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Introduction

- Zeman – Competence in Steel

The Austrian steel structure company, Zeman, founded in 1965 has developed into an internationally operating steel structures business. The product range stretches from complex steel structures above buildings for manufacturing, logistics and shopping centres up to sports facilities, architectural steel structures and machine and plant construction. In addition to advice and planning, construction management, manufacture, installation, logistics and software solutions also belong to the range of services of the company. From the building right up to the machine equipment, Zeman offers all-round complete services from a single source!

The success in Austria was the basis for the successful expansion into, above all, the markets of the CEE region. The integration of all constructional steelwork competencies and an in-house mechanical engineering department makes Zeman competitive internationally. The company is active worldwide with more than 20 operations and over 500 employees.

The Zeman Bauelemente Produktions GmbH is, as a 100 percent subsidiary of the Zeman Group, the "department for special machines" with innovative technology. We profit from decades-long experience in steel construction and build the plants exactly as the customer requires them. Practice-orientation with the most modern technology and innovative ideas is the guiding principle of Zeman Bauelemente.

- "Steel Beam Assembler" abbreviated to SBA - the Revolution in Steel Structures

Computer controlled robots implement the CAD plans 1:1 – without errors and in a fraction of the time which would be required manually for this. An especially high-performance scanner measures the dimensions of all components fully automatically on a feeder table and compares the data with the nominal data which are stored in the CAD plans. In doing so, all tolerances are taken into account and are implemented on the plant in real time.

At the same time, a positioning robot and two welding robots work closely together hand in hand. The robots complete these tasks significantly quicker and more accurately than a human could. In order to be able to manipulate the heavy steel components, there are especially developed rotation portals which bring the beams into any desired position.
- **Comparison of the SBA with the Conventional**

  + Elimination of the manual measurement and scribing
  + Automatic recognition of the attachment parts positions
  + No idle time due to the simultaneous working of the robots
  + Automatic infeed and outfeed of the beams
  + Project-related storage of empirical values for future use

- **Quality Advantages**

  + Lack of specialists no problem thanks to the use of the SBA
  + Constant and high quality of the processed beams
  + Environmentally-friendly production processes and energy savings
  + Easier assembly of the beams thanks to high precision during manufacture
  + Project-related storage for quality documentation automatically available

- **Why Zeman SBA**

  + Minimization of personnel deployment during manufacture
  + Shorter production times enable savings with simultaneous increases in capacity
  + Due to the high precision of the parts, savings in the follow-on costs, too
  + Flexible machine modular construction systems can be adapted to every customer requirement
  + Practice-orientated plants know what the customer needs

**The SBA Family – Overview of the different Plant Types**
Differences between various SBA concepts

Fully automated assembly and welding unit, consisting of integrated in-feed and unloading system. Integration with existing CNC beam saw/drill/coping units possible.

Fully automated assembly and welding unit most suitable for client with limited fabrication space in existing facility.

„The flagship”. Double sided production unit consisting of fully automated assembly and welding station. This concepts offers most efficient utilization of „handling-robot”. Whilst one production side assembles the beam, the second starts weld out procedure; all in permanent alternation. Integration with existing CNC beam saw/drill/coping units possible.

Fully automated welding unit for manually pre-assembled structures. Design follows SBA compact concept, except the feature of assembly.

- **Conti – continuous processing**

SBA conti design is chosen by fabricators running a facility with continuous material flow, allowing for easy integration in existing beam handling system and special preference for “assembling only” working mode. SBA conti design consists of 1 robot for assemble and 1 robot for tack weld and finish weld. Cross and longitudinal conveyors enable continuous beam loading without manual intervention (crane handling). SBA conti+ design consists of 2 robots for tack weld and finish weld.

- **Conti „2” – designed and built in double-side variant**

The flagship of Zeman’s SBA family.
SBA2 conti+ is a double sided line, consists of 4 robots for assemble, tack weld and finish weld robots. The final configuration of this line can be achieved step by step by applying ZEMAN’s modular installation concept. Fabricators dedicated to highest output, sufficient space availability and cautious investment planning will strive for SBA2 conti+, but start with SBA conti and gradually expand the system.

