



Dental Prosthetics

## Laser welding examples

- desktop Compact up to 2024
- desktop Compact from 2024
- Laser Welder SL10

# Laser welding in dental prosthetics.

The welding of small parts and appliances in dental prosthetics demands the same preparation and conditions as general laser welding.

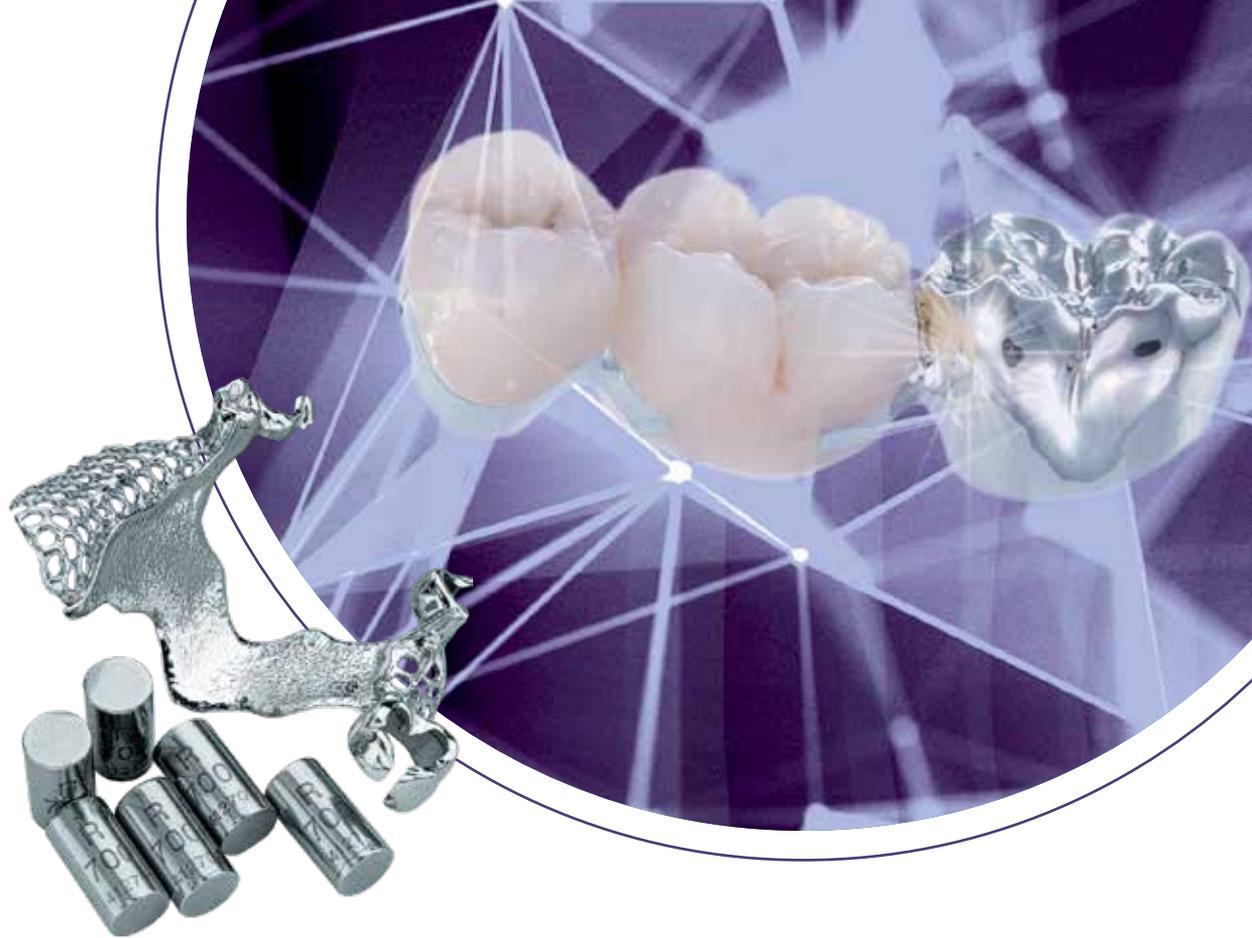
An accurate fit and gap-free preparation of the parts to be joined is essential for the successful welding of, in part, very thick parts (e.g. base plates) to extremely thin parts (e.g. clasps).

