

**TOP FORM!**

■ **DEPOSIT WELDING** ■ **LASER** ■ **ROFIN**

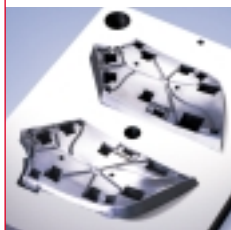


WE  
THINK  
LASER

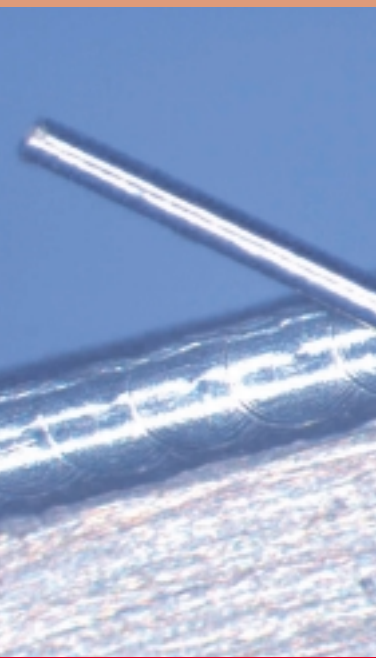
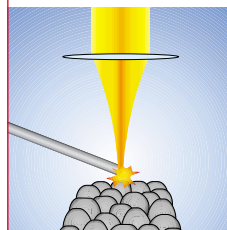
Crack-free deposit weld on tool steel



Molds of all sizes can be welded with the the StarWeld Tool Open



Layers or surfaces are welded with a filler wire with high precision – layer by layer



Deposit welding with filler wire

Deposit welding along an edge without modification of the basic structure

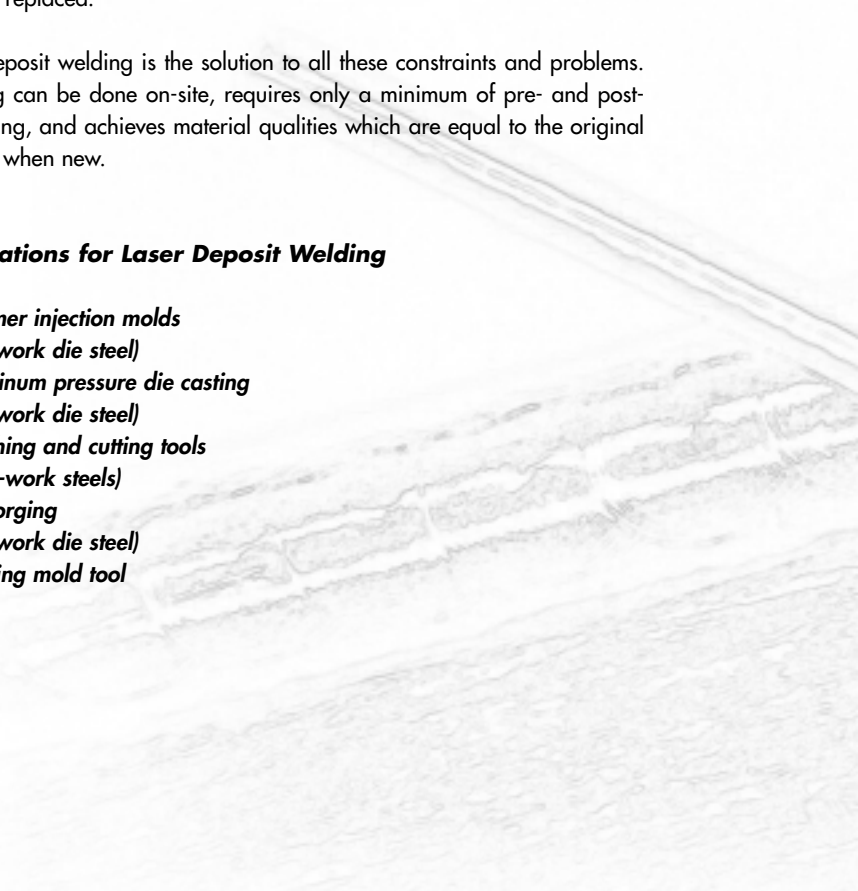
## As good as new

Forming, punching or die casting tools are exposed to great strain every day. Over time, wear, tolerances or damage are inevitable. Conventional repair methods are time-consuming and costly. Distortion, softening and crack formation limit their applicability. And frequently the final results do not meet the high quality standards of the tool and mold making industry. Components, which have been produced in a refurbished mold, may even fail the strict quality tests performed by the end customer. As a frequent result, the mold must be replaced.