- **Compact – compact construction**

SBA compact design consists of 1 robot for assemble, tack weld and finish weld. This system is best utilized for “assembling only” working mode. This steel beam assembly robot welding machine can achieve up to 15.000tons/year to tack and assemble cleats to beams. If welding is required, the SBA compact design can delivered as + version with a second robot system. Loading and unloading of beams is done by crane. The space requirement is limited to only 23m in length.
- **Eco – Economic Welding**

The SBA eco steel beam robot welding cell fabricates and fully welds out cleats to beams that have previously been manually tacked and assembled. This specification is cost effective and provides additional flexibility of the type of parts that can be fabricated in the robot welding cell. SBA eco consist of 1, or optionally 2, welding robot(s).

- **Why Plus (+) Versions**

Each type of the Zeman plants is supplied as standard in the normal version with a welding robot. This robot is arranged on an overhead external outrigger in order to be able to easily reach all positions on components. With the Plus (+) versions there is another complete, identically constructed robot including outrigger. This means that the welding operation is carried out in almost half the time, as these robots can weld at the same time. This design only makes sense when a lot of welding needs to be carried out on the plant. The second robot makes no sense if the customer intends almost exclusively just to assemble. Therefore Zeman also offers modular systems for every purpose.

- **Arrangement of the individual Plant Types with Layouts, Dimensions and Technical Data**

- **SBA Compact**
- **SBA Compact+**

- **SBA Conti**
- **SBA Conti+**

![SBA Conti+ Diagram](image1)

- **SBA 2 Conti+**

![SBA 2 Conti+ Diagram](image2)
- SBA eco (1100er+600er)
- SBA eco+ (1100er + 600er)
Possible Options of the Zeman SBA Plants

- Length and Width Variants of the Plants

Zeman plants can be supplied in various product lengths (max. component length total overall) and various beam heights (width).

- 12, 16 and 18m
  - Standard design for 12m long components
  - Very common 16m design is sufficient for the most application scenarios.
  - 18m as the greatest possible length. Longer components would suffer too much sag and are only possible to a limited extent with this type of plant.

- 600 (Eco), 1100 and 1500mm
  - Standard design is 1100mm as max. beam height (80mm min.)
  - 1500mm design as the largest possible variant (100mm min.)
  - 600mm as a simpler, lower cost variant possible for the Eco welding plant only.

- Infeed and Outfeed Systems of the different Design Variants

As a rule, all conveyor systems are individually adapted by Zeman in accordance with the customer's requirements. There are, however, standard dimensions which are sufficient for many applications.
- Infeed lengthwise with Length variations

Design as a driven roller track in modular lengths. The standard here is 13.5m for 12m beams. Naturally, the infeed roller track is adapted accordingly with increasing plant / beam lengths.

- Infeed Crosswise with different Quantities and Widths
Standard design with 3 cross feed units of 5m length. These units are constructed very robustly and can, by means of driven lift trucks, move the beams optionally in both directions and also secure them. With longer plant variants and / or in special cases, the number of cross feed units can be increased as required in accordance with the customer's wishes.

- **Outfeed Fixture – Innovative and Complex**

![Diagram of outfeed fixture](image)

*Zeman* has developed a unique, special unloading fixture for finished components with all attachment elements. The challenge here is an automated conveying solution despite protruding plates and other attachment parts blocking handling in all directions.

- **Combined Special Conveyor Systems, Lifting Tables**

Craneless transport in automated production is of the greatest importance. Conveying and handling tasks must be carried out as quickly as possible and with the least possible effort. *Zeman* takes special customer requirements very seriously and constantly makes every effort to find practical and compact solutions. At different customers worldwide, we have implemented a large number of special solutions with regard to conveying technology – according to the motto, the impossible is made possible.

**Example of an additional unloading solution on a SBA2conti+ plant:**

![Diagram of SBA2conti+ plant](image)
Welding Possibilities (PB, PF, Multilayer) and Pre-heating Possibility

In order to comply with today’s state-of-the-art technology regarding welding requirements, our SBA plants are equipped with many weld seam configurations and possibilities. In the standard variants, single pass fillet weld and Y seams are included (4 – 6mm a-dimension in accordance with the European Standard, EN 1090-2).

As optional variants there are multi-pass designs up to 16mm a-dimension. All weld seam types are possible and here the Zeman SBA system is "teachable". The customer himself can add special weld seams. The basic data base is configured with the following seam sizes: 4, 5, 6, 8, 10, 12 and 15mm.