To produce a good laser weld in dental prosthetics, the parts must be prepared so that they lie flat against one another. Ideally, the connection seam of the seam to be joined should be ground with a grinding point so that the two seams lie flat against one another. Only then is it possible to join these parts directly to one another without using filler material.

If the parts have no more than point contact, or if there is a slight gap between them, a suitable filler material such as remanium® wire  $\varnothing$  0.35 mm is necessary.

Generally speaking, laser welding should always be carried out under the shielding gas argon in order to prevent oxidation in the weld seam. This gives the weld seam the stability it requires. The welding spots must have a metallic luster.

The various components used in dental prosthetics often have a shiny metallic surface, which may cause the laser beam to be reflected. Because of the elaborate finishing involved, these parts are not usually subjected to sandblasting.



In order to achieve the desired welding result nonetheless, it may be necessary to vary the angle at which the laser beam strikes the point of connection. This means that the welding power has to be adapted to the circumstances in question. Normally, the power is increased individually, and the angle selected in such a way that it proceeds from the **thicker to the thinner** part. To smooth the welding seam, widen the diameter from 0.80 mm to 1.20 mm for the desktop Compact lasers and from 0.80 mm to 1.60 up to 2.00 mm for the Laser Welder SL10. The welding parameters stay the same.

Application examples are described below. The welding parameters vary from situation to situation.

**The following list gives an overview of the welding examples:**

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Laser welding of bar constructions with implant abutment components

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## Example 1

# CoCr partial denture:

Welding a small connector with filler material.



Fig. 1



Fig. 2

### Preparation

The area to be welded is opened to a gap of 0.5 mm using a separating disc. Cast filler material from the carbon-free CoCr alloy remanium® GM 900 (REF 102-250-00) is fitted into the gap. This filler material should be available as wax sheets in thicknesses varying from 0.30 mm – 0.60 mm and as wire in diameters from 0.40 mm – to 0.70 mm as cast material.

The filler material is trimmed to size so that the dimension of the small connector appears circularly enlarged by approx. 0.5 mm. The parts to be welded are sandblasted to a mat finish with Al<sub>2</sub>O<sub>3</sub> of grain size 150 µm. The plate is tack-welded to one side of the weld with two laser weld spots (Fig. 1).

#### Laser output, tacking:

	Voltage/ output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V	3 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W	6 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V	5 ms	0.8 mm

Using carbon-free CoCr laser welding wire (REF 528-200-10, REF 528-210-10 or REF 528-215-10), one side of the remanium® GM 900 filler material is welded to the small connector. One third of the laser beam is aimed at the tip of the wire and two thirds at the gap to be filled.

#### Laser output, welding:

	Voltage/ output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V - 250 V	3 ms - 6 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W - 2400 W	6 ms - 8 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V - 280 V	6 ms - 8 ms	0.8 mm



Fig. 3



Fig. 4

Laser welding wire is applied continuously to the joint in the form of a welding bead. The welding power must be selected in such a way that the laser beam penetrates to the center of the object from both sides.

The same number of weld spots is applied alternately from above and below. Ensure that the weld is well covered with argon. The point of welding should always be turned to face the argon nozzle.

Now the actual joining process can begin.

The filler material is welded to the second side of the small connector alternately from above and below using CoCr laser welding wire (Fig. 3).

**Laser output, welding:**

	Voltage/output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V - 250 V	3 ms - 6 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W - 2400 W	6 ms - 8 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V - 280 V	6 ms - 8 ms	0.8 mm

**Laser output; smoothing**

	Voltage/output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V - 250 V	3 ms - 6 ms	1.2 mm
<b>desktop Compact</b> from 2024	2200 W - 2400 W	6 ms - 8 ms	1.2 mm
<b>Laser Welder SL10</b>	250 V - 280 V	6 ms - 8 ms	1.6 mm - 2.0 mm