Laser deposit welding is the solution to all these constraints and problems. Welding can be done on-site, requires only a minimum of pre- and post-processing, and achieves material qualities which are equal to the original product when new.

### Applications for Laser Deposit Welding

- **Polymer injection molds**  
(Hot-work die steel)
- **Aluminum pressure die casting**  
(Hot-work die steel)
- **Punching and cutting tools**  
(Cold-work steels)
- **Die forging**  
(Hot-work die steel)
- **Blowing mold tool**

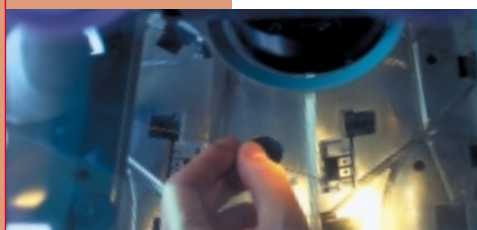


Wires with a diameter down to 100 microns can be welded

Surface deposit welding, welding on an inside edge



Deposit welding



Surface deposit welding

## A cost-effective investment

Save yourself the laborious, time-consuming and cost-intensive transport of tools for repairs. Reduce unproductive down times of your machines. Be quicker to respond to design modifications. And last but not least, establish a new and seminal field of competence in your own company. As experience has shown, a deposit welding laser system already amortizes after one or two years, even if only used occasionally. We'll gladly do a detailed economic calculation for you and prepare a customized financing or leasing plan.

## Fast and simple

The laser beam welds a hand-guided filler wire on to the workpiece with great accuracy and high strength. Wires with a diameter as small as 100 microns can be processed. Clear evidence of the unrivaled high accuracy of this technology: A small heat-affected zone, rapid heating and cooling, exact control of the beam power via pulse shaping – all these factors induce only a minimum thermal load on the workpiece. Even with crack-sensitive material the mold does not need to be pre-heated.

Processing is spot-accurate, even in tight geometries or difficult to access places or gaps. The unique patented tilt-adjustable optical system lets you work on vertical surfaces without rotating or tilting the mold. The accuracy of laser deposit welding saves complex post-processing with a milling machine. In many cases a simple finishing of the seam is sufficient, e. g. with a drawing die.

### Process Advantages

- **Tools and molds are returned to mint condition**
- **On-site repairs, minimal post-processing**
- **Reduced down times**
- **Welding of wires with diameters as small as 100 microns**
- **Processing of difficult geometries**
- **Low heat input**
- **Low risk of distortion, crack formation or softening**
- **Processing of high-alloy tool steel**
- **Quick response to design modifications**

TIG welds are significantly wider and show fusion penetration notches which require extensive post-processing

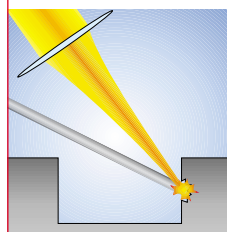
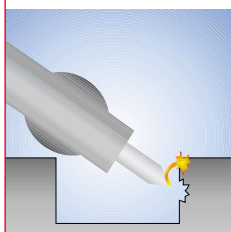
With TIG-welding arc movements might occur which do not allow welds near interfering contours or in small cavities

Only laser welding allows accurate welds even near interfering contours or in small cavities



Laser Weld

Laser welds are considerably finer and require much less post-processing



## Perfect Quality

Laser welding can handle base materials of up to 64 HRC. Lasers repair damages, locally improve wear resistance and correct production defects with a quality that can only be achieved with laser deposit welding. The micro-structural transformation is much less than with other technologies. Through the use of filler materials with a high melting point, significantly better layer properties are obtained.

Laser deposit welding guarantees high-quality repairs, approved by customers because of the high standards of laser welding.

