



3D-WELDING TABLE SYSTEM ROBOTICS - AUTOMATION



FÖRSTER welding systems GmbH

With our 25 years of experience in rationalization of welding-related manufacturing processes we are able to realize customer-specific solutions for almost any welding task.

Thus, a variety of innovative patented solutions, of which have won several prices, have developed since the family company was established.

Dipl.- Ing. (EWE) Rainer Förster

Scopes:

- Production of a flexible welding table system for the steel processing or the stainless steel processing respectively
- Combination of 3D welding tables with most diverse motion functions
- Production of component-specific handling and welding jigs
- Partnership for turnkey welding robot systems and welding devices as well as training and service
- In-house CNC production and development
- · Welding specialist retailer and welding system service
- Store and supplier of industrial gases



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power & competence networking





2011 IN GOLD



2002 IN GOLD







Perfect

to the last detail



Property rights

| European Patent Application: | 912 299 |
|------------------------------|-------------------|
| German Patent: | 196 190 66 |
| German Patent Application: | 198 152 34 |
| German Patent Application: | 199 104 83 |
| German Patent Application: | 198 111 57 |
| German Patent Application: | 10 2010 015 357.5 |
| Utility model: | 296 085 56 |
| Utility model: | 20 2010 005 029.4 |

<u>Awards</u>

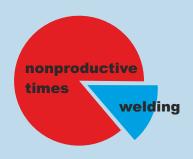
State price 2011 in Gold 2002 Bavarian State Prize in Gold 1997 Bavarian State Prize in Gold Saxony-Thuringia Innovation Prize

Welding Tables

Why welding tables?

A 3D welding table is the basis for a fast and accurate manufacturing of welded parts. It is used for positioning of single parts where it ensures the straightness and angularity; furthermore, it minimizes the welding distortion and thus reduces the costs drastically.

It is absolutely essential for a single-part production and functions as a flexible fixation system in a series production.



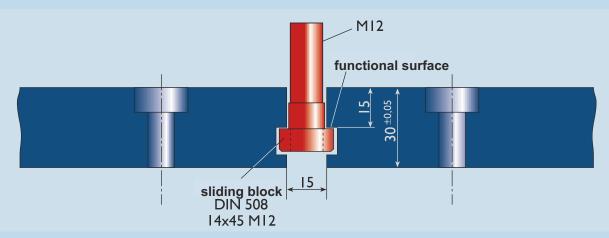
What are the advantages of Forster 3D welding tables?

- Table surfaces are designed in special grey cast iron or in Al-Cu alloy as an optimum material
- All stops can be steplessly set with high precision
- Table surface can be opened to accommodate any protruding parts
- Rails of table surface can be used to extend the table

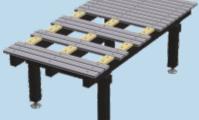
What is the advantage of the T-slot system?

The T-slot represents the ideal way to solve the widest variety of clamping tasks with the simplest means (sliding block) flexibly on one working surface.

T-slots permit a precise stepless positioning of all clamping elements and stop to any point on the table. This ability is a significant advantage and is especially useful for processing of cases and frames since several stop squares can be placed precisely into the corners of the components.







No spatter-sensitive H7 holes are required for receiving special clamping fixtures, and our patented version of the T-slot between two rails prevents the functional surface (bearing surface) from becoming dirty.

Rhombic slot blocks can even be inserted from above into T-slots that are already in use.

Certain areas of the table surface can be opened to insert any protruding parts. This has proven to be particularly useful in practice. The rails can also be replaced, protecting the user during particularly coarse welding work.

Even a higher heat input to the table surface allows our t-slot rails to expand freely and does not cause distortion.

made in "one casting"

Saving of time

Nowadays, the mere welding time has become efficient by modern manufacturing methods. The most significant part of the working time is being used for arranging the individual parts according to exact measures and angles as well as for measuring, adjusting and correcting. The accurate preparation of the components and a precise working basis to create an assembly, in connection with universal clamping and stop elements, results in a significant time saving even in single part production.

Precision

The table and the steel square are made to extremely precise standards. In fact, the flatness and the angularity comply with the "H" section, or "Fine" requirements of ISO 2768 T2. The individual rails of the table surface exhibit a tolerance of \pm 0.05 mm and are therefore interchangeable.

Measuring and positioning

The table surface has a 100×100 etched grid for orienting straight lines and angles. Parts are normally created by first placing them at a right angle to the stops on the side and front edges of the table. The length and the width of the part, which normally does not match a fine grid, can be easily defined by infinitely adjusting the steel square.

Only possible with the slot system!

The ability to make adjustments simultaneously in two axes makes it possible to precisely adjust the stops at the precise point and in the precise direction.

Special grey cast iron

Better than any additional surface treatment!

What benefits are there in a welding table made of special grey cast iron?

Since conventional steel made welding tables have many disadvantages on welding we developed the world's only modular welding table consisting of graphite-containing grey cast, the optimum material for coarse welding work.



Secure protection from spatter!

