Electron Beam Technology
• Welding
• Hardening

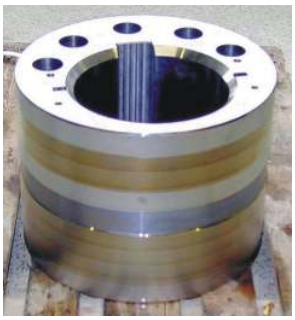
-Cost-saving, safe and clean-

History

Since the forties of last century, tests have been made to use and weld metals by means of accelerated electrons. Heat is not put in conventionally through heat conduction and convention, but through transformation of kinematic energy of electrons into heat. At the end of the fifties of last century it became possible to join thicker plates by butt welding. This had been the starting point of industrial utilisation. Mainly nuclear engineering, aviation and aerospace industries are more and more profiting from this new technology.

Combined housing with 2D and 3D weld seams

Splined shaft for a pinion carrier, finally welded



Hardening of an eccentric bush, 0.8 mm deep, ductile cast iron GGG 60

Angle valve body with 3D saddle contour, 30 mm wall thickness

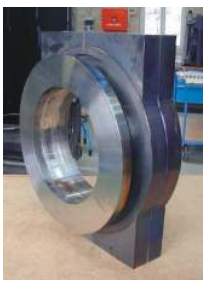
Electron beam welding of conveying belts, 0.2 mm

What is electron beam welding

Electron beam welding is a fusion welding method with the minimum of heat input. Prominent features of the electron beam are extremely slim weld seams with minimum distortion and much freedom with regard to design and material properties. Through the high welding speeds, the electron beam is suited both for metal foils and work pieces with a thickness of up to 100 mm.
All parameters may be monitored and documented electronically.

Application

The electron beam technology is widely applied in all fields of economy: Vehicle construction, apparatus and plant construction, aviation and aerospace industries, medical engineering and all other fields of metal-processing industries.
Electron beam technology is a promising technology especially under the aspect of continuously rising raw-material prices.



Components for gate valve bodies of titanium

Pump casing for displacement pump

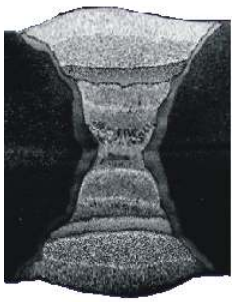
The company profile

JOSCH Strahlschweisstechnik GmbH is your efficient and competent partner for innovative welding engineering solutions.
In our company, the innovative machining operations based on beam welding technology are consistently implemented by use of our own modern electron and laser jet equipment.
The core business fields of our company are electron beam welding and electron beam hardening of components from all fields of mechanical engineering as paid labour as component supply including material and machining, especially in applications where equipment is subject to obligatory acceptance.
Moreover, we accomplish specific welding work on your products or your new developments with specific materials and material combinations that are difficult to weld but require compliance with high quality standards.
Our customers may profit from all advantages of electron beam technology since we additionally offer the development of components tailored to the requirements of electron beam welding.
Even technology transfer is possible on customer's request. This means that technologies tested on customer's products are assigned to customer's company including the associated equipment. Consequently, the customer may use these new technologies on its own and free from any risks.

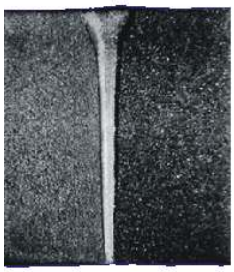
Certificates / Approvals

Josch Strahlschweisstechnik GmbH holds the following certificates:
- DIN EN ISO 9001 : 2000
  (DVS ZERT)
- Manufacturer to AD Merkblatt HP 0 / HP 100R
  (TÜV Nord Anlagenbau)
- Audit to DIN EN 729 - 2
  (TÜV Nord Anlagenbau)

plus diverse process tests for heat-resistant materials, nickel-based alloys, titanium and material combinations.



Inert gas welding
Double V-weld 30 mm
Strong shrinkage



Beam welding
Plain butt weld 30 mm
Almost no shrinkage

Technology

The classical definition requiring:

- Identical material,
- Identical material thickness,
- Low heat input,
- Low concentration of accompanying elements and
- Low carbon content,

is not at all applicable to simple connection welding of materials through electron beam welding.

The reason for that are narrow deep grooves and high processing speeds. Consequently, electron beam welding is not only used successfully for special materials, diverse material combinations, thin-walled and thick-walled designs.