## Example 2

# CoCr partial denture:

## Broken clasp.



Fig. 1

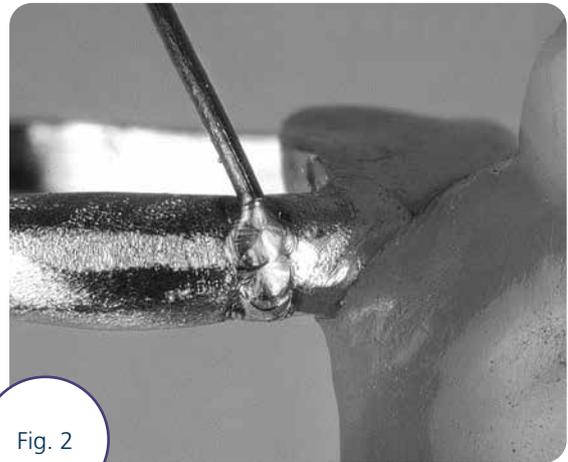


Fig. 2

### Preparation

The fracture area is sandblasted to a dull finish on both sides with  $\text{Al}_2\text{O}_3$  of grain size  $150\ \mu\text{m}$ . The broken clasp is adjusted to the correct position on the model. A spot weld is applied to fix the broken part to the clasp.

Using carbon-free CoCr laser welding wire (REF 528-200-10, REF 528-210-10 or REF 528-215-10) weld the two parts together. Aim one third of the laser beam at the tip of the wire and two thirds at the gap.

#### Laser output, tacking:

	Voltage/output	Pulse duration	Diameter
desktop Compact up to 2024	230 V	3 ms	0.8 mm
desktop Compact from 2024	2000 W	2 ms	0.8 mm
Laser Welder SL10	230 V	3 ms	0.8 mm

#### Laser output, welding:

	Voltage/output	Pulse duration	Diameter
desktop Compact up to 2024	230 V - 250 V	3 ms - 6 ms	0.8 mm
desktop Compact from 2024	2000 W - 2100 W	2 ms - 3 ms	0.8 mm
Laser Welder SL10	230 V - 250 V	3 ms - 5 ms	0.8 mm

Ensure that the weld is well covered with argon. The weld spots should have a metallic luster.

The clasp is welded alternately from the outside and the inside.

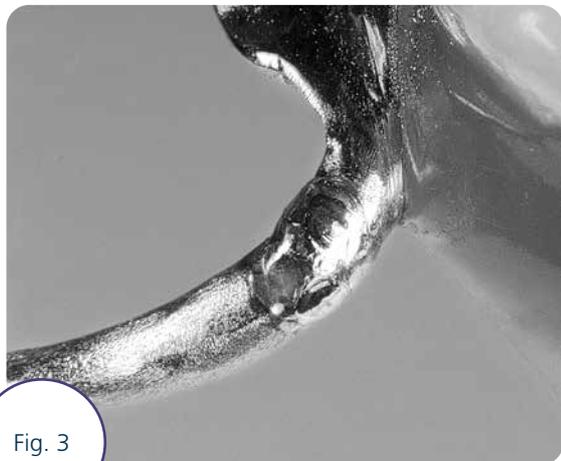


Fig. 3



Fig. 4

The surface of the weld can be smoothed by the so-called flooding process (Fig. 3).

The weld seam is then finished and polished using the usual materials.

The framework was made using the CoCr partial denture alloy remanium® GM 280 (REF 102-280-10) (Fig. 2).

#### Laser output; smoothing

	Voltage/ output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V - 250 V	3 ms - 6 ms	1.2 mm
<b>desktop Compact</b> from 2024	2200 W - 2400 W	6 ms - 8 ms	1.2 mm
<b>Laser Welder SL10</b>	250 V - 280 V	6 ms - 8 ms	1.6 mm - 2.0 mm