Weld spatters adhere to grey cast iron less than any no other material. This is due to two essential mechanisms of action: the characteristics of grey cast iron themselves and the particularly good adherence and diffusion of release agents.

The material we use contains a high percentage of graphite. In the same way that graphite saves the facilities in the casting technology from metal adhesions it protects your welding table against weld spatters.

Our open-pored surface combined with the structure of special grey cast iron enables a secure diffusion and enrichment of special mold oil. Thus, it offers an additional protection.

Striking liquid metal causes an immediate activation of the embedded protection and maintenance agents by evaporation and, therefore, prevents the adhesion of the metal drop.

However, should a weld spatter stick on the surface, it would break off in a brittle manner due to the features of special grey cast iron - the table surface would remain as a flat plane surface.



Special grey cast iron

the most successful basis for rough welding processes.

Further advantages of special grey cast iron are the significantly lower expansion coefficient in exposure to heat compared to steel as well as the improved sound dissipation as used for motor and gear housings.

Aluminium-copper

Why using an aluminium-copper alloy as table surface?

The professional handling of stainless steels (austenites) requires a strict separation of ferritic materials and, therefore, an adequate welding work table since even finest adhesive contaminants and scratches may cause continuative corrosions on the surface.

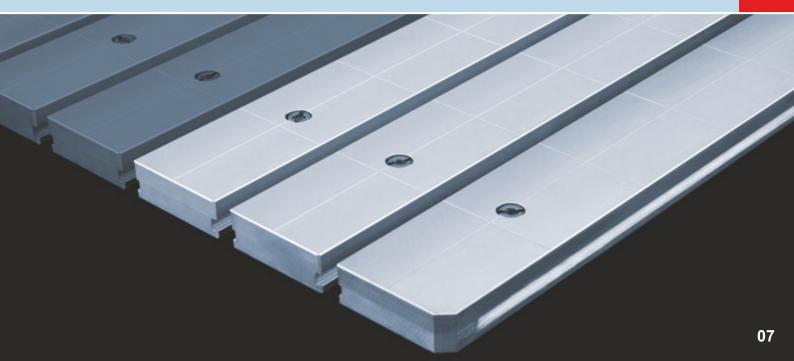
In general, weak spots in surface finishing can only be corrected by complete "immersion pickling". Therefore, for companies working with stainless steel, it is of great interest to have safe covering of the welding work table, having permanent contact with the work pieces prior to processing.

Thus, for the more delicate processing of stainless steel parts, a table surface made of an aluminium-copper alloy has proven to be especially advantageous.

Due to a relative high tensile strength (= F37, similar to structural steel) at low surface hardness, damages are barely caused to polished stainless steel surfaces.

The high thermal conductivity of the aluminium-copper alloy at normal temperature also almost entirely prevents the adhesion of potential welding spatters.

However, the use of a protection spray is still recommended in continuous operation.



3D-Clamping and welding tables

predominantly for MAG welding

Special grey cast iron table surface, no spatter-sensitive H7 holes

predominantly for use with stainless steel Al-Cu alloy table surface

The table surface is completely covered with special grey cast iron rails or non-ferritic rails with a spacing of 100 mm. The special grey cast iron rails have an engraving of 100×100 mm.

The maximum permissible concentrated load per rail is 1.5 tons for special grey cast iron and 1.0 tons for Al-Cu alloy. If required, the overall maximum permissible component load can be increased up to 5 tons.

Standard table, stationary

for steel processing in special grey cast iron for stainless steel processing in Al/Cu alloy

| 3000 x 1500 x 810 mm GG 25 Order No.: 1108 | 3000 x 1500 x 810 mm Al/Cu Order No.: 1308 |
|---|--|
| 3000 x 1200 x 810 mm GG 25 Order No.: 1109 | 3000 x 1200 x 810 mm Al/Cu Order No.: 1309 |
| 2400 x 1200 x 810 mm GG 25 Order No.: 1110 | 2400 x 1200 x 810 mm Al/Cu Order No.: 1310 |
| 2000 x 1000 x 810 mm GG 25 Order No.: 1115 | 2000 x 1000 x 810 mm Al/Cu Order No.: 1315 |
| 1800 x 1200 x 810 mm GG 25 Order No.: 1120 | 1800 x 1200 x 810 mm Al/Cu Order No.: 1320 |
| 1000 x 1200 x 810 mm GG 25 Order No.: 1130 | 1000 x 1200 x 810 mm Al/Cu Order No.: 1330 |

Standard table, moveable

for steel processing in special grey cast iron

| for stainless steel processing | |
|--------------------------------|--|
| in Al/Cu alloy | |

| 3000 x 1500 x 835 mm GG 25 Order No.: 1008 | 3000 x 1500 x 835 mm Al/Cu Order No.: 1208 |
|--|--|
| 3000 x 1200 x 835 mm GG 25 Order No.: 1009 | 3000 x 1200 x 835 mm Al/Cu Order No.: 1209 |
| 2400 x 1200 x 835 mm GG 25 Order No.: 1010 | 2400 x 1200 x 835 mm Al/Cu Order No.: 1210 |
| 2000 x 1000 x 835 mm GG 25 Order No.: 1015 | 2000 x 1000 x 835 mm Al/Cu Order No.: 1215 |
| 1800 x 1200 x 835 mm GG 25 Order No.: 1020 | 1800 x 1200 x 835 mm Al/Cu Order No.: 1220 |
| 1000 x 1200 x 835 mm GG 25 Order No.: 1030 | 1000 x 1200 x 835 mm Al/Cu Order No.: 1230 |

Other sizes and designs on request.