In addition, the Zeman assembly plants also have an optional possibility of automatically pre-heating heavy, thick end plates. Especially with higher-value material (S355 and more) such measures are absolutely necessary.

By turning the beam in the plant, it is not necessary to carry out out-of-position welding. Almost exclusively here, welding is in the horizontal PB position. PF for vertical seams is possible but should be avoided wherever and whenever possible.

All welding robots are equipped with a burner service station and a calibration station in order to always guarantee consistent quality.

- Single Pass and Multiple Pass Welding Seams
- Positions for welding

PB = horizontal welding for fillet welds (in horizontal and vertical orientation)

PF = up-hill position / up-hill weld (vertical welding from bottom to top)

- Pre-heating

Optional equipment for pre-heating assigned to handling-robot. This feature is designed for heavy-walled head- and bottom-plates. Attention: only available for all compact and conti variants; for eco concepts not available.
- Accessibility to welding seams

  Space available for length-wise orientated plates in open H-members

  ![Accessibility Diagram 1](image1)

  ![Accessibility Diagram 2](image2)

  Space available between 2 stiffeners (welding seam at web-area)

  ![Accessibility Diagram 3](image3)

  ![Accessibility Diagram 4](image4)

  Space available between 2 stiffeners for lateral welding seams (welding seam at flange-area)
- **Master / Slave Splitter**

To ensure the most efficient and equal usage of both welding robots (this applies to all SBA“+” variations with two welding robots), Zeman has developed a Master/Slave splitter for the work preparation software Pro-Fit. The Master/Slave splitters allows, by simply using the pc mouse, to set a virtual line defining, which half of the beam will be processed by which welding robot.

- **Add-on parts and size limitations**

Zeman SBA lines are not only able to tack and weld standard plates to the beam, but also parts such as angle profiles or hollow sections. For all parts applies a maximum possible length of 1400mm and a maximum weight of 200kg. All other limitations are being displayed in following list:
### Sheet Metal
- Sheet thickness from 5mm to 60mm
- Smallest possible dimension: 50x100mm
- Largest possible dimension: 800x1400mm (but max. 200kg)
- Any desired form also with desired bores, but no circular parts

### Angles
- Smallest possible angle 60x60mm
- Largest possible angle 180x180mm
- Maximum wall thickness 15mm
- With the above listed dimensions, angles can also be asymmetrical.
- Maximum length 1400mm

### Cleats (H, U, Shaped Tubes)
As a rule, beams, U profile parts or rectangular and square shaped tube parts can be fitted as cleats.
- Maximum cleat height 240mm
- Dimensions for shaped tubes 80x80 up to 240x240mm
- Maximum length 1400mm
- Diagonal cuts in one plane only (not spatial)

### T-Pieces
Are previously assembled metal sheets for a top plate connection, crosswise to the main profile. Finds application mainly in stage construction. This solution has been developed in order to implement non-accessible weld seams.
- Maximum size 240x180x1400mm
- Maximum total weight 200kg
- Maximum sheet thickness for stiffeners 15mm

### Special Parts
Must be separately checked in each case and in part certainly possible. In every case, all Zeman plants have as standard a plate turning station as standard equipment. This means that if asymmetrical sheets are lying the wrong way round on the scanning table, the plant recognizes automatically that these parts must be turned before attachment. The handling robot then automatically turns the part before its attachment.

### Technical Possibilities and Advice for Optimized SBA Production
Already at the design stage a lot of attention can be paid regarding suitable SBA production. To be taken into account here are the maximum limit dimensions of the main profile and also the attachment parts, the design of the weld seams and the accessibility for the welding robot for each individual situation. Inasmuch as the customer can influence the connection details, it is useful in every case to instruct the detail planner accordingly.
- Typical examples for SBA friendly production
**Modular SBA system**

Please see below a full list of all available SBA options. The below table shows the availability of options and informs about the basic configuration of each SBA type. Some options can be upgraded after ordering the machine, whereas others need customer’s decision when the order is being placed.

