Part optimization

Clever design: This is how your part gets more profitable

TRUMPF

The key to success – there's more in your parts than meets the eye

You're familiar with your components, and know that they do their job. But what other potential is hidden inside them? Find out now in our workshops and seminars on part design. Whether you wish to manufacture parts more profitably, produce new parts, or add an new application – the relevant knowledge regarding sheet metal and tube design will help you trim your parts for success, while saving money as well.

Cost-efficiently designed parts

- are the key to efficient manufacturing
- combine functionalities
- reduce the need for reworking
- require fewer process steps
- pave the way to networked production

Design parts – add value

Get started now and launch your components to a whole new level. You will acquire the required knowledge in workshops with a sound technological basis which focus on sheet metal and tube design. As a beginner, you will learn the necessary skills related to design. As an expert, you will expand on your expertise and get more out of your parts.

Cost-effective design: Reduce production steps and costs through the function-based redesign of your components.

Sharpen your view: Get input for creative ideas and new solutions.

Apply your skills directly: Gain practical knowledge using exercises and your own components.

Make use of experience: Take advantage of our practical knowledge gained in more than 1,000 workshops.

Manufacture at maximum capacity: Use the production possibilities of your sheet metal processing facility to their fullest potential.

Sheet metal part design

Less is more

Lighter, cheaper, or more functional: How would you like your parts? When sheet metal parts have a well-thought-out design, this allows your laser cutting, punching, or bending machines to reach their full potential – while saving on materials, costs, and effort.

Save while designing

The right tricks allow you to design your parts economically, for example by reducing the number of single parts and process steps. The support bracket shown here originally consisted of three parts connected with four weld seams, plus separately cut threads. It was redesigned out of just one bending part, welding is no longer necessary. An additional bend even allows you to reduce the sheet thickness and form the threads directly on the punching machine.

