

TEMPEL

PRODUCTS. PERFORMANCE. PRIDE.

With over 70 years of experience, we're a leading independent manufacturer of precision magnetic steel laminations for motors, generators, transformers and beyond.



AUTOMOTIVE

MOTOR &
GENERATOR

TRANSFORMER

WWW.TEMPEL.COM

USA | Canada | Mexico | India | China



AUTOMOTIVE	3
MOTOR AND GENERATOR	4
TRANSFORMER	5
THE TEMPEL DIFFERENCE	6
MATERIAL SELECTION & PROCESS TESTING	7
PROTOTYPE SERVICES	8
TOOLING & QUALITY PRODUCTION	9
QUALITY CONTROL	9
VALUE-ADDED BENEFITS, CORE ASSEMBLY	10
TEMPEL CHICAGO AND CORPORATE HEADQUARTERS	11
TEMPEL BURLINGTON	12
TEMPEL DE MEXICO	12
TEMPEL CHENNAI	13
TEMPEL CHANGZHOU	13
TEMPEL MILESTONES	14

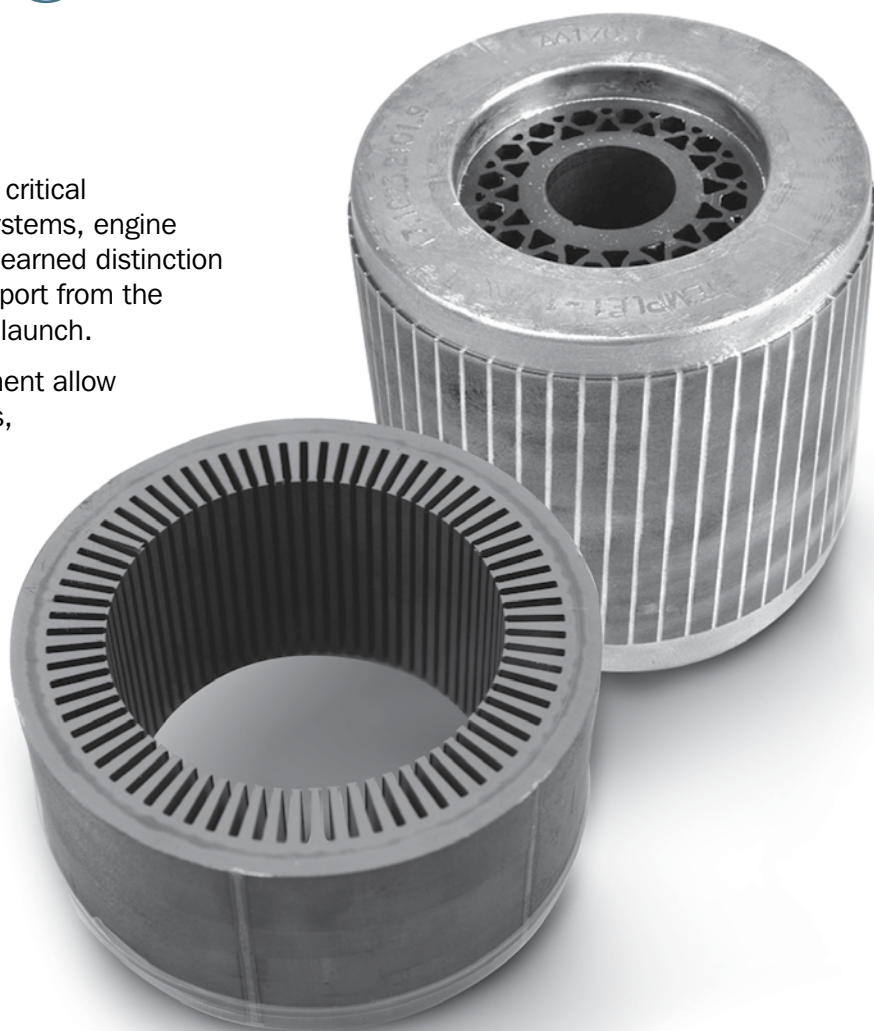
AUTOMOTIVE

We've served the automotive industry for decades in such critical applications as electric power steering, antilock braking systems, engine cooling and fuel/oil/water pumps to name a few. We have earned distinction for providing customers with collaborative engineering support from the critical theoretical design phase through serial production launch.

