hardening machine series.
- 2009  
eldec founds the sales and service office in China. Presentation of the MICO product line. Presentation of VL-H, the world's first pick-up hardening machine.

### Leading companies rely on innovative eldec solutions:



**eldec**

**Glowing Innovations.**



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