

Gert van Wakeren

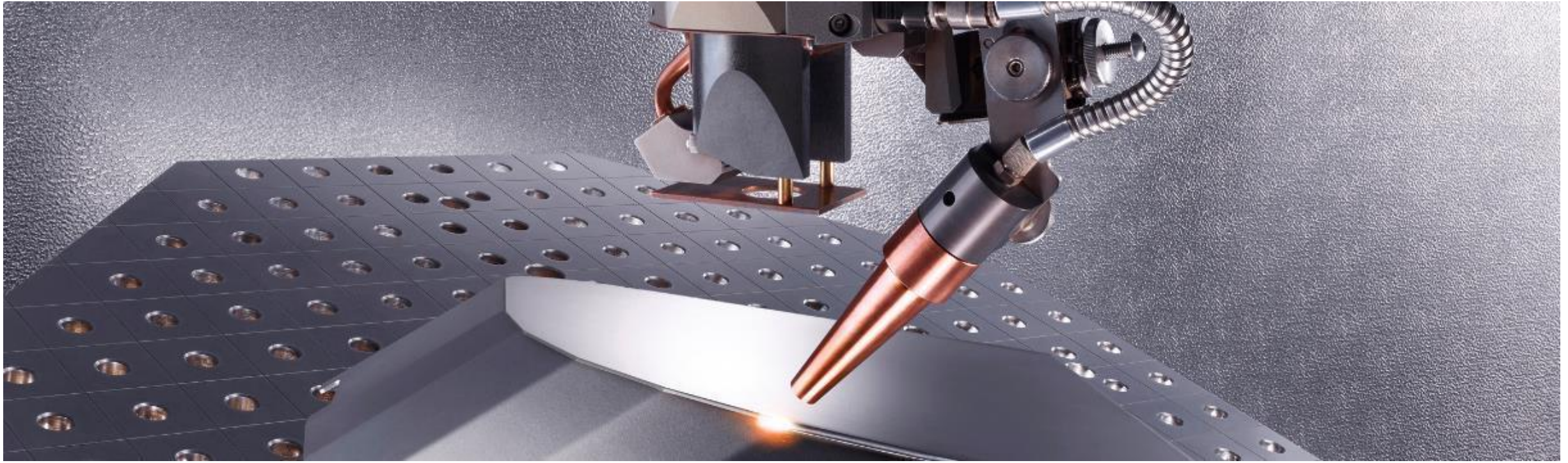
Sales Engineer

TRUMPF

Gert is een laserlasexpert die betrokken is bij de verkoop en implementatie van o.a. laserlassystemen.

Hij heeft een belangrijk aandeel gehad in het ontwikkelen van lascabines voor veilig en gecertificeerd handlaserlassen.



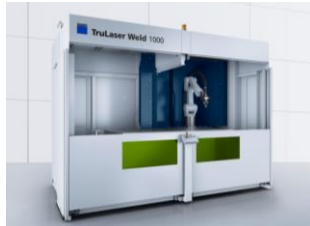
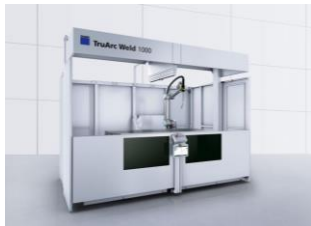


Future expectations on automated sheet metal laser welding

Gert van Wakeren
Sales Engineer / Account Manager Laser Technology
TRUMPF Nederland B.V.

Overview of the TRUMPF welding portfolio

Laser and arc welding solutions



TruArc Weld 1000

TruLaser Weld 1000

TruLaser Station
7000

TruLaser Cell 3000

TruLaser Cell 5030

TruLaser Weld 5000

TruLaser Cell 7040

Arc welding

Laser welding

Laser welding

Laser cutting,
Laser welding
LMD

Laser cutting
Basics in Laser
welding

Laser welding

Laser cutting
Laser welding
LMD

► Easy entry into fully automated arc welding with extremely simple operation and programming

► Easy entry into fully automated laser welding with extremely simple operation and programming

Discontinued

► Cost-efficient laser welding system with smallest footprint

► Productive and universally applicable, also for individual customer solutions and automation

► Low-cost entry into flexible laser processing, specialized for small batch sizes due to the low hourly machine rate

► Specialized laser welding system with best accessibility for applications with best seam quality

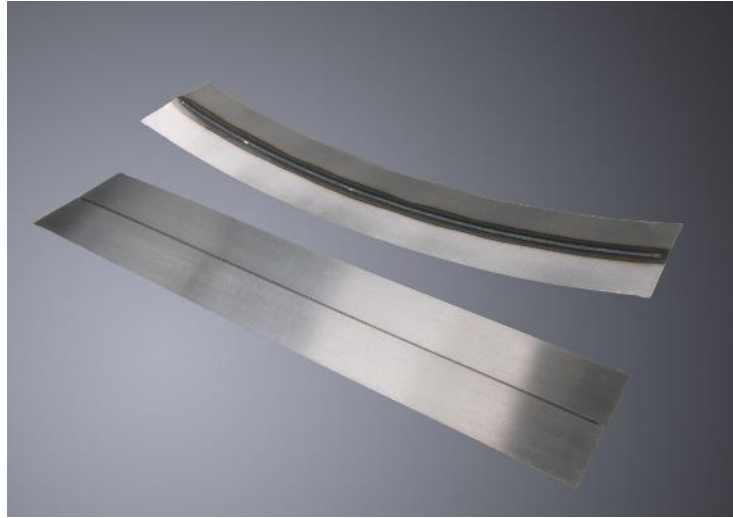
► Highly flexible laser processing machine with extensive functions and excellent precision even with high dynamics

Optimum laser welding

Laser welding brings you: high part quality...



Visible seams of best optical quality



Minimum component distortion



High-tensile seams

→ REDUCED COMPONENT COSTS



weldguide.trumpf.com

For further information directly
visit the WeldGuide

Optimum laser welding

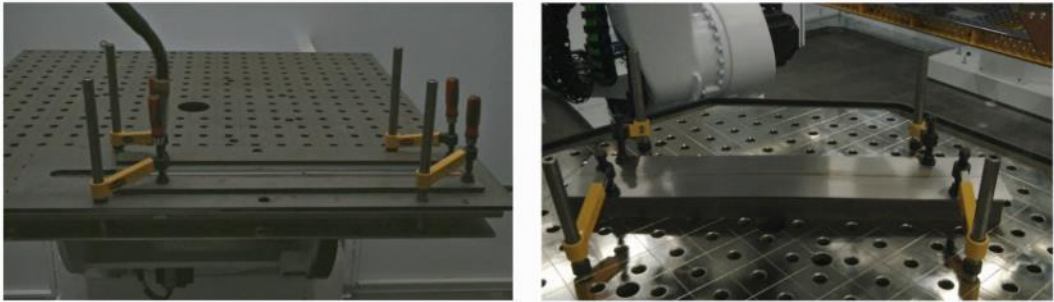
... high productivity ...