Conventionally manufactured support bracket

Optimized support bracket made from sheet metal

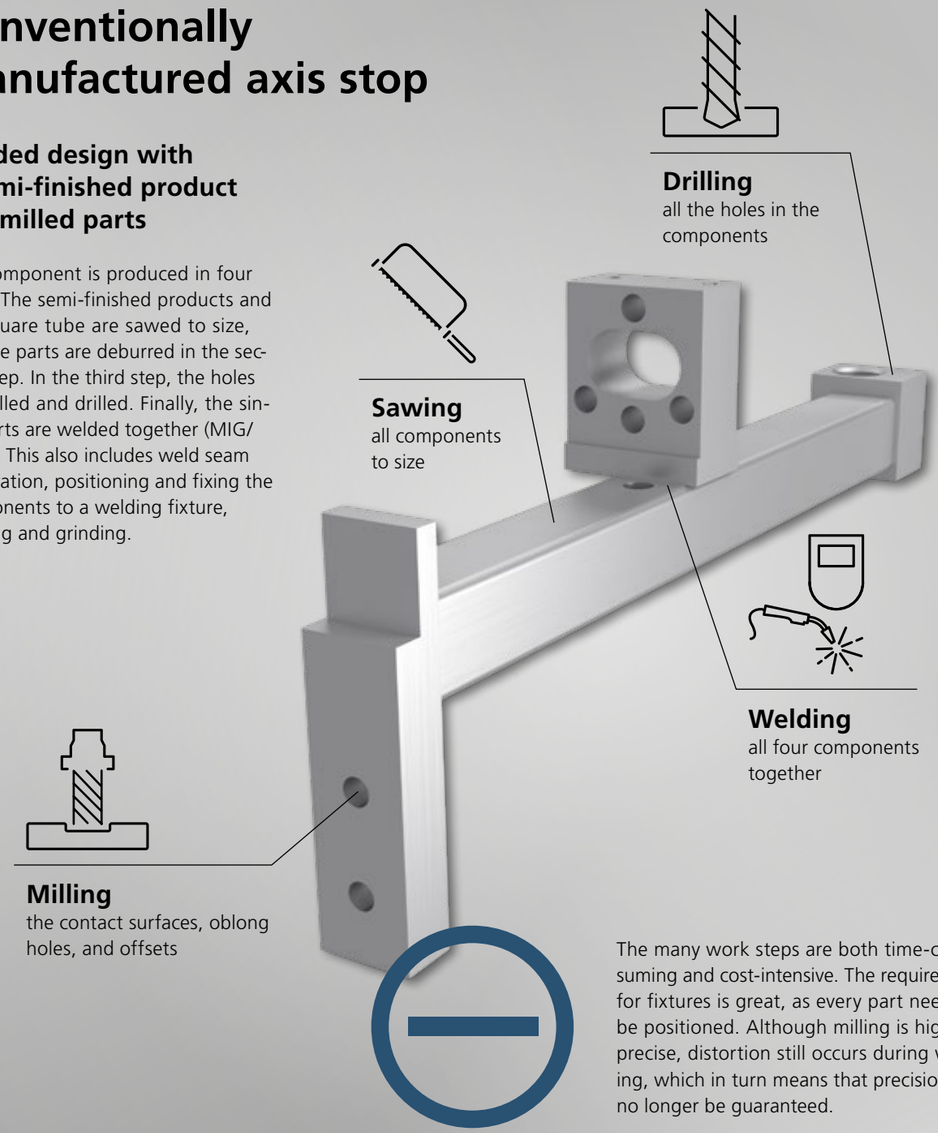
Optimized component

Conventional component

Conventionally manufactured axis stop

Welded design with a semi-finished product and milled parts

The component is produced in four steps: The semi-finished products and the square tube are sawed to size, and the parts are deburred in the second step. In the third step, the holes are milled and drilled. Finally, the single parts are welded together (MIG/MAG). This also includes weld seam preparation, positioning and fixing the components to a welding fixture, welding and grinding.



Drilling
all the holes in the components

Sawing
all components to size

Welding
all four components together

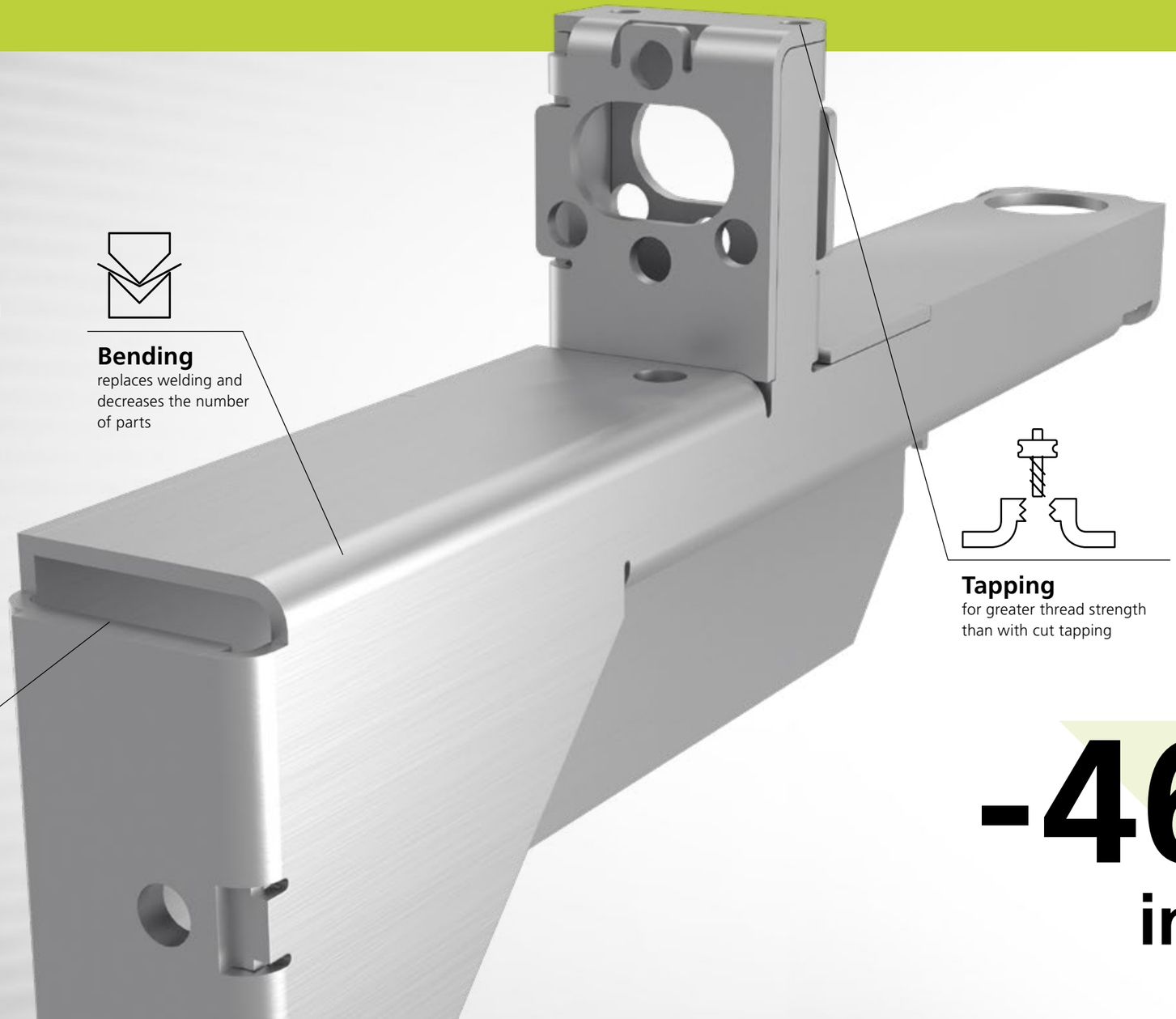
Milling
the contact surfaces, oblong holes, and offsets

The many work steps are both time-consuming and cost-intensive. The requirement for fixtures is great, as every part needs to be positioned. Although milling is highly precise, distortion still occurs during welding, which in turn means that precision can no longer be guaranteed.