<table>
<thead>
<tr>
<th>Option</th>
<th>SBAcompact</th>
<th>SBAcompact+</th>
<th>SBAconti</th>
<th>SBAconti+</th>
<th>SBA2conti+</th>
<th>SBAeco</th>
<th>SBAeco+</th>
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</tr>
</tbody>
</table>

- Tailor-made solutions for almost every user

The company Zeman is focused on the continuous growth and improvement of the SBA system. Specific customer requirements can be integrated in SBA. Software updates and additional functions are being provided without any extra costs for the customer. Costs for updates, which require a change of the machine’s hardware, have to be carried by the customer. In any case Zeman is always happy to receiving any suggestions concerning options or improvements of the SBA system and will do the utmost to follow customer’s wishes – just contact us.

**Implementing the Zeman SBA system into an existing production**

- Connecting to a saw/drill line or other coping robots

Saw-/Drilllines and coping robots usually do have a lower working height than our SBA lines. Due to large beam widths and correspondent sizes of SBA rotators the working height of SBA is 1100mm and higher (for 1500mm rotators). This requires a lifting station between the outfeed of the saw-/drilline and the infeed of SBA. Depending on the hangar’s footprint and existing machinery, cross- and length- conveyors can be installed to connect machinery. Zeman will be glad to elaborate a proposal for each customer individually.
Outlet with possible connection to painting area

Especially in the area of the outlet it proves to be difficult to automatically transport the assembled beams incl. all their add-on parts. Zeman’s SBA offers the possibility of an automatic unloading station, which offers the possibility to comfortably continue by using a crane. Nevertheless, Zeman can offer to other solutions to directly link SBA to other equipment, such as a painting line for example. For further information, please do not hesitate to get in touch with Zeman.

Automatic processing of add-on parts – Plate sorting, Box solutions, etc.

Plate and beam cutting online via NC and DSTV nowadays is a standard procedure. With SBA it becomes also a standard to automatically assemble and weld add-on parts. Zeman now has developed opportunities and solutions for automatic deflashing, sorting and direct all parts to the right location. Even the most innovative steel fabrication plants are still missing this very important logistic solution. Zeman’s all new SPS-line (Scanning and Plate Sorting) with RFID identification the bridge between cutting and assembly has been built.

Productivity and rentability of SBA lines

Comparison tables with different sample beams

Based on different sample beams, the following table will display the efficiency of the different SBA lines expressed in minutes and tons, which certainly varies according to the weight of beam and amount of add-on parts.

While evaluating the table, please consider the different columns showing the times for assembly and welding.

An interesting fact is the yearly tonnage, which can be reached with each individual SBA line.
One needs to take into account, that the values can vary to an extend of +/- 10%, depending on the precise execution of welds and individual assembly situations.
- Chart comparison SBA types with manual processing

Please find below examples of different beams processed with SBA and compared to manual fabrication. One needs to consider, that these values may vary according to specific type of projects and productivity of each individual involved in the process.
Comparison of beam samples

Sample part item: No. 6
Beam profile: HEB 650
Total weight: 2759 kg
Total length: 10500 mm
No. of add-on parts: 23

- Assembling and tacking time: 36 minutes
- Welding time: 79 minutes
- Measurement, loading and unloading: 5 minutes
- Tack length: 2758 mm
- Welding length: 32138 mm
- Total: 120 minutes
- 0.73 hour/ton
- Only assembling: 1,80 minutes/pcs.
- Including weld out: 5,20 minutes/pcs.

All welding's a=5mm according to DIN EN 1090

Sample part item: No. 214
Beam profile: HEA 260
Total weight: 464 kg
Total length: 6000 mm
No. of add-on parts: 13

- Assembling and tacking time: 18 minutes
- Welding time: 35 minutes
- Measurement, loading and unloading: 9 minutes
- Tack length: 590 mm
- Welding length: 11280 mm
- Total: 62 minutes
- 0.33 hours/ton
- Only assembling: 2,98 minutes/pcs.
- Including weld out: 4,77 minutes/pcs.

All welding's a=5mm according to DIN EN 1090
The Revolution in the Software Area – Zeman Pro-Fit, Simple and Brilliant

- **Brief description of Pro-Fit**

Zeman’s in-house software solution is able to extract all necessary information from various 3D-construction programs and to create an automatism for programming the robots. Only a few mouse clicks are necessary to prepare data in a way that the SBA’s robots work faultlessly and perfectly together. Profit imports XML-data, defines the position of the rotators, sets tacking points and welding seams, defines the magnet gripper’s size for each add-on part, calculates and avoids possible collisions, shows production data and statistics to ensure a smooth production process.
Intelligent Automation

Various automatic calculation method makes it an easy task to operate Pro-Fit. By clicking through the different menus the operator just needs to check some sequences and plays more an observative role, since almost everything is automated. Only at special occasions the operator needs to intervene. Red and green check boxes (traffic light) give information about limits and procedures and can be easily interpreted by the operator.