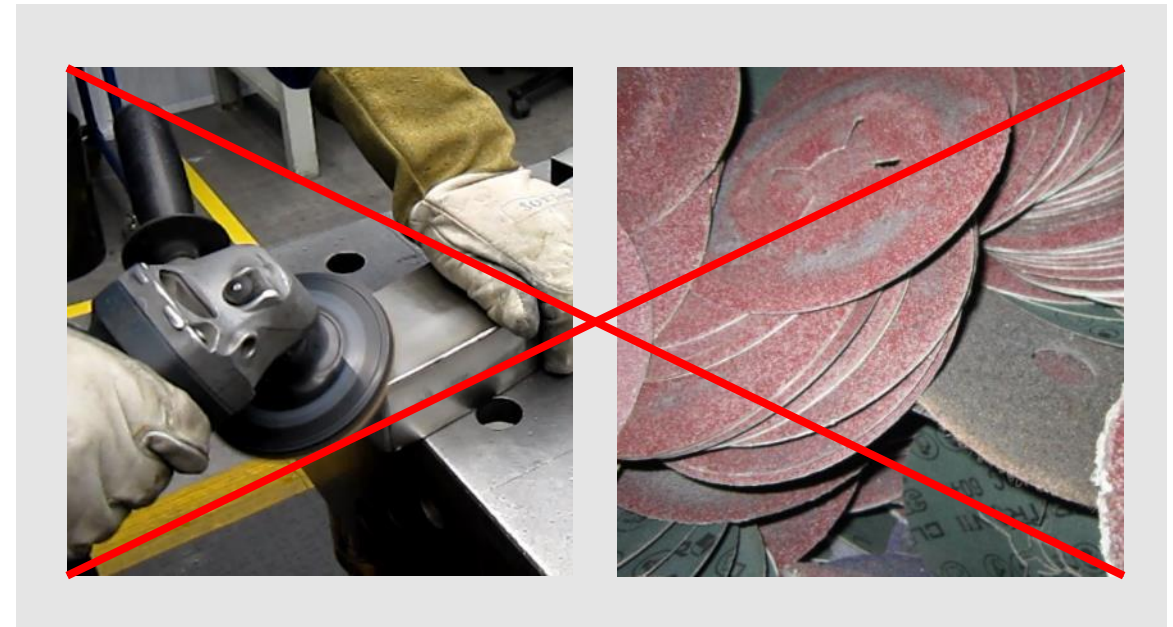
Time comparison in seconds

MAG vs. **laser**

00:59.04 00:03.92



High process speed when welding



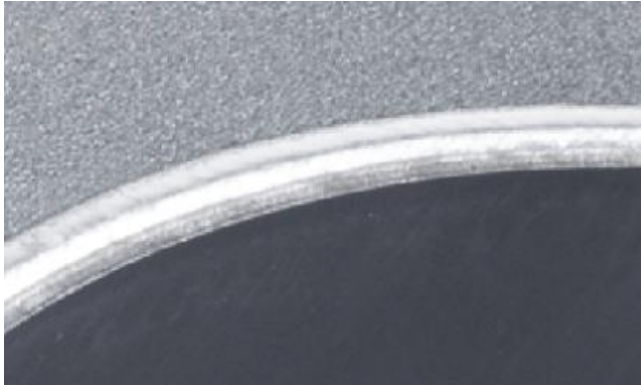
Significantly fewer refinishing operations; in some cases, none at all

→ **REDUCED COMPONENT COSTS**

Optimum laser welding

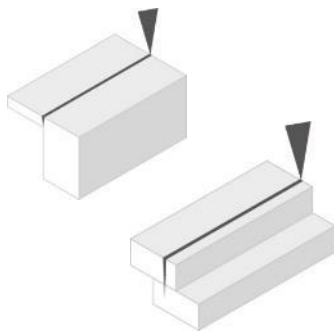
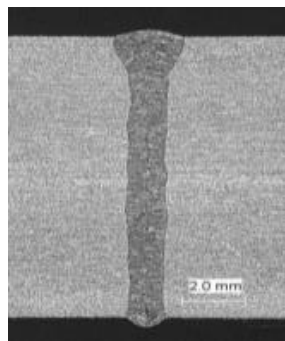


... and high flexibility – different processes in one system



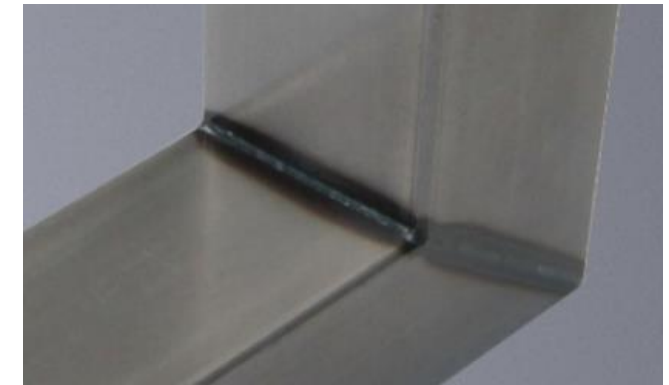
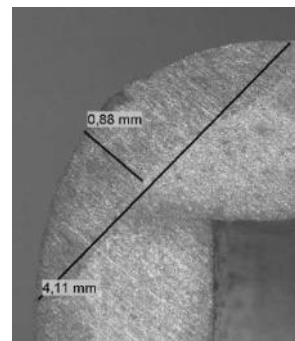
Deep penetration welding:

- Maximum productivity
- More design freedom



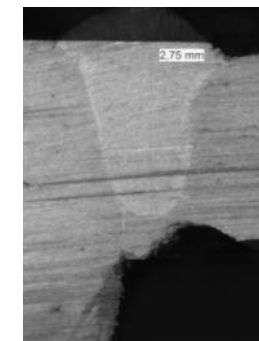
Heat conduction welding:

- Highest optical seam quality
- Radius without grinding



FusionLine (optional):

- Largest bridging
- Joining with filler material



Solid state laser TruFiber 4001 / 6001



Robust and brilliant for best welding results



TRUMPF TruFiber solid-state laser - Option TruFiber 4001 or TruFiber 6001

Would you like ...

- ... brilliant beam quality for the best welding results?
- ... a long-lasting and best-available laser?



The TruFiber solid-state laser offers ...

- ... a stable laser concept proven thousands of times over
- ... a construction that is insensitive to back reflections



Solid state laser TruDisk 4001 / 6001 / 8001

For special layouts or 8 kW laser power



TRUMPF TruDisk solid state laser - Option TruDisk 4001 / 6001 / 8001

Would you like ...

- ... brilliant beam quality for the best welding results?
- ... a long-lasting and best-available laser?
- ... overcome large distances between laser and machine?



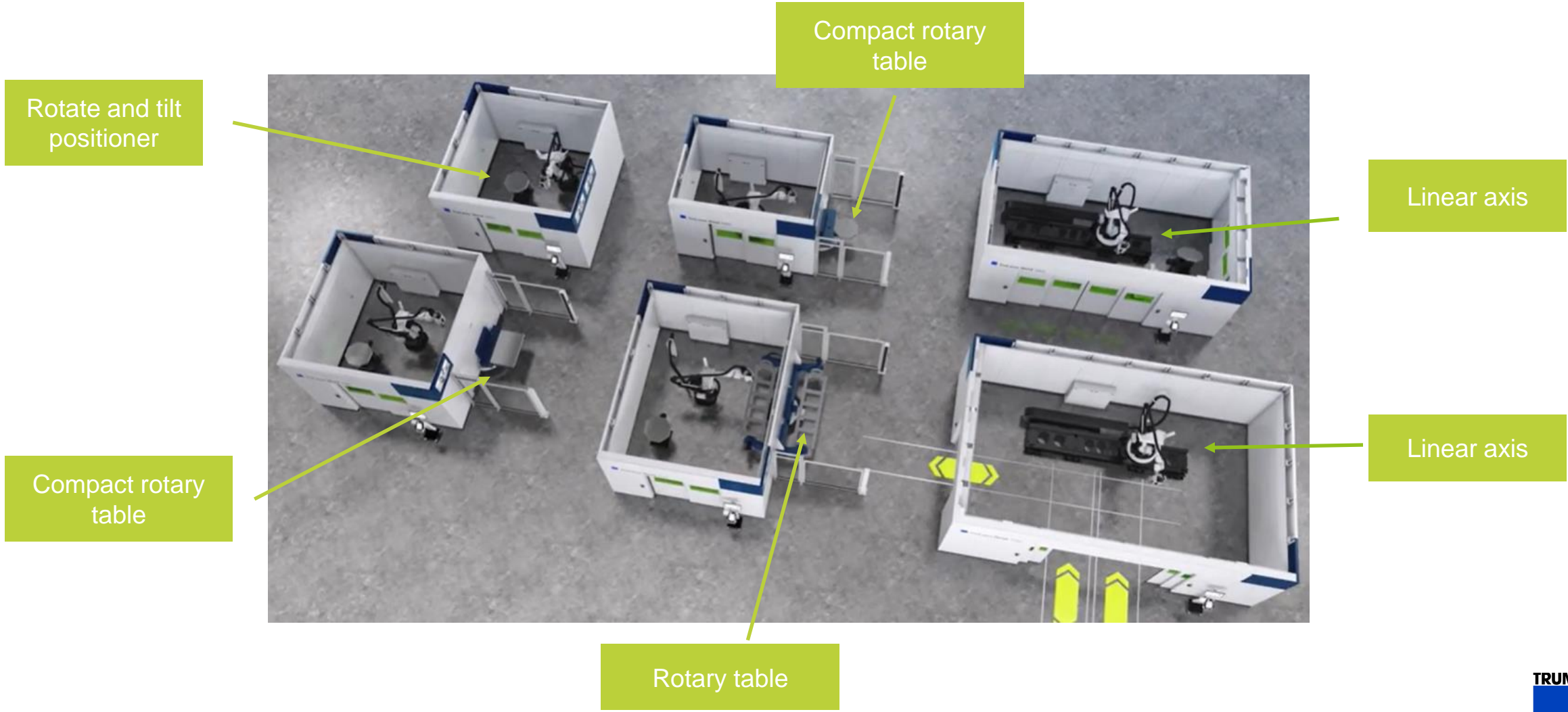
The TruDisk solid-state laser offers ...