Our automotive experience and early engineering involvement allow our customers to reduce product development cycle times, improve motor efficiency and reduce overall system cost.

Well known for being one of the automotive industry's leading lamination suppliers, Tempel has built a strong reputation for supplying OEM and Tier 1 light passenger and commercial vehicle hybrid/EV applications.

We've made significant investments in North America and China to support hybrid/EV business growth including a state-of-the-art Automotive Focus Factory at our Tempel Changzhou facility. We've also invested in a high-tech production line in North America that is used to support hybrid/EV research and development and will be completing a hybrid/EV Focus Factory at our Tempel de Mexico facility in 2019.



MOTOR AND GENERATOR

Motor and generator laminations are the biggest part of what we do. We can provide laminations for virtually any product that needs a motor. We've manufactured laminations for everything from components that power handheld electric shavers to pump motors, HVAC-industrial applications and large, segmented laminations for hydropower plants.

We have an exceptional range of some of the most advanced progressive and large blank & notch stamping capabilities in the world and are uniquely positioned to handle any production requirements. Tempel also offers critical value-added services such as welding, cleating, die-casting, deburring and recoating, and laser cutting.

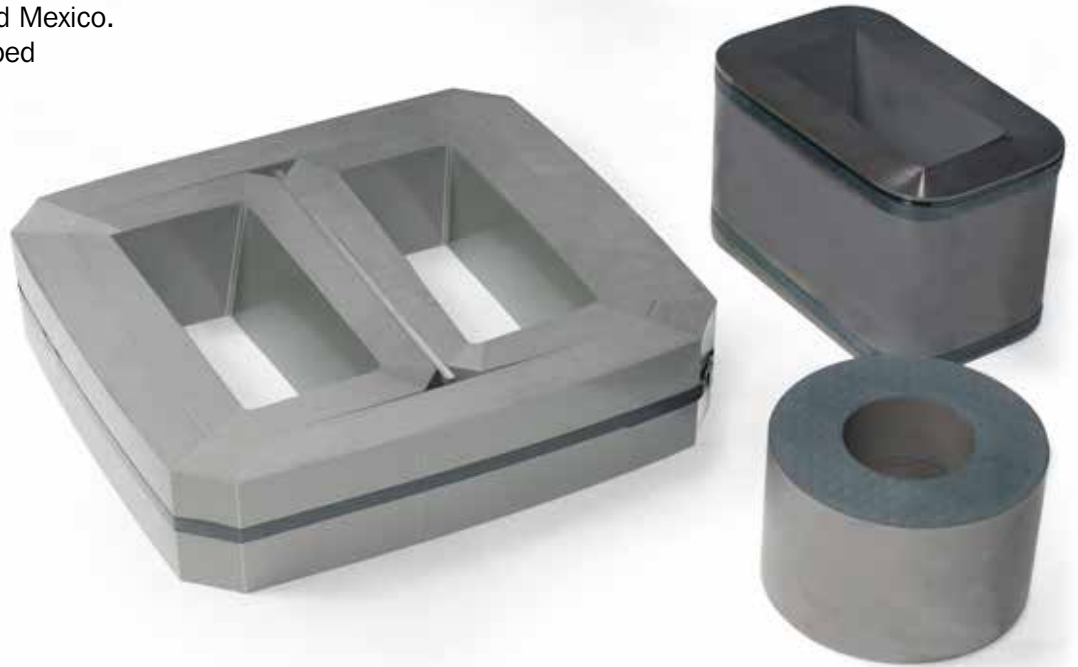
Our products can be found in garage door lifts, military vehicles and locomotives, just to name a few. We also service a variety of industries including oil, gas and mining.



