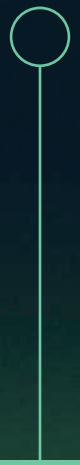
ENRX

Induction heating applications

THE PROCESSES, THE EQUIPMENT, THE BENEFITS



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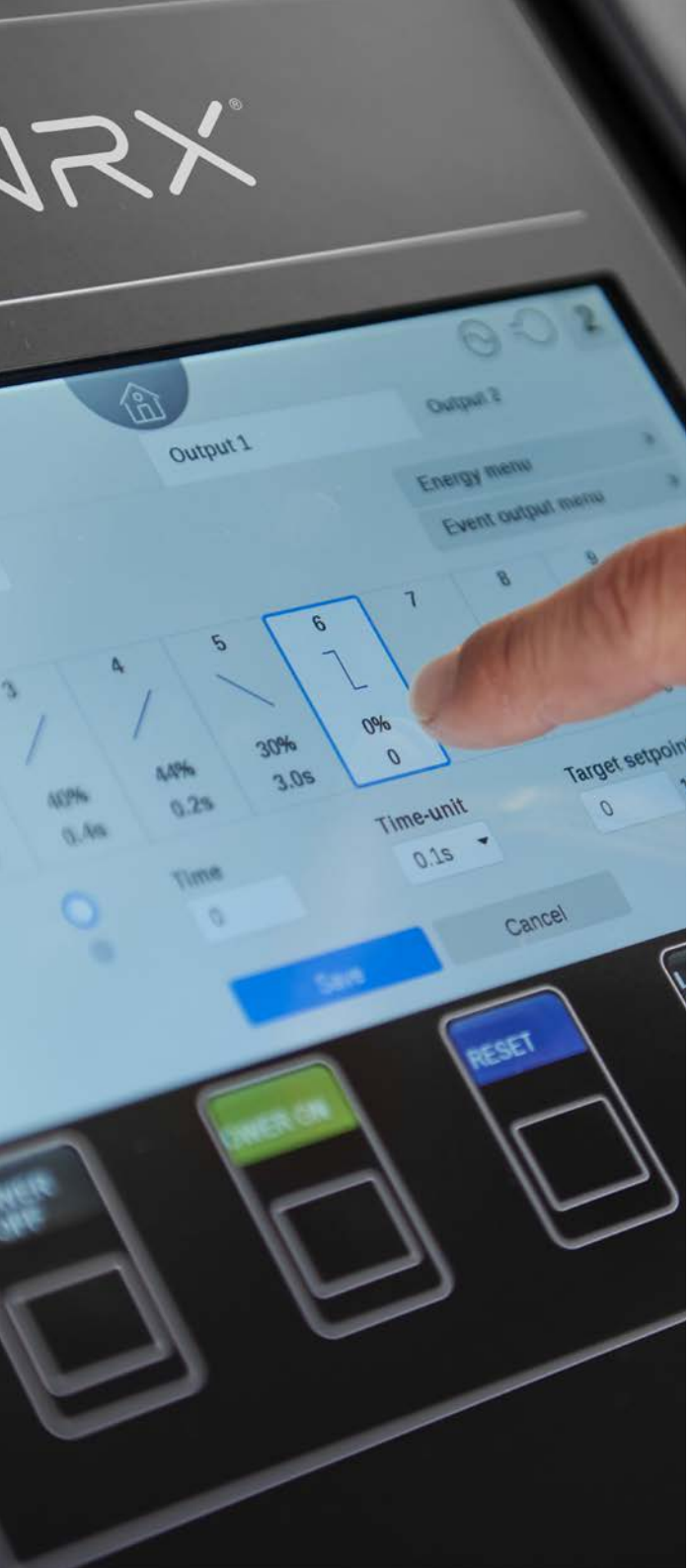


Introduction

Induction heating is fast, precise, clean, energy-efficient, controllable and repeatable. Even more important, at ENRX we've figured out how to use this amazing technology for practically any industrial heating application. ENRX – the right energy can take you anywhere.

ENRX is a powerhouse in induction heating, wireless inductive charging and contactless power supply for advanced manufacturing and mobility. We have a history within induction heating that goes back to the 1950s. Since then, we've grown to become one of the world's leading induction heating suppliers. To date, more than 30,000 induction systems have been installed, supported by our worldwide network of factories, laboratories, offices and agents.

From the start, we wanted to extend the benefits of induction technology to the widest possible range of industrial applications. This led us to pioneering the use of induction for straightening ship decks and bulkheads, as well as using solid state technology to make induction heating equipment smaller, safer, more versatile and more reliable.

Today, our solutions are used to make everything from faucets to spaceships; from solar cells to bulldozers. And, because many of our solutions are compact enough to be mobile, you'll also find ENRX equipment at offshore platforms, wind farms and power stations.