- ... a stable laser concept proven thousands of times over
- ... a construction that is insensitive to back reflections
- ... the option to have special machine layouts



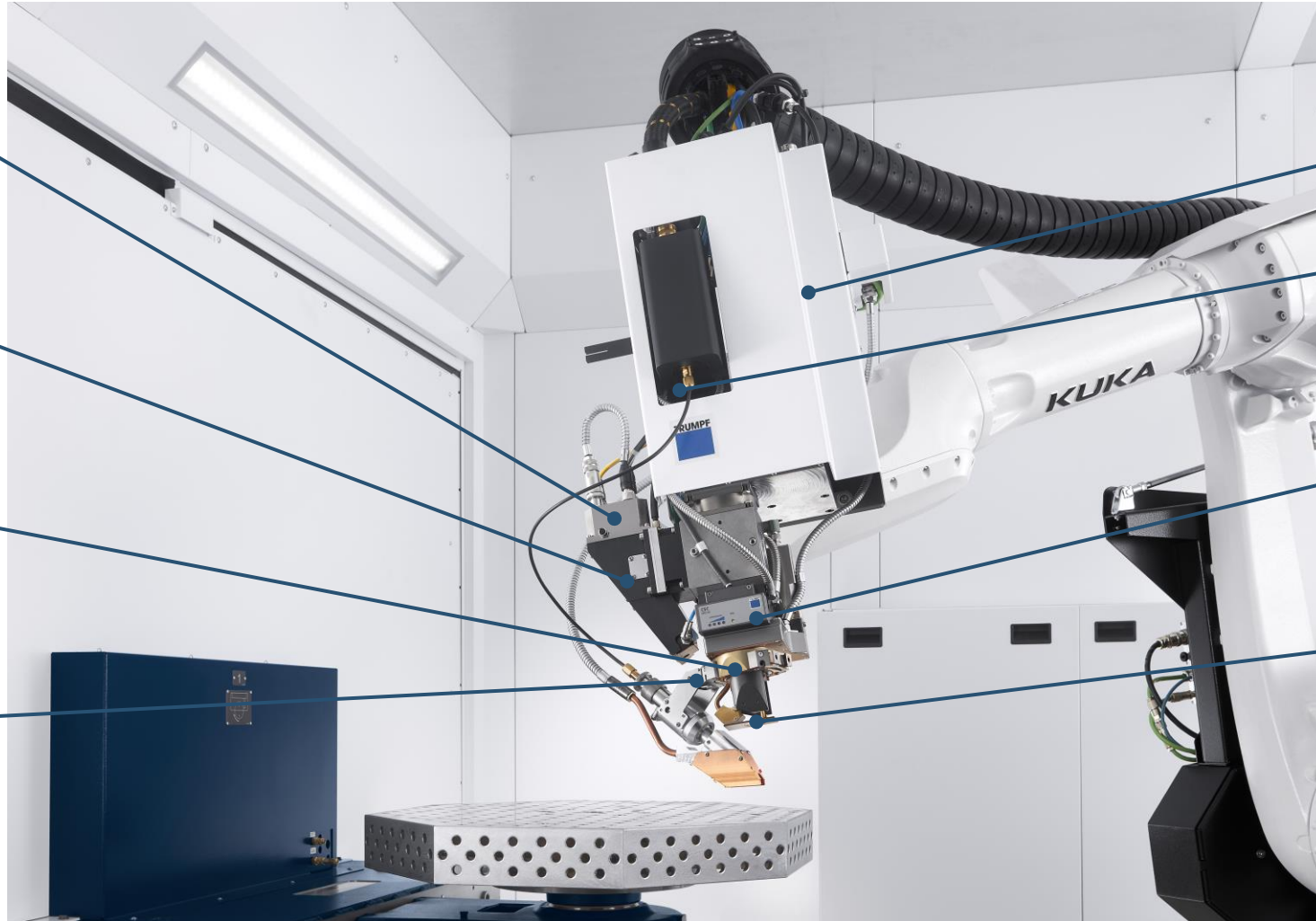
Customer specific configurations

One machine – many versions



Welding optics

Swiss army knife of laser welding



TeachLine

Camera for monitoring the welding process

Rotary module

Interface for:

- Linear nozzle
- Perlator nozzle
- FusionLine combi nozzle

Motorised focus adjustment

FusionLine

Protective gas monitoring

Crossjet

BrightLine Scan

Flexible and robust



BEO D70

Focus area

30 mm

Scanning properties

No scanning function



PFO SF – 20 HA

Focus area

No defocusing

Scanning properties

2700 Hz, $\pm 0,1$ mm

500 Hz $\pm 4,5$ mm



BrightLine Scan Welding Head

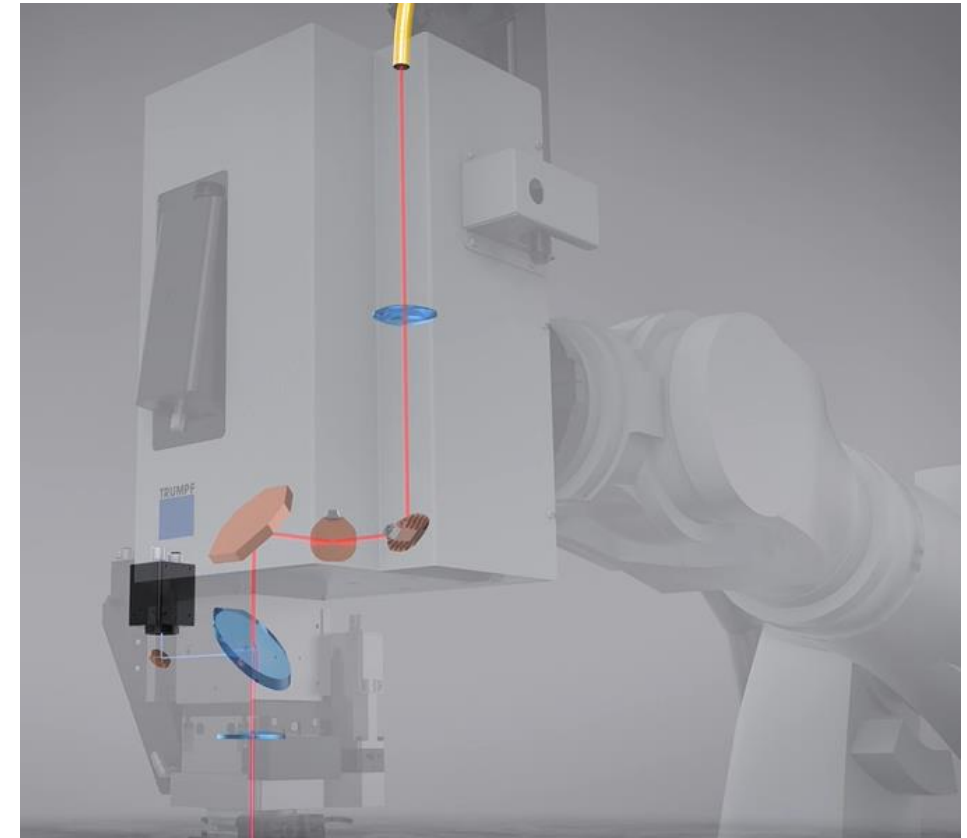
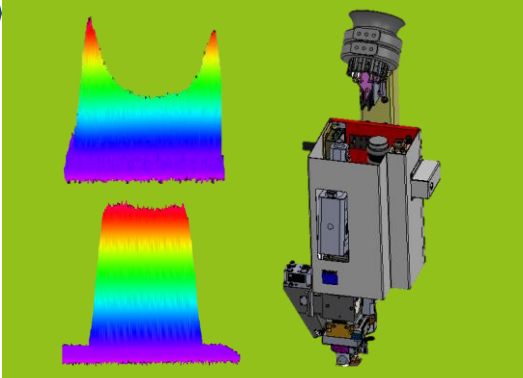
Focus area