## Example 3

# CoCr partial denture:

## Extension with bent retention

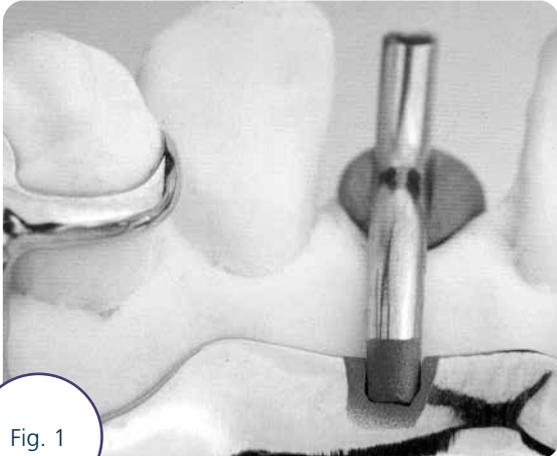


Fig. 1

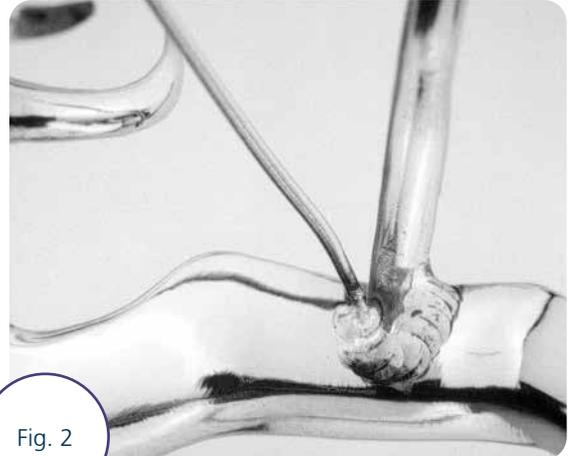


Fig. 2

### Preparation

We recommend using Co-based wires such as remaloy® straight wire to extend a partial denture with a bent wire retention.

When using half-round remaloy® wire 1.75 mm x 0.90 mm (REF 528-158-00), a gap is first ground into the sublingual bow with a separating disc and the remaloy® wire is fitted into the gap, leaving no space.

The areas to be welded are sandblasted to a mat finish with Al<sub>2</sub>O<sub>3</sub> of grain size 150 µm. The CoCr wire is tacked to the framework with a spot weld (Fig. 1).

#### Laser output, tacking:

	Voltage/output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V	3 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W	3 ms - 6 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V	3 ms - 5 ms	0.8 mm

Using carbon-free laser welding wire (REF 528-200-10, REF 528-210-10 or REF 528-215-10), weld the two parts together. Aim one third of the laser beam at the tip of the wire and two thirds at the gap.

#### Laser output, welding:

	Voltage/output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V - 250 V	3 ms - 6 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W - 2400 W	6 ms - 8 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V - 280 V	5 ms - 8 ms	0.8 mm

Ensure that the weld is well covered with argon. The weld spots must have a metallic luster.

The joint is welded completely on the top side and then in the same way on the opposite side. Laser welding wire is applied continuously to the joint in the form of a welding bead (Fig. 2).

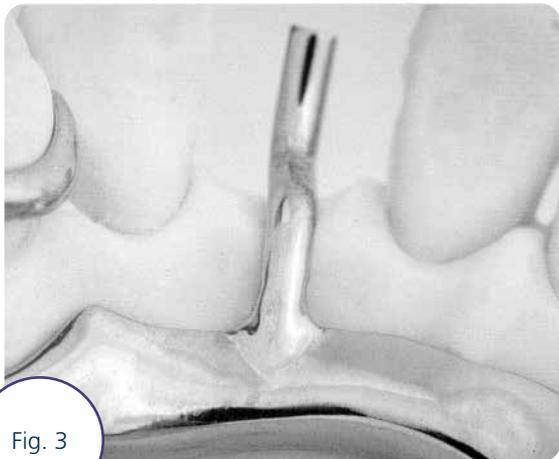


Fig. 3

The surface of the weld can be smoothed by the so-called flooding process.

The weld seam is then finished and polished using the usual materials.

The sublingual bow was made using the CoCr partial denture alloy remanium®GM 800 (REF 102-200-10) (Fig. 3).

