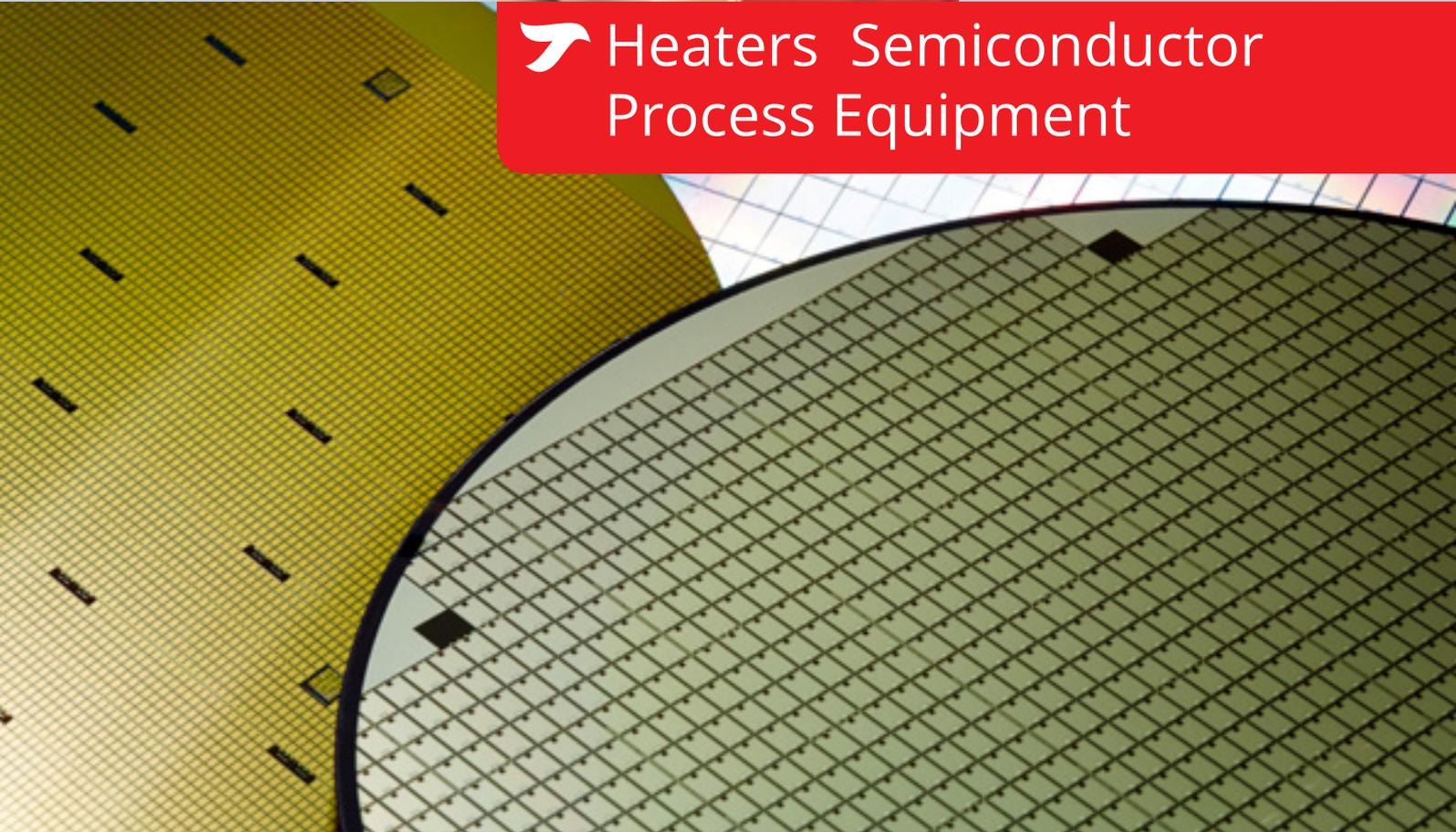


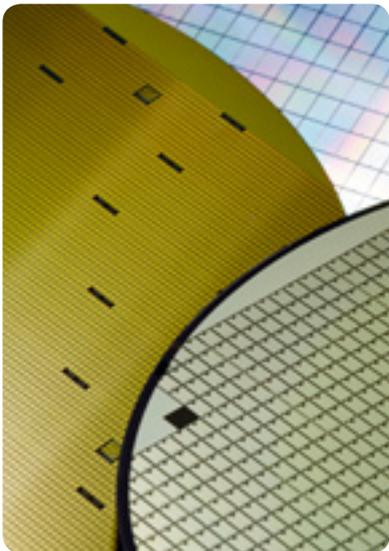
➤ Heaters Semiconductor Process Equipment





THERMOCOAX

SEMICONDUCTOR



Applications

➤ **WAFER PROCESSES:**

- Deposition
- Patterning
- Doping
- Etching
- Testing
- Packaging

➤ **FLAT PANEL DISPLAY**

➤ **FLEXIBLE ELECTRONICS**

➤ **NANOTECHNOLOGY**

Our capabilities

Our mission is to develop state-of-the-art, complete thermal solutions and this through advanced innovation from conception, to prototype development right the way through to production.

