



Induction Heating for the Automotive Industry

Experience the Excellence.™

Automotive Applications are a Core Competency at Ambrell

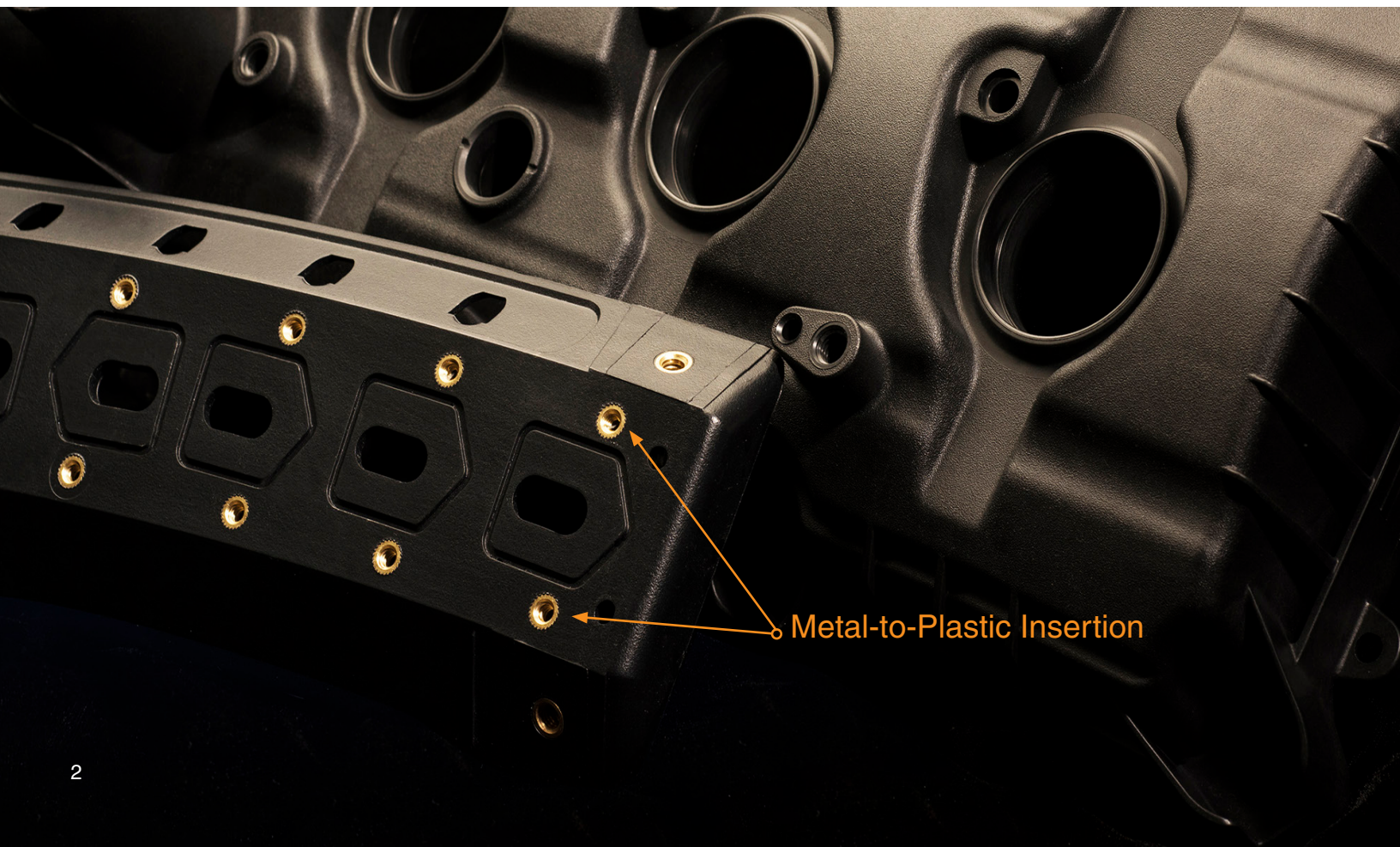
For decades, Ambrell has been partnering with the world's largest automotive OEMs and integrators as well as Tier 1 and 2 suppliers. And when it comes to induction heating requirements, we understand your need for stringent heating performance including the automotive industry's tightest tolerances. To meet these requirements, we deliver repeatable, reliable and precise heating for your parts and automation systems through an industry-exclusive process we call PRECISION MATCH™ (see page 4).