Economic solutions are always based on designs that meet the requirements for electron beam technology since the technological advantages of electron beam technology are combined with easy joint examination and savings in machining efforts.

The advantages:

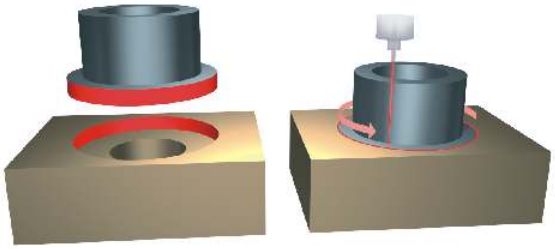
The benefit for our customers:

● Narrow weld seam with minimum energy input	→ Minimum shrinkage and minimum distortion
● Narrow heat-affected zone	→ Elimination of welding stresses through equalisation with elasticity of basic material
● Welding under vacuum	→ Perfect gas shielding
● Simple weld seam preparation	→ Square butt joint as standard
● High welding speeds	→ Welding in one course with welding depths between 0.2 and 100 mm
● Welding of critical materials and different types of material	→ Permits totally new and cost-saving designs
● Cost and material-saving procedure, Combination from welding and hardening is possible in one clamping position	→ As compared with conventional technologies, the unity of material, machining, welding and hardening permits cost savings between 20% and 60%.

Scope of Performances

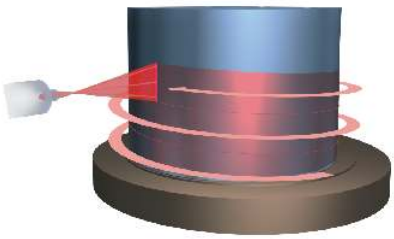
Standard

Electron beam welding



- Weld seams with a depth between 0.2 and 100 mm in one single position
- Steel with up to 0.4% carbon content without pre-heating and/or post-weld treatment
- Steels > 0.4% up to 0.8% carbon content with pre-heating and/or post-weld treatment
- Non-ferrous metals like copper and aluminium
- High-melting metals like tungsten and molybdenum

Electron beam hardening

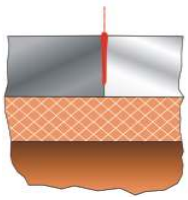
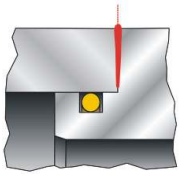
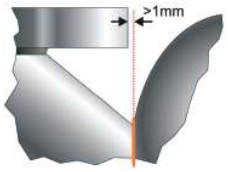
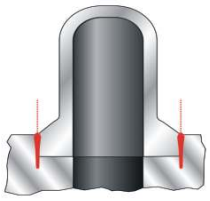


- Edge layer hardening with penetration depths between 0.3 mm and 1.5 mm
- Hardness up to 60HRC depending on material (for materials with a carbon content of ≥ 0.3%, such as C45, 42CrMo4, GGG60 ...)
- Exact spot hardening of precisely defined areas
- Hardening and welding are possible in one clamping position

Specific applications

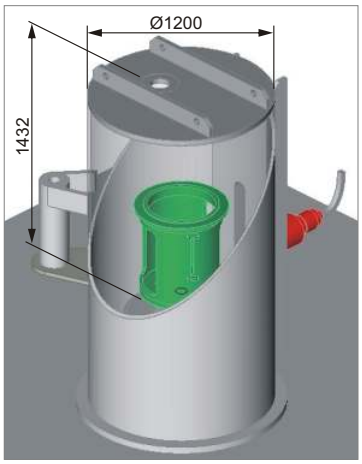
Special applications without effects on components located near seam:

Advantages in problematic zones:

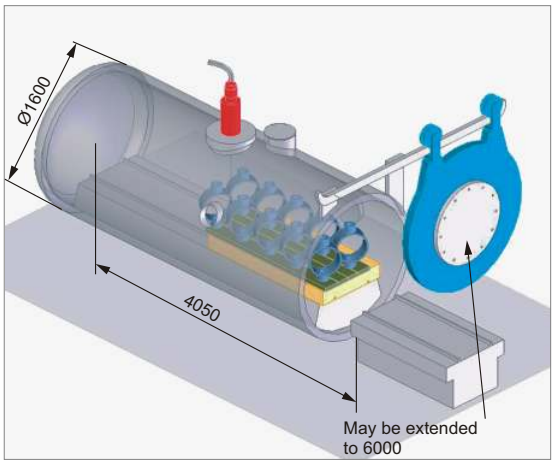
No destruction of plastic bush 1 mm below the weld seam	Installed O-ring 3 mm close to the seam	Groove and thread in a distance of 3 mm	Diagonally across	In areas difficult to reach	Without influence on the fit in the socket
					

