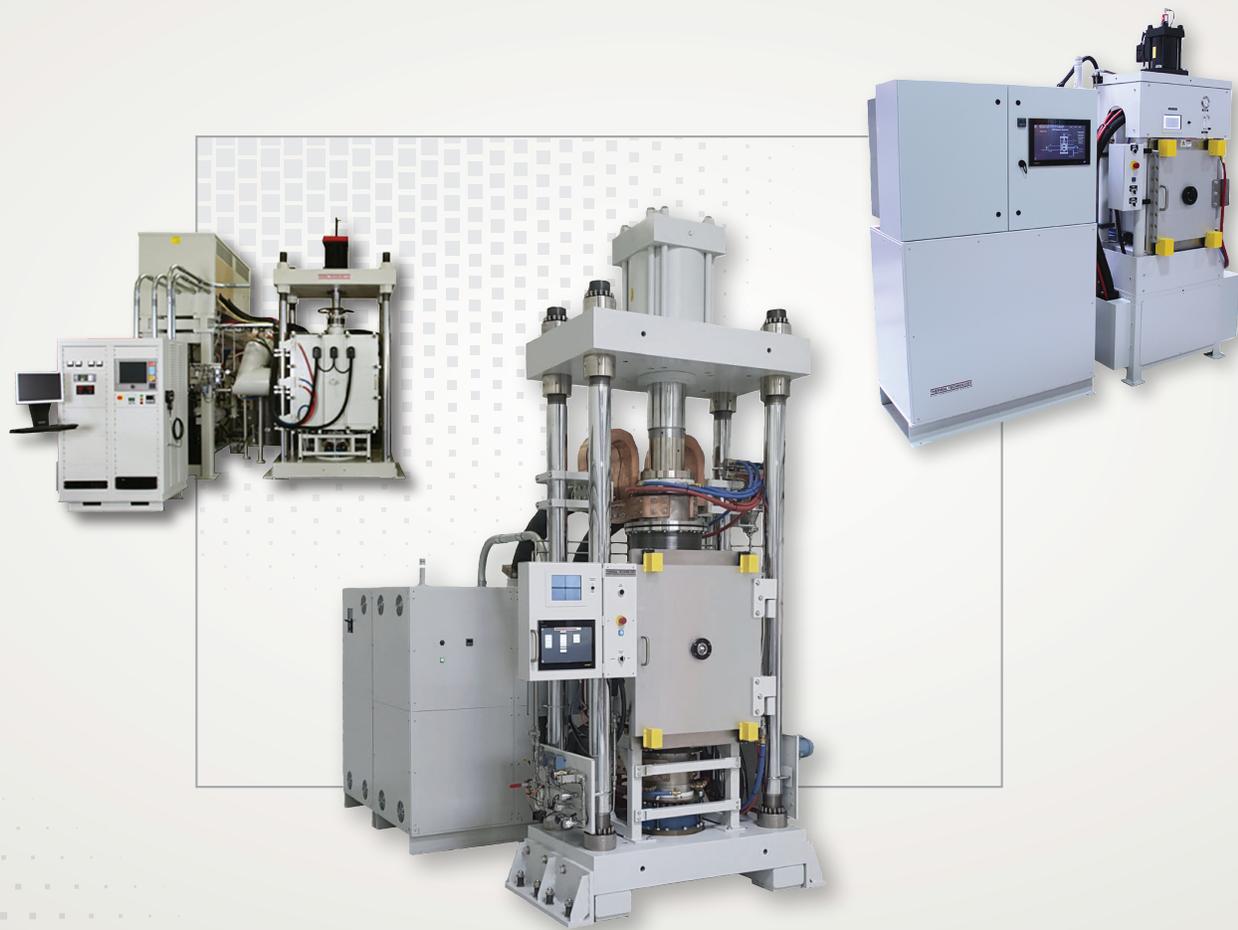


thermaltechnology.com

ADVANCED THERMAL PROCESSING SYSTEMS

PRESS SYSTEMS

Spark Plasma Sintering ■ Direct Current Sintering ■ Hot Press



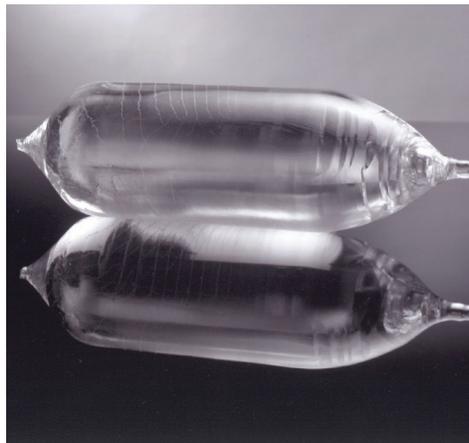
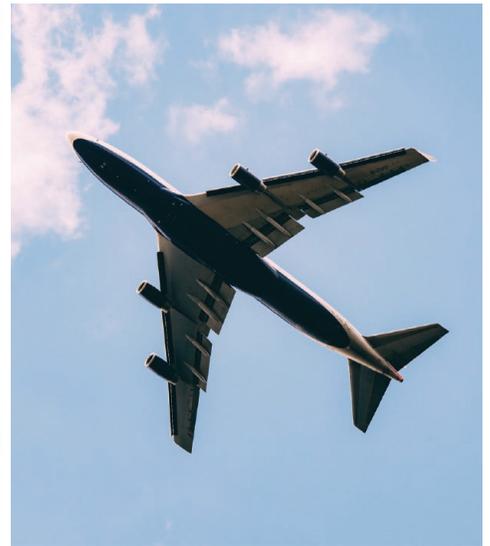
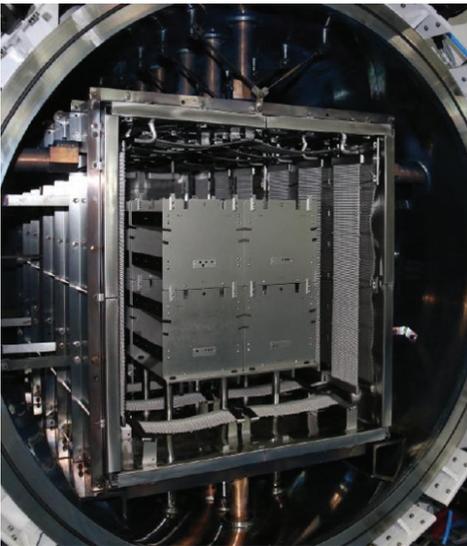
THERMAL TECHNOLOGY LLC™

H I G H T E M P E R A T U R E E X P E R T S

THERMAL TECHNOLOGY IS THE ONLY U.S.-BASED MANUFACTURER OF SPARK PLASMA SINTERING (SPS) SYSTEMS AKA FAST, AND THE WORLD'S ONLY PROVIDER OF BOTH SPS AND DIRECT CURRENT SINTERING (DCS) PRESS SYSTEMS.

The use of innovative metals, ceramics and composite materials in industrial and consumer products is expected to grow in the coming years as the availability of these materials increases and their cost of manufacturing continues to come down. One critical requirement for this growth is a production proven hot press system that can deliver high volumes of materials at price points that allow design engineers to take advantage of the improved mechanical, optical and electrical performance these new advanced materials offer for use in next-generation products.

Thermal Technology is a leading provider of hot pressing systems utilized in the production of high temperature ceramics, advanced composite materials and functionally graded materials (FGMs) for use in the aerospace, semiconductor, defense, power generation, automotive, medical device and other commercial industries. Our hot press systems have been tested by the world's leading universities, top research institutes and a growing number of industrial clients in the development of innovative, next-generation products.



Applications around a DCS 200 press system (clockwise): refractory hot zone, DCS 200, aerospace applications, armor and ballistics applications, crystal growth, medical applications.



SPARK PLASMA SINTERING (SPS) AND DIRECT CURRENT SINTERING (DCS) SYSTEMS

