

# IMPROBOND

Drähte . Laserbedarf



• LASER WELDING WIRES AND LASER SUPPLY

### . The meaning of LASER:

A laser is a device that emits light (electromagnetic radiation) through a process of optical amplification based on the stimulated emission of photons. The term "laser" originated as an acronym for Light Amplification by Stimulated Emission of Radiation

During the last years, the number of applications for laser welding has grown considerably. The good controllability of laser energy and its exposure time to material, over a wide range of settings, also allows welding of materials with high melting points or high conductivity.



edge repairing

### . Advantages of the laser welding:

- punctual energy input, exactly localised, even in very fine structures.
- limitation of work piece deformation to very slight or none.
- high mechanical strength of welded seams.
- seams are slim and flat, their surface oxide-free.
- non-contact welding without effects of mechanical force on the work piece
- no edge burning
- excellent process control ensures constancy of quality in manufacturing

Whether damage, wear and tear, or change of work piece design, laser welding assists modifications and repairs on moulds and tools, quickly, precisely, and without loss of form.

Only minor finishing is required since the deposit application is similar to the original contour. The laser fusion welding process allows fine energy dosing: Only a small volume of material is melted, thus avoiding tension. Consequently, weldings free of cracks are obtained. In most cases previous warming of the material is not essential. The tensile strength of the basis material can be reproduced by using a selection of filler wires. A subsequent heat-treatment is not necessary. Even copper and aluminium alloys are welded with successful results. And for tool steels it is possible to obtain hardness of up to 60 HRC.

The use of laser is also increasing for welding of thin sheet metal parts.

### . Applications are:

- seams and corner joints on casings
- butt-welding of pipes
- welding of short tubes on smooth sheet metal
- rotation seams on turning parts
- welding seams on junctures

Finishing work, such as sanding or straightening, becomes to a large extent unnecessary, since the high quality seams resulting from welding alone usually meet the optical requirements without finishing work. The use of laser welding technology in mechanical engineering is still in its early stages.



building up of material

### . Applications for repairing are:

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- camshafts, crankshafts
- compressor rotors
- turbine rotors
- gears
- rollers and casing parts

Basis materials that can be processed range from GGG 40 up to extremely heat resistant Nickel based alloys.

Due to the limited heat-affected-zone (only tenths of millimeters), formation of coarse grain does not take place. The properties of the basis material remain preserved after welding. Further advantages are the possibility of welding at room temperature without thermal pre-treatment of the basis material.

Due to their outstanding characteristics, laser welding machines have become an indispensable production tool in medical technology.

Whether in the production of implant-systems, or the manufacture of surgical instruments or endoscopes, the particular properties of laser welding joints and seams are recognized here for their full validity:

- narrow welding seams with high strength
- gas tight bonding of seams
- corrosion-resistant
- porous free with smooth surface, suitable for high-temperature-sterilisation
- biocompatibility in accordance with the basis material

### . Weldable materials:

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- high-alloy cold and hot working steels
- non-alloy ferrous materials
- low-alloy steels
- stainless steel
- steel and cast iron alloys
- bronze, copper alloys
- nickel alloys
- aluminium alloys
- titan alloys
- precious metals such as gold, silver and platinum



circular weld

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table laser welding system

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## Steels — comparison DIN Werkstoffnummer AISI (SAE)

weldable by laser and laser welding wires for these steels and other steels available

| Werkstoff-Nr. | DIN                | AISI (SAE)    |
|---------------|--------------------|---------------|
| 1.2344        | X 40 CrMoV5.1      | H 13          |
| 1.4306        | X 2 CrNi19-11      | 304 L         |
| 1.4307        | X 2 CrNi18-9       | 304 L         |
| 1.4401        | X 5 CrNiMo 17-12-2 | 316           |
| 1.4404        | X 2 CrNiMo 17-12-2 | 316 L         |
| 1.4435        | X 2 CrNiMo 18-14-3 | 316 L         |
| 1.4006        | X 10 Cr 13         | 410           |
| 1.4021        | X 20 Cr 13         | 420           |
| 3.7025        | 17861              | Titan Grade 1 |
|               | ER 4145            | Aluminium     |

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