### ***Laser Deposit Welding vs. TIG- and Micro Plasma Welding***

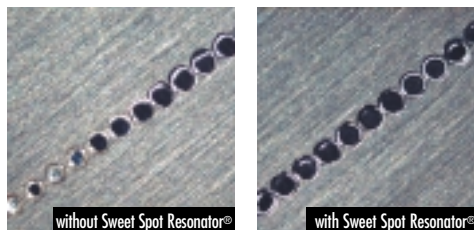
- ***Low fusion penetration***
- ***Spot-accurate***
- ***Laser welding of base materials of up to 64 HRC hardness***
- ***Simple post-processing***
- ***No distortion***
- ***Low heat-input***





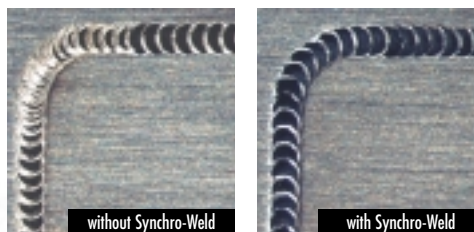
#### StarWeld Tool Family

From the left: StarWeld Tool Open for on-site repairs of molds of any size; StarWeld Tool Integral for workpieces of up to 350 kg; StarWeld Tool Performance, our most compact model



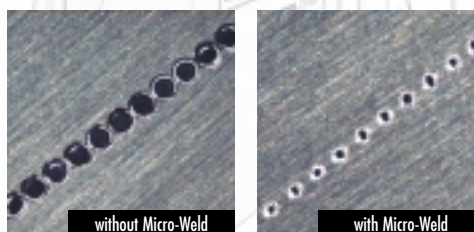
#### Sweet Spot Resonator®

The patented Sweet Spot Resonator® provides a constant good beam quality. This makes for a "tolerant" welding process in which varying material qualities or a small deviation from the z-focus are being compensated. Many applications like welding of thin wires or highly reflective materials can only be achieved through the Sweet Spot Resonator®.



#### Synchro-Weld

The Synchro-Weld function makes for a consistent spacing of weld spots in a set curve. This is achieved through the adaption of the weld spot sequence to the speed of the controlled axes. This guarantees a constant high quality of the weld seam.

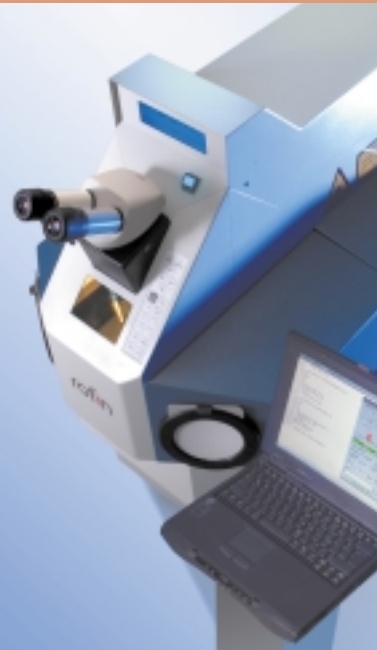


#### Micro-Weld

Conventional manual welding tools typically have a minimum focus diameter of about 0.3 mm. Special applications like welding of extra thin wires need a much smaller focus and very high precision. The Micro-Weld module developed by ROFIN can create a focus spot of less than 0.1 mm. The Micro-Weld option can be conveniently toggled through a switch. It allows welding wires of 40 µm repeatably in consistently high quality.

StarWeld Tool Integral – a manual laser welding tool with a motor-driven cross table for molds of up to 350 kg

StarWeld Tool Open – a unique weight-compensated cantilever system conveniently positions the laser over the workpiece



StarWeld Tool Performance CNC

Simple programming allows high-precision welding of small series



## Laser Systems for the Tool and Mold Making Industry

### StarWeld Manual Performance CNC

ROFIN has equipped the StarWeld Manual Performance – the market leading manual laser welding tool – with up to three CNC controlled axes and an optional swivelling axis. A very compact, highly precise system of excellent price-performance ratio. It combines the advantages of CNC technology with the convenient usability of a manual laser welding tool and involves minimal set-up and programming time. With StarWeld CNC you can process workpieces of up to 400 mm x 200 mm x 100 mm (LxWxH) with a repeat ability of less than 20 µm. What's more, without changeover time the system can be used as a manual laser welding tool.

### StarWeld Tool Integral

With its large swing doors and the sturdy and precise motor-driven cross table, the StarWeld Tool Integral can take workpieces up to 50 cm long and weighing up to 350 kg. This allows processing of large molds and tools. As an option, by leaving the large doors open, the StarWeld Tool Integral can be transformed into an open laser class IV work station for oversize workpieces. The StarWeld Tool Integral is also an all-in-one device, without external units for cooling or beam generation. The system can be equipped with a crane loading option.