Compatibility with various 3D-Systems

In principle all 3D steel construction software systems for our SBA lines are compatible as long as they can display XML and NC data according to DSTV. Additionally it is required to install an interface between Zeman “Pro-Fit” and the construction software. This link ensures, that all data is being converted into an SBA friendly format for correct interpretation. For common systems such as Tekla, BoCAD etc. there are already existing interfaces.

Please consider, that systems without DSTV are not compatible. For example ACAD, Rhino, Catia and similar.

For the following systems interfaces are already existing:

- **Tekla (Trimble)**  
  The most popular system in steel fabrication worldwide.

- **BoCAD**  
  Mostly used in western European countries.

- **Advanced Steel Graitec**  
  The supplementation to Autodesk AutoCAD.

- **SDS2**  
  Mostly to be found in American countries.
Tables and attachments

○ Overview: Dimensions, Capabilities and consumables of SBA lines

<table>
<thead>
<tr>
<th>SBAcompact</th>
<th>SBAcompact+</th>
<th>SBAconti</th>
<th>SBAconti+</th>
<th>SBAeco 500</th>
<th>SBAeco 600+</th>
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</thead>
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<tr>
<td>Length (12m version)</td>
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<td>26100 mm</td>
<td>66900 mm</td>
<td>66900 mm</td>
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<td>80900 mm</td>
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<td>29000 mm</td>
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<td>32700 mm</td>
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<td>87900 mm</td>
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<td>6000 mm</td>
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<tr>
<td>Electrical Power 409V/ 50 Hz</td>
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<td>80 kW</td>
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<td>Compressed air:</td>
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<td>Welding gas:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen (only with plasma)</td>
<td>1.56 bar; 18m³/h</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propane (only for pre-heating):</td>
<td>0.78 bar; 6 m³/h</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Welding wire:</td>
<td>8-15 m/min. and per robot; EN ISO 14341-A; GISI1; 1.2 mm or similar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

○ Tabular listing of all limitations for the complete SBA family

In general we differentiate between main profile dimensions, sizes of add-on parts, weld sizes and general indications of the complete profile (weight, dimensions, etc.). Furthermore, there are some optional limitations, which can be learned from below mentioned table.
## FUNCTIONS/CAPABILITIES AND LIMITS OF SBA