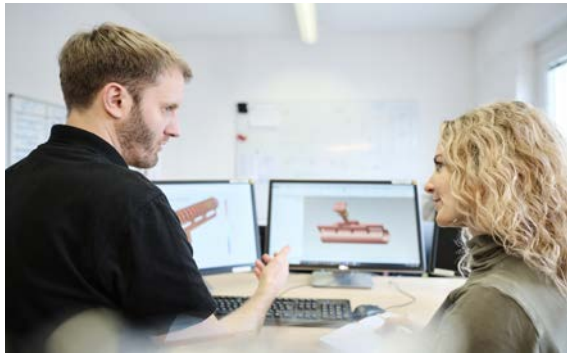
The following pages give a brief overview of the main application areas for our equipment. But of course, a document like this cannot cover everything. If you'd like to know more – about us, or the technical and commercial benefits of induction technology – please get in touch. You'll find the contact details on our website www.enrx.com.

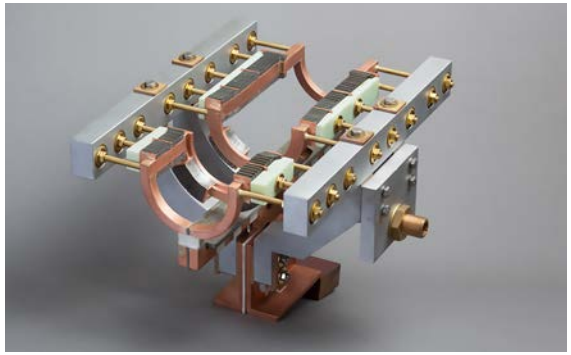
Induction coils

The induction coil, also known as an ‘inductor’, is essential to the induction heating process. Many factors contribute to a coil’s effectiveness: the care taken to make it, the quality of the materials used, its shape, its maintenance, its correct matching with the power source, etc. That’s why it’s so important to insist on professionally made and maintained coils – preferably from the same people who made your induction system.

ENRX has perhaps the world’s most advanced coil making and coil care programs. We not only design and make customized coils for all materials and applications, we also have preventive maintenance and coil logistics solutions. These initiatives ensure you always use the right coils, and that their working life is maximized.

The details of every single ENRX coil are entered into a constantly updated database. As a result we can quickly and smoothly replace or repair any coil, anywhere – without compromising on quality or productivity.





ENRX coils

Our in-house coil expertise and facilities let us make bespoke coils for virtually any specialist application. As the photo on the left shows, we are also experienced in building exceptionally dimensioned coils.

Induction hardening

What is induction hardening?

Induction hardening uses induced heat and rapid cooling (quenching) to increase the hardness and durability of steel. Induction is a no-contact process that quickly produces intense, localized and controllable heat. With induction, only the part to be hardened is heated. Optimizing process parameters, such as heating cycles, frequencies and coil and quench design, result in the best possible outcomes.

What are the benefits?

Induction hardening boosts throughput. It is an extremely fast and repeatable process that integrates easily into production lines. With induction it is usual to treat individual workpieces. This ensures each separate workpiece is hardened to its own precise specifications.The optimized process parameters for each workpiece can be stored on your servers. Induction hardening is clean, safe and typically has a small footprint. And because only the part of the component to be hardened is heated, it is extremely energy-efficient.

Where is it used?

Induction is used to harden numerous components. Here are just a few of them: gears, crankshafts, camshafts, drive shafts, output shafts, torsion bars, rocker arms, CV joints, tulips, valves, rock drills, and slewing rings, as well as inner and outer races.

What equipment is available?

HardLine is the ENRX family of hardening systems that offers vertical, horizontal, rotary table and centerless equipment. At the heart of our hardening solutions are Sinac generators, available with output power ratings and frequencies ranging from 5–2000 kW and 0.3–350 kHz. ENRX can also deliver turn-key hardening plants that include handling equipment, washing/straightening processes and process development as well as service and support programs.

ENRX hardening solutions are used by many of the world's leading car manufacturers and their suppliers. High throughput, short lead times, assured quality and worker/environmental safety are key reasons why they choose our solutions.

An ENRX solution is used to harden the giant slewing rings used in wind turbines.

Induction tempering

What is induction tempering?

Induction tempering is a heating process that optimizes mechanical properties such as toughness and ductility in workpieces that have already been hardened.

What are the benefits?

The main advantage of induction over furnace tempering is speed. Induction can temper workpieces in minutes, sometimes even seconds. Furnaces typically take hours. And, as induction tempering is perfect for inline integration, it minimizes the number of components in the process. Induction tempering facilitates quality control of individual workpieces. Integrated induction temper stations also save valuable floor space.

Where is it used?

Induction tempering is widely employed in the automotive industry to temper surface-hardened components such as shafts, bars and joints. The process is also used in the tube and pipe industry to temper through-hardened workpieces. Induction tempering is sometimes performed in the hardening station, other times in one or several separate temper stations.

What equipment is available?

