



PRESS RELEASE

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PERSONAL SERVICE AT THE HEART OF LONG TERM BUSINESS RELATIONSHIP BETWEEN PCML AND ELECTRON BEAM WELDING SYSTEMS MANUFACTURER CVE

Electron beam (EB) welding has become a vital joining technology in many industries, as well as making some manufacturing process possible, in several cases EB welding is the only technology that could be used to achieve the desired result. It has also streamlined some manufacturing processes consequently making them more economical and in other cases its deployment has allowed the use of specialist metals in particular combinations that would otherwise not be possible to weld together.

Cambridge Vacuum Engineering (CVE) a division of Aquasium Technology Limited have unrivalled expertise in electron beam technology gained over 40 years of industrial experience.

Operating from their UK factory, near Cambridge, they design, manufacture and provide after-sales support of their extensive range of Electron Beam Welders and Vacuum Furnaces.

With almost 1000 installations in diverse manufacturing industries worldwide they provide solutions for metal joining and thermal treatment processes. They work with manufacturing projects, from concept to component solution and machine commission, ensuring project success every step of the way.

Most EB welding systems are of high value, complex in design and require long term planning and control to ensure they are delivered on time, within budget and to specification; consequently it is essential that components & assemblies are delivered to CVE on time by their suppliers.

According to Carl Dean, Production & Procurement Manager at CVE, "PCML are a key long term supplier of components and assemblies. We started working with PCML in 2000 when they first started trading and ever since day one they have worked in very close partnership with us at all times, providing a very personalised service, this high quality service ensures that we always receive our components and assemblies on time and to our very high standards"

At the heart of the EB welding system is the EB column and within that is situated the actual **filament** which produces the charged electrons. **Filament life** is dependent on the conditions used including beam power and the materials being welded.



Filament replacement takes less than 10 minutes including the time required to vent and re-evacuate the beam column. In the new design the process does not affect the mechanical alignment of the column which avoids the need for time consuming adjustment.

Repeatability is achieved by the **filament alignment jig** that ensures accurate positioning of the filament within the **grid cup**. Systems can be provided with interchangeable grid cups for even higher productivity.

Apart from manufacturing a range of complex individual components for CVE EB welding systems, **PCML also manufactures and assembles the above critically accurate Filament Alignment Jig Assembly, Grid Cup Assembly and Filament Holder** essential components of CVE EB welding systems.

The **Filament Alignment Jig Assembly** comprises of approximately fifty different types of manufactured components produced, using CNC milling and turning centres, which have to be precisely assembled by hand in a strictly controlled way and environment. Once assembled the **Jig** is then inspected and set up using a Coordinate Measuring Machine (CMM). The next stage in the manufacturing process involves the drilling of pilot holes and insertion of dowel pins to set the **Jig**, this has to be carried out in clean room conditions. Final inspection is then carried out with the data recorded and supplied to the customer in a Certificate of Conformity. Each **Jig** has its own unique identifier. The total time taken for the assembly, inspection, setting and final inspection of each jig is 13 hours. **Jig** assembly height accuracy to $\pm 0.02\text{mm}$ is a critical requirement in the finished **Jig**.

The **Grid Cup Assembly** comprises of approximately 14 different types of manufactured components which also have to be precisely assembled by hand using a very precise documented method in a controlled environment. Inserting and securing the individual **Filament** is a very delicate operation, each filament is only 0.5mm thick with an exposed working area of 1mm consequently manipulation of the **Filament** within the **Grid Cup Assembly** is carried out using the CMM itself when setting the **Filament** up. The **Grid Cup Assembly** has to be calibrated to accept up to 6 different **Filament** sizes depending on the final application. Final inspection is then carried out with the data recorded and supplied to the customer in a Certificate of Conformity. The total time taken for the assembly, inspection, setting and final inspection of each **Grid Cup Assembly** is 2 hours. Positional tolerance of the **Filament** in the **Grid Cup Assembly** is $\pm 0.028\text{mm}$.

According to Gavin Goates, Director, PCML, "CVE are one of the very first companies we worked with back in 2000, when we started trading, they are now one of our top customers. Both our businesses have grown in parallel and we recognised from day one that because of the complex high value turnkey nature of the CVE business we needed to build a very close relationship to ensure their components & assemblies are delivered on time, within budget and to specification."



Further information for the Editor about CVE EB Welding Applications

Electron beam welding gives engineers the freedom to simplify designs and reduce manufacturing costs by allowing complex finished components to be fabricated from separate parts that are then welded together. The alternative is often to produce intricate one-piece components that inevitably incur high production costs.