#### Laser output; smoothing

	Voltage/ output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V - 250 V	3 ms - 6 ms	1.2 mm
<b>desktop Compact</b> from 2024	2200 W - 2400 W	6 ms - 8 ms	1.2 mm
<b>Laser Welder SL10</b>	250 V - 280 V	6 ms - 8 ms	1.6 mm - 2.0 mm



## Example 4

# Combination weld metal denture plate (CoCr) to secondary telescope (Au-Pt).



Fig. 1

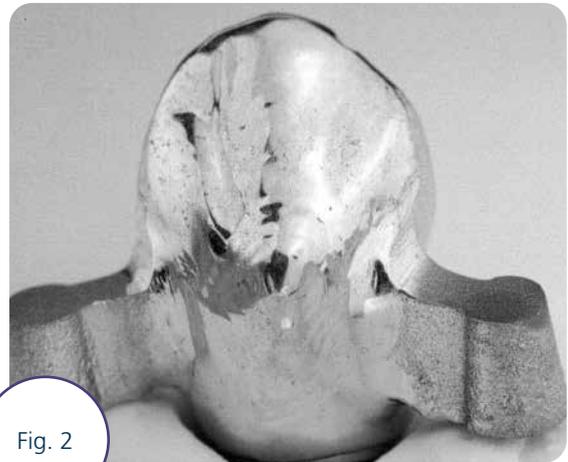


Fig. 2

### Preparation

A retention in the shape of a wax conical pin for laser welding is modeled on the secondary telescope (Fig. 1 and Fig. 2).

The metal denture plate is waxed up over this retention and left open in the occlusal and at the base. To ensure the best possible fit, the joining gap must be kept as narrow as possible. The more accurately the work is done, the better the fit after welding. The parts to be welded are sandblasted to a mat finish with  $Al_2O_3$  of grain size  $150 \mu m$  (Fig. 3).

Welding is carried out on the master model. The first two tack points are located on the occlusal side in such a way that the weld on the opposite side is in the center of the retention pin.

#### Laser output, tacking:

	Voltage/ output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V	3 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W	3 ms - 6 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V	3 ms - 5 ms	0.8 mm

Ensure that the weld is well covered with argon. The weld spots must have a metallic luster.

The workpiece is then removed from the model and two tack points are applied from the basal side.



Fig. 3



Fig. 4

The workpiece is now checked for an accurate fit on the master model (Fig. 3).

Next step, tacking.

**Laser output, welding:**

	<b>Voltage/output</b>	<b>Pulse duration</b>	<b>Diameter</b>
<b>desktop Compact</b> up to 2024	230 V - 250 V	3 ms - 6 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W - 2400 W	6 ms - 8 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V - 280 V	5 ms - 8 ms	0.8 mm

Then the joint is welded at high power alternately from the occlusal and the basal side.

**Laser output, welding:**

	<b>Voltage/output</b>	<b>Pulse duration</b>	<b>Diameter</b>
<b>desktop Compact</b> up to 2024	230 V - 250 V	3 ms - 6 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W - 2400 W	6 ms - 8 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V - 280 V	5 ms - 8 ms	0.8 mm

The number of weld spots opposite to one another must be identical. Should any warping be noticed during welding, it must be compensated immediately by applying counter points. It may therefore be necessary to apply a higher number of spots to one side of the weld in order to compensate for warping (Fig. 4).

In this manner, one joint is fully welded before beginning to weld the next secondary crown to the partial denture framework. This allows the exactness of the fit to be continuously monitored. Since welding precious metals requires more energy, the beam should be aimed two thirds towards gold and one third towards CoCr.

The joint is closed interdentally using a low welding power.

The secondary crowns were made using an alloy with high gold content and the partial denture construction of the CoCr alloy remanium®GM 900 (REF 102-250-00).

Smoothing is not required in this case.



## Example 5

# Laser welding of bar constructions with implant abutment components.



Fig. 1

The rematitan® bar must be fitted with great accuracy; it must be tension-free and without any gap (Fig. 3).

The screws for the moving parts of the Paralas are then tacked in position.



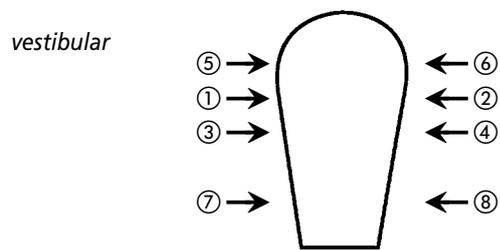
Fig. 2

Begin the joint between bar and abutment with a tack weld. Apply a central vestibular weld spot ① to one end of the bar.