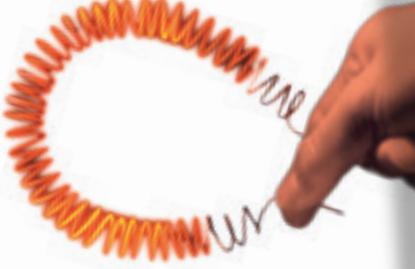
We offer custom made thermal systems, providing our customers with safer, cleaner and the most cost effective solutions.

THERMOCOAX has extensive skills and expertise endorsed by some of the most demanding industries such as Nuclear, Aeronautical & Solar...

With the acquisition of ISOPAD, THERMOCOAX now has an even broader line of heating systems & sensors for the Semiconductor Industry.

COMPETENCES:

- ▶ 3D Design / thermal modeling
- ▶ Brazing (Laser, Plasma, TIG)
- ▶ R&D and Engineering project management
- ▶ Metallographic technics in failure analysis
- ▶ Grade 2 Clean packaging



The industry's
most trusted
Mineral
Insulated
Cable



THERMOCOAX Unique Value Proposition

THERMOCOAX manufactures a wide range of thermal systems for semiconductor process equipments that meet your exact requirements.

Whether you need our standard heaters or want a custom application,

THERMOCOAX can provide you with a complete solution from initial prototype engineering to final product manufacturing.

THERMOCOAX heaters have a wide operation range from cryogenic temperatures up to 1000°C, and are available in a variety of sheath materials, avoiding contamination.

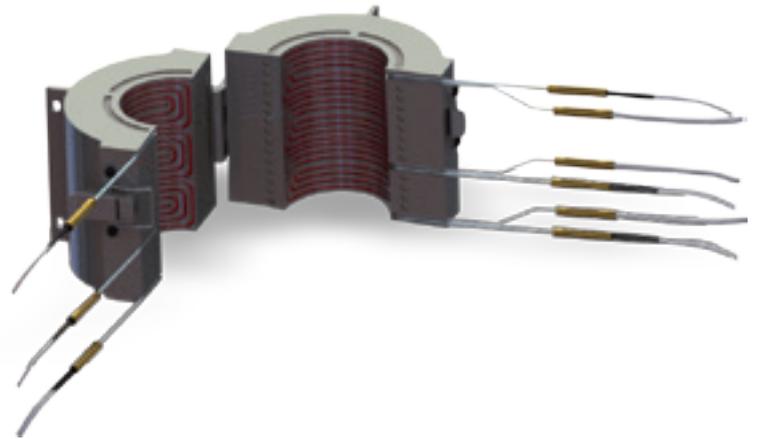
THERMOCOAX unique manufacturing process allows our heaters/ sensors to accommodate virtually any shape, with an exclusive internal hot-cold transition possible while enabling completely seamless outer sheath.

Why choose THERMOCOAX ?

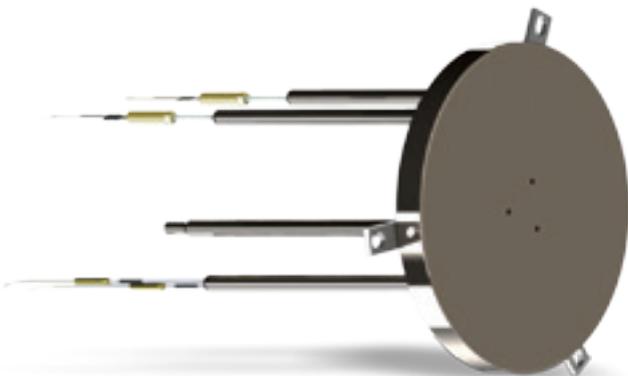
Product reliability

Largest European manufacturer of heaters for semi process equipment

Production capacities in USA-Germany-France with traceability of semi-finished / manufactured products



**55 YEARS IN MANUFACTURING
THE INDUSTRY'S MOST TRUSTED
MINERAL INSULATED CABLE**



HEATING SYSTEMS SEMICONDUCTOR

- ▶ Deposition CVD – PECVD – MOCVD – ALD – PVD
- ▶ Etching / Ion Implantation / Annealing
- ▶ Lithography
- ▶ Packaging
- ▶ And more... Flat Panel Display, Flex Electronics, nanotechnology...