### StarWeld Tool Open

The new StarWeld Tool Open brings mobile laser welding to perfection. Instead of dealing with time-consuming dismantling of large tools and molds you can now do repairs on site. The weight-compensated cantilever system with a reach of of 1.70 m and a maximum working height of 1.80 m should be sufficient even for the largest workpieces. During the welding process the system is controlled via joysticks from a removable control. Axes-control is facilitated by the alignment of the axes with the workpiece and can then usually be restricted to only one axis. Motorized focus adjustment from 0.4 to 1.6 mm and pulse shaping give additional flexibility to weld seam formation.

CNC laser welding with a brief "teach in" – StarWeld Performance CNC

The patented swivelling optics allow welds on undercuts – StarWeld Tool Integral



Micro axes – StarWeld Tool Open



Monitoring via a LCD screen or an optional microscope – or a combination of both – is possible. The axes system swivels on a ball joint

## Flexible and industry-proven

### CNC laser welding

A CNC controlled laser is not profitable? CNC is too complex for a small production lot? For typical lot volumes of 10 to 1,000, the investment in a CNC controlled laser system is often eschewed because operation is perceived as too complex and time-consuming. Not so with the StarWeld CNC line, where operation is exceedingly simple: The operator can use the mouse or cursor keys to jog the axes manually, thus quickly teaching the desired contours. Drawings can be imported or created via the CAD system and fed into the axes control system. Direct CNC programming is also possible. All programming methods can be combined to allow, for example, for later adjustments of programmed paths.

### Swivelling optics

With the patented swivelling optics of the StarWeld Tool Integral you can process even complicated workpiece geometries. The optics allow for the laser beam to swivel freely along two axes. Vertical surfaces, undercuts, deep grooves and other areas that are usually difficult to access can be now reached without rotating or tilting the workpiece – a decisive advantage especially for large and heavy molds or tools.

### Micro axes

With the motor-driven micro axes of the StarWeld Tool Open at the end of the articulated arm, you can accomplish a precision as yet unheard of. The optimized positioning geometry lets you process, for example, wires of 200 µm with welding widths of 400 µm. The quality of the weld minimizes post-processing considerably, making your repairs even more profitable.

ROFIN combines the advantages of a worldwide leading laser producer with professional competence in our customers' industries. At all times we have been engaged in the development not only of laser sources but also of complete turnkey laser systems for a variety of application areas. The first compact system for applications in the crafts industry was developed by ROFIN/Basel Lasertech. With more than 4,000 units in the field we are the market leader for manual laser welding systems.

In cooperation with various partners in the tool and mold making industry, we not only offer lasers but also complete solutions. Consulting in the metallurgic field, or sampling in our application laboratory – laser competence and application know-how are our first priority.

ROFIN laser systems are highly regarded as ergonomic and ready-to-use tools all over the world. The tight service network guarantees quick on-the-spot support. Our position as a global laser manufacturer with extensive know-how and competence allows us to offer optimized solutions for many different laser applications: cutting, welding, polymer welding, deep engraving, marking, sintering or hardening.

Ask us! We look forward to helping you!

## SOLUTIONS FROM A SINGLE SOURCE

[WWW.ROFIN.COM](http://WWW.ROFIN.COM)

Carl Baasel Lasertechnik GmbH & Co. KG  
 Petersbrunner Str. 1b  
 D-82319 Starnberg  
 Tel: +49(0)8151-776-0  
 Fax: +49(0)8151-776-159  
 Email: [info@baasel.de](mailto:info@baasel.de)

MICRO

ROFIN-SINAR Laser GmbH  
 Berzeliusstraße 83  
 D-22113 Hamburg  
 Tel: +49(0)40-733 63-0  
 Fax: +49(0)40-733 63-100  
 Email: [info@rofin-ham.de](mailto:info@rofin-ham.de)

MACRO

ROFIN-SINAR Laser GmbH  
 Neufeldstraße 16/Günding  
 D-85232 Bergkirchen  
 Tel: +49(0)8131-704-0  
 Fax: +49(0)8131-704-100  
 Email: [info@rofin-muc.de](mailto:info@rofin-muc.de)

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