Cleverly designed axis stop

Cost-effective solution made from two sheet metal parts

You cut the component to size on a laser flatbed machine – including oblong holes, round holes, and geometries. You can form threads directly with a punch or punch laser machine. Then you bend it as needed on a bending machine. Joining aids reduce the need for positioning work, and therefore the need for welding fixtures. What changed in the design? Laser cutting and bending have replaced sawing, drilling, milling, and welding.



Bending
replaces welding and decreases the number of parts

Tapping
for greater thread strength than with cut tapping

Laser cutting
allows for any desired geometries to be cut into sheet metal, and produces holes

The new design lowers the number of parts, thus reducing the joining processes and material usage. Functionality increases at the same time. The double sheet attachment optimizes the flow of force and the attachment of the cable ties is integrated in the sheet metal. This allows you to save approximately 46% in costs.

-46%
in costs

Laser welding part design

Rethinking is worthwhile

A laser welding system allows you to manufacture at much lower expense than with conventional welding, as long as you identify the proper parts and make these suitable for laser welding. You can receive design and manufacturing-related tips and tricks from us.

Here is how you make your parts suitable for laser welding

The proof is in the comparison with TIG manual welding: The laser allows you to weld up to 90% faster and noticeably cheaper – without filler material. The water tank shown here demonstrates how a manually welded part can become a cost-effective laser-welded part.

Its seams need to be watertight; the laser allows you to weld these in a fraction of the time. The lower heat input also reduces the amount of distortion.

Laser-welded water tank

Conventionally welded water tank

Optimized component

Conventional component

Conventionally manufactured cover

Every part is an expensive, one-off job

The cover for electronic components such as electrical cabinets must be sealed and free of distortion. Up until now it was produced in four steps: The sheet metal is cut with a laser and then bent ten times. The third step comprises TIG welding, prestapling, and rewelding. Finally, the cover is reground and buffed.

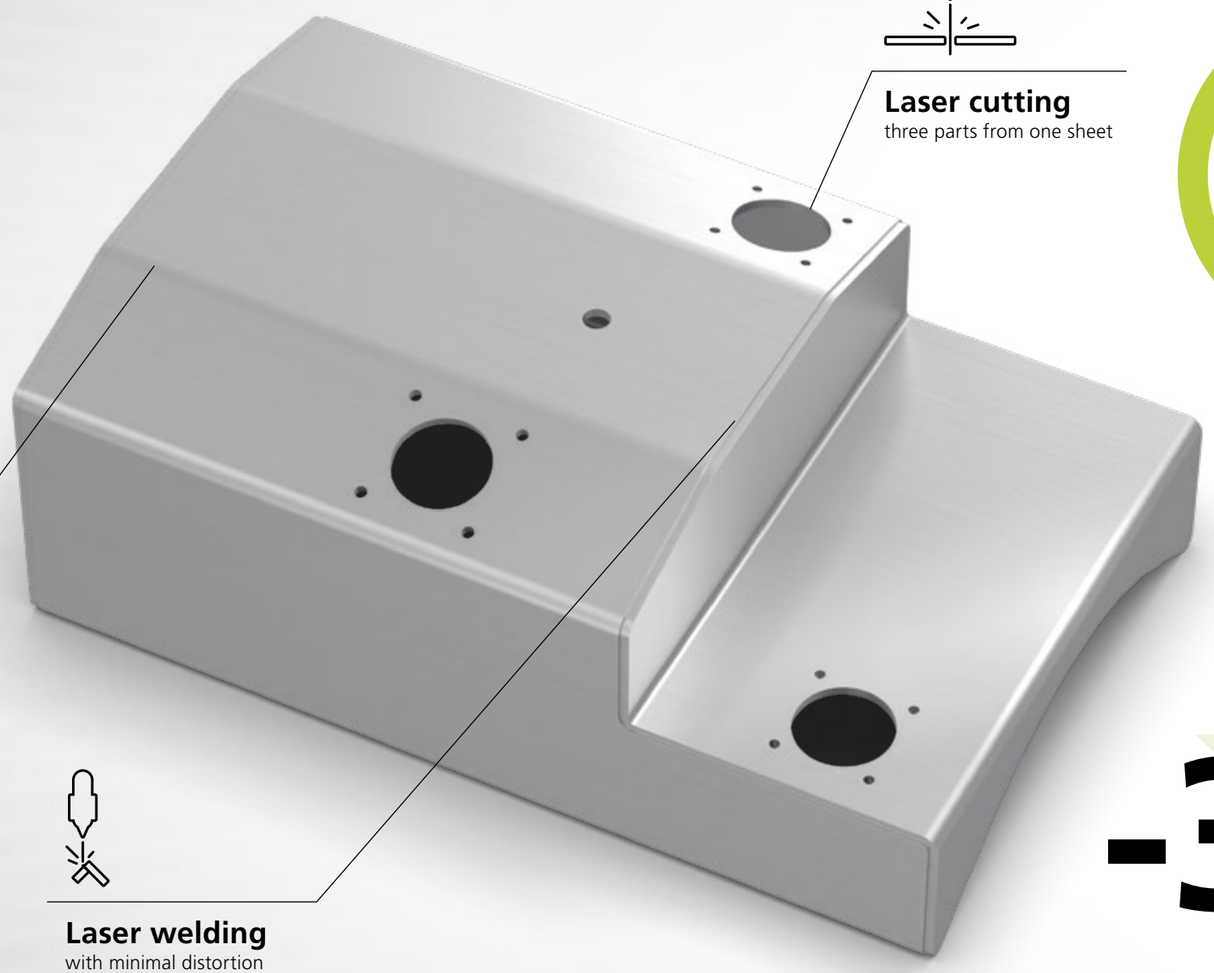
Welding results in distortion that needs to be corrected. Welding, grinding, and polishing are also time-consuming and expensive aspects of manual work. It is impossible to achieve reproducible quality in this way.

