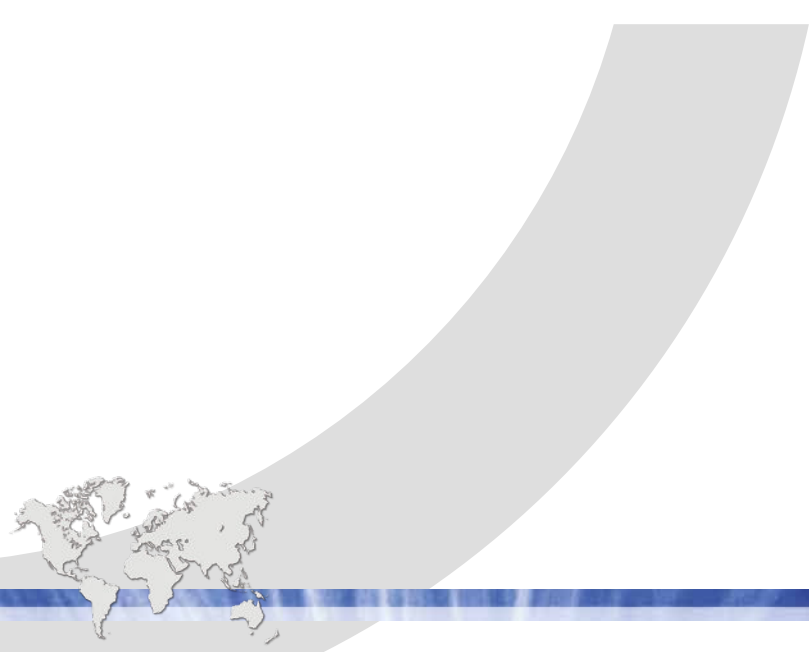


THE INNOVATORS OF THE ELECTRON BEAM



SOLUTIONS FOR THE
AUTOMOTIVE INDUSTRY



THESE ARE PRECISE AND RELIABLE LINKS



Location in Langenselbold (Frankfurt area)

GBT-GROUP – THE INNOVATORS OF THE ELECTRON BEAM

In our capacity as a globally operating medium-sized company, we are leaders in the development and manufacture of electron beam machines and production lines for welding, perforation, drilling and surface treatments.

Customers benefit globally from our know-how, from reliable, innovative technology and from our many years of experience as electron beam specialists, ranging from the aviation and aerospace industries, manufacture of turbines, electrical engineering and including special applications.

THE SPECIALIST FOR THE AUTOMOTIVE INDUSTRY

PTR Strahltechnik GmbH develops and manufactures machines and production lines especially for the automotive industry. These are, in particular, the modular production machines from the EBOMAT PP production series (indexing machines), PS (load-lock indexing machines) and RE (high performance machines), as well as fully automatic production cells (lines and stand-alone solutions) for mass production. PTR Strahltechnik GmbH also delivers EB generators from the EBOGEN construction series in low voltage technology up to 60 kV.





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HIGH TECH WITH ELECTRON BEAM



The EB welding process requires the lowest input energy to create specific welded joints, compared to all other fusion welding processes. **The main advantage for industrial production** processes is the minimal weld deformation, which allows fully machined single parts to be joined and welded ready to install.



The electron beam is created and used in a vacuum – there is no better protection in welding metallurgy.



The electron beam produces very narrow welding seams thanks to the high power density (depth: width ratios up to 40:1) which have practically no distortion.

THE ADVANTAGES OF THE EB WELDING PROCESS

1. HIGH POWER DENSITY

The extremely high power density of the electron beam creates the so-called deep-weld effect, where even large material cross sections can be joined in a single weld pass – mostly without filler material. Micro-welds can also be executed with the electron beam without any problems.

2. ECONOMICAL AND COST SAVING

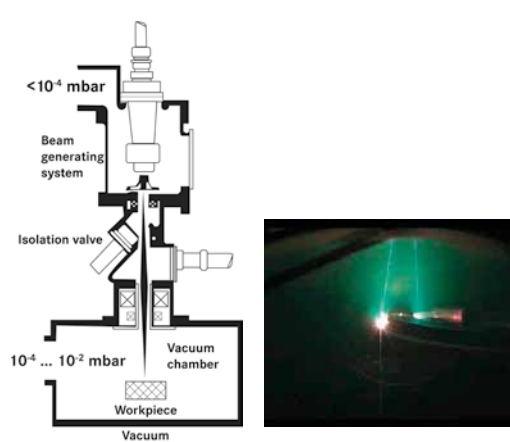
Higher efficiency, greater working speed and no filler material account for the excellent cost-effectiveness of the beam technology.