Our innovative rapid powder consolidation technologies, Spark Plasma Sintering (SPS) and Direct Current Sintering (DCS) utilize high amperage DC current for quick and even thermal processing. SPS (pulsed DC current) and DCS (constant DC current) systems quickly process conductive, non-conductive and composite materials, including nanomaterial, to any level of density with high homogeneity at lower operating costs. Thermal Technology's High speed IGBT power supplies can be configured to your specific applications.

Emerging markets for SPS and DCS systems include the development of thermoelectric generators for automotive applications. This developing green technology converts waste heat from engine exhaust and industrial plants into electricity. Other applications include fuel cell materials, high strength and wear resistant tooling, sputter targets, diamond compaction for abrasives and the development of pure or mixed metallics, ceramics or cermets where maintaining nanometric and fine microstructure is required.

As of 2017, the complete Press furnace line received a global upgrade which includes numerous key advancements. Starting with a new fully integrated touch screen control package. All programming and operation interface can now be conducted effortlessly on the furnace. Operation can be fully manual and/or automatic, and data is automatically captured. Data storage is virtually unlimited. This is a state of the art, high speed control system that perfectly integrates with our advanced digital servo proportional valve hydraulics and fast reacting IGBT power supplies. In keeping with our highly acclaimed strategy of using a separate PC for operation/programming interface, this control system also features a full HTML-5 interface that enables any computer with a modern web browser to securely connect to the furnace and control the system.