-10 mm to +55 mm

Scanning properties

500 Hz, $\pm 4,5$ mm

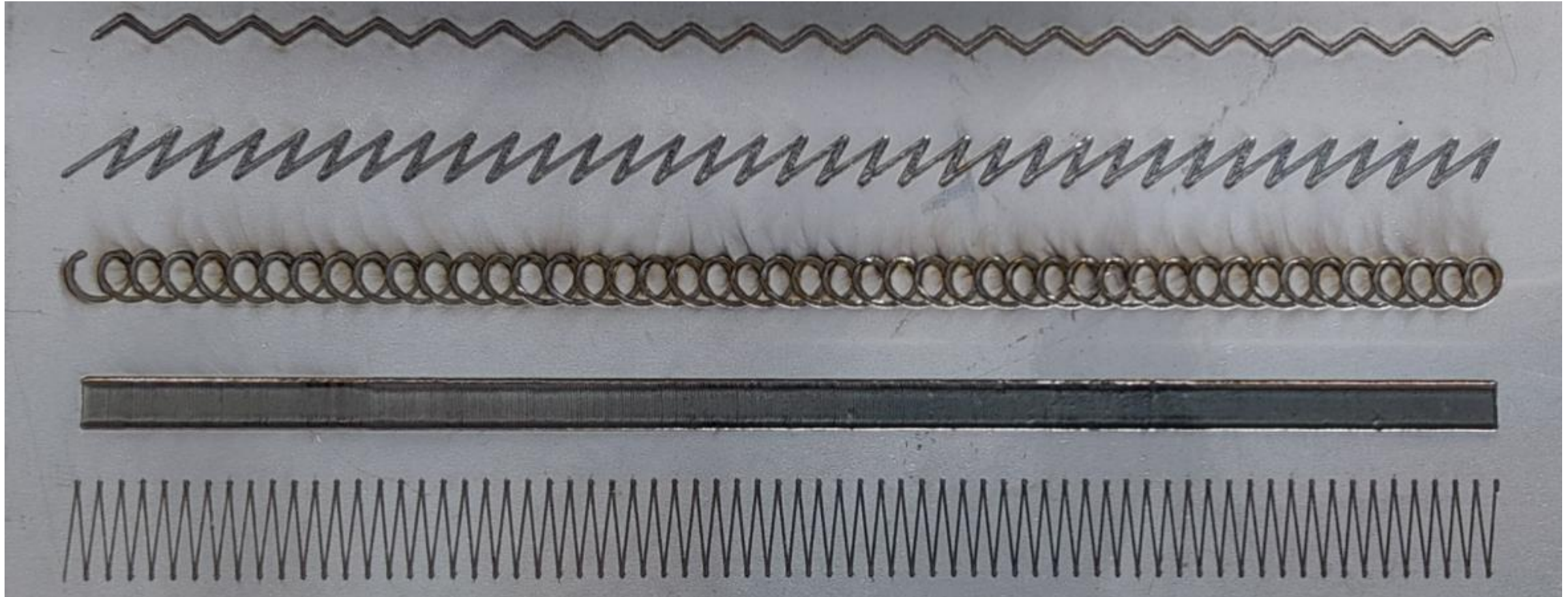
2700 Hz, $\pm 0,1$ mm



» The new optics combines the advantages of previous processing optics and thus expand the range of applications

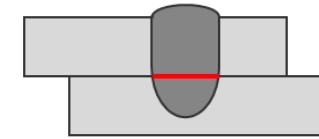
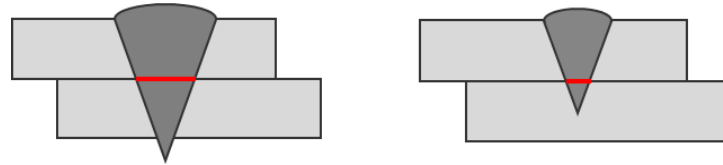
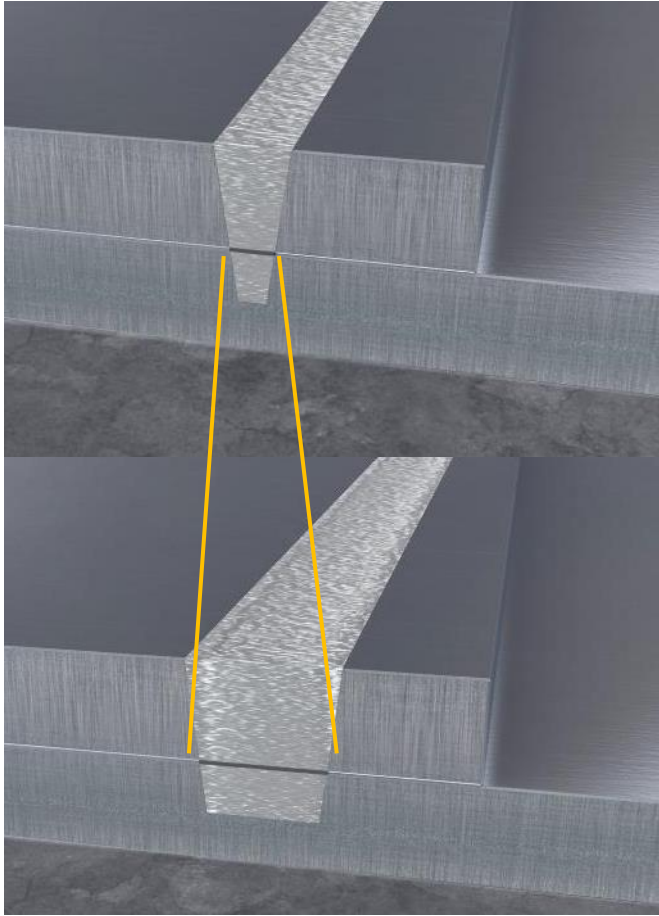
Brand new: Scan function with the PFO SF - 20 HA

Almost any freedom of scan contours in high frequency

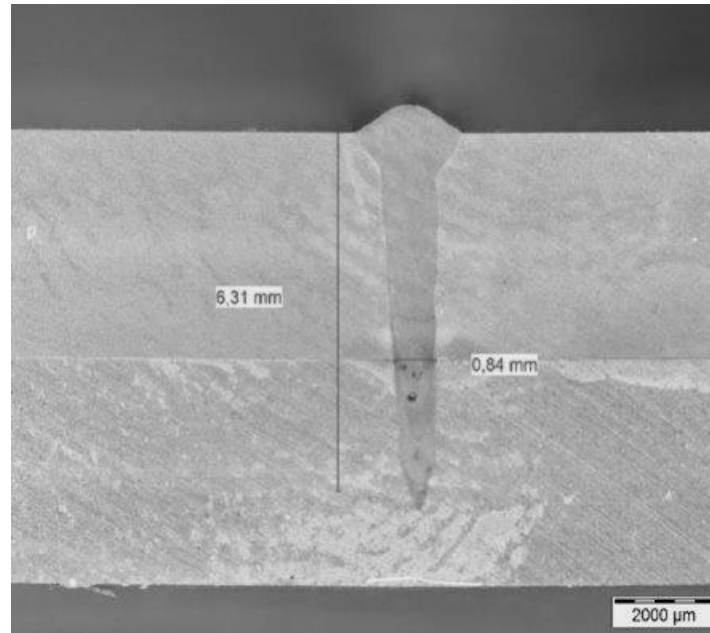


BrightLine Scan - many advantages

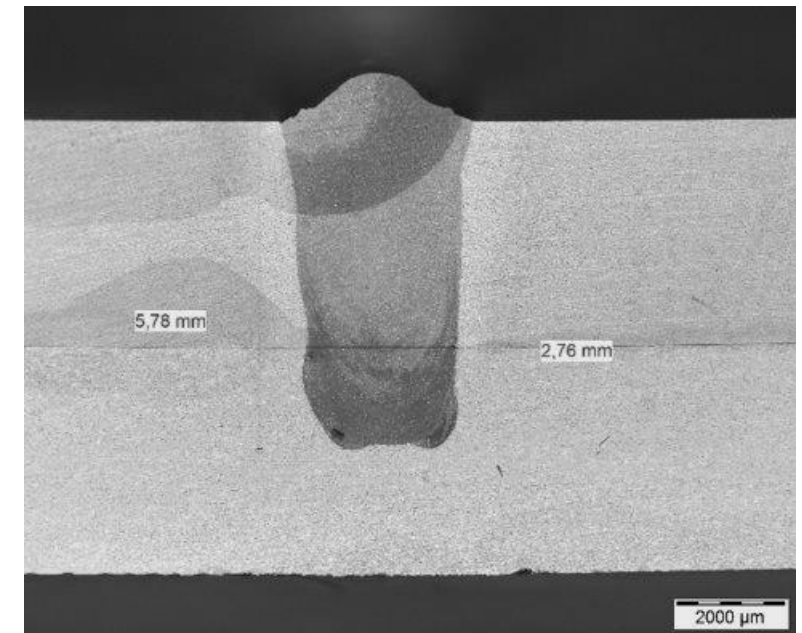
Seam width and tie-in cross-section adjustable



Stronger connection for lap seams



Deep welding without BrightLine Scan
(P = 6000 W; v = 8 m/min; z = 0 mm)

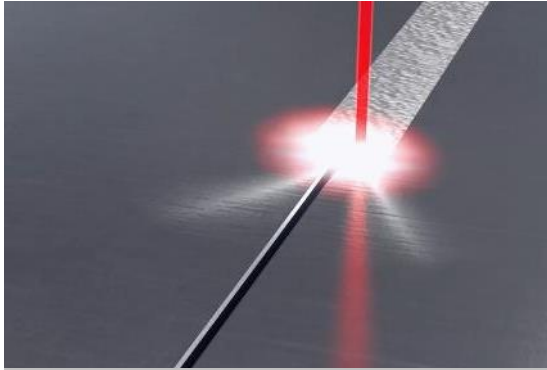


Deep welding with BrightLine Scan
(P = 6000 W; v = 4 m/min; f = 500 Hz; A = 1.2 mm,)

P = 6000 W; v = 4 m/min; z = 0 mm; f = 500 Hz; A = 1.2 mm

BrightLine Scan - many advantages

Higher tolerance



- Greater gap bridgeability without additional material
- Uneven edges better weldable
- Non-ideal corners (without 70% overlap) rounded

Earlier:

- Such corners were weldable only with filler wire.
- Alternatively, a laser-compatible redesign was necessary

Today:

- Thanks to the adjustable seam width, BrightLine Scan can also weld such components without reshaping and without wire.