Manufacturing costs may be further reduced through the elimination of production steps and waste materials. Traditional post welding operations such as machining, straightening, cleaning, polishing and heat treatment can often be avoided. This commonly makes electron beam welding the final step prior to assembly

Electron beam welding can offer:

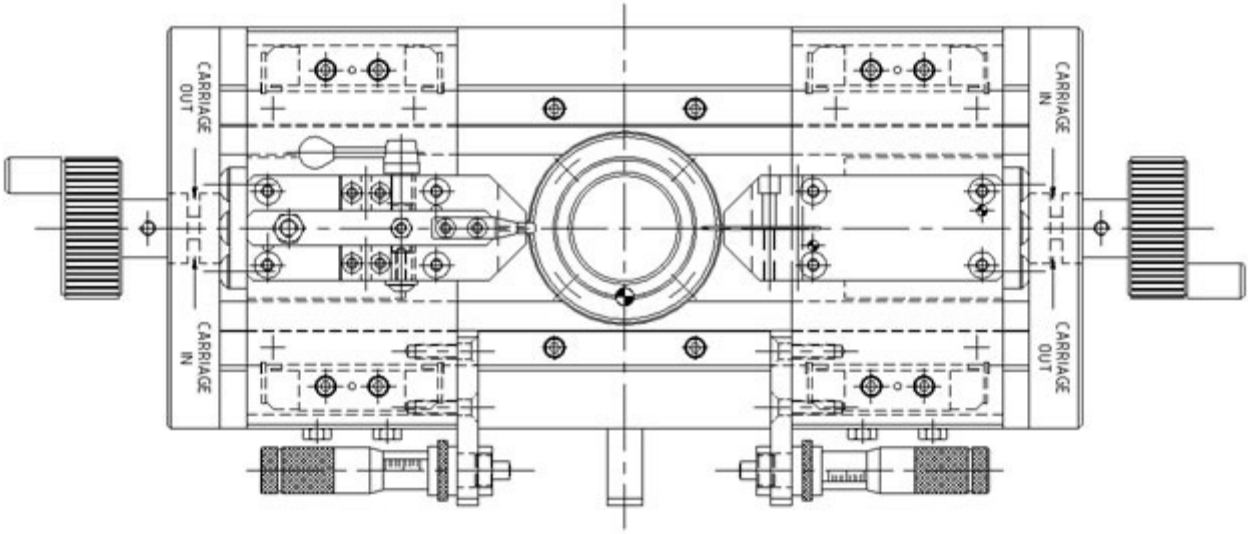
- Low distortion of components
- No oxidation of the surface
- Minimal weld bead
- Accuracy and repeatability
- The joining of difficult to weld metals and alloys
- The joining of dissimilar metal combinations
- Consistent high quality welds

Electron beam welders use a focused beam of electrons to give a spot of high energy density. This produces a deeply penetrating weld with an aspect ratio of up to 50:1 depth/width ratio. Thus, for a given penetration, a minimum amount of metal is melted. Heat input is also minimal resulting in the least possible distortion - often none at all when suitable jiggling is used.

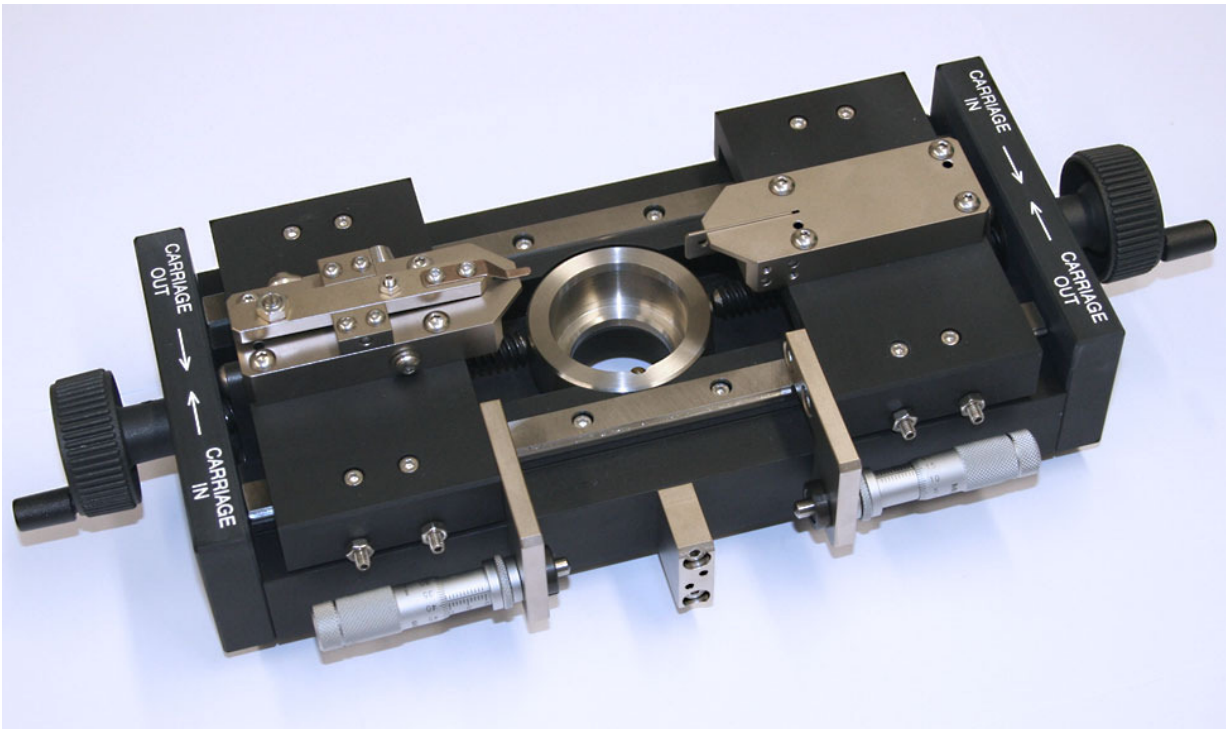
Typical Applications using EB Welding include:

- Transducers assembly for use in controlling many industrial processes
- Aneroid capsule manufacture for critical deployment in many sectors
- Turbocharger assembly for use in automotive engines
- Storage and fuel rod construction for the nuclear industry
- Measurement equipment manufacture for space exploration probes
- Transmission component fabrication in the automotive industry
- Wind Turbine Fabrication

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Jig Assembly Plan View Drawing

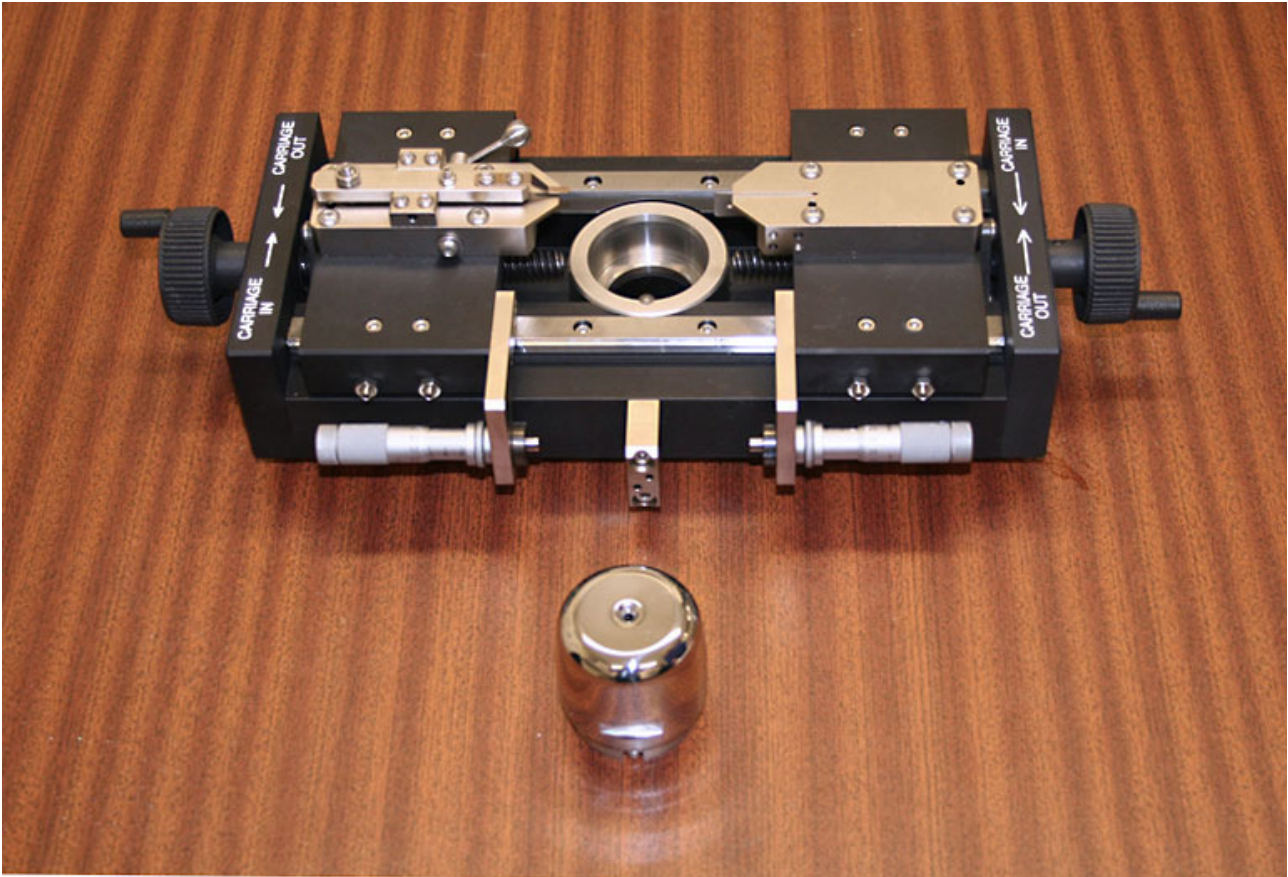


Completed Jig Assembly



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Completed Jig Assembly with Grid Cup Assembly in the foreground