3. THE RIGHT SEAM FOR EACH TECHNOLOGY

Electron beam welding is used to join metallic materials with all the usual welding seam depths required. The very narrow seam configuration with its low heat-affected zones, drastically minimise the input of energy and distortion throughout the whole component. Precision parts or components with a high degree of mechanical properties can be easily welded with the process, usually without filler material.



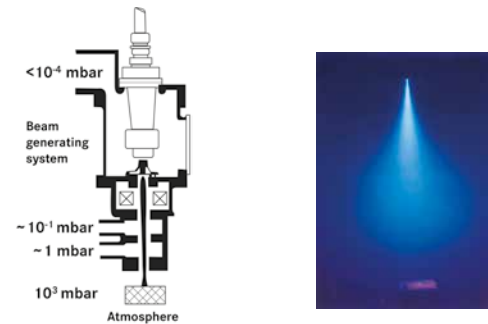
■ PROCESS VARIANTS



EB technique in vacuum

THE ELECTRON BEAM IN VACUUM

The workpiece is placed in the vacuum chamber, which will be evacuated to work vacuum and then the welding proceeds. The innovative technology of “fast beam deflection” makes the electron beam multi-talented and is able to execute several processes simultaneously.



EB technique at atmosphere

THE ELECTRON BEAM AT ATMOSPHERE

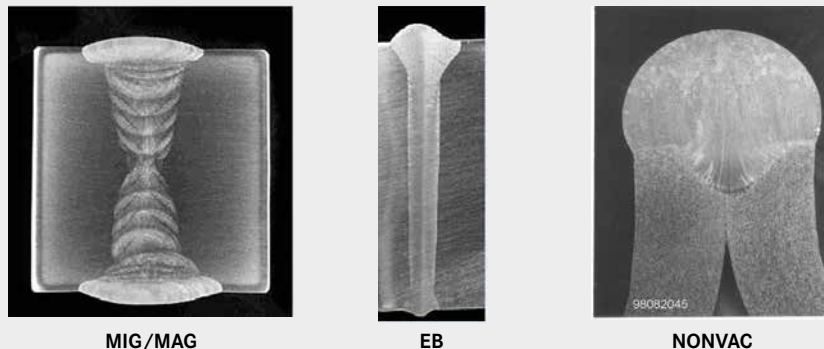
The beam is “emitted” from the vacuum of the generator by way of fine pressure stages. This means that welding can take place without chamber evacuation, achieving seam depths of up to 20 mm. The advantages for large components are:

- **High welding speed**
- **Good tolerance ability**
- **Minimum component distortion**
- **No inert gas is necessary**

■ THE TECHNOLOGIES

WELDING

The main area of application for material processing is the welding of all materials suitable for welding and many combinations between them. EB welded seams are single pass, even with larger plate thicknesses – narrow seams under vacuum, wider in atmosphere (NONVAC).



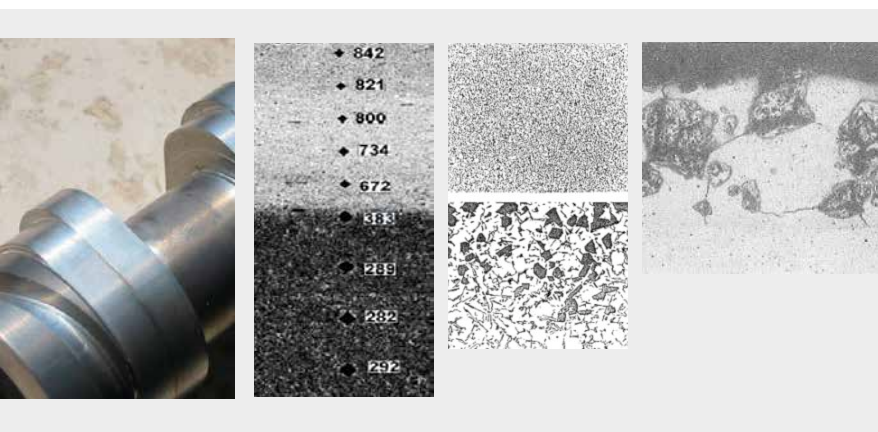
SURFACE MODIFICATION

The surface of a workpiece can be transformed extremely accurately as far as heat is concerned, thanks to the fast beam deflection. The structure and its characteristics change in exactly the way the user requires.