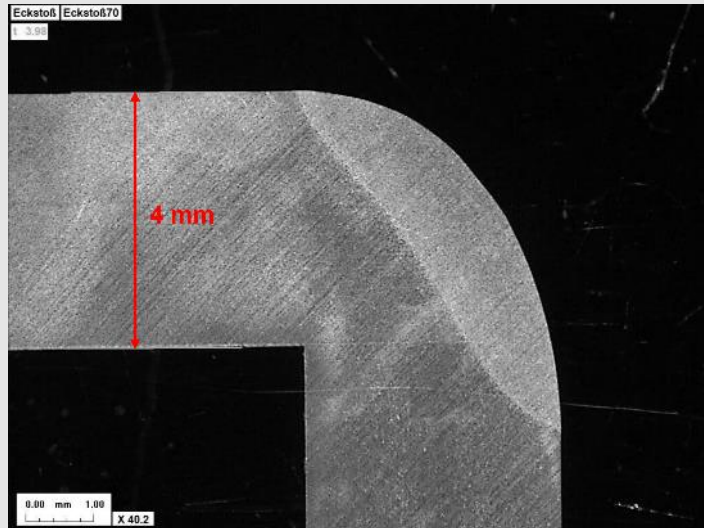


Components that were previously only weldable with wire are now also possible without.

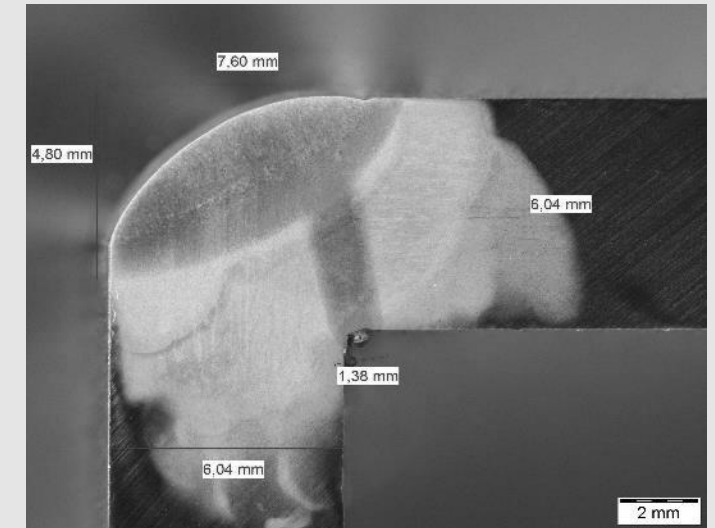
BrightLine Scan - many advantages

Higher plate thicknesses for heat conduction welding

Up to 4 mm sheet thickness as standard pitch sets in mild steel, stainless steel and aluminum



Successful extreme test:
6 mm sheet thickness VA

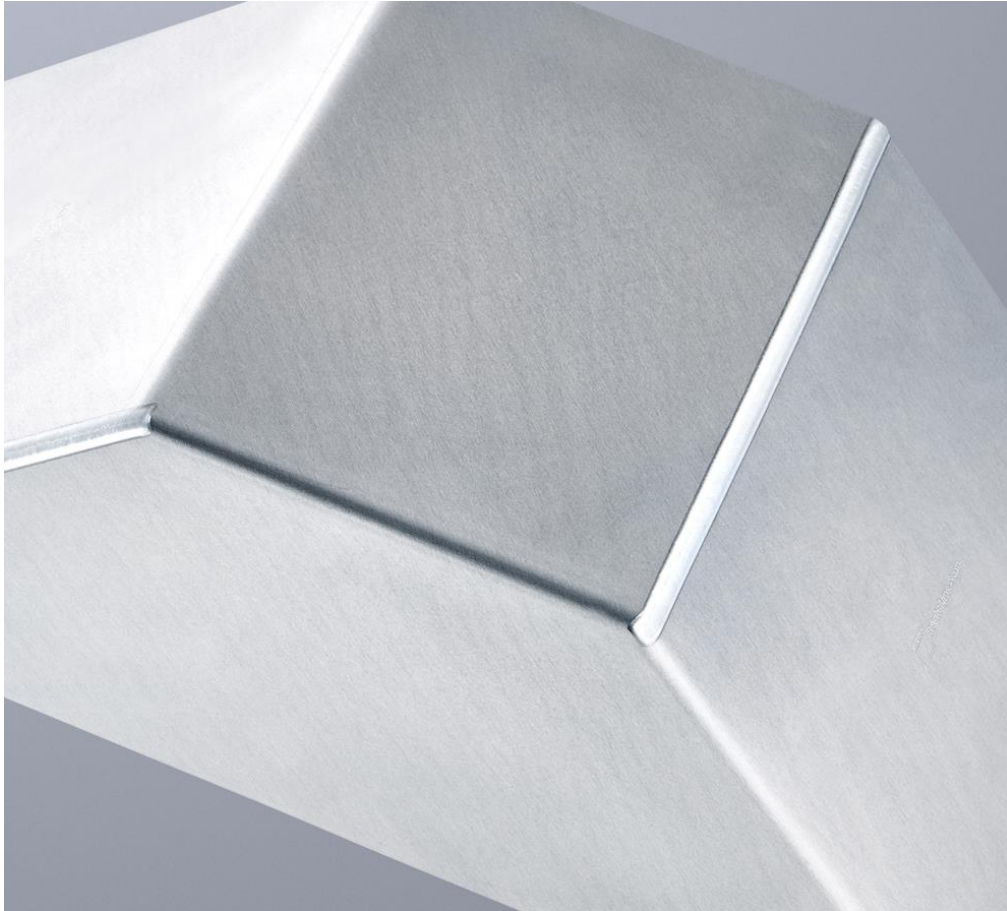


A huge leap compared to without BrightLine Scan.

(In the past, 3 mm in stainless steel and mild steel and 2.5 mm in aluminum was the limit. Today, there are standard parameters of up to 4 mm for all three materials.)

BrightLine Scan – many advantages

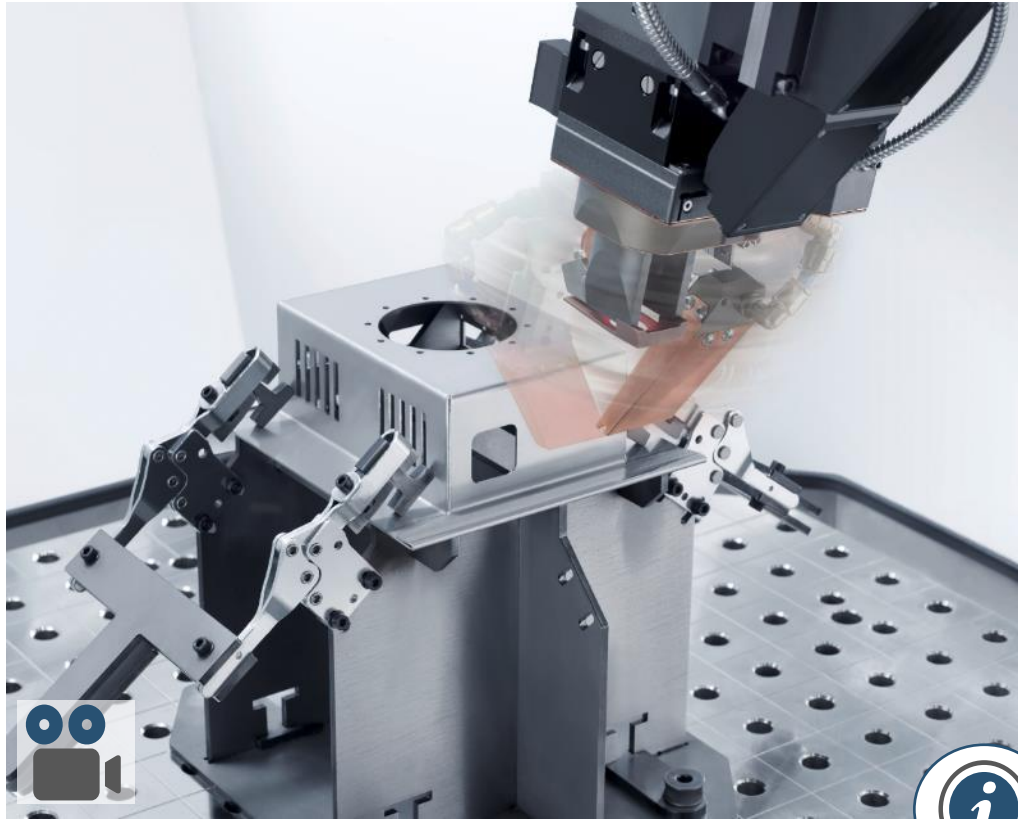
Corners $\neq 90^\circ$ process-safe weldable



BrightLine Scan welds even difficult geometries with process reliability.