Complete HardLine systems are ideal for many tempering applications. The chief benefit of such systems is that hardening and tempering are performed by one machine. This delivers significant time and cost savings in a small footprint compared to alternative technologies. With furnaces, for example, one furnace often first hardens the workpieces, with a separate furnace then being used for tempering. Stand-alone ENRX Sinac and Minac systems are also used for tempering applications.

A shaft moving at high speed through an induction coil. Induction tempering is unrivalled for its speed and precision.

A complete ENRX tempering system typically includes power sources, coils, handling mechanisms and control software. Training, maintenance and service options are also available.

Induction brazing

What is induction brazing?

Brazing is a materials joining process that uses a filler metal (and usually an anti-oxidizing solvent called flux) to join two pieces of close-fitting metal together without melting the base materials. Instead, induced heat melts the filler, which is then drawn into the base materials by capillary action.

What are the benefits?

Induction brazing can join a wide range of metals, even ferrous to non-ferrous. Induction brazing is precise and quick. Only narrowly defined areas are heated, leaving adjacent areas and materials unaffected. Correctly brazed joints are strong, leak-proof and corrosion resistant. They are also very neat, usually requiring no further milling, grinding or finishing. Induction brazing is ideal for integrating into production lines.

Where is it used?

ENRX brazing systems can be used for virtually any brazing task. To date, our systems are typically used in the electrotechnical industry to braze generator and transfomer components like bars, strands, rings, wires and SC-rings. They also braze fuel pipes as well as AC and brake parts for the automotive industry. The aeronautics sector uses induction to braze fan blades, blades for casings, and fuel and hydraulic systems. In the houseware industry our systems braze compressor components, heating elements and faucets.

What equipment is available?

Our brazing solutions usually include an ENRX mobile Minac or stationary Sinac system. Both product families offer a wide range of output powers and frequencies, together with automatic matching and robot compatibility.

Brazing with an ENRX system. Note how the heating zone is fully visible, something that is practically impossible with flame brazing.

An ENRX Minac brazes generator windings. Minac's mobility and the handheld transformer let operators access hard-to-reach areas.

Induction bonding

What is induction bonding?

Induction bonding uses induction heating to cure bonding adhesives. Induction is the main method for curing adhesives and sealants for car components such as doors, hoods, fenders, rearview mirrors and magnets. Induction also cures the adhesives in composite-to-metal and carbon fiber-to-carbon fiber joints. There are two main types of automotive bonding: spot-bonding, which heats small segments of the materials to be joined; and full-ring bonding, which heats complete joints.

What are the benefits?

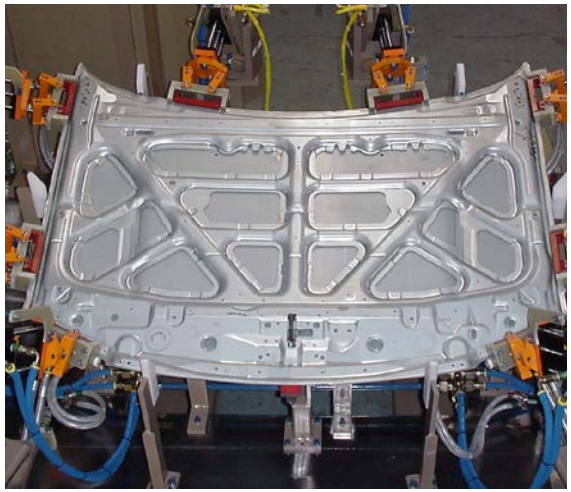
ENRX spot bonding systems ensure precise energy inputs for each panel. Small heat affected zones minimize total panel elongation. Clamping is not needed when bonding steel panels, which reduces stresses and distortion. Each panel is electronically monitored to ensure that energy input deviations are within tolerances. With full-ring bonding, a one-size-fits-all coil reduces the need for spare coils.

Where is it used?

Induction is the preferred bonding method in the automotive industry. Widely used to bond steel and aluminium sheet metal, induction is increasingly employed to bond new lightweight composite and carbon fiber materials. Induction is used to bond curved strands, brake shoes and magnets in the electrotechnical industry. It is also used for guides, rails, shelves and panels in the white goods sector.

What equipment is available?

ENRX is the world's largest induction curing specialist. In fact, we invented induction spot curing. We also invented the U-Coil® process, the most advanced hem bonding system on the market. A self-aligning and 100 per cent repeatable system, U-Coil® ensures uniform heating with the lowest possible distortion risk. The equipment we deliver ranges from individual system elements such as power sources and coils, to complete and fully supported turn-key solutions.



Two of our induction bonding systems. The top photo shows a solution for full-ring bonding. The bottom photo shows spotbonding, a method invented by ENRX.

Induction welding

What is induction welding?

With induction welding the heat is electro-magnetically induced in the workpiece. The speed and accuracy of induction welding make it ideal for edge welding of tubes and pipes. In this process, pipes pass an induction coil at high speed. As they do so, their edges are heated, then squeezed together to form a longitudinal weld seam. Induction welding is particularly suitable for high-volume production. Induction welders can also be fitted with contact heads, turning them into dual purpose welding systems.