➤ Wafer Process Equipment Heaters & Sensors

SEMI STANDARD CLEANNESS

Physical Vapor Deposition PVD tools – R&D

Heating Coil - Robust and versatile heating application

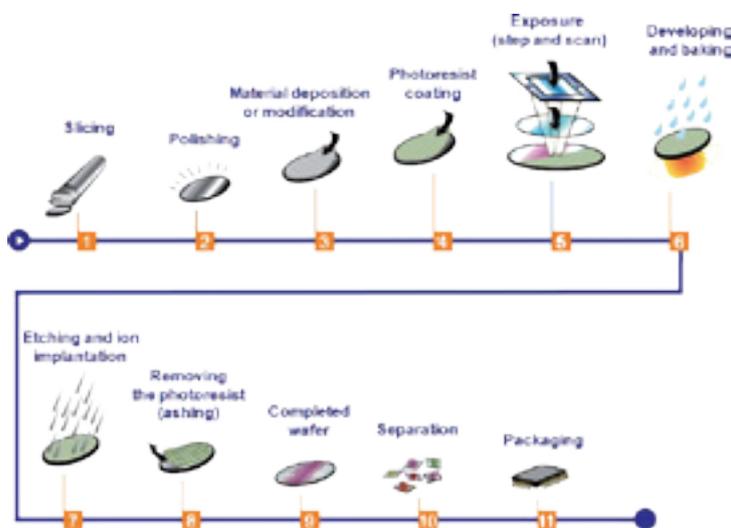
- Diameter up to 150 ±3 mm / 200mm with reinforced frame
- Working temperature 1 000 °C
- True cold End Heater
- Thermocouple integrated
- Operating conditions: vacuum or atmosphere, HF, corrosive environment



Ion Implant

Ion Source - Evaporator with ZEZ heater brased onto stainless steel

- Operating up to 1 000 °C / 115VDC
- Vacuum brased



Lithography Nanoimprint – Immersion - EUV

Heating Tube - Cold ends heater coiled and brased on stainless steel, Inconel or molybdenum tube

- Final packaging in clean room class 10 (US FED 209 E)
- NTC thermistor inserted inside the tube
- Operation conditions 24VDC
Water environment option



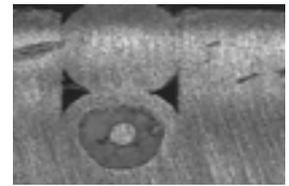
Heating and Temperature measurement solutions for each wafer production step

Hot Plates – Chucks HEATING PLATE FOR R&D OR FAB EQUIPMENT

Chemical Vapor Deposition ALD - CVD - PECVD - MOCVD

Custom Hot Plates - From thermocouples to high temperature uniformity performance chucks

- ▶ Diameter up to 450mm
- ▶ Working temperature up to 1 000 °C
- ▶ Optimal temperature uniformity / repeatability performances
- ▶ Material: Aluminium, Stainless steel, Inconel
- ▶ Construction cast or machined, sandwich or single plate
- ▶ Connections compatible with UHV
- ▶ Fast heat up ramps and cooling circuit option
- ▶ Custom sheath thermocouples



Mineral cable heater
press fit into the groove

OPTIMAL TEMPERATURE UNIFORMITY

Annealing

Multi Heating Zones Ovens - Heaters mounted inside or outside the chamber

- ▶ Up to 4 heating zones 12000W total
- ▶ Working temperature 200-650°C



Etching

Aluminum Hot Plate - Machined aluminium chuck with 2 zones ZEZ cold end technology heaters + thermocouple

- ▶ Diameter 190mm
- ▶ Working conditions
776W – 110V

TRUE COLD ENDS TECHNOLOGY HEATERS

References

THERMOCOAX Rank #1

Independent study conducted on thousands of heaters running over a period of 34 years

MAXIMUM AVERAGE NUMBER OF FAILURE 1,2

THERMOCOAX true cold and heater technology features:

- ▶ hot / cold transition in continuous sheath
- ▶ Tight bending radius x3 OD
- ▶ Single long length cable > 15m

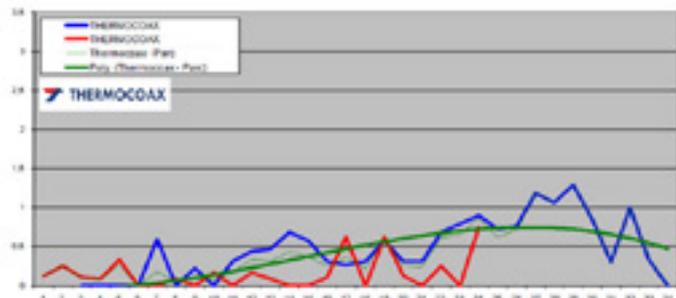
THERMOCOAX ISOPAD

- ▶ Silicon free jacquets
- ▶ Flexible heated hoses
- ▶ Heating tapes for tracing



Feed through

Average Numbers of failure



Concept, Designs using SolidWorks and computer model techniques (CMT) and Computational fluid dynamics (CFD)

Calibration and testing using French COFRAC certified laboratory (NIST)

Project management handled by our highly qualified, in-house Engineering team.



OUR COMPANY

With nearly 60 years of experience in heating solutions and temperature measurement, THERMOCOAX has acquired a great deal of skill and expertise. THERMOCOAX products are widely used and endorsed in many industries where the highest quality and utmost reliability are essential. All our mineral insulated cables are manufactured in-house with our proprietary and unique procedures.



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Site Planquignon



Thermocouples
& Heating Elements
ATEX
certified and notified