<table>
<thead>
<tr>
<th></th>
<th>min.</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beam sizes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of beam</td>
<td>150 (200)</td>
<td>1100 (1500)</td>
</tr>
<tr>
<td>Width of beam</td>
<td>80 (100)</td>
<td>500</td>
</tr>
<tr>
<td>Length of beam</td>
<td>3000</td>
<td>12000 (18000/18000)</td>
</tr>
<tr>
<td><strong>Beam types</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H-beams</td>
<td>150 (200)</td>
<td>1100 (1500)</td>
</tr>
<tr>
<td>Welded H-beams</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Corrugated SIN beams</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Rectangular/square tubes</td>
<td>80x80</td>
<td>500x500</td>
</tr>
<tr>
<td>U-profiles</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td><strong>Weight limits in kg</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADD parts</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>max. beam weight</td>
<td>-</td>
<td>6000</td>
</tr>
<tr>
<td><strong>Dimensions of ADD parts</strong></td>
<td>50x100x5</td>
<td>800 x 1400 (1800) x 60</td>
</tr>
<tr>
<td>Corner frame application</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td><strong>Other available ADD parts (in mm)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angle beams (L-profiles)</td>
<td>60x60x60</td>
<td>180x180x1400</td>
</tr>
<tr>
<td>Rectangular/square tubes</td>
<td>80x80x60</td>
<td>200x200x1400</td>
</tr>
<tr>
<td>U-profile</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Cleats (H-beam)</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Timbering style structure</td>
<td>not available at the moment</td>
<td></td>
</tr>
<tr>
<td>T-parts (pre-welded parts)</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td><strong>Welding seams</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic tack weld generating (programming)</td>
<td>automatic set by pro-FIT but changeable by operator</td>
<td></td>
</tr>
<tr>
<td>Close-up welds (spot welds)</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Curved welding (radii)</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Automatic re-orientation of the weld gun</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Fillet welds single layer</td>
<td>a3</td>
<td>a6</td>
</tr>
<tr>
<td>Fillet welds multi layer</td>
<td>a8</td>
<td>a15</td>
</tr>
<tr>
<td>V-welds single layer</td>
<td>a4</td>
<td>a6</td>
</tr>
<tr>
<td>V-welds multi layer</td>
<td>a8</td>
<td>a10</td>
</tr>
<tr>
<td>Full penetration welds</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Gap detection/-compensation</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Automatic seam tracking system (AWC)</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Part2Part welding</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Vertical welds (up-welding) only tack-welding</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td><strong>Plasma cuts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copying</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Beam holes</td>
<td>not available at the moment</td>
<td></td>
</tr>
<tr>
<td>Bevel cut at the rear side of beam</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Chamfer located cross in the beam</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td><strong>Pre-heating</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head-footplate</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Other accessories (assembly parts)</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>heat against bending of accessories</td>
<td>partially</td>
<td></td>
</tr>
<tr>
<td>heat against bending of beam</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td><strong>Auto measurements and tolerance compensation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto centring/averaging</td>
<td>Beam always measured at assembly position</td>
<td></td>
</tr>
<tr>
<td>Auto fillet detecting (fillet welds)</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Auto groove detecting V-type welds</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Holes at accessories as reference for assembly</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Auto pushing method in different directions</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Assembly/-production tolerances</td>
<td>+/- 1mm</td>
<td></td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero-point offset of main beam (changeable by operator if needed)</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Master/Slave job splitter</td>
<td>yes (in case of 2 Robot version)</td>
<td></td>
</tr>
<tr>
<td>Free definition of gripper tool positions on accessories (if needed)</td>
<td>automatic and flexible</td>
<td></td>
</tr>
<tr>
<td>Turning devices</td>
<td>open-top (free of barriers)</td>
<td></td>
</tr>
<tr>
<td>Clamping</td>
<td>beam clamped in all directions</td>
<td></td>
</tr>
<tr>
<td>Number of different sizes of gripper tools</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Work preparation software (programming)</td>
<td>all necessary parameters and options; change-and programmable</td>
<td></td>
</tr>
</tbody>
</table>
- Interfering contours while loading, rotating or unloading

It needs to be differentiated between SBA lines which need un/loading with crane and automatic models.
- Calculation sheet for price evaluation of desired SBA Model

<table>
<thead>
<tr>
<th>Client:</th>
<th>Price:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>SBA Type:</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Options:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Opt 1</td>
<td>2nd welding robot</td>
</tr>
<tr>
<td>Opt 2</td>
<td>Profile width up to 1500mm</td>
</tr>
<tr>
<td>Opt 3</td>
<td>Product length up to 16m</td>
</tr>
<tr>
<td>Opt 3.1</td>
<td>Product length up to 18m</td>
</tr>
<tr>
<td>Opt 4</td>
<td>Multilayer a8, a10, a12, a15</td>
</tr>
<tr>
<td>Opt 5</td>
<td>Pre-heating system</td>
</tr>
<tr>
<td>Opt 6</td>
<td>Plasmacut</td>
</tr>
<tr>
<td>Opt 7</td>
<td>Magnetgripper Size 0</td>
</tr>
<tr>
<td>Opt 8</td>
<td>Camera system for remote support</td>
</tr>
<tr>
<td>Opt 9</td>
<td>Tapered profile as main profile</td>
</tr>
<tr>
<td>Opt 10</td>
<td>SIN profile as main profile</td>
</tr>
<tr>
<td>Opt 11</td>
<td>Corner frame application</td>
</tr>
<tr>
<td>Opt 12</td>
<td>Angle profiles as ADD part</td>
</tr>
<tr>
<td>Opt 13</td>
<td>Additional profit workplace</td>
</tr>
<tr>
<td>Opt 14</td>
<td>Operating platform</td>
</tr>
<tr>
<td>Opt 15</td>
<td>Automatic outlet system (unloading)</td>
</tr>
<tr>
<td>Opt 16</td>
<td>Automatic inlet system (profile entry) length and cross conveyor</td>
</tr>
</tbody>
</table>

Total:  

31
Additional Zeman machinery complementary to SBA and modern steel fabrication

- Interplay between SIN and SBA and other beam welding systems

Also part of Zeman’s portfolio is a SIN beam line for fully automatic production of welded beams with corrugated web. This revolutionary system saves up to 30% of construction weight, by keeping the same static values and can be variably produced according to the “just in time” principle, in every desired beam dimension, by using common basic materials such as coils and sheets. Please find more information to this topic on our website www.zebau.com.