Rotary module for shield gas guidance

Laser welding independent of direction



Would you like ...

- ... better accessibility for more complex components?
- ... simpler clamping system?
- ... faster programming and welding?



The rotary module offers ...

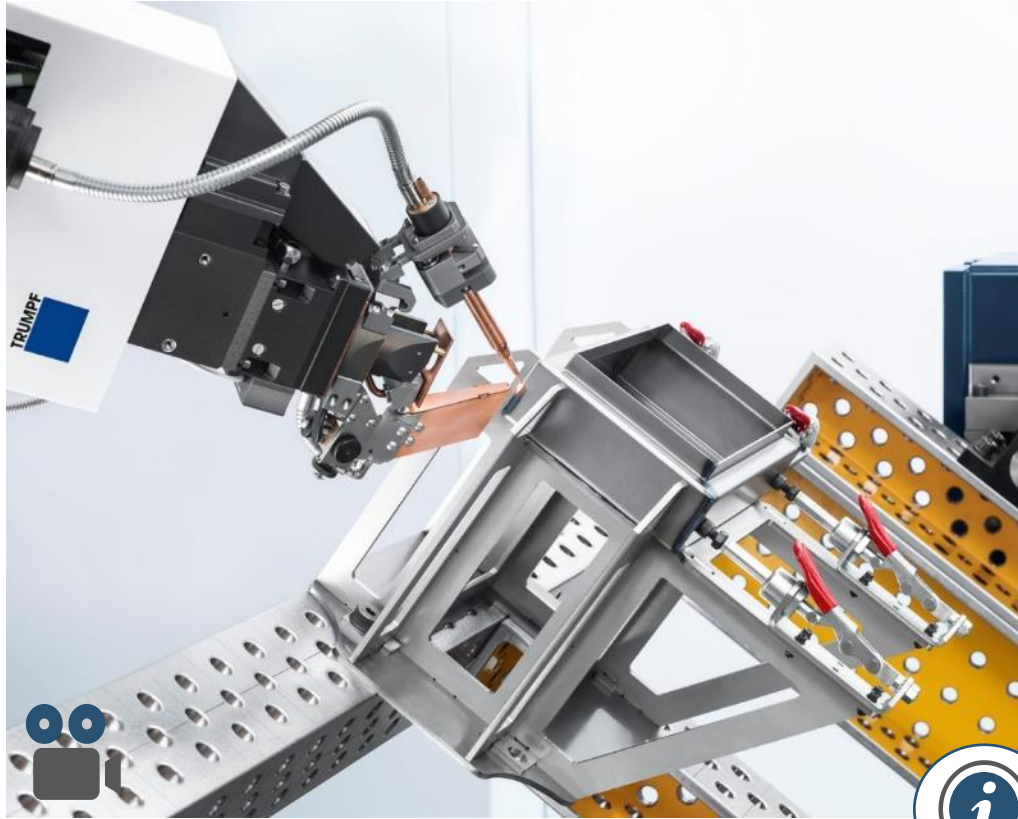
- ... a shielding gas nozzle rotating steplessly around the optics
 - This means less reorientation of the robot is required: programming is easier, especially with more complex geometries, and you weld faster



With the rotary module for shield gas guidance, the nozzle can rotate 360° around the optics

FusionLine

Tolerant laser welding



Would you like ...

- ... to close gaps up to 1 mm in width?
- ... to weld components that are not designed for laser welding with the laser?
- ... to use the full flexibility when welding with your system?



The FusionLine function offers ...

- ... a perfectly harmonized combination of laser, beam guidance, optics and welding wire supply
- ... rotatable welding wire supply and slender ring focus
- ... a parameter collection for common materials and data for the optimal startup and shutdown strategy

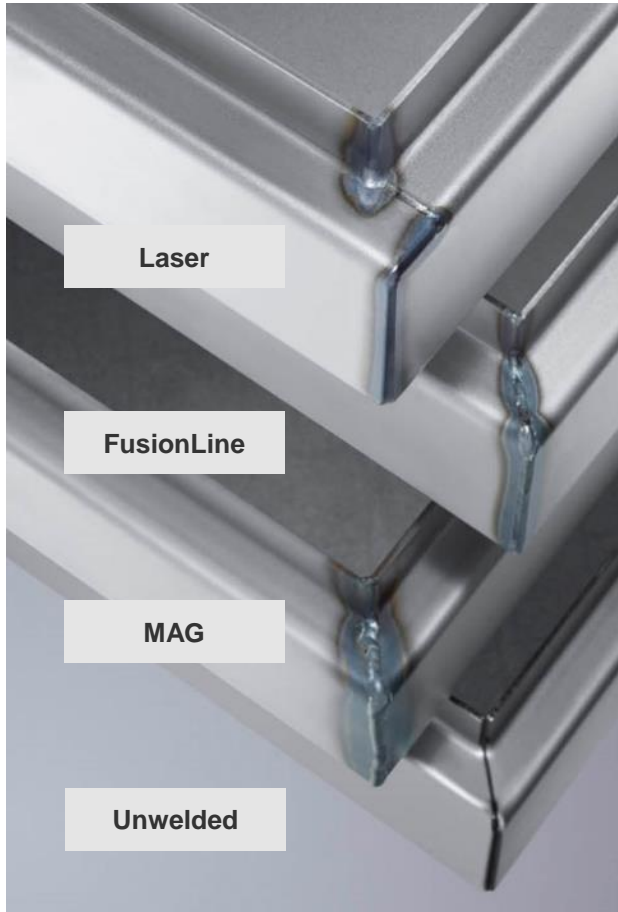


FusionLine forgives inaccuracies that may occur during bending, for example



FusionLine

Technical description (1/3)



Fewer refinishing operations

Seam quality is significantly higher than with arc welding, but not quite as good as with a pure laser weld.

Full flexibility

FusionLine, heat conduction and deep welding, in one part, on one system, without retrofit.

Picture shows terminal boxes made of mild steel (from bottom to top): non-welded, MAG hand-welded, FusionLine welded, redesigned for laser compatibility and laser-welded



Lower requirements

FusionLine forgives inaccuracies. In many cases you can, therefore, save yourself the redesign for laser compatibility.