On request, single rails are also available in the following lengths: 800 / 1000 / 1200 / 1500 mm.

mobile, stationary, variable



The four legs have adjustable feet which allow the table to be adjusted to a working height of 800 - 900 mm.



Mobile design with 3 steering wheels and 2 additional adjustable feet for a secure standing position.



Table design

The modular system makes it possible to design the most diverse and customized table surfaces with only a few components.

The entire table surface can be moved in unlimited ways.

To meet your specific requirements various combinations of lift tables, horizontal rotary tables and vertical turntables are available for you.

Stops and clamping elements

multi-purpose and effective

Clamping arm (Ø 50 mm)

Material: steel, with adjustable and pivoting clamping element. Thrust piece Ø 60 mm with V-block made of steel or bronze

| Ø 50 | Order No.: 2050 |
|------|--------------------|
| Ø 50 | Order No.: 2050 Br |

Support arm Ø 50 mm

Material: steel, for 3D clamping, infinitely adjustable, for free spatial positioning

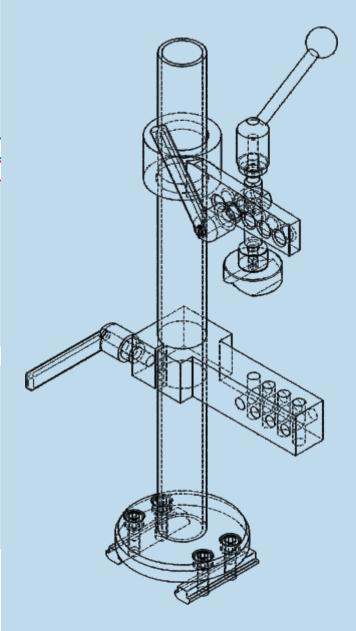
Ø 50

Order No.: 2051

Clamping tower Ø 50 mm

Precision steel tube, for 3D clamping, infinitely adjustable, for free spatial positioning

| Ø 50 x | 300 mm | Order No.: 2052 |
|--------|---------|-----------------|
| Ø 50 x | 600 mm | Order No.: 2053 |
| Ø 50 x | 900 mm | Order No.: 2054 |
| Ø 50 x | 1200 mm | Order No.: 2055 |









Clamping arm Ø 30 mm

Material: steel, chromated, with adjustable and pivoting clamping element. Thrust piece Ø 30 mm with V-block made of steel or bronze

| Ø 30 | Order No.: 2010 |
|------|--------------------|
| Ø 30 | Order No.: 2010 Br |

Clamping column Ø 30 mm

Precision steel tube, chromated, with sliding block and setting collar in various lengths

| Ø 30 x 150 mm | Order No.: 2020 |
|---------------|-----------------|
| Ø 30 x 350 mm | Order No.: 2021 |
| Ø 30 x 550 mm | Order No.: 2022 |

Stops and clamping elements

precise and handy

Try-square

 100×170 mm, grey cast iron GG 25 or aluminium, chromated, outer surface machined, with retainer

| 100 x 170 mm | GG 25 | Order No.: 3013 |
|--------------|-------|-------------------|
| 100 x 170 mm | Al | Order No.: 3013Al |

 170×170 mm, grey cast iron 25 or aluminium, chromated, incl. lever retainer, outer and side surfaces machined

| 170 x 170 mm | GG 25 | Order No.: 3014 |
|--------------|-------|-------------------|
| 170 x 170 mm | AI | Order No.: 3014Al |

 600×350 mm, grey cast iron 25 or aluminium, chromated, with 6 threaded bore holes, incl. lever retainer, outer and side surfaces machined