DCS 10: 10 tons force and 5,000 amps



DCS 25 and 50: 25 and 50 tons force, and 10,000 and 20,000 amps



DCS 100 and 200: 100 and 200 tons force, and 30,000 and 50,000 amps

TECHNOLOGICAL BENEFITS

- High speed powder densification process requiring significantly less process time and energy consumption than conventional sintering methods
- Retains nanometric and fine microstructures for superior finished material properties
- Glove box friendly design
- Produces materials with controlled and uniform porosity
- Efficient and rapid sintering for fast cycle times
- No pre-forming or binders required
- Preservation of purity due to simpler fabrication process
- Front load access

SPS/DCS CONFIGURATIONS

Our modular IGBT power supplies can be configured to your specific applications.

Thermal Technology offers very large systems, up to and above 500 tons force and 150,000 amps and above. We also offer fully automated linear high throughput systems.



HOT PRESS SYSTEMS

Thermal Technology's hot pressing systems are designed for simultaneous application of high temperature and high force. Primary applications include powder densification and diffusion bonding of metals, ceramics, cermets and composite materials.

Systems include:

- Graphite, tungsten, molybdenum or ceramic hot zones
- Optional interchangeable hot zone (available on certain models)
- Can be utilized as a batch furnace with addition of optional components



HP 10

Operates up to 2400C in vacuum/inert gas atmospheres. Has 10 tons force load frame and hydraulics. Provides 360 degree exposure to punch and die.



HP 25

Operates up to 2400C in vacuum/inert gas atmospheres. Has 25 tons force load frame and hydraulics. Provides 360 degree exposure to punch and die.



HP 100

Operates at 1,450°C with a 100-ton force load frame and hydraulics. The 24" x 24" x 30" molybdenum hot zone is capable of diffusion bonding multiple parts in one load.

TECHNOLOGICAL BENEFITS

- Robust four-column, rigid load frame
- Highly accurate force control
- Reliable powder densification and diffusion bonding
- Optimum hot zone temperature uniformity
- Low entry costs
- High level of repeatability
- Long life, low maintenance

HOT PRESS SYSTEM CONFIGURATIONS

Graphite, Refractory Metal, and SiC Hot Presses

MODEL	PRESS CAPACITY TONS	MAX HOT ZONE	
		INCHES	MM
HP 10	10	4" diam. x 6"	101.6mm diam x 152.4mm
HP 25	25	8" diam. x 12"	203.2mm diam x 304.8mm
HP 50	50	12" diam. x 12"	304.8mm diam. x 304.8mm
HP 100	100	24" diam. x 24"	609.6mm diam. x 609.6mm
HP 200	200	24" diam. x 24"	609.6mm diam. x 609.6mm

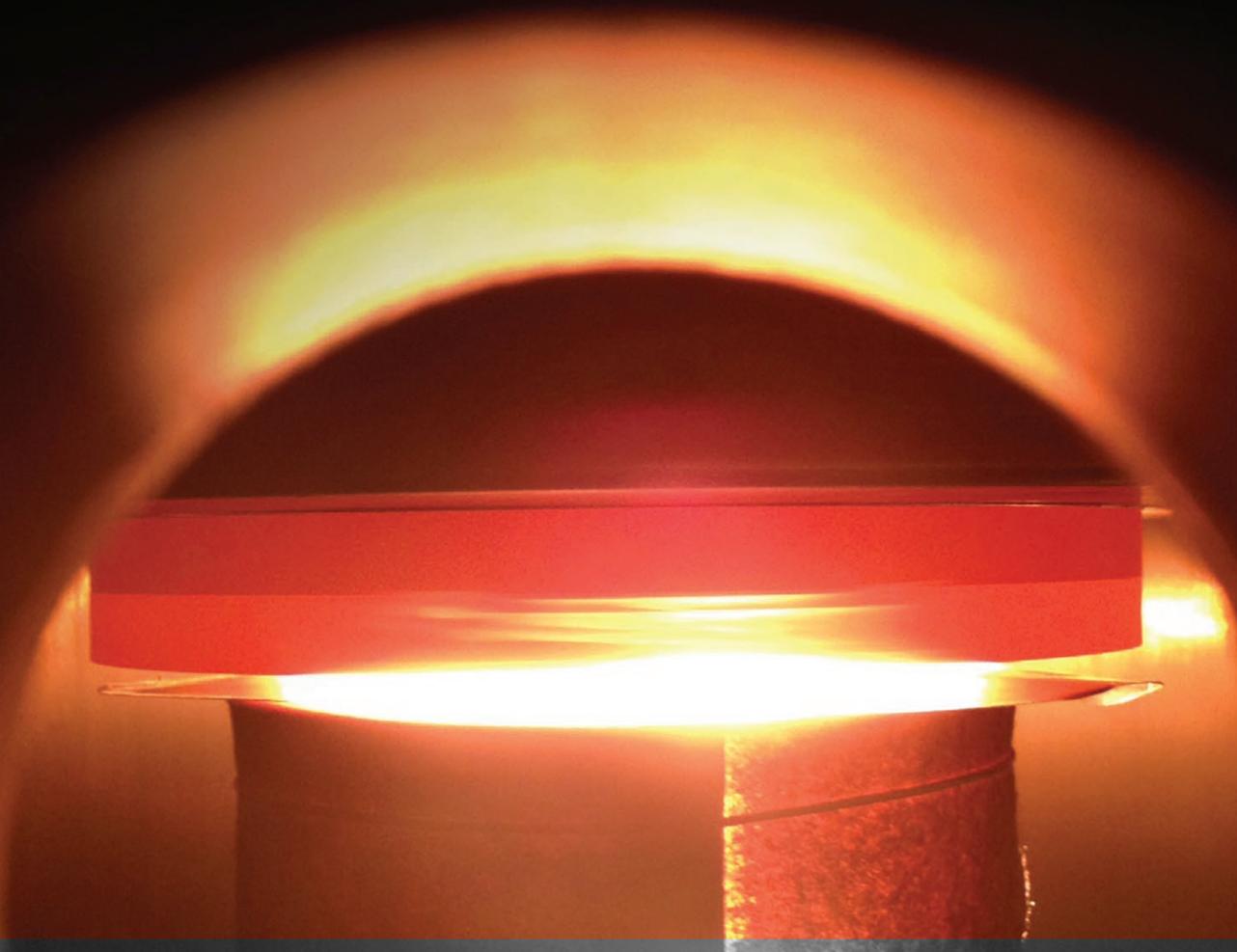
Customized and larger configurations are available



