

Production facility: focus on innovation

Thales's grid tubes are designed, developed and manufactured in a production plant in Thonon, southeast France, certified to ISO 9001:2000 and ISO 14001. Spanning some 25,000 square meters of floor space, including 200 square meters of clean rooms, Thonon is recognized worldwide as a center of expertise in power sources. R&D teams at Thonon are working on innovative new solutions for industry.

Thales industrial tubes at a glance

- In service in 40,000 generators worldwide
- 120 million operating hours/year
- 200 different models, for all industrial applications



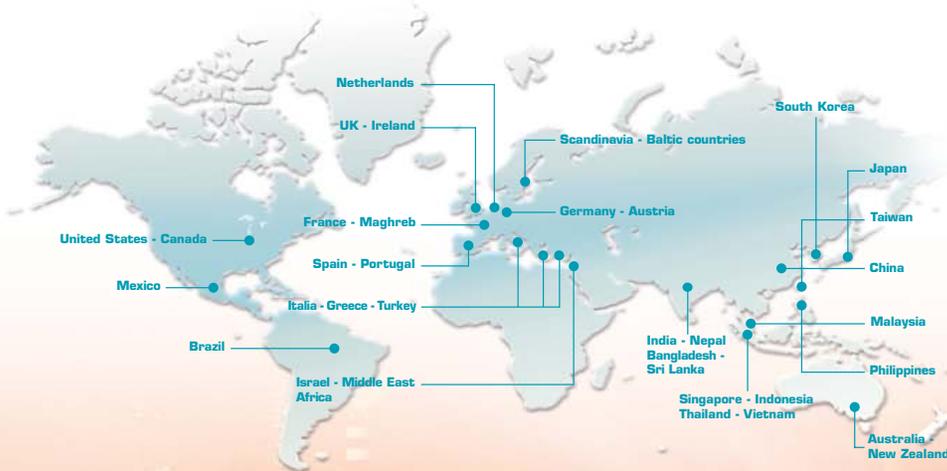
THALES



>> Richardson Electronics global support network

Richardson Electronics is the world wide distributor of Thales industrial products. RELL has been distributing electron tubes since more than 60 years and has developed the best logistic services in the industry. It now has 45 sales offices and stocking locations around the world.

For more information regarding the products, feel free to ask Richardson Electronic - www.rell.com



THALES MICROWAVE & IMAGING SUB-SYSTEMS
2, rue Marcel Dassault - BP 23
78141 Vélizy-Villacoublay Cedex - France

Phone: + 33 (0) 1 30 70 35 00
Email: rfms.marketing@thalesgroup.com

RICHARDSON ELECTRONICS, Ltd
40W267 Keslinger Road
LaFox, IL 60147-0393 - USA

Phone: +1 630 208 2200
Email: edg@rell.com

Image 2/24/06 - S113A/2010-11 Credits photo: Thales. The trademark cannot be considered to be a contractual specification. This information here on may be modified without notice.

RF industrial heating
Power grid tubes for induction heating



Thales, a long-standing partner to industry

With over 60 years of experience in the design and manufacture of electron tubes, Thales is the benchmark supplier to a number of industries that call on these tubes for induction heating applications, including pipe welding and heat treatment.

We have made a two-pronged commitment to our customers: to ensure the long-term viability of tube technology, which has proven its reliability and flexibility; and to deliver high-quality products, based on our expertise in the complex underlying processes. Whether for induction, dielectric, or laser applications, we offer the largest range of tubes on the market, plus comprehensive support services around the world.