Today, automotive applications account for one-third of Ambrell's overall business and have become a core competency we provide to OEMs, integrators and suppliers across the globe. Our innovative induction heating solutions address a wide array of applications

from conventional gasoline and diesel-powered cars and trucks to hybrid and electric vehicles. At Ambrell, we are proud to say our products can be found in some of the most technologically-advanced manufacturing plants in the automotive industry.

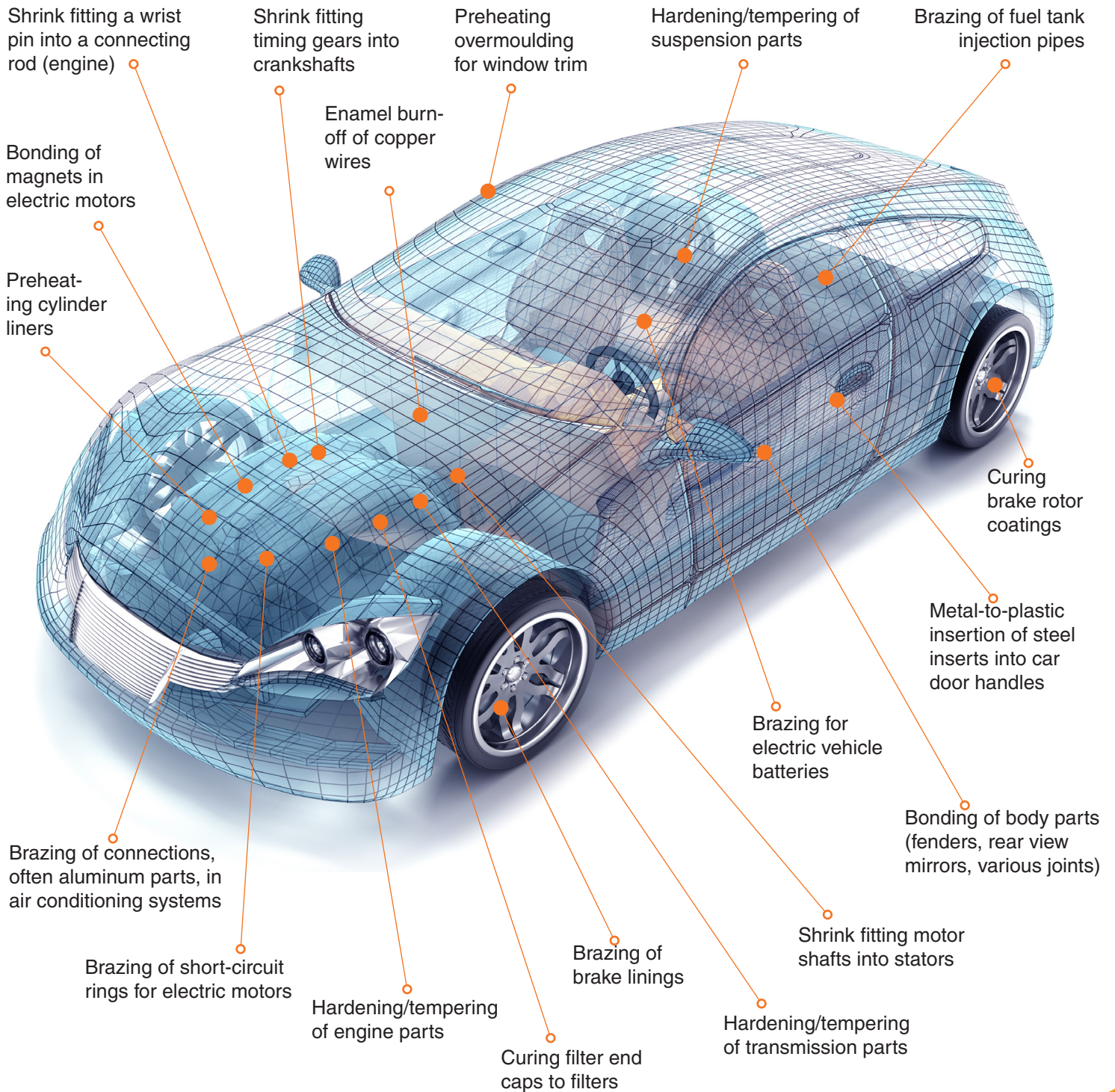
Below are some of the automotive applications we specialize in at Ambrell:

- ANNEALING
- BONDING
- BRAZING
- CURING
- FORGING
- GENERAL HEATING
- HEAT TREATING
- MATERIAL TESTING
- METAL-TO-PLASTIC
- SHRINK FITTING
- SOLDERING
- AND MORE



Sampling of Induction Heating Applications

Ambrell's induction heating systems are ideal for a variety of automotive applications. Our systems are known for their safe, flameless and energy-efficient design. In addition, you get repeatable, reliable and precise control needed for localized heat that is directed only to the area that requires heating.



Exclusive PRECISION MATCH™ Process

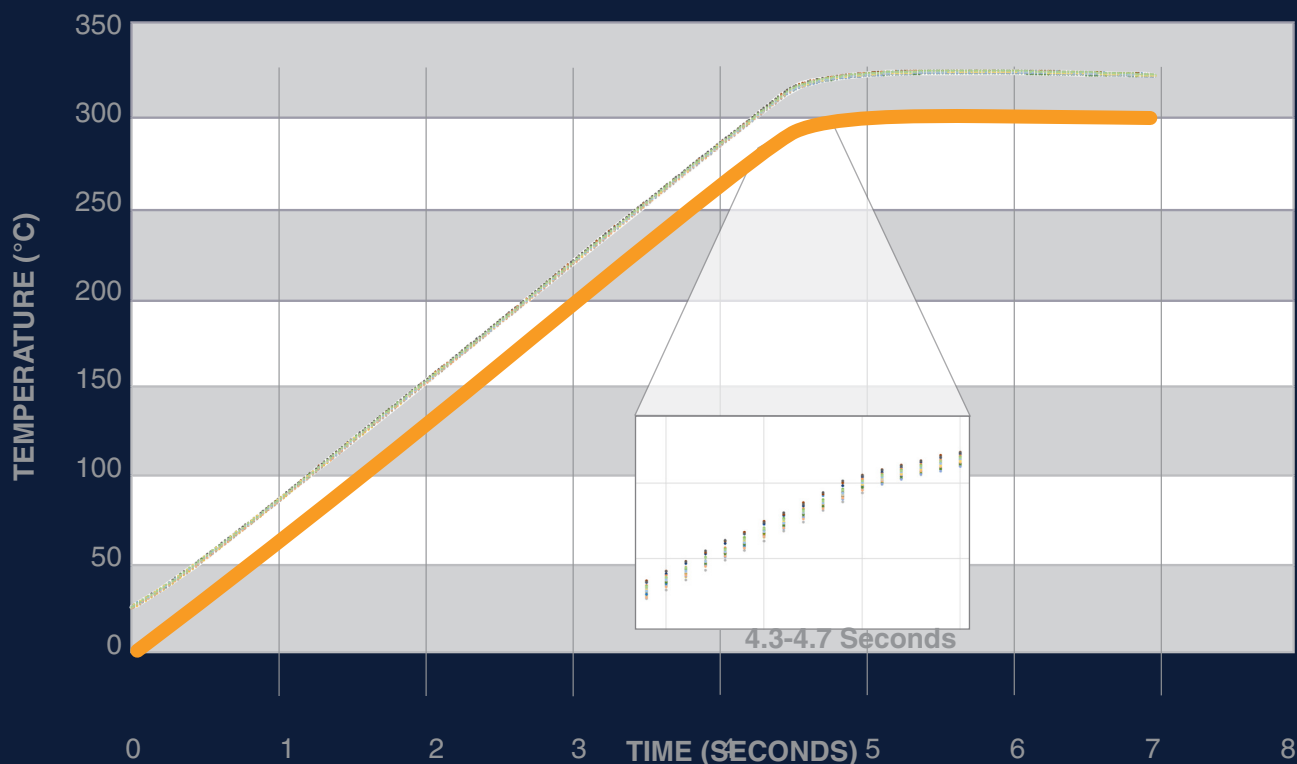
Delivering repeatable, reliable and precise heating for the most demanding tolerances.