For example:

- **Annealing**
- **Remelting and alloying**
- **Structuring**

Surface treatment on a component takes place exactly where it is required.



THE HIGH TECH SYSTEMS FOR PRODUCTION

The electron beam works globally in order to process, weld or generate surface treatments for gears, motors, turbochargers, chassis and body work with the highest quality and efficiency. EB processes are used on steels, light metals and super alloys, as well as combinations of these materials.

The high precision of EB processing usually ensures components ready for installation without refinishing.



■ PRODUCTION MACHINES EBOMAT CONSTRUCTION SERIES



Since in the automotive industry, the components to be welded are usually small-sized a small vacuum chamber is preferable. PTR production machines from the EBOMAT construction series are compact modular constructions. They provide for all the technically necessary equipment on a common platform and can be operated manually or automatically.

In addition to their precise operation, the machines are outstanding because of their evacuation times of a few seconds, thus achieving the greatest productivity in all forms of application with a multiplicity of combination options.



PTR is certified according to ISO 9001:2008
and is a certified manufacturer and welding company according to AD 2000 Pamphlet HP 0 and DIN EN ISO 3834-2

- CYCLE TYPE MACHINES
- LOAD-LOCK CYCLE TYPE MACHINES
- HIGH-PERFORMANCE MACHINES
- SINGLE PURPOSE- AND SPECIAL MACHINES
- SMALL CHAMBER MACHINES
- NONVAC MACHINES
- AUTOMATED PRODUCTION LINES
- CYCLE TYPE MACHINES WITH LASER AT REDUCED PRESSURE



■ MASS PRODUCTION

Mass production in car manufacturing is characterised by components with complex designs with several individual parts.

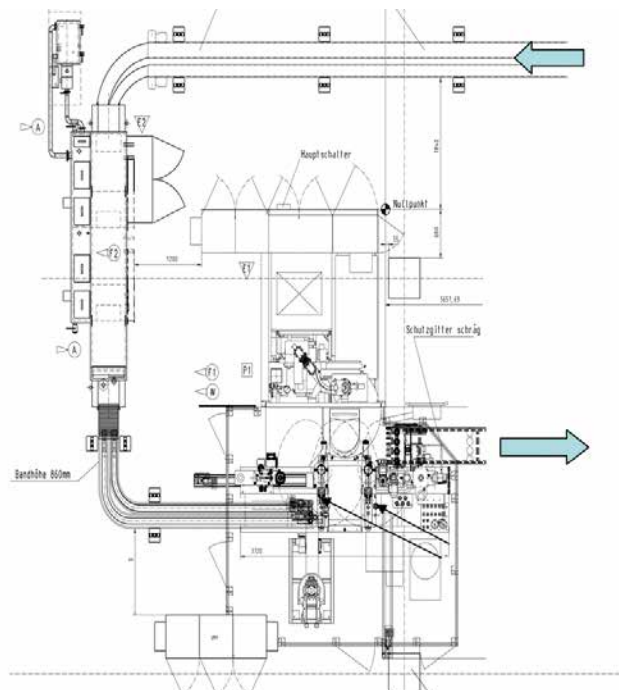
PTR production machines – with the same basic concept – can be constructed and customised for each application. The special design of the component clamping system and the optimised welding technology guarantee success for production in the millions.



■ PRODUCTION LINES

During the whole manufacturing process, components are transferred from machining, for example, to welding and then directly onto assembly.

For this purpose, PTR delivers turn-key, fully automated production lines that sort, clean, assemble, tack, pre-heat if required, EB weld and test the respective parts before transferring them on in the required order. The necessary handling can be taken over at the customer's request by a belt conveyor system, a robot or portals of the modular construction type.



INNOVATION IN PERFECTION

■ PRODUCTION MACHINES

Unlike labour machines or job shop machines, production lines or cells for series production have to meet specific criteria, such as incorporation into the production environment, additional safety equipment, robustness, ease of operation, servicing and efficiency.