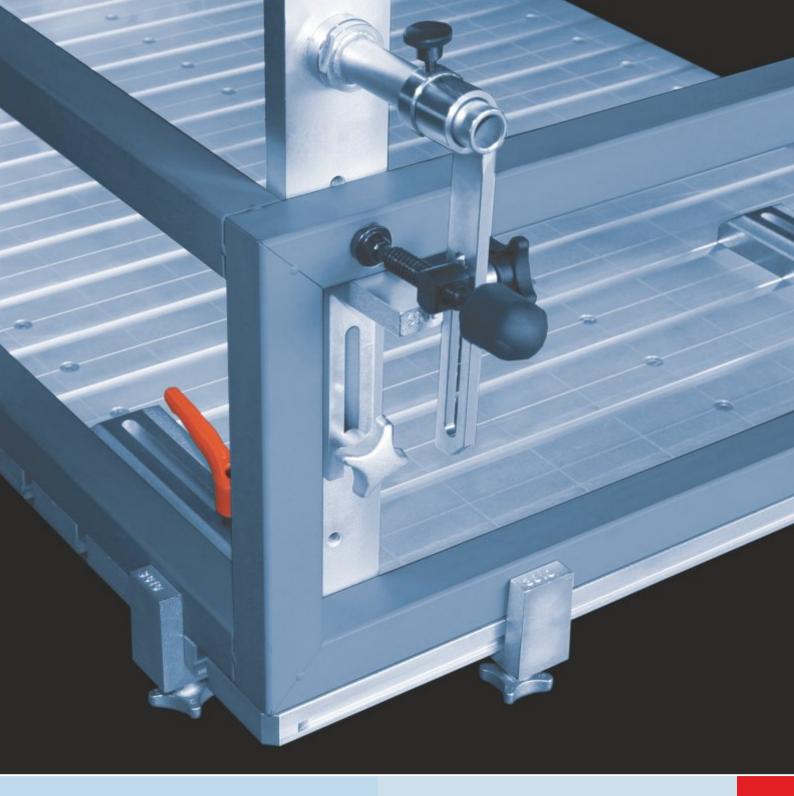
| 600 x 350 mm | GG 25 | Order No.: 3015 |
|--------------|-------|-------------------|
| 600 x 350 mm | Al | Order No.: 3015Al |

 1000×350 mm, grey cast iron 25 or aluminium, chromated, with 6 threaded bore holes, incl. lever retainer, outer and side surfaces machined

| 1.000 x 350 mm | GG 25 | Order No.: 3016 |
|----------------|-------|-------------------|
| 1.000 x 350 mm | Al | Order No.: 3016Al |









Edge stop

Material: grey cast iron 25 or aluminium, chromated, for stopping the workpiece at straight and right angles along the outer table edges; foot with slant for secure positioning, complete with retainer in two different heights

| 70 mm | GG 25 | Order No.: 3010 |
|--------|-------|-------------------|
| 70 mm | Al | Order No.: 3010AI |
| | | |
| 200 mm | GG 25 | Order No.: 3011 |
| 200 mm | Al | Order No.: 3011AI |
| | | |

Stops and clamping elements

precise and accurate

Flat stop

 $170 \times 40 \times 20$ mm, steel or aluminium, chromated for positioning sheet metal and profiles, with retainer

| Steel | Order No.: 3012 |
|-------|-------------------|
| Alu | Order No.: 3012AI |

Quick-release clamp with flat stop

for clamping sheet metal and small parts. The quick-release clamp can be infinitely positioned in the x and y axes using it in combination with the flat stop.

Order No.: 2042

Four-sided angle

grey cast iron 25 or aluminium, chromated, machined on six sides,

with two positioning studs each, height 100 mm, with retainer

| 100 mm | GG 25 | Order No.: 3017 |
|--------|-------|--------------------|
| 100 mm | Al | Order No.: 3017 Al |

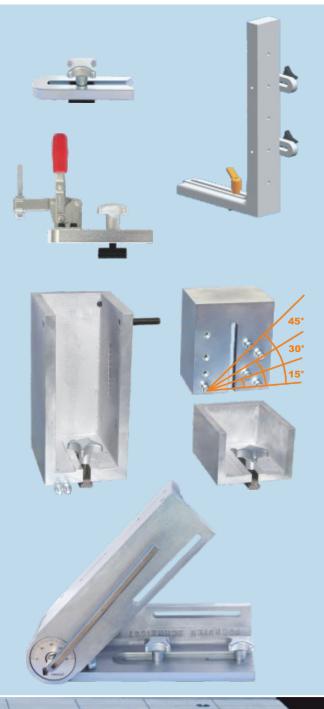
as before, height 300 mm

| 300 mm | GG 25 | Order No.: 3018 |
|--------|-------|--------------------|
| 300 mm | Al | Order No.: 3018 Al |

Infinitely adjustable angle

 350×350 mm, grey cast iron 25 or aluminium, chromated, with key and retainer

| 350 x 350 mm | GG 25 | Order No.: 3019 |
|--------------|-------|-------------------|
| 350 x 350 mm | Al | Order No.: 3019Al |









Flat clamp

for clamping flat parts, projection 200 mm, maximum clamping height 110 mm (adjustable)

Order No.: 2040

Clamping jaws

for clamping flat parts to the try-square, projection 70 mm, maximum clamping range 60 mm (adjustable)

Order No.: 2041

Stops and clamping elements

simple and user-friendly

Flange clamp with clamping tower

for free positioning of various flanges, mountable on clamping tower 50 mm; a max. clamping height of 1100 mm can be reached

Ø 50 x 600 with tower Order No.: 3030

Horizontal clamp without column

for generating horizontal clamping forces, thrust piece made of steel or bronze; delivered without column

| Ø 30 | without column | Order No.: 2043 |
|------|----------------|-------------------|
| Ø 30 | without column | Order No.: 2043Br |