Of course all SBA lines are also equipped to process SIN beams, as well as regular welded beams. Also cambered beams up to 60mm can be assembled and welded, which gives a high flexibility in the production portfolio.

- Plate processing and sorting with Zeman’s know-how

Zeman’s SPS line for scanning and sorting prepared plates (and other add-on parts) is the optimum link between a factory’s cutting area and beam processing area, ideally with SBA. SPS does not only facilitate sorting plates, but also saves time and brings enormous advantages to the internal logistic of a factory. A visible tracking of each part within the production becomes possible.

- Robotic painting with smart automation technology

A large point of weakness in many steel fabrication plants is the coating of assembled parts. To ensure a steady and high quality, Zeman relies also in this sector on robotic support. Fully automatic painting covering each corner in various paint thicknesses and colours. Filtering technology, energy saving concepts and drying techniques according to the highest standard of technology.

- Other machinery by Zeman (Purlin line, rollformer...)

Zeman machinery also offers many other interesting systems, such as:
- Roll-formers for roof and wall cladding, multifunctional purlin lines for cold rolled profiles and fully automatic change of size up to panel fabrication lines for PU and rock wool panels.
- All Zeman machines correspond to the highest level of engineering and are being perfectly adapted to the customer’s needs. Just contact us to find out more.
Typical Questions and Answers about the SBA Plants

How long does the data import take (from a 3D programme, for example, BoCAD), and the production planning for a component with an average of 10 attachment parts?
Approx. 5 minutes per component, special elements a little longer. Semi-automated suggestions.

How does a data import from 2D programmes (for example, AutoCAD) work?
Only the blanks (sheet metal geometries) can be imported. The position and thickness of the parts and the definition of the main element (beam) must be entered again and/or newly drawn. Suitable programmes are Tekla, BoCAD, etc.

What welding times and weld seam sizes does the sample beam in the machine have?
In total for 21m of weld seams a=5. Total welding time with manipulation (turning) approx. 40 min.

Can other profiles such as European (HEA, HEB...) be imported and processed, for example, Russian or American Dimensions?
The rolled section profile in I-form is irrelevant. The profile data is always taken from the XML interface. Thereby it is also possible to process sheet steel beams, corrugated web beams or also tapered beams. U-profiles and shaped tubes with the appropriate stiffness are also possible without problems.

Is it possible to import data from other 3D systems such as, for example, Tekla or X-Steel? Or is this only possible with BoCAD?
In principle all common 3D steel structure systems which have the possibility for a DSTV and an XML interface can be used. In each case, a small interface programme for the adaptation of the respective software is necessary. In the event of an order, this is done by the CAD manufacturer in collaboration with Zeman or is already available for the most common systems.

What accuracy can be achieved with this plant?
+/− 1mm.

What about the rolling tolerances of the beam profile?
As a rule, bent or deformed beams are measured on assembly of the respective attachment components at the respective position in order to compensate for such tolerances. We can compensate for these tolerances. In doing so, the pre-condition is that the tolerances do not exceed the general component tolerances of the welded elements. In addition, it is recommended to manufacture the attachment parts which are fitted to a beam with negative tolerances. The beam itself should also be cut undersize in its length.

Is there a tool in Pro-FIT for job distribution between master and slave robots?
The front and rear parts of the beam component are automatically divided between the master and slave (in the centre of the beam). If for production-related reasons an off-setting of this division is required then it is possible manually with a simple movement of the mouse.

What welding processes do you use and is it possible to change these on the plant?
We currently use MAG 135 with solid wire 1.2mm. Naturally, for other applications it is possible to change the size of the wire and also the wire type (for example, flux-cored wire) without a great deal of effort.

Can other attachment parts such as sheet steel be processed in the plant?
There is the possibility to fit angles with certain limit values and also cleats (small I-profiles) as attachment parts. In addition, there is a fixture available at the beam end for special sheet metal constructions (frame corners). There is also the possibility of shaped tubes, U-profiles and T-pieces as attachment elements.