THALES

Richardson Electronics

www.thalesgroup.com

The world's widest range of tubes for RF industrial applications

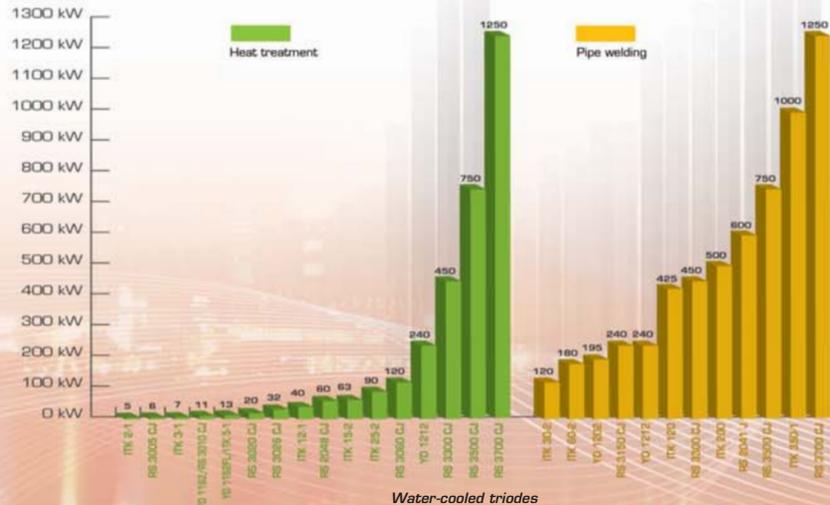
>> Thales: recognized expertise in high-power RF applications

No matter what industry you're in, you can count on Thales.

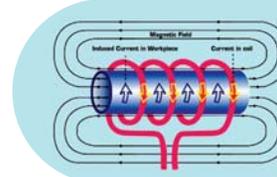
- **A range of products that covers all market requirements**, with tubes developing 5 to 1,250 kW of power. This means we can meet all your needs, whether for petrochemicals, construction, automotive, aviation or other applications.
- **The largest catalog of products.** Thales is today's largest manufacturer of grid tubes for industry, with products by Thomson, ABB and Siemens all integrated in our production lines.
- **The most efficient solution.** All Thales's products are manufactured in France, using strict component quality control procedures. We focus on product quality to ensure long operating life and reduced system maintenance costs.
- **Delivery within 48 hours.** Timely delivery is of course essential in industry, especially when you're waiting for replacement parts! At Thales, we deliver within 48 hours to keep your production lines up and running. Our worldwide distributor guarantees virtually immediate product availability from their stock.
- **Customer support and technical assistance around the world.** Thales engineers and local technical assistance teams support your development of RF industrial heating solutions. We can also custom-design products for your new systems, and provide upgrades and replacement kits for your older systems.



>> Thales's best-sellers: versatile solutions keyed to market requirements



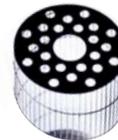
>> Pyrolytic grids, a major advance in induction heating



Induction heating, used to weld or process conducting materials, offers advantages that make it a perfect industrial match for medium and large production runs:

- Precise heat settings and absence of thermal inertia (quick startup)
- Heating of inaccessible parts
- Excellent reproducibility
- Higher energy efficiency
- Facilitates automation and saves space
- Heat source generates no pollution

Thales has developed a new technology for these tubes, namely the **pyrolytic grid**. Based on the crystallization of pyrolytic graphite, it produces a single-piece part, without any welds. This structure, coupled with the graphite's intrinsic mechanical properties, gives the grid unrivaled qualities:



- Very high thermal conductivity
- Very low thermal dilation coefficient, for reduced space between electrodes
- Excellent resistance to thermal shock
- Excellent chemical stability at high temperatures
- Good mechanical resistance, increasing with temperature
- Low and constant electrical resistivity
- Much lower thermal and secondary emission effects than with metallic grids

Tubes with the pyrolytic grid stand up much longer to operating conditions involving high grid current levels. Which means that our **Pyrobloc®** tubes offer **better reliability** and **longer operating life** in high-power systems.

>> Induction heating: precision plus reproducibility

Two major processes for multiple industrial applications

- 1 - Pipe welding:** in this process, tubes are made by rolling strips of steel into the desired form then welding the edges together.
- 2 - Heat treatment:** of a mechanical part uses predetermined heating and cooling cycles to change the internal structure of the material. This process improves the quality of steels and increases their lifespan.

Industrial Applications:

- Petrochemicals:** Finning on carbon steel tube for use in heat exchangers.
- Building & Civil Engineering:** Pipe welding to build structures including buildings, bridges, viaducts, etc.
- Automotive:**
 - Hardening and tempering for engine parts (shafts and gears).
 - Brazing seams in air-conditioning systems.
- Aerospace:**
 - Brazing fan blades on jet aircraft.
 - Heating prior to welding and bending tubes/profiles on ships.
- Fibers and cables:** Plasma heating for the fabrication of optical fibers.