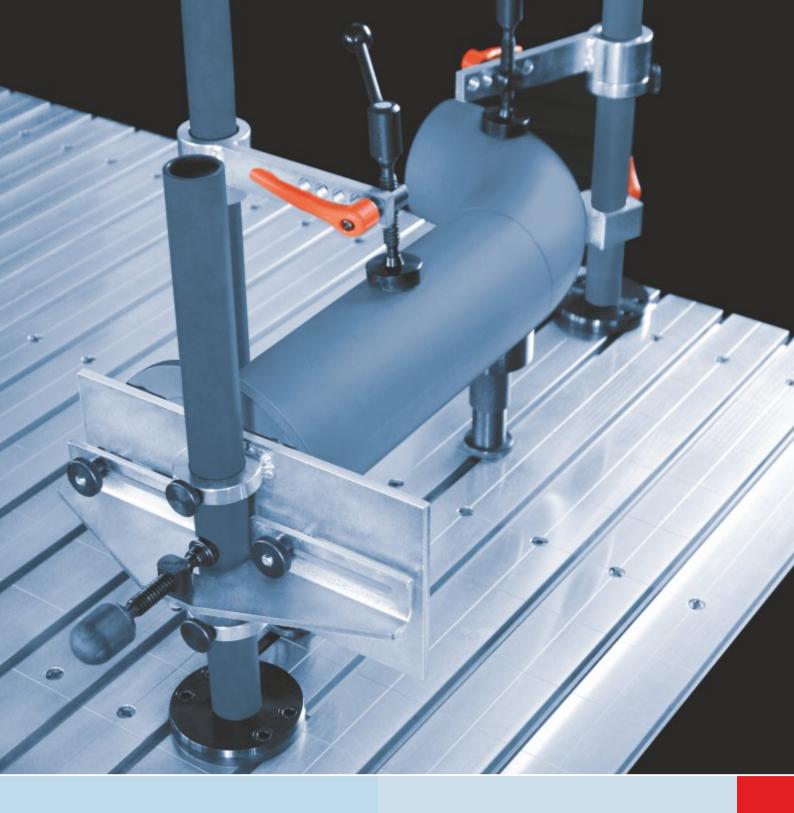
for generating horizontal clamping forces at various heights, infinitely adjustable, delivered with two columns Ø 30x350 mm

| Ø 30 | with 2 columns | Order No.: 2044 |
|------|----------------|-------------------|
| Ø 30 | with 2 columns | Order No.: 2044Br |











V-block support

Ø 60 mm, Ø 100 mm, V-block 120°, steel or bronze with threaded piece with adjusting screw with sliding block

| Ø 60 | Order No.: 3020 |
|-------|-------------------|
| Ø 60 | Order No.: 3020Br |
| | |
| Ø 100 | Order No.: 3021 |
| Ø 100 | Order No.: 3021Br |
| | |

Accessories

tried and tested

Accessories rack cart

1000 x 800 x 1650 mm, moveable, for carrying a wide range of accessories

Order No.: 2090

Protection and maintenance agents

silicone-free, for deep ingression into the porous cast structure ensures secure protection from splatter adherence

10 I tank with spray pump bottle12 aerosol cans, each 400 ml

Order No.: 2094 Order No.: 2092

Double slot profile 50 x 55

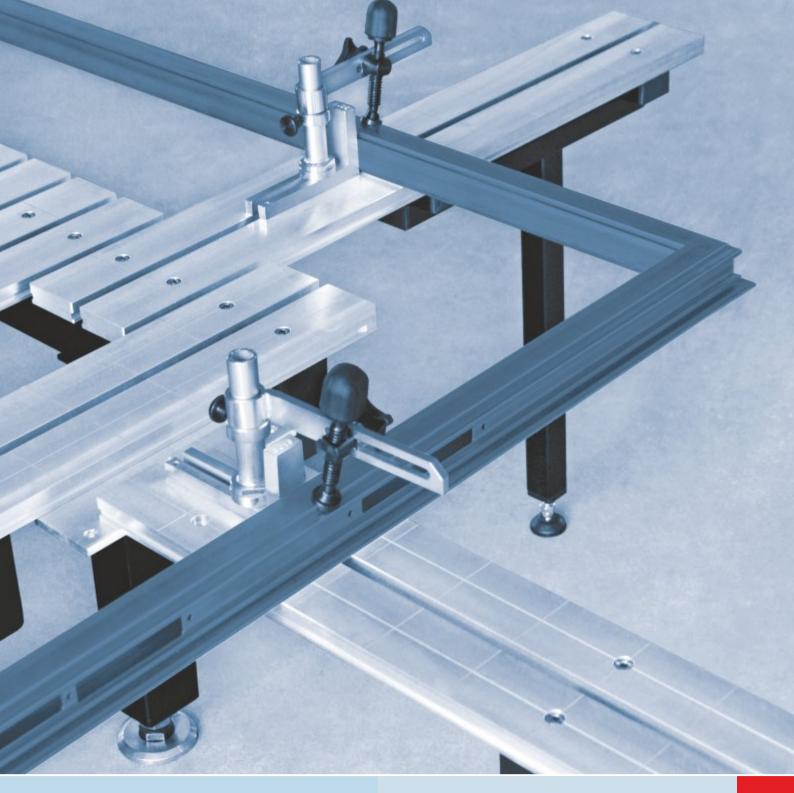
The profiles consist of a high-strength F37 aluminium alloy. The standard 14 mm T-slot allows the affixing of all Förster stops and clamping elements. These profiles can be used as a slot add-on for steel squares or for the erection of limit stop walls for 3D sheet metal framework structures. The profiles can be shifted and locked simultaneously in two axes by means of special connecting elements. As accessories, both simple connectors and connectors for biaxial movement are available.