Can rusty materials be processed in the plant?
As a rule, yes, so long as it is welding-related acceptable. In this case, however, a flux-cored wire welding process should always be used.

What is the maximum gap dimension between the beam and sheet metal parts?
It is possible to tack gaps up to 4mm. When welding, however, faults can occur. Such positions must be checked and possibly be re-worked (visual weld inspection after leaving the component). The plant is equipped with a "gap detection" function and recognizes air gaps, the welding parameters are automatically correspondingly adjusted, too.

Are there service stations or similar in the plant?
For each welding robot there is a fully automatic burner cleaning station and a measurement station for comparison with the theoretical robot tips. In addition calibration is possible for the adjustment of the handling robot. Naturally the mechanical system is equipped with reference switches and absolute encoders in all axes. All media (such as welding wire, gas etc.) are monitored by sensors. For a better overview during production, accompanying camera systems are installed (option).
Can other weld seams such as fillet welds be welded in the plant? What is the maximum weld seam size?
As a rule, all common weld seams are possible. Standard seams such as Y-seams in usual sizes are already installed and available. Should a non-standard weld seam dimension be required, the plant is “teachable”. The weld seam parameters and layer structures are defined once and this data is permanently stored in the database. Naturally, multiple layer structures are possible (Multilayer). Here there is also a pre-heating function, on the one hand to improve the weld quality and on the other hand to counter welding distortions. This pre-heating function can within limits also be used as a beam setting function.
Maximum weld seam size for fillet welds 15mm and for Y-seams, 12mm.

What cutting thicknesses and types are possible with the Plasma Option?
The Plasma is intended for processing the beams on the beam start and end as otherwise the plant would create too much contamination. Here we are concerned with a notching function for cuts which cannot be made on a standard saw. But it is certainly possible to carry out welding edge preparation in these beam areas.

How do I prevent collisions between the robots?
Through limit value checking of the individual attachment parts, portals and the beam itself. In addition, a minimum clearance between the master / slave is always maintained. Should, for production-related reasons, this minimum clearance not be achievable, one robot automatically waits until the other is finished at this position. The system already checks at data import all the limit values, dimensions and possibilities and reports, for example, too large parts.

Are there possibilities for undershooting and / overshooting the minimum and maximum dimensions of the possible construction elements?
In individual cases it must be checked what type of construction (very light or very heavy) is to be processed. Within certain limits we can adapt the plant to the customer’s requirements.

What type of capacity can I expect from an SBA line?
The total capacity mainly depends on the use of SBA. Existing customers of SBA tend to use their machine according to current workload.
Some times require highest efficiency and quick assembly in order to complete large orders.
In case the SBA is being used for assembly only the total capacity expressed in tons will be higher compared to the capacity of the same SBA used for assembly as well as for welding.
Another important fact, which influences the capacity expressed in tons, is the type of projects which need to be executed. Heavy beams with only a small number of add-on parts lead to a higher ton/year figure than light weight beams with many add-on parts.
On request Zeman will calculate processing times on SBA based on your specific project files.

Customer Service?
Zeman’s service personnel receives customer’s messages any time of the day and can fully log into the relevant SBA line. For best overview Zeman offers a remote camera system, which helps to improve Zeman’s service. Customers all over the world are satisfied with Zeman’s after sales service.

Maintenance of Machine?
Zeman offers a detailed maintenance guideline, which mostly indicates how to lubricate sensors and which parts need special attention. Most of maintenance is done by keeping tracks and sensors clean.

Spare Parts?
Zeman is recommending a spare part package worth approx. EUR 50,000.-. No need for customer for large stocks of spares, they will be sent from Zeman directly.

How will be assured, that operators are able to control the machine?
There will be extensive trainings provided by Zeman, before and after installation of SBA.
The training is included in the machine’s purchasing price and has not only and educative value, but also provides for good relationship between customer’s machine operators and Zeman staff.

How does the machine detect errors in accuracy, when considering that plates with holes need to be fitted?
During the scanning process size, thickness and holes of all parts are being measured. If accuracy of plates is not sufficient, the machine will stop during the scanning process and operator can decide to use the part, correct it or replace it.
Positions of the holes are known, because the beam will be measured and “0” position will be defined.
Legal Notice

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