Developed by Dr. Girish Dahake

Our in-depth knowledge and experience in thermal dynamics, electrical engineering and manufacturing six sigma techniques includes thousands of induction heating feasibility and parts-testing projects conducted at Ambrell's renowned Applications Laboratory, also known as THE LAB. Under the direction of Dr. Girish Dahake, Sr. Vice President of Global Applications and veteran of nearly 25 years in THE LAB, Dr. Dahake has been the driving force behind the development and implementation of our PRECISION MATCH process.

The PRECISION MATCH process evaluates your heating requirements through in-depth mathematical analysis and rigorous laboratory testing of your parts to match your tolerance specifications with absolute precision. Combining this process with our high-quality induction heating equipment, you get the best total solution designed to maximize yields, improve quality and decrease process times. Our solution can also play a key role in helping you eliminate inconsistencies that lead to production downtime or OEM recalls. Additionally, the heating results we provide through our process are reproducible – and can be standardized – for all your global operations.

Example of Precise, Repeatable Induction Heating from Ambrell: Results of 28 Heating Cycles of Steel Insert for 4.5 seconds ($\Delta T = 3^\circ\text{C}$)



Automotive Success Stories with Ambrell

Ambrell has an abundance of experience working with automotive manufacturers, integrators and suppliers. The expertise of THE LAB and the reliability and versatility of Ambrell's EKOHEAT and EASYHEAT systems are common reasons why we're the go-to provider for so many companies in the industry.

Major Automotive Maker Chooses Ambrell for Carbide Brazing Application

A major automotive manufacturer chose a competitive system based on purchase price but quickly found the applications support and system reliability to be unsatisfactory. At that point, they contacted Ambrell to design a solution that worked for them. Their application involved brazing carbide onto steel for cutting tools for their machine shop. They do a large amount of machining and their carbides wear over time. THE LAB was able to design a solution that met their specifications. After many issues with a previous vendor, they now have the right solution for their application.

Integrator Turns to THE LAB at Ambrell for Turbocharger Applications

An integrator needed to build four fully automated cells for metal-to-plastic insertion applications. The application involved four parts for a turbocharger for a major automotive company. Brass inserts were used for all of the parts. The integrator turned to THE LAB at Ambrell to determine the right systems for their automated cells. The client ended up purchasing one 6 kW EASYHEAT, two 10 kW EASYHEATs and one 15 kW EKOHEAT for the four cells. The systems are now in production with impressive five-second heat times.



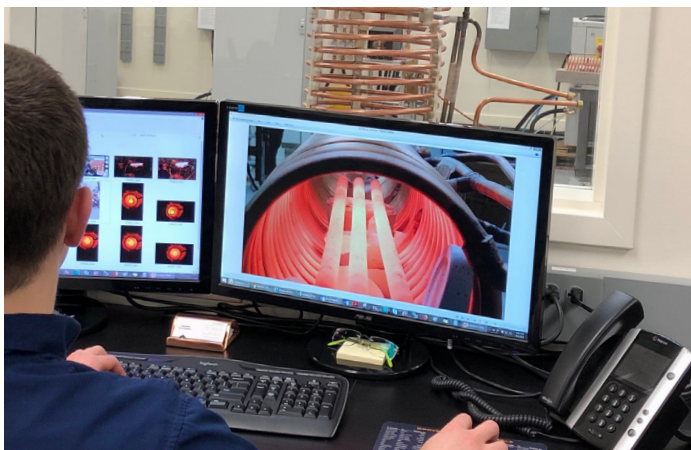
Integrator Leverages EKOHEAT's for Rotor Curing Application

An integrator for a rotor manufacturer has been a loyal Ambrell customer over the years. System reliability and the work of THE LAB are big reasons why. The application involved drying and curing protective coatings on brake rotors. THE LAB has worked to increase their throughput through projects such as heating multiple rotors in a single coil with a custom-designed coil and an EKOHEAT.

Tier 1 Automotive Supplier Chooses Ambrell Thanks to Superior Support

A Tier 1 supplier of electronic systems and components chose Ambrell for an application that involved joining filaments of copper wire for terminal and battery cable. The client chose Ambrell over a competitor due in part to our system's CE certification. Additionally, they also valued the expertise from THE LAB. The client traveled to THE LAB, discussed specifications, and Ambrell's application engineers were able to design a solution that met their needs. This was the beginning of a long-term relationship with Ambrell.

The Gold Standard in the Industry



Leaders of THE LAB: Dr. Girish Dahake located in the U.S. and Frank Kuster located in Europe.