Cleverly designed cover

Reproducible quality

The design which is suitable for laser welding consists of three sheet metal parts, which are cut with a laser in the initial step.

The sheets are bent eight times to make the elements that comprise the covers. The single parts are joined via laser welding. In doing so, only minimal distortion occurs, and the weld seams create joints. No reworking is necessary.



Laser cutting
three parts from one sheet

Bending
eight bends

Laser welding
with minimal distortion
and high visual quality

The optimized design separates the tolerance chain and simplifies the process of fitting the parts to one another. External access is improved at the same time. It is no longer necessary to weld gaps shut. The actual welding process is shortened and automated. Laser welding also replaces multiple work steps. Seam preparation is no longer necessary, and you also need to make fewer corrections as the lowered heat input means barely any distortion occurs. In total, the processing time in the example can be lowered by 82%.

-30%
in costs

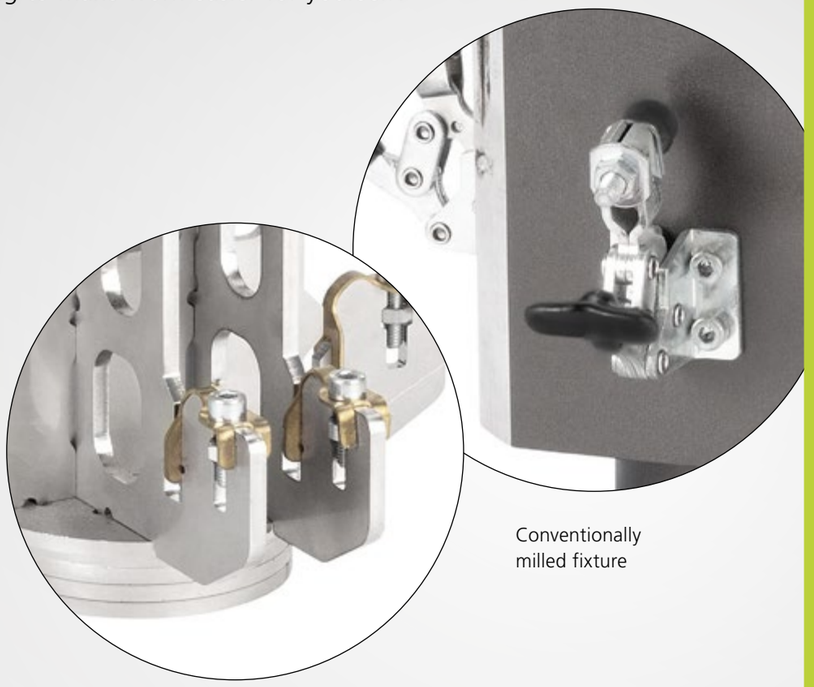
Laser welding fixture design

There’s a simpler way

Fixtures guarantee quality and more reliable processes during laser welding. However, what even experienced specialists often don’t know is that fixtures made of sheet metal parts are both cheaper and sufficiently precise for laser welding. You can also reduce production tolerances when welding. When are you going to make work easier for yourself?

Make every fixture a perfect success

Clamping fixtures made from sheet metal are economically superior to conventionally milled fixtures. This is because they lower both manufacturing costs and weight. What’s more, they allow for additional functions to be integrated. Our example shows a milling block with clamping devices. Requiring a number of holes to be drilled and deburred, and threads to be cut. On the other hand, the alternative plug-in design made from sheet metal is simple, quick, and affordable.