■ CYCLE TYPE MACHINES

Alternating cycle operation is the common procedure for the manufacture of parts in large volumes. PTR production machines from the EBOMAT PP (cycle machines), PS (load-lock cycle machines) and RE (high-performance machines) also work in this way – exchanging a component at one station while simultaneously welding in vacuum at another.



■ CYCLE MACHINES LASVAC (PL/RL) TYPE

Laser welding at reduced pressure:

Our production plants can also be equipped with a laser for welding at reduced pressure.

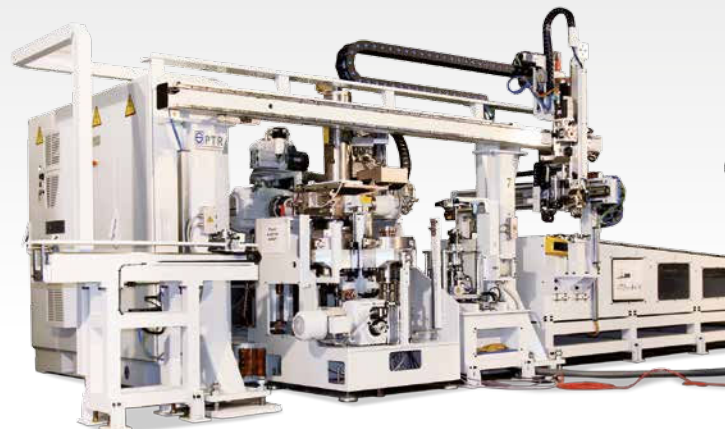


■ CUSTOMISED WELDING MACHINES

Special requirements necessitate specially designed and equipped EB machines. The PTR customised welding machines are tailor-made in terms of construction and production for the specific customer requirements so that production will satisfy the highest requirements.

■ AUTOMATED PRODUCTION LINES

It is obvious that loading, unloading, pre- and post-weld processes have to be incorporated into the production lines. These integrated PTR welding lines are designed as customised production lines or as stand-alone solutions and can be easily adapted to specific tasks.



JOB-SHOP WE PRODUCE FOR YOU

For some companies, outsourcing production temporarily or completely makes more sense. We undertake commissioned orders for you with our high-value machines and competent operating personnel, EB welding tasks according to the required quality and on time.

We can also undertake other services for you when there are bottlenecks in your own production.

Our Job-Shop advises and supports you in your production development and in the manufacture of prototypes. We also work together with our specialists from PTR machine construction to plan and develop your complete EB equipment tailored to your requirements.

- **Single part orders and mass production**
- **From cleaning to production**
- **All materials suitable for welding**
- **All welding depths**
- **Large and small components**



INTELLIGENT LINKED PRODUCTION

Gears are produced globally in VW companies, using synchro-rings and transmission gears that are welded with EB technology. The specific product and the respective operational production strategy determine the configuration of the integrated PTR welding lines. In most cases these lines are capable of producing different gear parts.



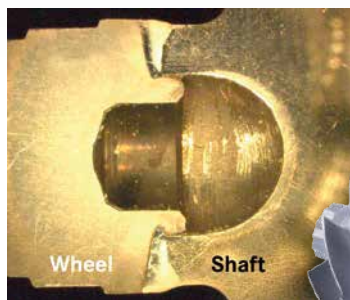
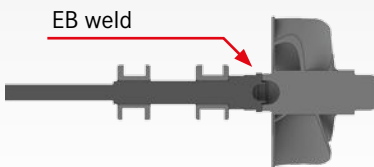
An annealed and fully ground cog is welded by an electron beam together with a pressed-on coupling body ready for assembly.



MAXIMUM ROTATIONAL SPEED GREATEST LOAD



The impeller is at the heart of each turbocharger. It is driven by hot gas and compresses the air. The turbine wheel, a nickel super alloy, and the steel impeller shaft are welded by an electron beam to withstand the greatest loads.



 **BorgWarner
Turbo & Emissions Systems**



HIGH-TECH GEARS WITH THE ELECTRON BEAM



ZF, is a global concern with many locations, ZF has been familiar with the precision technology from PTR for many years.

Premium quality vehicles from renowned manufacturers, including racing cars, are equipped with highly developed gears from ZF. The main components of these gears are welded with electron beams by PTR machines. The precision and constant quality have attracted ZF to install a total of more than 60 PTR machines over the years.



The cycle machines from PTR are integrated into fully automatic production lines. EB machines are also flexible and intelligently adapted when there are changes in production.



WORLDWIDE SALES



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