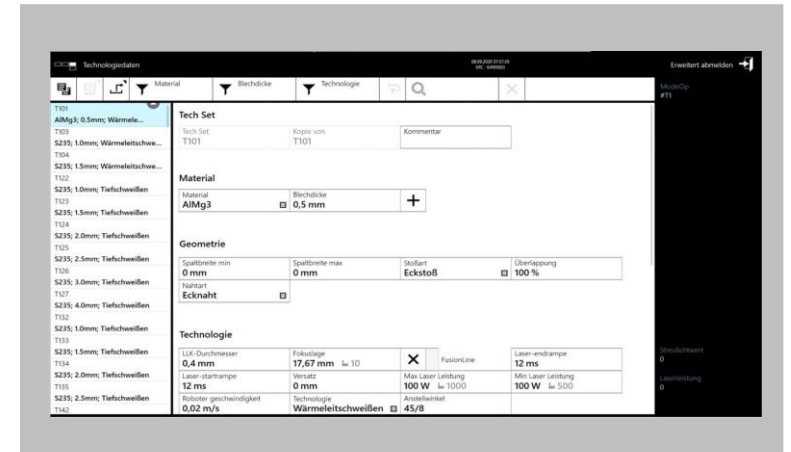
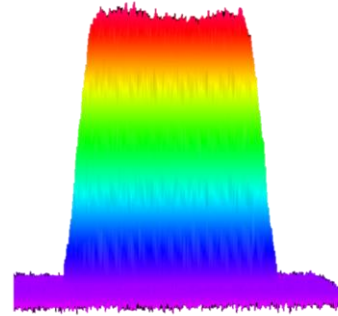
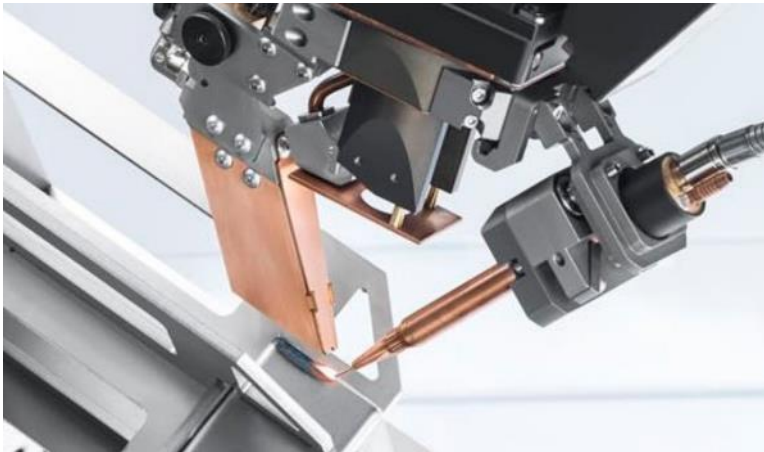
→ Higher capacity utilization

This allows you to produce significantly more components according to drawings than without FusionLine with the laser.

FusionLine

Technical description (2/3)

What's behind FusionLine?



- Optimized and rotatable wire feed
- Synchronization of wire behavior and path motion

- Intensity distribution matched to the welding wire with the scanner
- Safety during wire melting and energy input

- Parameters for common materials
- Data for optimum start-up and shut-down strategies

TeachLine

Improvement of process quality and stability



1/3: Segment Edge parameters

Edge polarity	Any	Edge criteria	Strongest	Edge threshold	10.0	-	+
Edge smoothing	1.0	Angle tolerance	10 degrees			-	+

Matching up the real world with the virtual world and automatic correction of the program with TeachLine

Would you like ...

- ... precise and repeatable welding?
- ... to reduce the effort for reteaching?
- ... to visualize the welding process optimally?



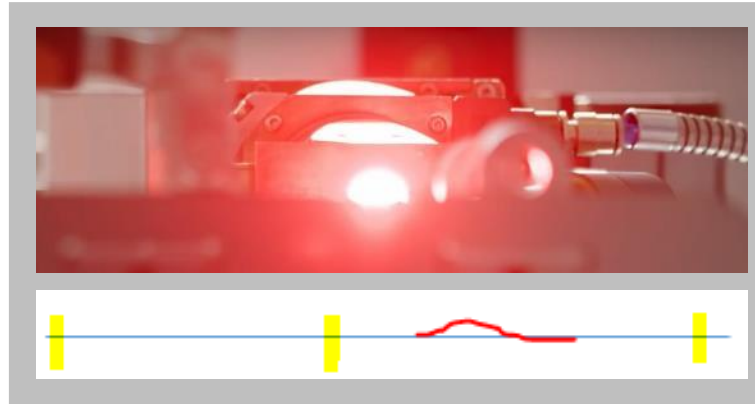
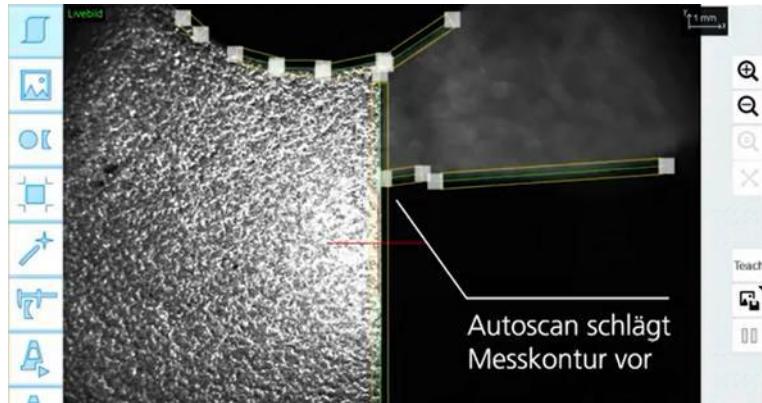
The TeachLine function offers ...

- ... a measuring sensor system for recording the actual position of the component and subsequent correction of the program
- ... a second line laser for direction-independent measurement
- ... intuitive operation that guides you through the program step by step
- ... a high-quality camera system and filter for optimal welding process visualization



TeachLine

Technical description (1/1)



Programming

- Define 3 measuring points
- Step-by-step operation or autoscan provide support with selecting the measuring point and measuring parameters

Measuring and position correction

- Robot moves to the 3 defined positions, TeachLine measures and adapts the program

Important: TeachLine only corrects the position of the component/path. The function does not detect possible inaccuracies within the component/path.

Other advantages

- Significantly better welding process visualization due to high-quality camera and filter
- Direction independence for measuring and teaching with a second line laser

Oseon – Work flows - Option

Create your perfect flow



Machine operator

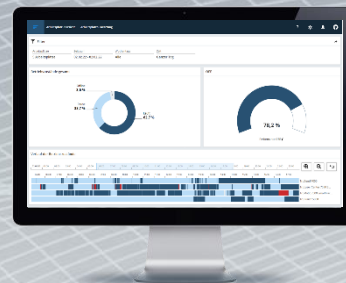


Production manager

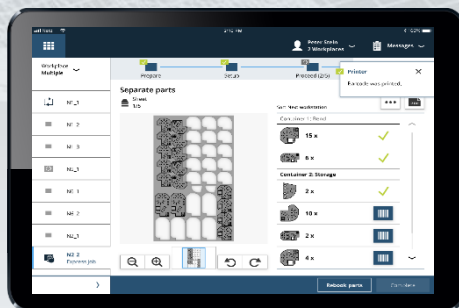


Warehouse staff

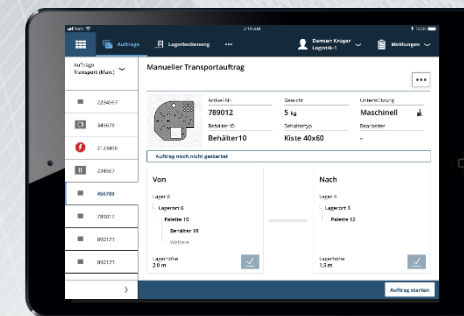
Analytics



Fabrication

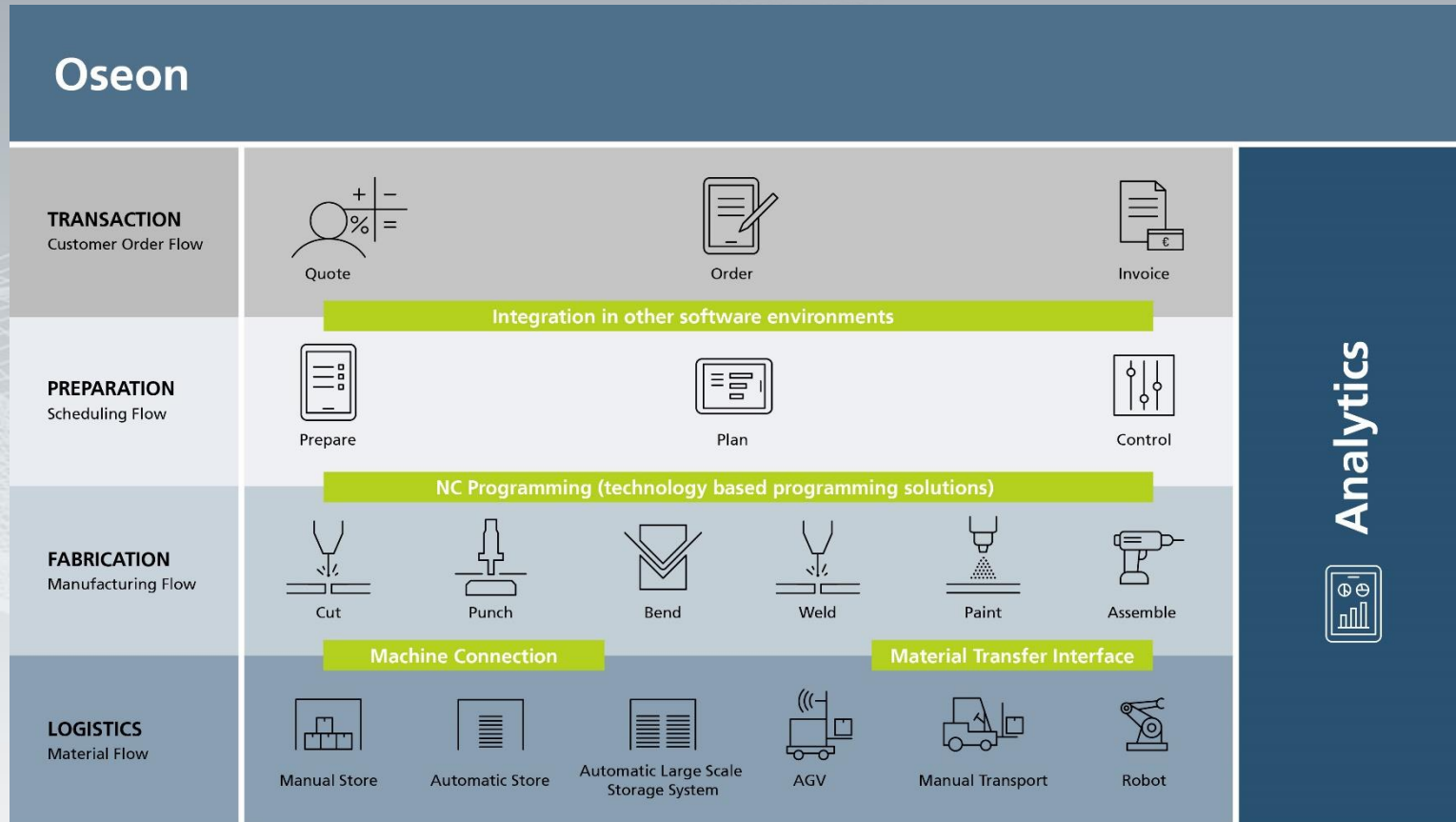
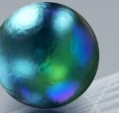