Conventionally milled fixture

Optimized fixture made out of sheet metal

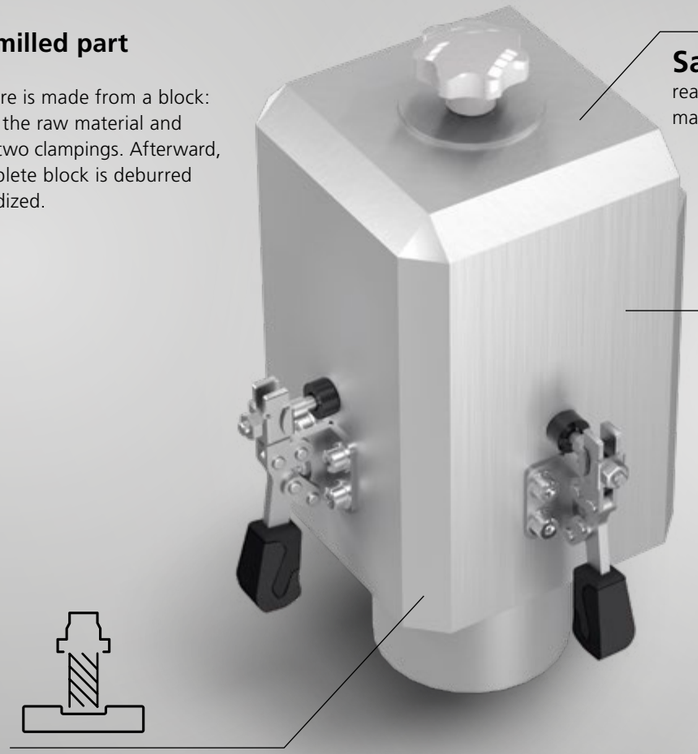
Optimized component

Conventional component

Conventionally manufactured welding fixture

Solid milled part

The fixture is made from a block: You saw the raw material and mill it in two clampings. Afterward, the complete block is deburred and anodized.



Sawing
ready-made raw material to size

Finishing
by deburring and anodizing

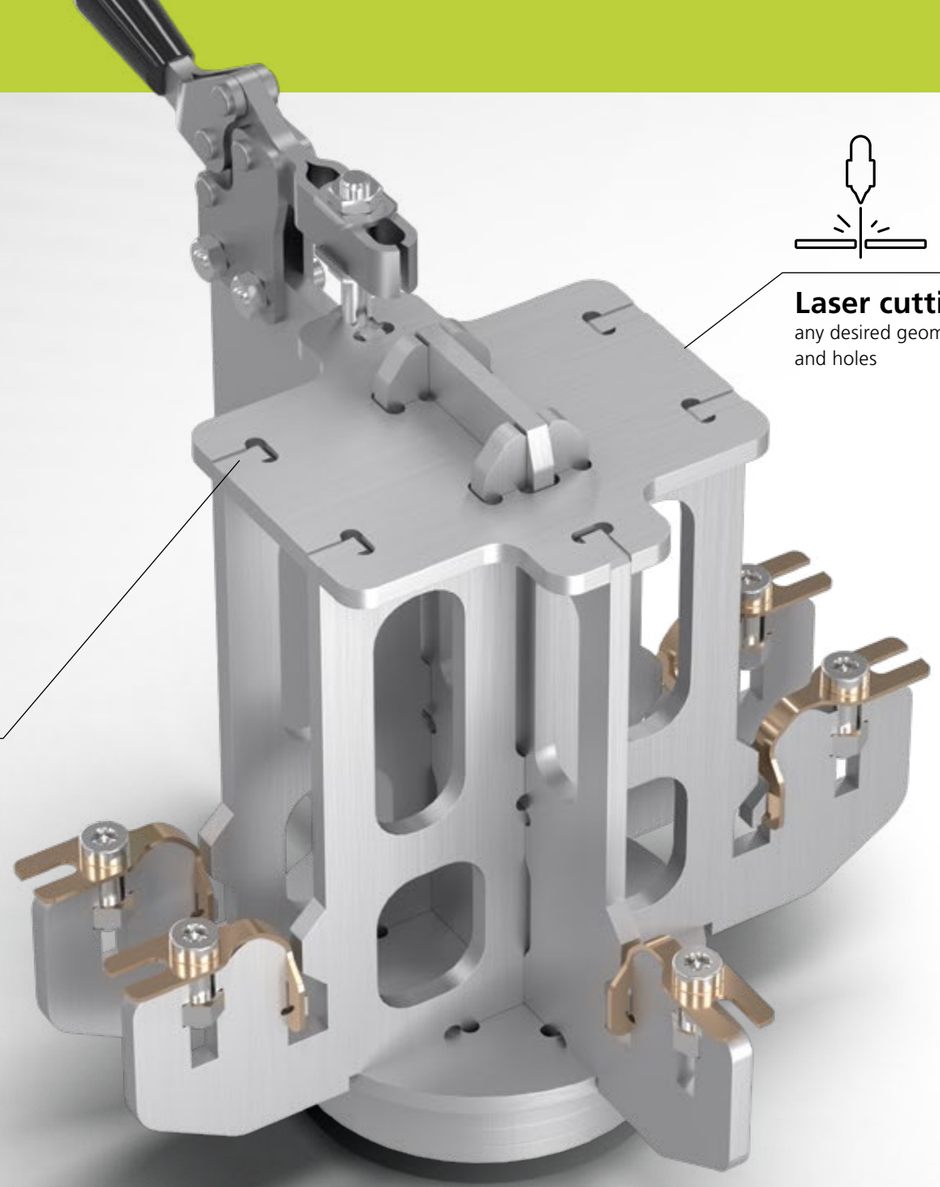
Milling
all reference surfaces and mounts as well as all through holes and threads