Product sold by the meter

on request









Support foot

for fitting two cast rails to extend the table

Order No.: 1604

Table extension plate

 $300 \times 120 \times 10$ mm, used for connecting several tables (2 pieces per connection) or to extent a table with two cast rails and support foot (attachment to both the front and the long sides is possible).

Order No.: 1602

Cover plate made of hardwood 200 x 100 x 30 mm, for covering uncovered frame spaces

Order No.: 1601

Welding tables



for manufacturing frames for smaller profile frames 1500 x 1000 mm; components are subject only to inserting – tacking - welding



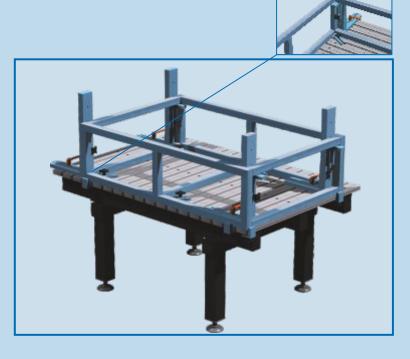
The edge of the table is used as a straight / right angle for frame constructions by using edge guides.

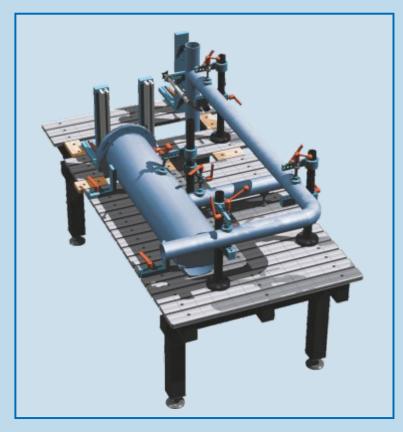
Flat edge guides / small stop angles can be precisely positioned in the T-slot and form a complex unit with the fitted clamping element.

For large and projecting frame constructions, the table surface can be adjusted to the relevant working tasks by laterally shifting the rails.

Application examples

for rack manufacturing frame rack $1500 \times 1000 \times 400$ mm (both front and rear sides of rack are pre-fabricated as frames)





for tube manufacturing various possibilities of tube clamping

Welding tables

Large structural steelwork constructions can be manufactured on movable table bridges.

The example on hand: 30000 x 4000 mm



Single tables / table bridges can be moved and fixed on level rails in row or parallel across the entire area of the hall.

The rails with corresponding control members are

- installed into the floor or
- flat mounted on the floor.



movable on rails

For the manufacture of long structural steelwork constructions it is recommended to position our 3D welding tables within levelled guide rails in accordance with the job to be implemented.

| Structural steelwork rack 8000 x 2500 x 800 mm | | | |
|--|----------------------------|--------------|---|
| | | | |
| | / | | |
| | | | |
| | I рс. 2 рсs. | | 3D welding and work table 4000 x 1500 x 810 mm, stationary, partially covered with 30 cast rails 3D welding and work table |
| | 2 pcs. | | 2400 x 1200 x 810 mm, stationary, completely covered with grey cast iron rails Guide rail 10 m |
| * | 2 pcs. 2 pcs. | 2010 2021 | complete with anchorage Clamping arm with clamping elements ø 30 mm Clamping column, complete, ø 30 x 350 mm |
| | 2 pcs. 8 pcs. 4 pcs. | 2050 2051 | Clamping arm with clamping element ø 50 mm Support arm ø 50 mm |
| | 4 pcs. 2 pcs. | 2052 2054 | Clamping tower, complete, ø 50 x 300 mm Clamping tower, complete, ø 50 x 900 mm |
| | 2 pcs. 2 pcs. | 2055 3012 | Clamping tower, complete, ø 50 x 1200 mm Flat stop |
| | 4 pcs. 2 pcs. | 3015 3017 | Steel square 600 x 350 mm Four-sided angle, height 100 mm |

Special welding jigs

Welding jig with adjustable height

lifting

with hydraulic lift platform substructure and underride frames





adjustable in height

////

simple design with telescopic legs

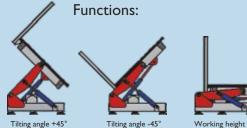
Welding jig with horizontal rotation function

The table surface can be rotated by 360° and adjusted to any desired position using a built-in ball-bearing rim.

