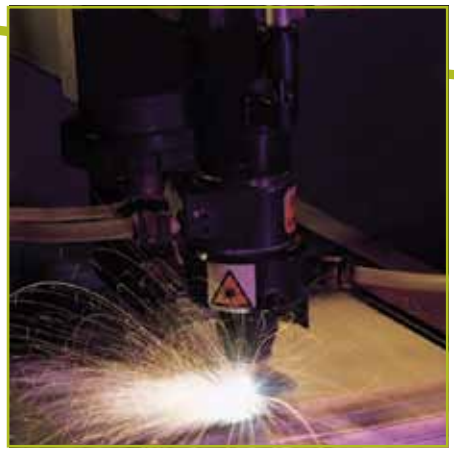
e2v

e2v.com/tubes

Industrial heating



Introduction

e2v has made quality industrial triodes and tetrodes in our UK factory for over 60 years. We provide a high level of technical support and our experts are on hand to help you with the selection and use of your product.

We are committed to working in partnership with our customers, providing them with exactly what they need. e2v continually strives to be responsive to customer needs, investing to achieve manufacturing lead-time reduction and improved customer service.

Ranging in power output from 25kw to 530kw, many of the triodes and tetrodes that we manufacture are either direct equivalents of other manufacturers' devices, or can be used to replace them with our guidance at a relatively low cost. All our devices are subjected to extensive high voltage conditioning and full functional RF/DC testing procedures.

Our dedicated engineering team will be pleased to advise on any of your vacuum device or application requirements.

Applications

Induction heating

Induction heating is a method of heating conductive material by subjecting it to an alternating electromagnetic field, usually at a frequency between 100 to 500kHz. An inductor (the work coil), acting as a primary winding of a transformer, surrounds the material which is to be heated (the work piece). This acts as the secondary winding. Alternating current (RF), flowing in the primary coil, induces eddy currents in the work piece that generates heat. The depth of eddy current penetration in the work piece and the distribution of the heat is determined by:

- the frequency of the primary alternating current
- the permeability of the material and
- the resistivity of the material

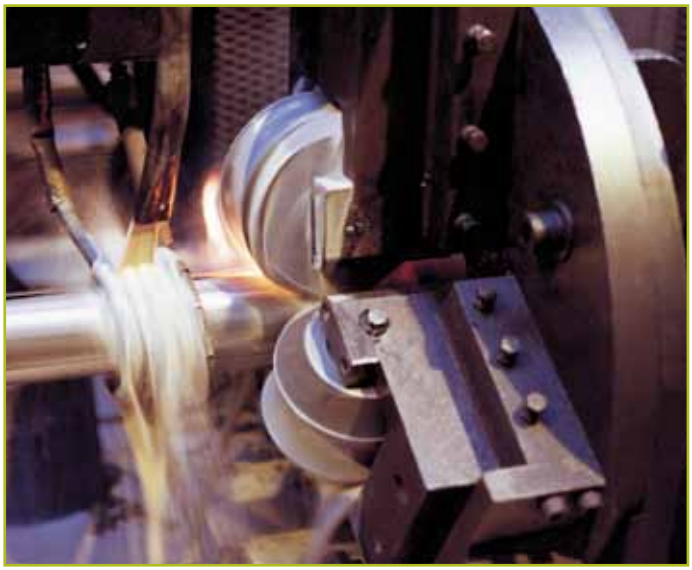
The particular design of the coils, along with temperature sensors and feedback controls, allows either the entire work piece or a specific area to be heated. The repeatability of the process is excellent. Oscillator circuits containing triodes are commonly used to generate the RF currents.

Pipe welding

Induction welding of tube and pipe products involves the formation of a metal strip between specifically designed rollers. The seam is brought together under a small amount of pressure and an electric current is induced along the seam to cause the welding. Triodes are used in oscillator circuits to feed RF current to the pipe welding work coil.

Induction hardening

Induction hardening involves using an appropriately designed work coil to selectively heat a defined depth of surface of the work piece to a pre-determined temperature, then “quenching” (rapidly cooling) the work piece, leaving a hardened (therefore wear-resistant) outer surface. Triodes are used to generate the RF current circulating through the work coil.



Dielectric heating

Dielectric heating (also known as capacitance heating) is a method of heating non-conductive materials. The material to be heated is placed between two electrodes, across which a high-frequency energy source is connected. The oscillating field passes through the material and as the direction of field changes, the polarisation of individual molecules reverse, rapidly causing friction and hence, heat. The higher the frequency, the greater the movement. Typically, frequencies in the range of 5MHz to 80MHz are used.

Plastic welding

Heating the plastic joint under pressure joins PVC, ductwork and polyethylene tanks surfaces. RF energy is easy to control and is ideal for plastic welding as the areas to be heated can be localised while the rest of the material remains cool. Typical products produced by RF plastic welding are office stationery, inflatable boats, tarpaulins and medical supplies.

RF drying

Many industries use an RF drying process. The food preservation industry uses it to completely remove moisture immediately prior to packaging and the textiles industry use it for the removal of water from freshly-dyed bobbins of textile. RF drying is ideal for many drying applications as water is very receptive to dielectric heating.

Wood gluing

Plywood, laminated wood, chipboard and MDF are examples of glued-wood products. These products are characterised by high-density, improved dimensional stability, strength and appearance and therefore have a greater advantage over natural wood. The main advantage of using RF for wood gluing is that the adhesive setting time is reduced from hours to minutes. This enables mass production to become open to the market.

Laser excitation and control

Over the last 30 years lasers have moved from the laboratory to the workplace. Our triodes and tetrodes are used in the power supplies of industrial CO_2 lasers, either to control or pulse the HV DC supply (DC excitation) or to generate RF power (RF excitation). In DC excitation, the laser gas is excited by a high DC voltage, controlled by a suitable vacuum tube, capable of working at voltages of up to 35kV.

In RF excitation, the laser gas is excited by an RF field generated by a suitable amplifier or oscillator system, using a triode or tetrode. In both cases, electricity is converted to a very small and powerful beam of light, able to deliver a large amount of energy over a very small area. Industrial laser systems (particularly using medium and high power CO_2 lasers) have replaced many traditional machine tools for punching, drilling and milling. They are also used for welding and material processing (surface hardening for example). We make a range of devices used in DC and RF excited laser power supplies.

Partnerships

Future technology innovation

e2v has strong links with universities. The mixture of design and production philosophies is managed with the emphasis on ideas integration; this brings balanced benefits in terms of capable design for cost-effective manufacture.

We constantly look to work with our customers on challenging new applications.

Do you have an idea for the future?
Then let us be your partner!

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