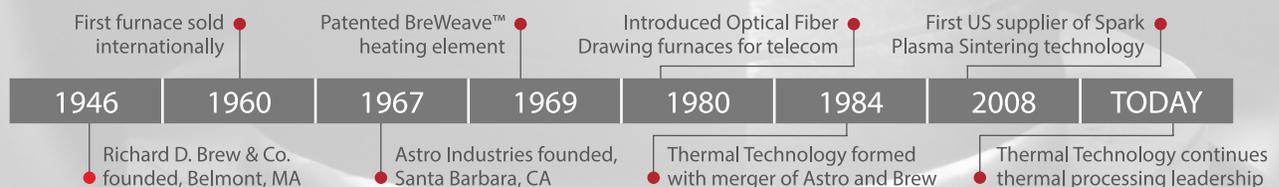
ENABLING PROCESS TECHNOLOGY FOR GLOBAL LEADERS SINCE 1946.

- > Developed and patented BreWeave™ technology
- > An install base of over 3,000 systems in 40 countries
- > Decades of technical innovation, process knowledge, full-factory testing, installation assistance and aftermarket support
- > Markets served include lighting, electronics, healthcare, renewable energy, communications and aerospace

Pictured:
Bottom shield pack and heater



FROM INDUSTRY PIONEER TO GLOBAL INNOVATOR



THERMAL TECHNOLOGY THERMAL PROCESSING SYSTEMS

SPARK PLASMA SINTERING SYSTEMS

A revolutionary, high speed powder densification technology offering significant savings of time and energy and the ability to retain nano structures.

DIRECT CURRENT SINTERING SYSTEMS

All the benefits of spark plasma sintering with a constant (non-pulsed) current designed for larger systems.

HOT PRESS SYSTEMS

For the simultaneous application of high temperature and high pressure. Effective and efficient powder densification, diffusion bonding and processing of composite materials.

PRODUCTION FURNACES

We offer vacuum, inert or reducing atmospheres and automatic controls. Two, four or six-side heating provides optimized uniformity. Effective for sintering, presintering, debinding, annealing, brazing and metallizing.

LABORATORY FURNACES

Suitable for a wide variety of laboratory and small scale production applications. These furnaces are reliable, versatile and easy to use with specific models ranging up to 3,000 ° C.

APF AND CPF SYSTEMS

Provide fully automatic, unattended operation at temperatures to 2,500°C. Parts processing is quickly cycled with rapid temperature ramp up and ramp down.

Service Commitment

Thermal Technology is dedicated to delivering the highest levels of satisfaction in the implementation of our processes and equipment. We respond to the needs of our customers with proven solutions, comprehensive training and support.

Mission Statement

Enable our customers' businesses by providing high quality thermal processing equipment solutions with outstanding support and service.

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HIGH TEMPERATURE EXPERTS

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