What are the benefits?

Automated induction longitudinal welding is a reliable, high-throughput process. The low power consumption and high efficiency of ENRX welding systems reduce costs. Their controllability and repeatability minimize scrap. Our systems are also flexible – continuous electronic load matching secures full power output across a wide range of tube sizes, ensuring maximum welding speed for each size. And, their small footprint make them easy to integrate or retrofit into production lines.

Where is it used?

Induction welding is used in the tube and pipe industry for the longitudinal welding of stainless steel (magnetic and non-magnetic), aluminium, low-carbon and high-strength low-alloy (HSLA) steels and many other conductive materials.

What equipment is available?

Weldac is ENRX's system family of proven high-output solid-state tube and pipe welders. The Weldac family covers a wide range of power sizes from 50 kW up to 2,200 kW and a frequency range of 60-500 kHz. Silicon Carbide or Insulated Gate Bipolar Transistor inverter technology results in an impressive efficiency factor of up to 95% from the mains to the welding coil, saving energy and reducing cooling water consumption. The short-circuit-proof design ensures safe and reliable operation.

Weldac can be fitted with various induction coils that are very easy to change.

Induction annealing/normalizing

What is induction annealing?

This process heats metals that have already undergone significant processing. Induction annealing reduces hardness, improves ductility and relieves internal stresses. Full-body annealing is a process where the complete workpiece is annealed. With seam annealing (more accurately known as seam normalizing), only the heat-affected zone produced by the welding process is treated.

What are the benefits?

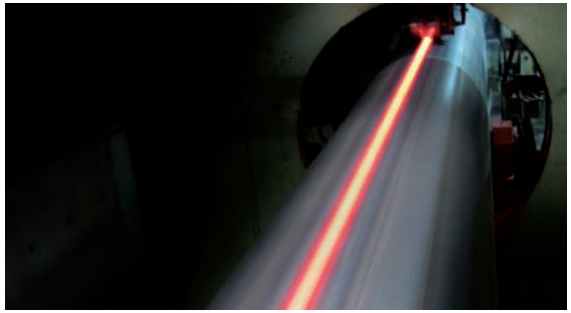
Induction annealing and normalizing delivers fast, reliable and localised heat, precise temperature control, and easy in-line integration. Induction treats individual workpieces to exact specifications, with control systems continuously monitoring and recording the entire process.

Where is it used?

Induction annealing and normalizing is widely used in the tube and pipe industry. It also anneals wire, steel strips, knife blades and copper tubing. In fact, induction is ideal for virtually any annealing task.

What equipment is available?

Each ENRX annealing system is built to satisfy specific requirements. At the heart of each system is an ENRX Sinac generator that features automatic load matching and a constant power factor at all power levels. Most of our delivered systems also feature custom-built handling and control solutions.



Orbital movement of the coils on this ENRX normalizing system means accurate tracking of the weld seam. Normalizing is essential for pipes used in the oil and gas industry.

The control system helps meet the challenges posed when normalizing weld seams on the new generation of API-standard pipe.

Induction pre-heating

What is induction pre-heating?

Induction pre-heating is a process where materials or workpieces are heated by induction prior to further processing. The reasons for pre-heating vary. In the cable and wire industry, cable cores are pre-heated before insulation extrusion. Steels strips are pre-heated prior to pickling and zinc coating. Induction pre-heating also softens metals before bending, and prepares tubes and pipes for welding. Mobile pre-heating solutions facilitate onsite repairs of bearing assemblies.

What are the benefits?

ENRX pre-heating systems are extremely efficient, resulting in major energy savings. When pre-heating steel strips and cable and wire, diode rectifiers ensure a constant power factor of 0.95, thus eliminating reactive power costs. Cycle times are short and continuous automatic matching means a single coil can handle wide production ranges. Induction pre-heating systems are compact and easy to integrate into existing or planned production lines.

Where is it used?

Induction pre-heating is employed in the automotive, mechanical, aeronautical, electrotechnical, white goods and shipbuilding industries. A major area of use is pre-heating for welding. Our mobile Minac systems are used in the offshore sector for onsite weld pre-heating. Minac units are also frequently flown to oil platforms and airports to perform repairs and maintenance.

What equipment is available?

ENRX designs and builds specialized systems for steel strip as well as wire and cable pre-heating. These systems typically feature our Sinac equipment, and offer horizontal or vertical coil layout designs. Customized layouts are also available. Mobile and compact ENRX Minac units are used for onsite pre-heating.

A medium-frequency ENRX Sinac pre-heats seamless offshore pipe prior to coating.

No dust, no fumes, no noise. An ENRX heater gets to grips with 170 millimetre anode stubs.

Induction post-heating

What is induction post-heating?