Modern plant technology

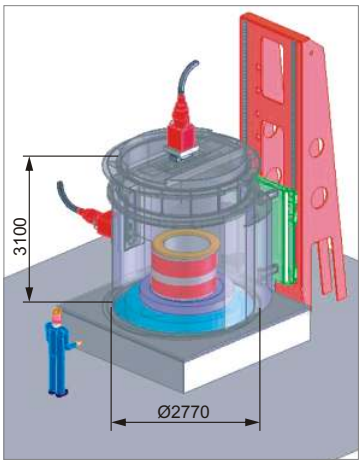
Electron beam welding system Josch 1
Components with up to 500 kg of weight,
1100 mm diameter and
1400 mm height.
The beam generator may be positioned radially and axially.
Component and beam positioning through 9 mechanical and/or electrical axes.



Electron beam welding system Josch 2
Components with up to 1200 kg of weight,
800 mm diameter and 4000 mm height.
The beam generator may be positioned radially and axially.
Component and beam positioning through 9 mechanical and/or electrical axes.

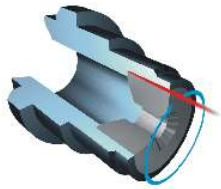


Electron beam welding system Josch 3
Components with up to 5000 kg of weight,
2500 mm diameter and
2500 mm height.
The beam generator may be positioned radially and axially.
Component and beam positioning through 13 mechanical and 5 electrical axes.



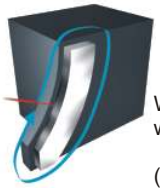
Dimensions in mm

Application examples (Principle drawings)



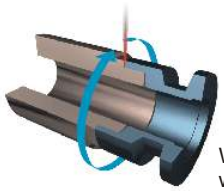
Welding of stellite 6 with stainless steel

(Purpose: Replacement of stellite build-up welding)

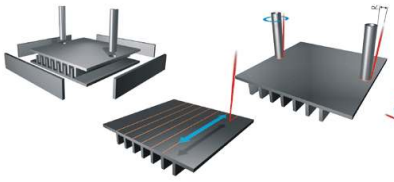


Welding of platinum with titanium

(Purpose: Saving of platinum)

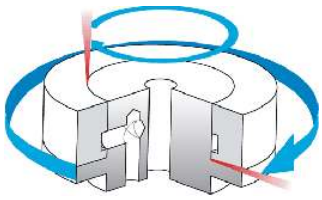


Welding of steel with copper



Heat exchanger made from high-melting metals

Minimum material use, minimum processing times



Welding of copper components

(Purpose: Formation of a cooling channel)

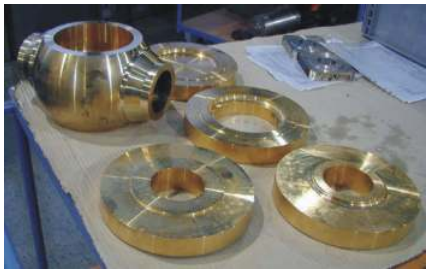
Application examples from our production

Canister filter DN 200, 3D and circumferential welds

Angle valve body for nuclear valves, 3D socket welding

Lever on crossbeam, 40 mm deep

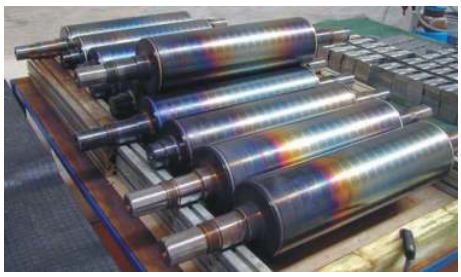
Drehgelenkträger aus StE 690, 50 mm Schweißtiefe



Casing parts from aluminium bronze

Electron beam welding of sockets from 13CrMo44

Titanium blanks for medial engineering



Edge layer hardening and welding of sockets in one clamping position

Gate valve bodies made from welded shells DN 150

Heater head made from heat-resistant steel

Circumferential weld seam DN 300, 15 mm deep, 15Mo3

Electron beam welded tungsten anodes

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Pump impeller with 3D welds

Water connection as copper-steel combination, electron beam welded