Logistics



Oseon – Work flows - Option

Create your perfect flow



Analytics



TruTops Weld

Faster programming, parallel production



Would you like ...

- ... less non-productive time on the machine?
- ... to create the finished program faster?
- ... to use employees according to their strengths?



The TruTops Weld programming software offers ...

- ... an offline programming system with which you can create programs on the computer while the machine is producing
- ... automatic calculation of the path motion
- ... integrated TRUMPF technological expertise and ingenious functions to make the job easier
- ... a virtual image of your machine and optics for programming and testing complex components

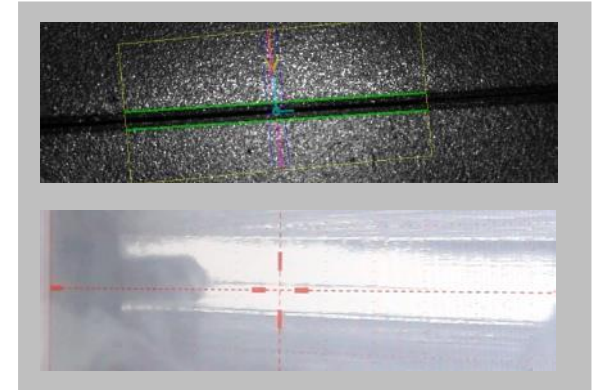
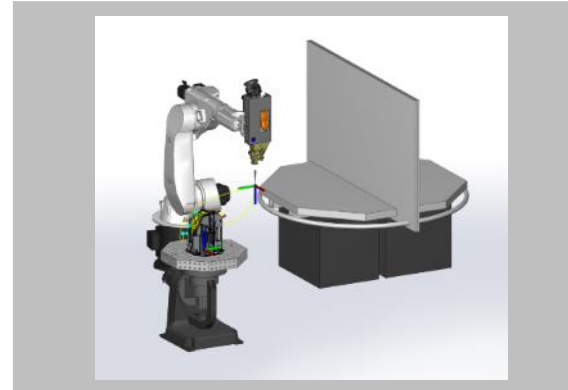
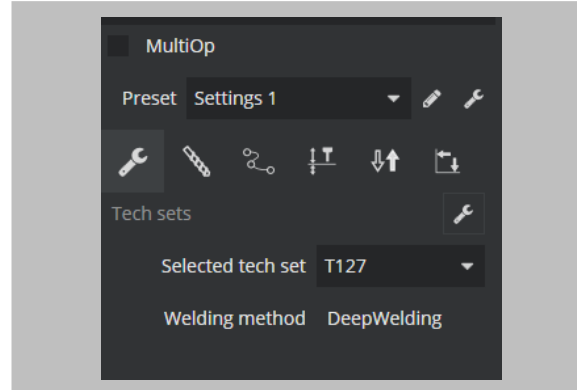
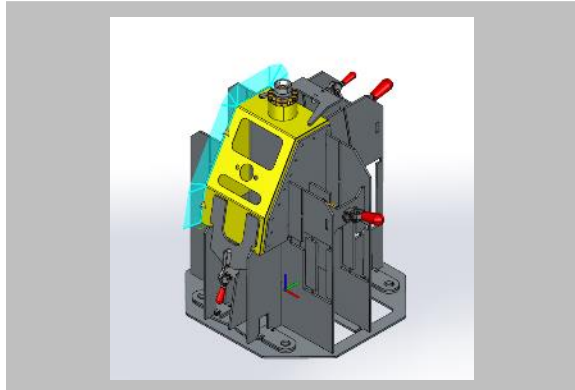


With TruTops Weld, you simply create the welding program offline on the computer



TruTops Weld

Technical description



Create welding path

Load the component and mark the seams to be welded.

Select parameters

Take the parameters that match your material and desired results from the integrated TRUMPF database or add your own.

Define component position

Place the component on the desired workpiece positioner and have the robot's movement calculated. In the event of collisions, simply adapt the program.

Bring to the machine

Download the program to your machine and test it once. For further parts you can use TeachLine, which detects the actual position and adapts the program accordingly.

Laser welding design

Workshop, seminar or consultation



Learn the basics of laser welding design from the sketch to the solution

Would you like ...

- ... to design laser welded parts economically?
- ... to exploit the full potential of the laser compared to conventional welding processes?



The offers for laser welding design offer ...

- ... seminars for learning the general design rules
- ... 2-day workshops for individual consulting and solutions for your components
- ... individual parts consulting on a daily basis



Fixture design

Workshop, seminar or consultation



Learn the design and construction rules for sheet metal fixtures

Would you like ...

... to design inexpensive fixtures from sheet metal?



The offers for fixture design offer ...

- ... seminars for learning the general design rules
- ... 2-day workshops for individual consulting and solutions for your components
- ... individual parts consulting on a daily basis





A screenshot of the WeldGuide website interface. The top navigation bar includes icons for home, Basics, Example parts, and Configurator. A sidebar on the left lists categories: Seam geometries, Part design, and Fixture construction. The main content area displays five welding types with images and descriptions: Heat conduction welding, Deep penetration welding, FusionLine, Lap seam, and Fillet seam.

Do you require information...

- ...about laser weldable part design?
- ...for the implementation of your fixture technology for laser welding?
- ...for the laser welding application?



The WeldGuide offers ...

- ...clearly categorized information for component design, fixture technology and possible seam geometries
- ...detailed descriptions with pictures.
- ...direct reference to practical examples of laser welding.



weldguide.trumpf.com



TRUMPF TruLaser Weld - A winning connection

Gert van Wakeren

Sales Engineer / Account Manager Laser Technology

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Technical data TruLaser Weld 5000 (LR03)



Machine and laser

	TruLaser Weld 5000 (LR03)
Handling system	
Type	High-Accuracy-Robot
Number of axes	6
Repeatability	± 0,05 mm
Welding cabin	
Possible dimensions	4800 x 3650 x 3215 mm 4800 x 4800 x 3215 mm 4800 x 5950 x 3215 mm 5950 x 4800 x 3215 mm 5950 x 5950 x 3215 mm 7100 x 4800 x 3215 mm 7100 x 5950 x 3215 mm 8250 x 4800 x 3215 mm 8250 x 5950 x 3215 mm 9400 x 4800 x 3215 mm 9400 x 5950 x 3215 mm
Max. work area/typical max. component size // loading	
Rotate and tilt positioner (max. working area)	2000 x 1000 x 1200 mm // 500 kg
Turntable (max. working area height / ø // loading per side)	1150 mm / 2350 mm // 250 kg
Compact rotary changer (max. working area ø / height // loading per side)	1500 mm / 1250 mm // 600 kg
Rotary changer (max. working space length / ø turning barrel // loading per side)	2600 mm / 1200 mm // 750 kg
Turning positioner (max. working area length / ø turning barrel)	4000 mm / 2000 mm // 1000 kg
Laser	
Available lasers	TruFiber 3001, 4001, 6001 and TruDisk 8001