TRANSFORMER

We provide the broadest range of components to the North American transformer market from our three production facilities located in Canada, the U.S. and Mexico. These products include, distributed gapped cores, slit coils, EI laminations, cut-to-length laminations, fully assembled step-lap and other mitered cores.

Transformer EI laminations are also made at our facilities in China and India. Coupled with a wide range of efficient material grades and on-site technical expertise and support, Tempel is the supplier of choice when considering a partner for your transformer core needs.



THE TEMPEL DIFFERENCE

We specialize in:

Progressive Stamping

- Loose and interlocked/stacked laminations
- Multi-row tooling
- Skewing and indexing
- Quick die change

Customer Advantages:

- Material savings
- Higher productivity
- Improved part quality
- Lower assembly costs

Blank & Notch

- Special design blanks for rotors and stators, segment laminations for large power generators
- Automated and manual notching equipment that stamps rotor and stator laminations concurrently
- Single-hit Stamping

We're one of the only companies in the world that can partner with you through your product development and testing phase.

DESIGN TO PERFORMANCE

Some of the most critical steps needed to ensure that your finished product meets all performance and cost expectations occurs in the design, prototype and material selection phases.

EXPERIENCED TEAM OF EXPERTS

Our highly experienced team, which consists of experts in sourcing, pricing, engineering, material technology, technical services and all roles in between, partners with you during every step of your project through your entire product development phase. We guarantee that our knowledgeable team will use their industry know-how and access to worldwide resources to ensure your project launches smoothly and on time.

ENHANCED MOTOR PERFORMANCE

Perhaps you've already created your product but want to make it more efficient or cost-effective. Our team of experts can use the latest engineering technology to disassemble and analyze the multifaceted components of your motor to help improve its performance.

MATERIAL SELECTION & PROCESS TESTING

Global Steel Sourcing

As one of the largest independent purchasers of electrical steel in the world, our procurement strategy aims to:

- **Identify preferred steel suppliers** who can deliver materials that meet our customer quality requirements.
- **Develop a sustainable sourcing portfolio** that ensures access to uniform, high-quality steel with equivalent performance in all global regions.
- **Provide the greatest value** proposition to our customers by mitigating risks for Tempel's customers through our comprehensive supply chain management.

We offer a wide range of the highest quality materials:

- Cold Rolled Motor Lamination Steel
- Non-Grain-Oriented Silicon Steel, Fully Processed and Semi-Processed
- Grain-Oriented Silicon Steel
- Other exotic alloys and steels based on application

Electrical Steel Sourcing Quality Assurance and Process Testing

We have one of the most comprehensive material and process testing programs in the industry. Before steel is accepted at our facilities, we use a custom-designed Gamma Tester to examine samples of each master coil to ensure that it meets our stringent cross-width thickness and shape profile standards.

Our comprehensive testing doesn't end there. To ensure that your product is produced using superior quality materials:

- Every wide coil of steel that enters our facilities undergoes Epstein Testing to measure its magnetic performance.
- Incoming raw material is also evaluated for core plate coating insulation and adhesion performance, hardness and surface roughness.
- An active product development and qualification program is observed to evaluate new steels, new suppliers and product manufacturability.

This program relies on an extensive database of new material appraisals, which include steel grades from nearly every electrical steel supplier in the world.

Just as critical to the performance of our finished product is our stringent process testing. Our manufacturing facilities at Changzhou, Chennai, Chicago and Mexico each meet Automotive Industry Action Group (AIAG) production part approval process (PPAP) submission requirements thanks to our robust process monitoring, which includes dynamic process key performance indicator (KPI) control and product audits at each process step. Through these protocols Tempel ensures that our processes are optimized and that the final product characteristics are within the customer specifications.