for rotating, tilting, lifting and swivelling

Welding jig with lift-tilting function

Electrohydraulic-operated independently of each other lifting within 500 - 1000 mm and tilting by 2 x 45° for loads >1.0 ton







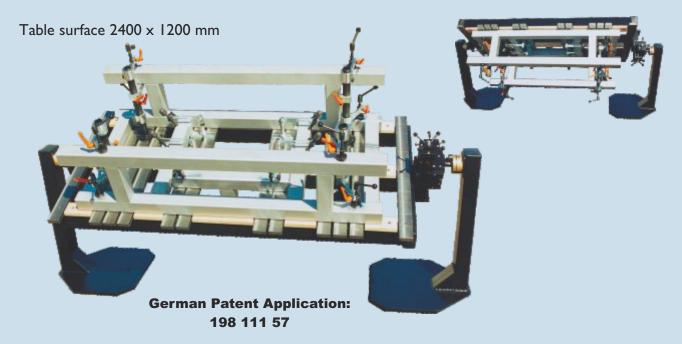


Lift/tilt welding table Work space: 2000 x 1200 mm (other sizes available) Max. component weight: I ton Working heights: 500 - 1000 mm Tilting angle: +/- 45°



Special welding jigs

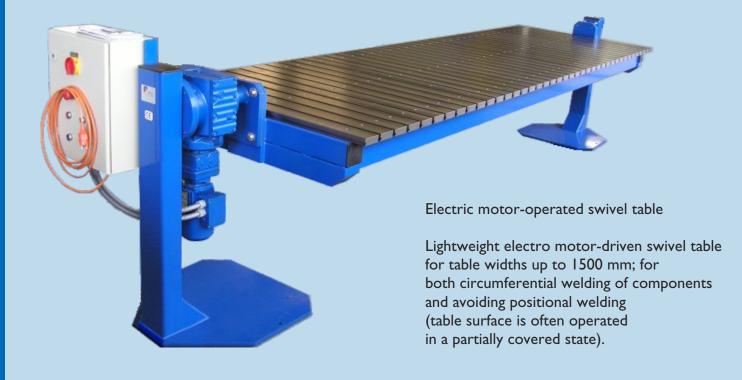
Rotating welding jig with balance point axis adjustment (illustration with building parts)



This table allows the positioning of individual parts of a component, to tack-weld them in place, and then weld them in the appropriate ideal working position. Thanks to the patented centre-of-gravity adjustment-of-axis feature, torque due to the gravitational force can always be set to 0, even when working with parts up to 1 ton, making it easy to move the part by hand. The secure stand of the table in the respective position is achieved by a fixing brake with additional locking device.

The variable table surface facilitates to expose certain sections of the table to ensure the welding of the component from beneath in one single chucking.

The result is significantly easier work, optimum welds, and a virtually warp-free workpiece. This kind of quality can also mean that subsequent machining is not necessary.



for rotating, tilting, lifting and swivelling

Welding positioners - electro motor-operated or electrohydraulic lift and swivel table

swivel table for components >1500 mm, swivel range 360°,

for both circumferential welding of components and avoiding positional welding (table surface is often operated in a partially covered state).

Where appropriate, it can be dispensed with the lift function by shifting the swivel axis eccentrically and thus reducing the swivel range to approx. 240°.



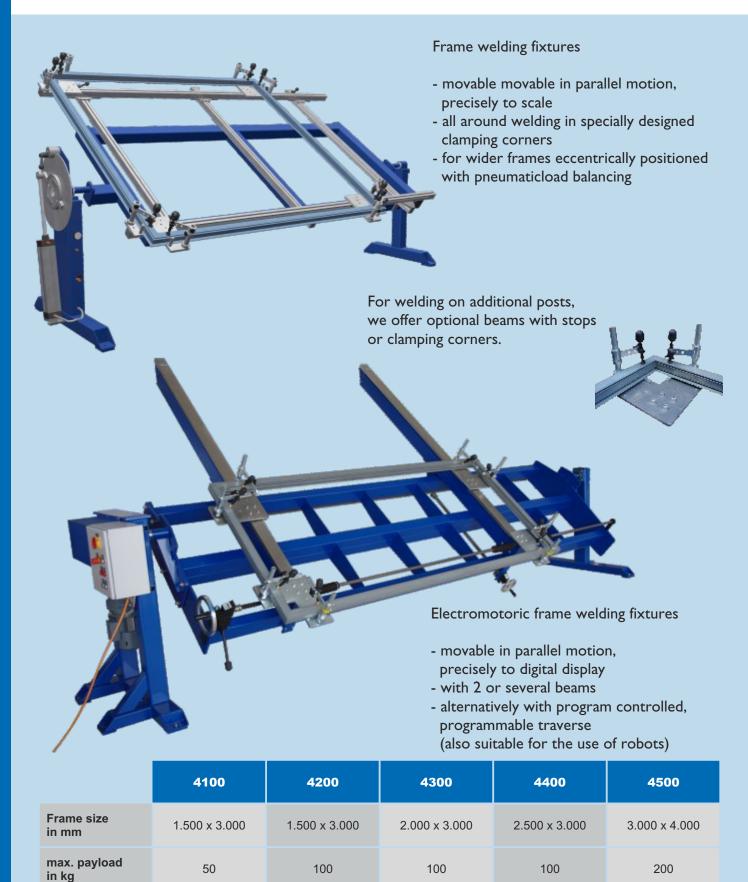


Manipulator

with lifting function and two pivot axles in order to reach all weld seams in flat position and ergonomic working height.