Milling is expensive, and surface finishing is time-consuming. Additional problems are the inadequate passive cooling of sheet metal parts during welding, which contributes to distortion and affects precision. Welded parts must be laboriously tapped out of the milled fixture, as the lack of space means they shrink onto the fixture.

Cleverly designed welding fixture

A functional lightweight design

Fixtures manufactured from sheet metal can be made lighter: Single sheet metal parts are produced using laser cutting – including holes and other geometries. These reduce the time and effort required for assembly and enable the flexible use of fixtures. Simply connect the precut laser parts together.



Assembling
and welding of single parts

Laser cutting
any desired geometries and holes

With the right design rules, you can improve the clamping process and design the fixtures as lightweight parts. In doing so you lower the manufacturing costs, weight, and the loading/unloading times for the fixture.

-17%
in costs

Tube part design

Conquer the world of tubes

Laser tube cutting eliminates entire process steps, which allows you to save money. Secure your share of the growing market for laser-cut tubes. We will advise you on exactly how this works with the appropriate advice.

The stage is set for your ideas

Tubes and profiles are used everywhere – from mechanical engineering and system construction all the way to the furniture industry, and lasers open up entirely new design possibilities.

Instead of welding two single parts together to make a corner connection, for example, you can achieve the same result more efficiently using a laser-cut tube with bend connections and positioning aids. When manufacturing with a laser tube cutting machine, you save 31% in costs, and produce the component in half the time.

Optimized component

Conventional component

Conventionally manufactured cantilever

High demands on time and logistics

Cantilevers such as this one are used in scaffolds, machine frames, cranes, and balcony railings. With conventional manufacturing, the vertical tube, horizontal tube, and the connecting rib are adjusted to one another in individual process steps. This includes sawing, deburring, milling, grinding, fixture construction, measuring, and welding.

Milling
contact surfaces, oblong holes, and offsets

Welding
all three components

Sawing
all components to size

Deburring
sawed and milled areas

A large number of simple yet time-consuming work steps, buffer time, and a high degree of logistical effort make production difficult.

Cleverly designed cantilever

Fewer components and production steps, and lower costs

The cantilever is now manufactured from two tubes with the identical shape and dimensions. Both parts are adjusted to one another on a laser tube cutting machine and then connected together; the joining aids reduce the effort needed for positioning.

Assembling
and welding of single parts

Laser tube cutting
of the entire assembly with just one clamping operation

The laser beam is an extremely flexible tool. It allows a laser tube cutting machine to take over many of the previously required process steps such as sawing, milling, grinding, and measuring. Bevel cuts replace weld seam preparation and laser-cut joining aids take over positioning with welding fixtures. The weld seam is also shortened. All in all, you save on components, process steps, and costs.

-83%
in costs

Arc welding fixture design

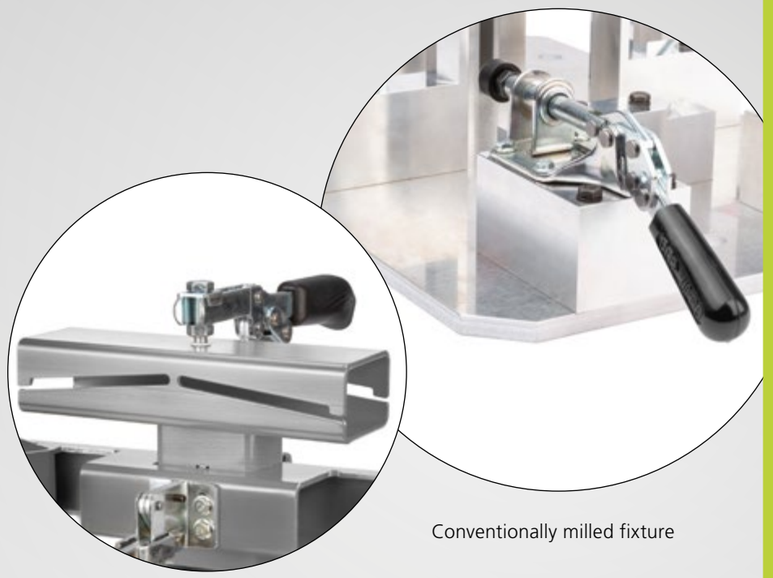
Better utilization for greater profit

Do you want to increase the utilization of your cobot for arc welding of welded assemblies? Then fixtures made of laser-cut sheets and tubes can help, even with small batch sizes. It’s easier than you might think.