Our Applications Laboratory – known in the industry as THE LAB – is where we solve our customers' most demanding and challenging heating applications. Led by Dr. Girish Dahake's worldwide team of elite engineers, Ambrell is uniquely qualified to assist you with your heating process needs.

With more than thirty years of laboratory expertise, our engineers have evaluated thousands of applications. Our team consistently provides innovative and effective induction heating solutions that deliver extraordinary results in one application after another. It's why THE LAB is the gold standard in the industry.

We invite you to visit THE LAB in either of our two locations: one in the U.S. and one in Europe. You will experience our state-of-the-art testing facility, which is fully equipped with Ambrell induction heating systems and hundreds of proven coil designs. In addition, you can interface with our engineers and see first-hand how we design prototype coils and develop effective solutions to maximize the efficiency of your heating process.

Applications Laboratory Overview

- Customer access to a wide array of induction heating equipment in THE LAB
- Hundreds of proven coil designs available
- Rapid coil prototyping for unique applications
- Video recording for slow motion studies includes availability of remote access
- Computer software for thermal analysis
- Quenching and closed loop heat-sensing capabilities
- Convenient, easy-to-use online form to get your free PRECISION MATCH Lab service

Free PRECISION MATCH Lab Service

Our engineers will design and test the optimal solution for your application. Follow these three easy steps:

- 1) Send us your parts and process requirements.
- 2) Our engineers will analyze your process and heat your parts to develop the precise and optimal solution to match your needs.
- 3) You will receive your parts back for inspection including a video recording of the induction heating process of your parts as well as a laboratory report with a system recommendation.

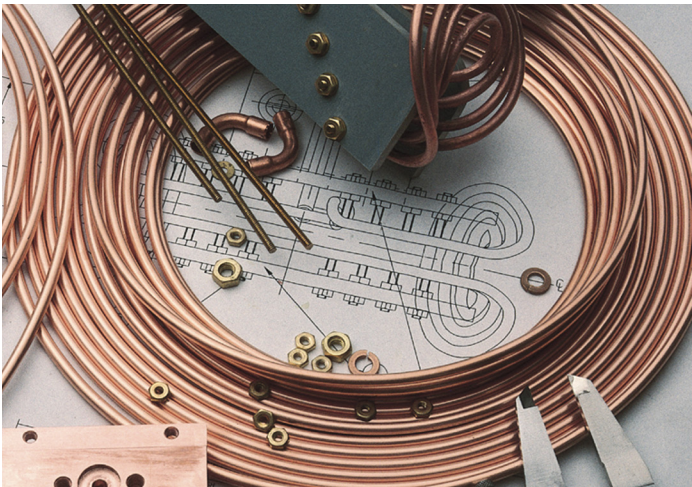
Ambrell Product Family

Ambrell offers a full line of induction heating solutions so the perfect system can be offered for your application. EASYHEAT and EKOHEAT systems are ideal for a multitude of automotive applications. Systems are CE marked and manufactured at Ambrell's ISO-certified headquarters in Rochester, NY USA. Benefits of Ambrell systems include:

- Precise heating with minimal wasted energy
- An easy-to-use display and control interface
- Moveable workheads for versatile integrations
- 100% duty cycle for demanding, automated integrations
- Auto tuning for heating parts of many sizes, compositions and geometries
- Configurable heating profiles for semi-automatic control and process management
- eVIEW induction heating software enables easy data monitoring and logging

Coil Fabrication

Custom-built coils from Ambrell are available for a wide array of automotive applications.



EASYHEAT[™] Systems

- 1-10 kW
- 150-400 kHz



EKOHEAT[®] Systems

- 10-500 kW
- 2-150 kHz



eVIEW[™] Induction Heating Software

- Monitors key operating parameters





*Our global reach includes a direct sales team along
with an extensive distribution,
channel partner and OEM network.*

About Ambrell

Founded in 1986, Ambrell Corporation, an inTEST Company, is a global leader in the induction heating market. We are renowned for our application knowledge and engineering expertise. In addition, our exceptional product quality and outstanding service and support are at the core of our commitment to provide a superior customer experience.

We are headquartered in the United States with additional operations in Europe including the United Kingdom and the Netherlands. All Ambrell products are designed, engineered and built at our manufacturing plant in the United States, which is an ISO 9001-certified facility. Over the last three decades we have expanded our global reach



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