for manual welding and robot welding

Frame welding fixtures



Pivoting range

Load balancing

Locking brake

360°

manual

360°

pneumatic

manual

225°

pneumatic

manual

225°

pneumatic

manual

225°

motoric

motoric

Railing welding gauge For straight railings and banisters

Federal Innovation Prize for crafts



- with initial, intermediate and end posts
- with handrail, intermediate chord and bottom chord
- with ornaments and every possible member divisions



- Very stable construction
- Inserting, tacking and all around welding in the respective optimum position
- Holder for handrail, intermediate chord and bottom chord are designed as "central clampers"
- Gradiant angle of banisters can be selected directly at the carriage
- The bar spacing and number of respective similar bar elements are to be entered into the input display
- Carriage with the holding fixture for the bar elements moves to the next position at the touch of a button
- Placement of bar elements is freely programmable
- The control is equipped with a touch display and an absolute encoder to avoiding sum errors





- 360° pivotable with fixation
- railing height: 450 to 1.200 mm
- railing length: 5.000 mm and 7.000 mm
- railing slope: 0 to 60°
- member division: 0 to unlimited
- battery capacity of the carriage > 8 hrs
- max. payload: 150 kg

Special welding jigs

Lift and swivel tables for big frame constructions with elektric or hydraulic drive. Welding jigs for big 3D-components





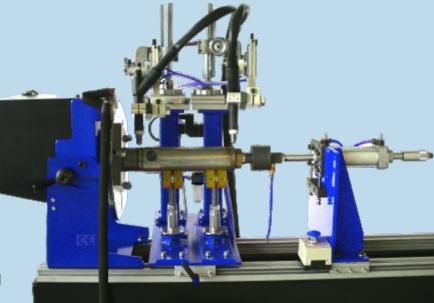
Welding automation



mechanized longitudinal seam welding



welding of corner joints onto vacuum beam



mechanized circumferential seam welding



customized automated welding facility

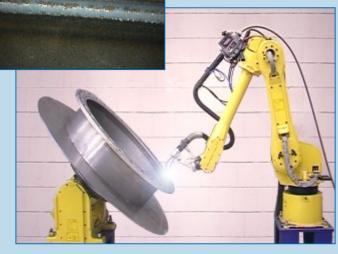
Automated serial production

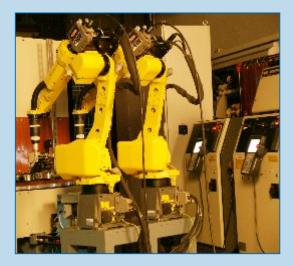
As system house for complete welding solutions

We create your special robot welding system and combine

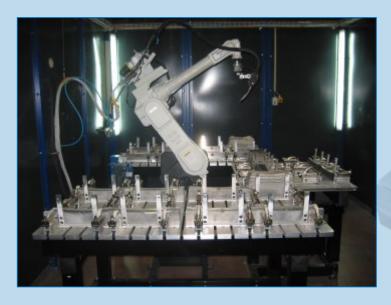
- our long-time experience in all areas of welding technology
- our extensive options in the field of plant and jig construction
- the in-house building element programming with comprehensive support and training for your staff, as well as sample welding and welding optimisation
- the integration of safety equipment like safety covers, fume exhaustion and other components







Robotic welding systems



Standard welding tables for the use of robots are useful for small to medium quantities, where the use of fixed devices is not practicable. With the help of our slot system, elementary devices can be created quickly by yourself and bolted for repetitiveness.







Robotics

Manipulators & special systems

Rotary jigs - positioners

with parallel lifting, rotating and tilting function with face plate or slotted table surface from 250 kg to 250 t





rotary jig / coil turner for heavy loads up to 40 t





Industrial assembly systems

Rollerbeds from 5 t to 150 t







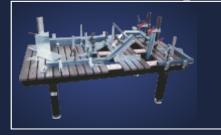
Submerged arc welding and MIG / MAG welding systems

with pole and portal from $3 \times 3 \text{ m}$ to $10 \times 10 \text{ m}$





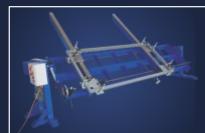
with parallel lifting, tilting and rotating function up to 250 t $\,$



3D-WELDING TABLE SYSTEM



WELDING, ASSEMBLING AND SPECIAL WELDING JIGS



FRAME WELDING FIXTURES & RAILING WELDING GAUGES



TURNKEY SOLUTIONS FOR MECHANIZATION, AUTOMATION & ROBOTICS



MANIPULATORS AND INDUSTRIAL ASSEMBLY SYSTEMS



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