Induction post-heating refers to any process where induction is used to heat workpieces or materials that have already undergone significant processing. Metal components and welds, for example, must often be post-heated to relieve internal stresses caused by a previous process. Induction post-heating is also used to heat cable cores following extrusion.

What are the benefits?

The speed, versatility, precision and controllability of induction make it ideal for numerous post-heating tasks. Our cable and wire post-heating systems, for instance, induce localized heat directly in the cable core. This results in extremely fast cross-linking of the insulation's polymers. At the same time, induction minimizes the risk of cable deformation. While our mobile Minac systems bring the benefits of induction to flame-free sites such as offshore oil and gas platforms.

Where is it used?

Our post-heating solutions are mainly used in the cable and wire, tube and pipe, electrotechnical and aviation industries. In the automotive industry, they post-heat rings, shafts, joints and gears; and cure corrosion-resistant brake disc covers. Induction is also used for tin re-flow applications.

What equipment is available?

Stationary ENRX Sinac systems – together with numerous options and control and handle features – are widely used for cable and wire and other high volume applications. Mobile Minac systems bring induction solutions to offshore platforms, wind farms, power stations, etc.

Onsite post-heating for the oil and gas industry is a growing application area for ENRX.

Induction forging

What is induction forging?

Induction forging uses induction to heat metal parts before they are shaped or ‘deformed’ by presses or hammers.

What are the benefits?

Induction forging has several key advantages over furnace forging. The speed and controllability of induction ensures high throughput. Induction also minimizes oxidation and helps maintain metallurgical integrity. Since induction delivers precise, localized heat, it saves energy. The consistency and repeatability of induction make it ideal for integrating into automated production lines.

Where is it used?

Induction forging is widely used in the metal and foundry industries to heat billets, bars and bar ends. Metals commonly forged with ENRX systems include aluminum, brass, copper, steel and stainless steel.

What equipment is available?

Three families of ENRX equipment can be used for forging applications: HeatLine, Sinac and Minac. However, HeatLine includes various models that are specially designed for high-output forging of billets, bars, handlebars, bar ends, bolts and pre-formed components.

A heated steel billet in an ENRX forging station.

An ENRX vertical partial heater. These systems can be fitted with any number of induction coils, and are available in IGBT and thyristor versions.

Induction melting

What is induction melting?

Induction melting is a process where metal is melted into liquid form in an induction furnace crucible. The molten metal is then poured from the crucible, usually into a cast.

What are the benefits?

Induction melting is extremely fast, clean and uniform. When correctly performed, induction melting is so clean that it is possible to skip the purification stage necessary with other methods. The uniform heat induced in the metal also contributes to a high-quality end result. ENRX melting systems have advanced ergonomic features. They not only make workplaces safer, they increase productivity by making the melting process faster and more comfortable.

Where is it used?

ENRX melting systems are used in foundries, universities, laboratories and research centers. The systems melt everything from ferrous and non-ferrous metals to nuclear material and medical/dental alloys.

What equipment is available?

ENRX offers five different furnace ranges to suit a wide variety of melting needs: single-axis tilt-pour, dual-axis tilt-pour, moving coil, rollover and laboratory.

Molten brass in a moving-coil melting furnace. The prefabricated (clay graphite) crucible remains static during the full melting cycle. Instead, the coil moves around the crucible without touching it. Dedicated crucibles – which also act as pouring ladles – eliminate inter-alloy contamination.

An ENRX single-axis tilt-pour furnace. Such systems can melt ferrous and non-ferrous metals (copper and aluminum alloys). Several models are available to suit all capacity needs. They are available with easy-to-change pre-fabricated crucibles or rammed linings.

Induction straightening

What is induction straightening?

Induction straightening uses a coil to generate localized heat in pre-defined heating zones. As these zones cool they contract, 'pulling' the metal into a flatter condition.

What are the benefits?

Induction straightening is extremely fast. When straightening ship decks and bulkheads, our customers often report minimum 50% time savings compared to traditional methods. Without induction, straightening on a large vessel can easily consume tens of thousands of man-hours. The precision of induction also boosts productivity. For example, when straightening truck chassis there is no need to remove heat-sensitive components. Induction is so precise it leaves adjacent materials unaffected.

Where can it be used?

Induction heating is widely used to straighten ship decks and bulkheads. In the construction industry it straightens beams. Induction straightening is increasingly used in the manufacture and repair of locomotives, rolling stock and Heavy Goods Vehicles.

What equipment is available?

ENRX Terac systems are specially designed for ship straightening. Each Terac includes a frequency converter, cooling system, operator panel and deckheating unit. A handheld unit replaces the deck unit when straightening bulkheads. Mobile Minac heaters are used for non-ship straightening tasks.

Terac works just as well on bulkheads and other vertical structures as it does on decks.

An ENRX Terac system ensures failsafe operation – it makes it impossible to overheat magnetic steel. Moreover, Terac does not produce toxic gases from the heating source.And, there is no acoustic noise.