PROTOTYPE SERVICES

State-of-the-art Laser Cutting Using a Laser Machine with a Fiber Optic Delivery System

- Materials: Electrical steel, mild and stainless steel, aluminum and copper
- Material thickness: From 0.004" [0.10 mm] to 0.50" [12.7 mm]
- Material sizes: Up to 120" [3050 mm] x 60" [1525 mm]



Most Advanced Annealing Facilities in the World

Annealing enhances electrical properties of laminations, providing the best performance for minimal cost.

Our precise, computer-controlled roller hearth furnace annealing facilities allow customers to effectively substitute more favorably priced semi-processed electrical steels for more expensive fully processed electrical steels.

Customer Advantages:

- Lowers core loss
- Improves permeability
- Relieves stamping stress
- Increases inter-laminar resistance through oxide formation

Progressive Stamping

- Loose and interlocked/stacked laminations
- Multi-row tooling
- Skewing and indexing
- Quick die change

Customer Advantages

- Material savings
- Higher productivity
- Improved part quality
- Lower assembly costs

Precision Welding

Creates a mechanically-robust assembly with smooth clean edges. Our expertise in welding ensures the highest quality of motor and transformer cores.

Customer Advantages:

- Completed core delivery improves process cycle time
- Welded components supplied by Tempel reduce equipment and labor costs in customer facilities
- Completed cores decrease quality issues

MIG Welding

Gas metal arc welding (GMAW) and gas metal arc welding-pulse (GMAW-P) – consumable electrode using a wire feeder.

TIG Welding

Gas tungsten arc welding (GTAW) and gas tungsten arc welding-pulse (GTAW-P) – non-consumable electrode.

Plasma Arc Welding

Plasma arc welding (PAW) - non-consumable electrode.

Laser Welding

TOOLING & QUALITY PRODUCTION

Tooling Design

The tight tolerances of our precision tooling, extended die life enabled by customized tungsten carbide cutting inserts and investment in cost-efficient manufacturing methods and equipment are all important to the success of your product. We offer in-house tool design, global tool sourcing and fully-equipped tool rooms for tooling maintenance.

ADDITIONALLY, WE HAVE:

- Fully self-sufficient tooling maintenance and repair capabilities in all divisions
- Asset management database to monitor tooling condition, die life, repairs and preventative maintenance
- Flexibility to build tooling in house or outsource
- Proprietary carbides and lubricants to extend die life
- Apprenticeship programs to develop talent



QUALITY CONTROL

Statistical Process Control Globally Supported by InfinityQS®

Tempel's Quality Assurance process is one of the most effective and thorough of any lamination supplier in the world. Our process includes detailed reviews and audits to ensure continuous adherence to quality improvement assessment requirements and VDA6.3 (Verband der deutschen Automobilindustrie E.V.) requirements.

Furthermore, we use the very best precision Stamping tools available in the world and conduct a variety of physical inspections and statistical analysis to ensure that every part produced meets customer requirements/specifications. Through the use of the most high-tech equipment available, we validate product and performance. We have a unified data repository that connects each of our facilities worldwide. Supported by the statistical process control software InfinityQS, we also utilize data collection and integration, real-time monitoring and analysis, and advanced reporting to ensure tight process control so that every part we make exceeds expectations each and every time.

VALUE-ADDED BENEFITS, CORE ASSEMBLY

Our core assembly and value-added services are available to customers who want to improve their project's overall process cycle time, while reducing equipment and labor costs.

More specifically, our value-added production allows motor manufacturers to focus on core competencies in motor assembly while reducing process complexity. It also facilitates reduced cycle times and improved flexibility for its customers, positioning them to better meet ever-changing customer requirements.

Our key core assembly and value-added services include:

Die Casting

We produce aluminum die-cast rotors for a wide variety of specifications with a high degree of precision. Advanced aluminum quality control, conductivity measurement and hydrogen saturation inspection ensure best conductivity and porosity. Our die casting value-added services include, quenching, ID reaming and burnishing, and OD grinding.

