

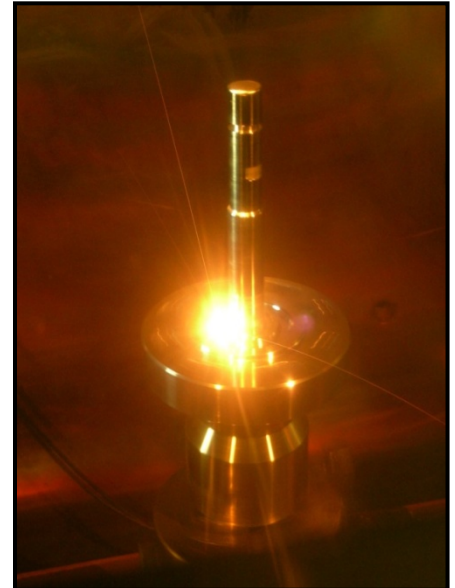
Electron Beam Welding

IFE – Department Electron Beam and Mechanical Workshop (EBMW) has for more than 40 years provided the Norwegian industry with EB-welding services.

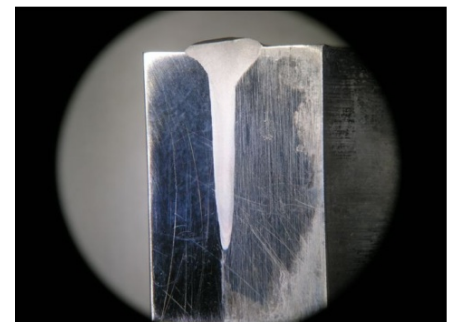
The most characteristic with EB-welding is the possibility to do deep welding combined with narrow weld seams, with a minor heat affected zone (HAZ).

Our four installed EB-machines are ready to take on your jobs for small and medium sized serial productions. Typical customers include aircraft, oil and gas, and nuclear industry.

Don't hesitate to contact us!



EBW process



Deep-penetration

We can weld:

- Titanium alloys, stainless steel, Ni alloys, alumina alloys, carbon steel
- Different alloy combinations
- Thicknesses from 0,1-70 mm
- Components up to 5000 kg
- Long components up to 4,1 m

Our facilities and services:

- Metallurgical Laboratory
- Microscopy, LOM, SEM, EDXA
- Helium leak testing
- Pressure testing
- Mechanical Test Laboratory
- Chemical Analysis Laboratory
- Corrosion- and Fluid Laboratory

Material technology:

- Materials – evaluation and selection
- Material examination
- Material testing

Unique properties:

- Fusion welding with an electron beam
- High energy density
- Low heat input
- Low distortion
- Thin to thick
- Parallel weld joint with width/thickness = 1/50
- No filler metal, no gas protection
- Welding most metals
- Welding of dissimilar metals

Welding equipment



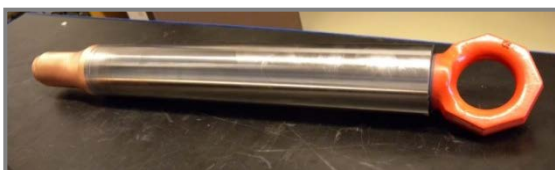
EBW Equipment

Manufacturer	Chamber size m	Power kW	Work load max kg
Hawker Siddeley Dynamics	1 x 1 x 1 * Elongation tubes: dia 600 mm length approx 4 m	6	500
Hawker Siddeley Dynamics	1,7 x 1,4 x 3,4	25	2000
Hamilton Standard	1 x 1 x 1 * Elongation tubes: dia 600 mm length approx 4 m	6	500
Hawker Siddeley Dynamics	4,3 x 2,3 x 2,3	15	4500

* Addition chamber approximately 1 m³

EB welding – Advantages

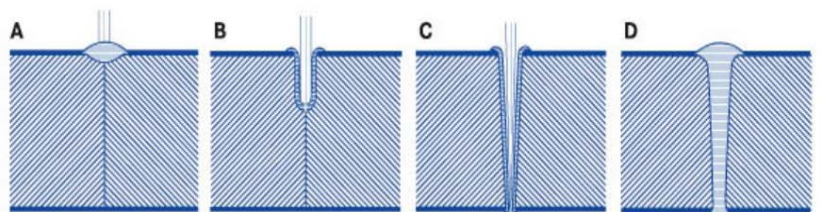
- All metallic materials can be melted using a focused electron beam and, as a consequence, most pure metals and alloys can be successfully welded.
- EB-welding is especially recommended for welding metallic materials which require low heat input, low shrinkage, low distortion, and for welding dissimilar or reactive metals.
- The special properties of electron beam welding derive from the high power and power density attainable in the beam spot, resulting in a «deep welding effect» as described below.



Cu to Ni Alloys

EB welding – Examples

- Sensors – subsea and topside
- Valves and hydraulic couples
- Encapsulation of electronics
- Components for air and space crafts
- Rocket components
- Reactor jigs
- Nuclear fuel
- Reactor core instruments



- The high energy concentration at the beam spot melts the material.
- Material vaporizes in the center.
- The beam penetrates deeper into the work piece through the vapor channel which is formed.
- As the work piece is moved, melted material flows front to back, solidifying around the vapor channel.