Induction shrink-fitting

What is induction shrink-fitting?

Induction shrink-fitting uses thermal expansion to fit or remove parts made of metal. By employing controlled heating, this method takes advantage of the expansion and contraction of materials, ensuring a precise and secure assembly or disassembly process.

What are the benefits?

Induction shrink-fitting excels in process controllability, ensuring consistent assembly or fast disassembly outcomes. The accurate application of heat not only reduces the risk of ovality but also proves to be energy-efficient, aligning with sustainability goals. Additionally, precise control of ramp-up times and holding temperatures increases efficiency.

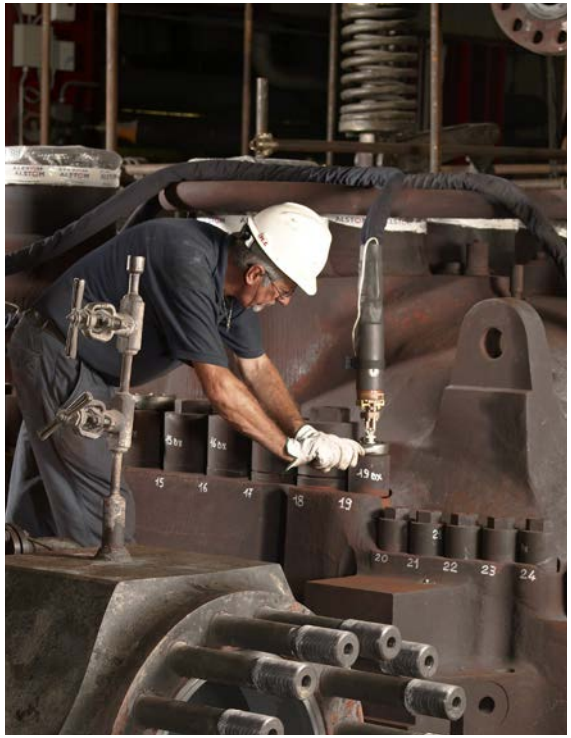
Where can it be used?

Our products are used in the automotive industry to shrink-fit gears, rings and motorhousing. They also play a critical role in maintaining and repairing aeroplanes, trains and trucks. Moreover, these products are employed in shrink-fitting tasks on offshore platforms and are increasingly used to remove giant nuts and bolts in power station turbines.

What equipment is available?

We provide versatile shrink-fitting solutions with two mobile products, Minac and Ventac, offering flexibility for on-the-go operations. Our stationary heat generator system, Sinac, is customisable for maximum efficiency, ensuring consistent and controlled heat for various shrink-fitting applications.

Ventac air-cooled induction heating system is ideal for shrink-fitting applications.



An example of shrink fitting – ENRX equipment removes large nuts and bolts in a fraction of the time needed by traditional gas or resistance heating.


It doesn’t get hot. It doesn’t
touch the component. So how
can a coil heat metal cherry red
in a few seconds?

How induction works

Induction is a flame-free, no-contact heating method that can turn a precisely defined section of a metal bar cherry red in seconds. How is this possible?

Alternating current flowing through a coil generates a magnetic field. The strength of the field varies in relation to the strength of the current passing through the coil. The field is concentrated in the area enclosed by the coil; while its magnitude depends on the strength of the current and the number of turns in the coil. (Fig. 1)

Eddy currents are induced in any electrically conductive object – a metal bar, for example – placed inside the coil. The phenomenon of resistance generates heat in the area where the eddy currents are flowing. Increasing the strength of the magnetic field increases the heating effect. However, the total heating effect is also influenced by the magnetic properties of the object and the distance between it and the coil. (Fig. 2)

The eddy currents create their own magnetic field that opposes the original field produced by the coil. This opposition prevents the original field from immediately penetrating to the center of the object enclosed by the coil. The eddy currents are most active close to the surface of the object being heated, but weaken considerably in strength towards the center. (Fig. 3)

The distance from the surface of the heated object to the depth where current density drops to 37% is the penetration depth. This depth increases in correlation to decreases in frequency. It is therefore essential to select the correct frequency in order to achieve the desired penetration depth.