Simply produce your own fixtures

Learn the design rules for arc welding fixtures and how to design your assemblies in the best possible way. Then you can design, adapt and replicate them quickly and cost-effectively in the future.

The example shows that, while the conventionally manufactured fixture is material-intensive and therefore expensive, the new cost-effective design made of tubes with a spring effect for tolerances is satisfying in every regard.



Conventionally milled fixture

Optimized fixture made from tubes

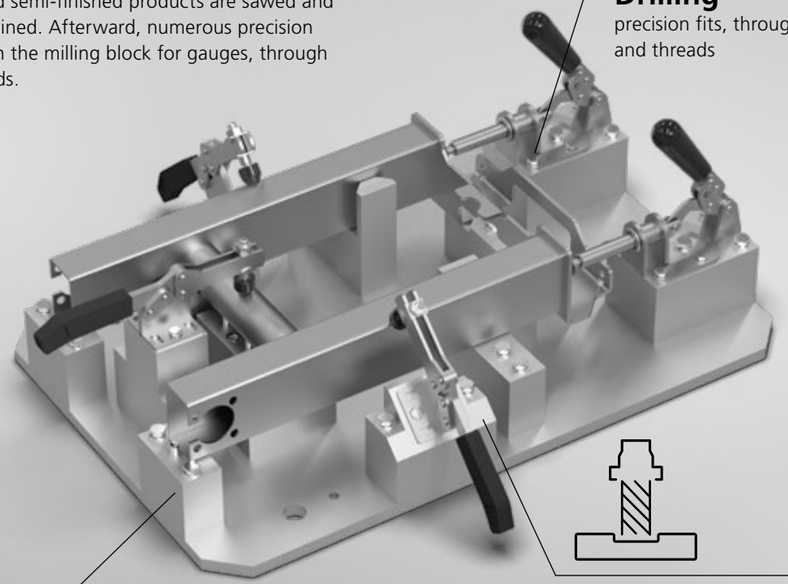
Optimized component

Conventional component

Conventionally manufactured welding fixture

Many parts and elaborate assembly

Raw material and semi-finished products are sawed and then bolted or joined. Afterward, numerous precision fits are created in the milling block for gauges, through holes, and threads.



Drilling
precision fits, through holes, and threads

Sawing
raw materials, various semi-finished products and dimensions

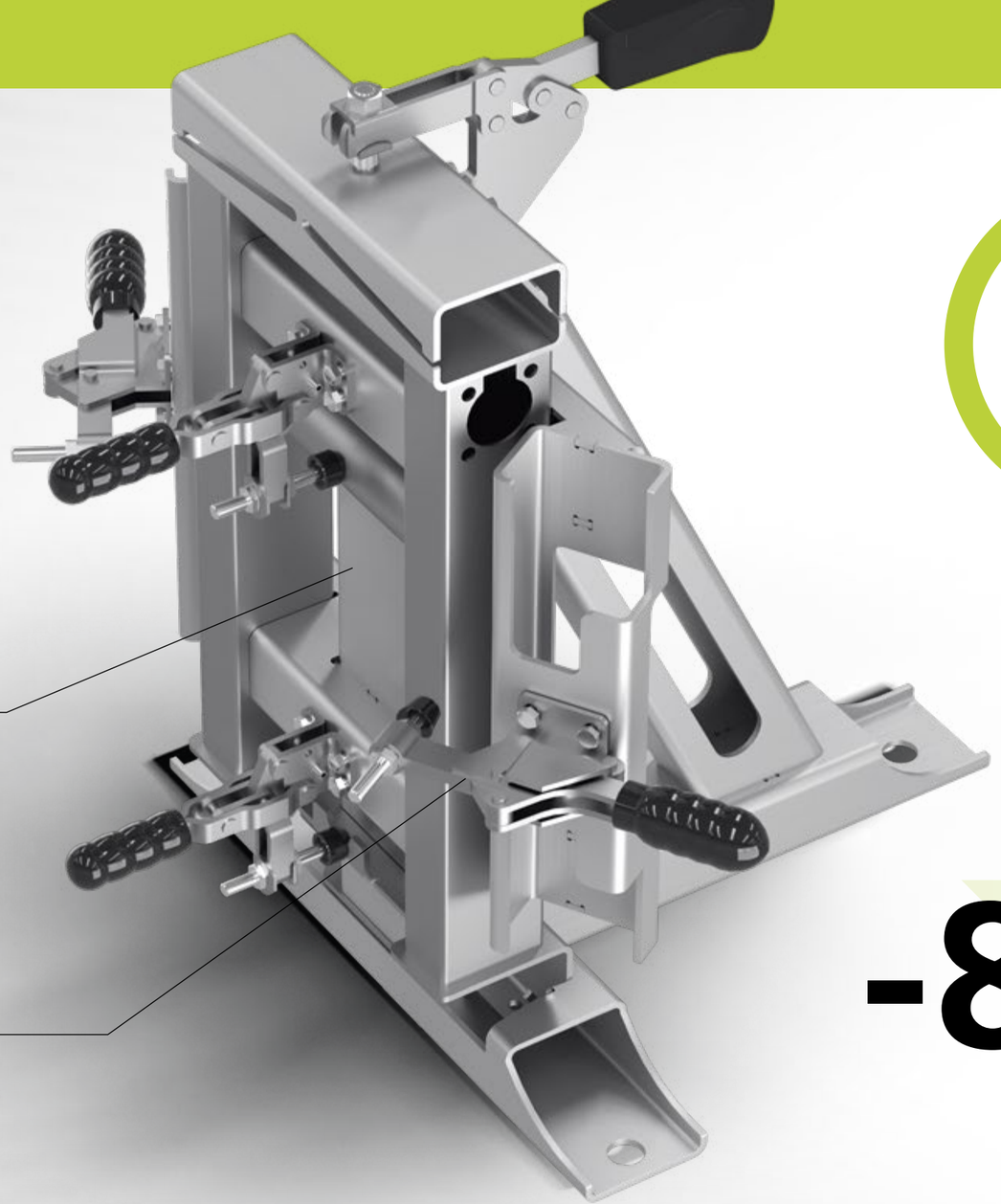
Milling
all surfaces which are to be bolted or joined