Through a joint venture partner, Tempel can also offer access to copper die-casting for especially demanding or high efficiency induction motor applications.

Deburring and Recoating

Primarily used for generator segment laminations.

MIG Welding

Gas metal arc welding (GMAW) and gas metal arc welding-pulse (GMAW-P) – consumable electrode using a wire feeder.

TIG Welding

Gas tungsten arc welding (GTAW) and gas tungsten arc welding-pulse (GTAW-P) – non-consumable electrode.

Plasma Arc Welding

Plasma arc welding (PAW) – non-consumable electrode.

Laser Welding

Vent Lamination Assembly

Includes laser cut laminations, fixture-cut “I” beams or flat bars, position and spot welding to lamination using resistance welding machine with servo driven copper table.

Thermoplastic Encapsulation

Through a strategic partnership, Tempel can also offer core unitization via thermoplastic encapsulation and has identified strategic suppliers for thermoplastic encapsulated products. This allows high stacking factors to be obtained, improved magnetics (in the case where unitization via interlocking is eliminated), simplification of production stamping tools and customized thermoplastic encapsulation resins that can facilitate thermal transfer.

Large Diameter Welded Seam Laminations

Customer Advantages:

- Single piece laminations
- Utilizes less material than traditional segmented stator and conventional blank and notch designs
- Eliminates split lines between the stator segments which can result in higher outputs and/or reduced core heights
- Requires less labor to assemble than segmented stators
- Less complex stator core assembly as the core inner and outer diameter are determined by the lamination, not the fixture



TEMPEL OFFERS:

- Precision Manufacturing
- Material Sourcing
- Metallurgical Analysis
- Engineering
- Prototyping and Product Design
- Quality Control and Assurance
- Tooling Design and Fabrication
- Value-Added Capabilities
- Global Supply Chain Management

**Locations**

In addition to the list of manufacturing facilities below, we have distribution centers strategically located in the U.S. Los Angeles and Philadelphia metropolitan areas. We also have a sales office in the United Kingdom and sales and engineering in Germany.

TEMPEL CHICAGO AND CORPORATE HEADQUARTERS

5500 N. Wolcott Ave., Chicago, IL. 60640, USA
 Phone: +001-773-250-8000
 Fax: +001-773-250-8910

**Quick Facts:**

- Employees: 400+
- Manufacturing Area: 36,000+ sq m (389,000+ sq ft)
- Total Active Presses: 60+
- Press Range (Tons): 60+

Certifications:

Chicago - IATF 16949:2016
 Chicago - ISO 9001:2015
 Chicago - ISO 14001:2015

Tempel Chicago List of Specialized Capabilities:

- Annealing
- Blank & Notch
- Bonding
- Deburring and Recoating
- Laser Cutting
- Rapid Production Intent Prototyping
- Riveting and Cleating
- Shaft Insertion
- Slitting
- Slot Paper Insertion
- Stator/Rotor Core Assembly
- Vent Lam Assembly
- Welding

TEMPEL BURLINGTON

5045 North Service Road
 Burlington, Ontario L7L 5H6, Canada
 Phone: +001-905-335-2530
 Fax: +001-905-335-5711



Tempel Burlington Quick Facts:

- Employees: 170+
- Manufacturing Area: 10,000+ sq m (110,000+ sq ft)
- Total Active Presses: 0
- Press Range (Tons): N/A

Certifications:

Burlington - ISO 9001:2015
 Burlington - Customs - Trade Partnership Against
 Terrorism (C-TPAT)

List of Specialized Capabilities:

- Annealing
- Butt-Lap Cores
- Distributed Gap Cores
- Mitre Cores
- Slitting
- Toroidal Cores

TEMPEL DE MEXICO

Andres Guajardo No. 315
 Parque Industrial Apodaca
 66600 Apodaca, N.L., Mexico
 Phone: +52-818-156-1000
 Fax: +52-818-156-1090



Tempel de Mexico Quick Facts:

- Employees: 600+
- Manufacturing Area: 33,000+ sq m (350,000+ sq ft)
- Total Active Presses: 40+
- Press Range (Tons): 60+

Certifications:

Tempel de Mexico - IATF 16949:2016
 Tempel de Mexico - ISO 9001:2015
 Tempel de Mexico - ISO 14001:2015
 Tempel de Mexico - Customs - Trade Partnership Against
 Terrorism (C-TPAT)

Tempel de Mexico List of Specialized Capabilities:

- Annealing
- Blank & Notch
- Distributed Gap Cores
- Die Casting
- Laser Cutting
- Rapid Production Intent Prototyping
- Riveting and Cleating
- Shaft Insertion
- Slitting
- Stamping
- Stator/Rotor Core Assembly
- Vent Lam Assembly
- Welding

TEMPEL CHENNAI

No. 7, Gudapakkam Village
 Puduchatram Post, Poonamallee Taluk,
 Tiruvallur District, Chennai 600 124 - India
 Phone: +91-44-6680-3900
 Fax: +91-44-6680-3905



TEMPEL CHANGZHOU

17 Tianshan Road
 Changzhou New District P.R.
 China 213022
 Phone: +86-519-8513-3350
 +86-519-8513-8633
 Cell Phone: +86-150-6196-5103



Tempel Chennai Quick Facts:

- Employees: 300+
- Manufacturing Area: 19,000+ sq m (210,000+ sq ft)
- Total Active Presses: 30+
- Press Range (Tons): 10+

Certifications:

Chennai - IATF 16949:2016

Chennai - ISO 9001:2015
 Chennai - ISO 14001:2015
 Chennai - OHSAS 18001:2007

Tempel Chennai List of Specialized Capabilities:

- Annealing
- Blank & Notch
- Riveting and Cleating
- Slitting
- Stamping
- Stator/Rotor Core Assembly
- Vent Lam Assembly
- Welding

Tempel Changzhou Quick Facts:

- Employees: 300+
- Manufacturing Area: 17,000+ sq m (189,000+ sq ft)
- Total Active Presses: 20+
- Press Range (Tons): 40+

Certifications:

Changzhou - IATF 16949:2016

- Changzhou - ISO 9001:2015/GB/T 19001-2016
- Changzhou - ISO 14001:2015/GB/T24001-2016
- Changzhou - OHSAS 18001:2007/GB/T28001-2011

List of Specialized Capabilities:

- AI Die Casting
- Annealing
- Rapid Production Intent Prototyping
- Riveting
- Shaft Insertion
- Stamping
- Stator/Rotor Core Assembly
- Welding



MILESTONES

We proudly started as a family owned business in 1945. Today, we're a global company, with our products used around the world. But to our team and our customers, we're still family.

1945
Tempel founded
Tempel founded in Chicago, IL,
USA, by Tempel J. Smith
(1909-1980)

1984
Steel Services Division established

1996
Acquisition of BCL Magnetics in Canada

1998
Tempel de Mexico in Monterrey opens

2001
Acquisition of PSW Industries

2002
Acquisition of Magnetic Metals
Brings opening of Tempel
Changzhou in China

2004
Acquisition of National Laminations

2006
Tempel Chennai in India opens

2012
Tempel Chennai expands plant

2018
Automotive Focus Factory opens
Tempel Changzhou in China

2019
Automotive Focus Factory opens
Tempel de Mexico

TEMPEL

TEMPEL



USA | Canada | Mexico | India | China

WWW.TEMPEL.COM

5500 NORTH WOLCOTT AVENUE
CHICAGO, IL 60640-1020 USA

[in WWW.LINKEDIN.COM/COMPANY/TEMPEL](http://WWW.LINKEDIN.COM/COMPANY/TEMPEL)

[YouTube WWW.YOUTUBE.COM/TEMPELSTEEL](http://WWW.YOUTUBE.COM/TEMPELSTEEL)