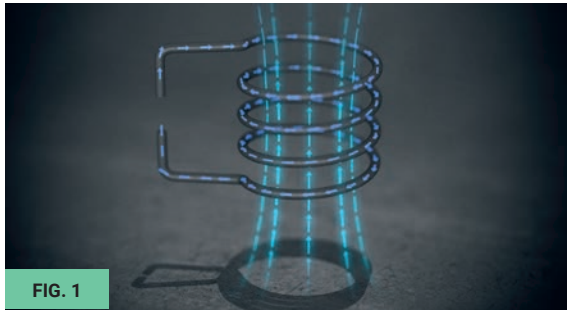


FIG. 1

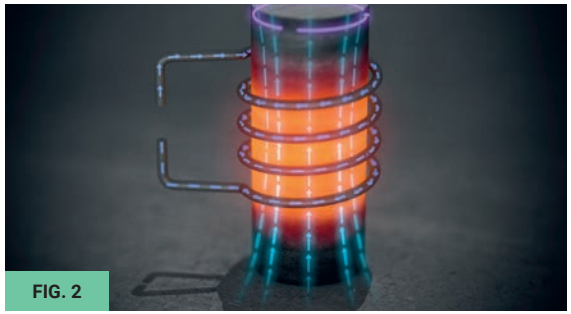


FIG. 2

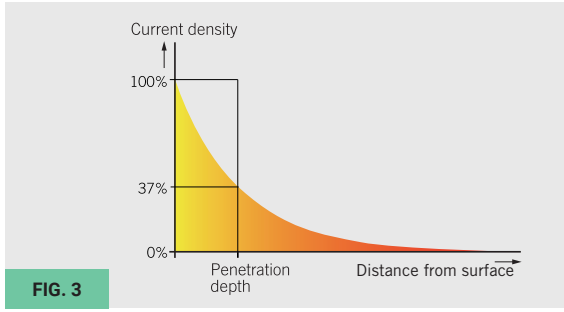


FIG. 3

The smarter heat – induction exploits basic electromagnetic laws to generate controllable heat directly in the workpiece. At no time does the coil touch the workpiece.

Selecting the best solution

Just how efficient is induction heating? What frequencies are best suited to your applications? This guide will give you some idea of the potential of induction. To learn more, just contact your nearest ENRX office or representative.

How much energy do you need?

Before calculating your energy requirements you first need to know:

- The type of material (steel, copper, brass, etc.)
- Workpiece dimensions
- Desired hourly production
- Desired final temperature

Calculate your energy requirements

Step 1 First determine the material's energy absorption rate. Figure 1 shows rates for some common materials.

Step 2 Multiply the energy absorption rate by your desired hourly production (kg/hour). The result is your specific power requirement.

Step 3 You can now ascertain the overall efficiency level of the induction equipment. Some typical induction heater efficiency levels for common materials are listed in Figure 2. Divide the calculated specific power need by the equipment efficiency rate. This gives you the total power requirement.

Power calculation

Example: Heating of magnetic steel

– Weight 0,5 kg

– Temp 20 °C to 1200 °C (68 °F – 2192 °F)

– Time 60 seconds

Table: At temp. 1200 °C => Pxt = 0.250 kWh/kgm

Calculate power: $P_{wp} = \frac{0.25(kWh/kg) \times 0.5(kg) \times 3600s}{60\ sec} = 7.5kW$

$P_{generator} = \frac{7.5\ k}{n} = \frac{7.5\ k}{0.7} =$ **10.7 kW**

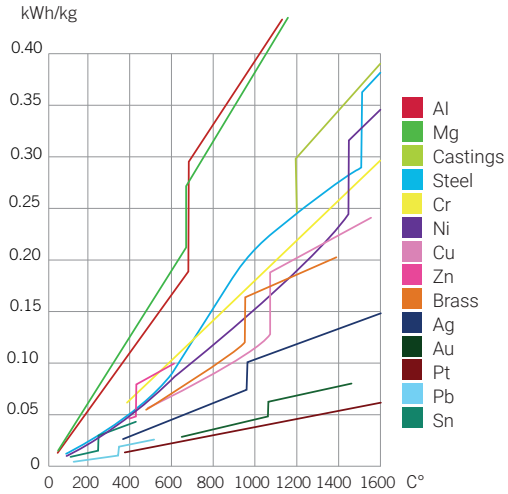


Fig. 1. Energy absorption rates for different materials

Material	Final temp.°C	Efficiency
Carbon steel	1250	0.65
Carbon steel	700	0.80
Stainless steel	1250	0.60
Brass	800	0.50
Copper	900	0.40
Aluminum	500	0.40

Fig. 2. Typical induction heater efficiency levels. The above values assume the use of enveloping multi-turn coils. Different coil designs may affect efficiency levels. For instance, the efficiency rate for copper is, because of the coil type normally used, usually 0.1-0.2.

Selecting the right frequency

The choice of frequency is crucial when using induction heating, as frequency determines the heat's penetration depth. This table shows approximate frequencies for through-heating some common materials.