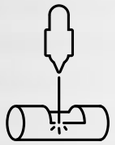
The numerous milled parts are both time-consuming and cost-intensive. The costs of chipping manufacture are high, and fits for pins and threads are necessary. This leads to enormous assembly effort. There is even room for improvement with the ergonomics, as the assembly must be welded when it is lying down.

Cleverly designed welding fixture

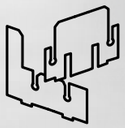
Ergonomic solution with spring effect and tolerance compensation

A tube plug-in design replaces the entire milling block. The laser tube cutting machine not only cuts the tube cross section to size, it also provides all parts with joining aids, which allow for precise positioning. The laser tube cutting machine also produces threads directly.





Laser tube cutting
parts, including all inner geometries and joining aids in pin form



Assembling
and welding of single parts

You benefit from fewer parts and less effort. Only one clamping device is required in the upper clamping tube. The visible longitudinal sections provide a spring effect to the fixture, and compensate for tolerances in the component. The vertical design of the fixture makes it easily accessible. The entire welding assembly can now be welded in one clamping operation, with greater dimensional precision and higher quality. All in all, the manufacturing time and weight are reduced.

-80%
in costs

Here is how to reach your goals

Part consulting: Get the best out of your parts. Work with TRUMPF experts to establish how you can design your parts to be more profitable.

Workshop: Gain personalized practical knowledge. Beyond the seminar, we look for potential within the parts range in your business. Working together, we will optimize and manufacture selected parts which you can directly implement into your designs and manufacture more cost-effectively.

Seminar: Become the expert in your sector. In TRUMPF seminars you will gain knowledge about processes, production, and design. You will also perfect a sample part as part of a team.

Product overview			
Training types	**Part consulting**	**Seminar**	**Workshop**
Contents			
Customization: Exclusively for one customer, manufacturing inspection and assessment of potential for optimization	■	□	■
Manufacturing knowledge: Machines, technologies, processes, state of the art	□	■	■
Design knowledge: Design systems, component design exercises, production of an optimized component	□	■	■
Part optimization: Finding/evaluating ideas for modification possibilities for customer-specific components	■	■	■
Speakers | Participants	1 | 1–6	2 | 1–12	2 | 8–12
Venue (in person/online) | dates	By request	Ditzingen / Online | Fixed	By request
Training topics			
Sheet metal part design	1 day	3 days	3 days
Tube part design	1 day	1 day	1 day
Laser welding part design	1 day	2 days	2 days
Fixture design for laser welding*	1 day	2 days	2 days
Fixture design for arc welding	1 day	2 days	2 days

*Only for customers with TRUMPF laser welding systems.

What part are you starting with?

The first step is very easy: Talk to us. Together we will come up with ideas for how you can take full advantage of the potential within your parts.

Whether you'd like more information or an offer, we look forward to hearing from you.

Contact us
Mobile: +49 171 9844297
E-mail: partdesign@trumpf.com

TRUMPF is certified to ISO 9001
(Find out more: www.trumpf.com/s/quality)

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