Material					Frequency
Steel – non-magnetic	**Steel – magnetic**	**Brass**	**Copper**	**Aluminum and al. alloys**	
Final temp. 1,200°C • Ø mm	**700°C • Ø mm**	**800°C • Ø mm**	**850°C • Ø mm**	**500°C • Ø mm**	**Hz**
150–500	27–75	110–	50–	50–	50
60–250	8–35	35–440	22–800	22–800	500
40–175	6–25	30–300	15–600	15–600	1,000
25–100	3.5–14	15–180	9–350	9–350	3,500
20–85	2.5–10.5	10–130	7–260	7–260	5,000
14–60	2–8.5	8–100	5–180	5–180	10,000
10–40	1.5–5.5	6–75	3–125	3–125	20,000
5–22	0.7–3.0	3.5–40	2–75	2–75	60,000
4–17	0.5–2.0	2.5–30	1.5–60	1.5–60	100,000
1.8–8	0.2–1.0	1.2–15	0.6–20	0.6–20	500,000

A family for every need

There are six product families within ENRX induction heating solutions. Together, these product families let you perform virtually any industrial heating task. In the unlikely event they don't meet your specific needs, we can sit down with you and devise your own customised induction heating solution.

HEATLINE
Industrial heat processing systems

WELDAC
High-output solid-state welders

MINAC
Mobile heat generators

VENTAC
Aircooled induction heating system

SINAC
Universal heat generators

HARDLINE
Industrial heat treatment systems

Some of our customers

ENRX equipment has been used to build and maintain everything from giant slewing rings for wind turbines to tiny components in luxury wristwatches. Below is a partial list of ENRX customers. Case stories and customer testimonials from around the world are available from your nearest ENRX representative.

ABB
AirTac
Alcatel
Alstom
Andritz Hydro
Ansaldo
ArcelorMittal
Ashok Leyland
Aston Martin
Audi
Autocam
Avesta Sandvik Tube
Baosteel
Bartell Machinery
Benteler
BHEL
BMW
Bodycote
Boehler
Bombardier
Borg Warner
Borusan
Bosch
BPW
Brakes India
Burseryds Bruk
Busatis
Caterpillar
Changzhou XD
Chery
CHESS
CPOC
DAF
Daimler
Danfoss
Delphi
Deutsche Bahn
DEUTZ
Dongfang Electrical Machinery
DongfangElectric
Dongfeng
Dongfeng-Nissan
Dongying Dongyi
Doosan
Dörrenberg Edelstahl
Dreister
Edelstahlwerke Südwestfalen
Electricity generating authority of Thailand EGAT
EMD Curtiss Wright
Electro-Mecha. Corp.
ENQUEST
EXXONMOBIL
FAG
Fardis
FAW
Federal-Mogul
Ferrovaz
Fincantieri
Ford
Fraunhofer-Institut
GCME
Gearbox del Prat
Geislinger
Gelenkwellenwerk Stadtilm
General Electric
General Motors
Getrag
GKN
Greatwall
Gree
Grundfos
Hägglunds
Hair
Halberg Precision
Haldex Garphyttan
Hanomag
HarbinElectric
Heidelberger Druckmaschinen
Hilti
Hitachi
Hoerbiger Antriebstechnik
Hörmann Industrietechnik
HQM Haertetechnik
Hydro Aluminium
Hyundai
I.S.R.
IFAPowertrain
Indar
ISI Airbag
Jaguar Land Rover
John Deere
Johnson Control
Jos L. Meyer
Joseph Vögele
JTEKT
KBP Kettenwerk
KmB Technologie
KME
Kobelco
Komatsu
Kongsberg Automotive
Koni
KS Kolbenschmidt
Lankhorst Indutech
Läpple
Linamar Antriebstechnik
Linde
LUK
Magna
Mahle
Maillefer
Malakoff Power
MAN
Mannesmann
Marcegaglia
MAZDA
Mercedes Benz
Metalor
Miba
Mitec
Mitsubishi
MTU
Mubea
Nexans
Nexteer
Nippon Steel
NIPPON Oil
NISSAN
NSK
NTN
OAO 'Electrosila'
Opel
Padana
PETRONAS
Pratt & Whitney
PT Inti Gandi Perdana
Sulzer
PTT
Renault
Retezarna
Rieckermann
Rockinger
Roctool
Roth Technik
Rothe Erde
Rover Group
S.N.R.
SAAB
Saint Gobain
Sandvik
Sauer Sundstrand
Savoilor
SCANIA
Schaeffler
Schneeberger
Shanghai Baosteel
Shanghai Turbine Generator
ShanghaiElectric
Shawcor
SHELL
Showa
Showcor
Siemens
SKF
Skoda
SNR
Splintex
Sprimag
Stabilus
Stellantis
Stihl
STX Europe
Sumitomo
Suzlon
Suzuki
Swarovski
Technip
Tenaga National
Thyssenkrupp
Tianjin Pipe International
Timken
Toshiba
Toto
TOYOTA
Transformer
TRW
Vallourec
Vestas
Visteon
Voestalpine
Voith
Volkswagen
Volvo
Vyksa Steel Works
Wanxiang
Wanxiang Qianchao
Wazhou
WEG
Weigl Antriebstechnik
Whirlpool
XinqianglianSlewing
ZF
Zhuzhou Electric

About ENRX

ENRX is a global green tech company driven by induction. We offer induction heating, wireless inductive charging and contactless power supply with low or no carbon footprint for virtually any application within mobility and manufacturing.

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