### Laser output, tacking:

	Voltage/ output	Pulse duration	Diameter
<b>desktop Compact</b> up to 2024	230 V	3 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W	3 ms - 6 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V	3 ms - 5 ms	0.8 mm

Ensure that the weld is well covered with argon. The weld spots must have a metallic luster.



*oral*  
 1, 2: Tack weld  
 3, 4, 5 etc. Joining weld

Fig. 3

Then apply a counter spot ② from the oral side using the same power setting.

The actual welding process is carried out alternately from the vestibular and oral side with increased power settings ③ ④ ⑤ ⑥ ⑦ ⑧ etc.

**Laser output, welding:**

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	230 V - 250 V	3 ms - 6 ms	0.8 mm
desktop Compact from 2024	2200 W - 2400 W	6 ms - 8 ms	0.8 mm
Laser Welder SL10	250 V - 280 V	5 ms - 8 ms	0.8 mm



## Example 5

# Laser welding of bar constructions with implant abutment components.



Fig. 1

In this manner, the rematitan® bar is welded all the way round to the sleeve of the bar abutment until a continuous bead of weld spots overlapping by two thirds is achieved (Fig. 5).



Fig. 2

After the welding process, the bar structure is finished and polished (Fig. 6).

Each bar is initially connected to only one bar abutment. Only afterwards is the other end of each bar welded. This ensures that the accuracy of the fit can be constantly monitored and the danger of warping in the structure as a whole is minimized.

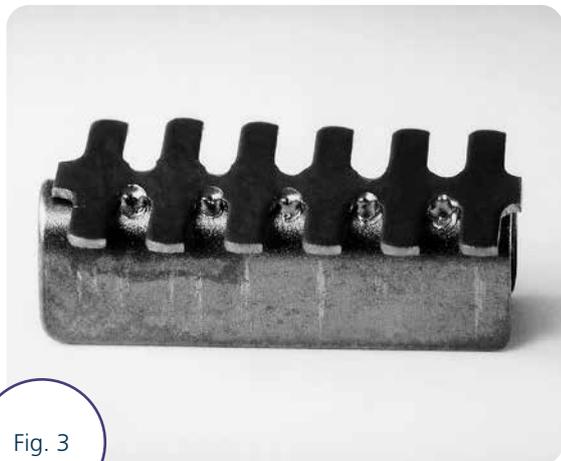


Fig. 3



Fig. 4

The titanium retentions are welded to the shortened titanium rider with spot welds applied on the side (Fig. 7).

Completed rematitan® bar construction with titanium rider in position (Fig. 8).

**Laser output, welding:**

	<b>Voltage/ output</b>	<b>Pulse duration</b>	<b>Diameter</b>
<b>desktop Compact</b> up to 2024	230 V - 250 V	3 ms - 6 ms	0.8 mm
<b>desktop Compact</b> from 2024	2200 W - 2400 W	6 ms - 8 ms	0.8 mm
<b>Laser Welder SL10</b>	250 V - 280 V	5 ms - 8 ms	0.8 mm



# desktop Compact and accessories Laser technology.



desktop **Compact**

More than 30 years experience in dental laser welding reflected in one compact desktop unit. The desktop Compact laser can be used for many applications in dental prosthetic and orthodontic welding - for delicate welds and for secure joint welds. The finely adjustable dosage makes welding much easier. Until now, lasers with such compact dimensions were not available in this laser performance category. Simple machine operation prevents drowsiness at work.

- Compact table top unit
- Easy operation and good overview with touchscreen
- High output reserve
- Ergonomically designed - large working chamber with inclining laser axis
- High-quality microscope with a wide field of vision
- Integrated pulse forming - 4 pre-set pulse shapes
- Two inert gas nozzles, one flexible and one fixed retractable
- Large pulse adjustment range - easy operation using joysticks
- Integrated extraction and cool air nozzle

**desktop Compact**

REF 090-578-50

**Optional accessories for desktop Compact**

Electrically adjustable stand	REF 090-574-00	1 piece
Argon fitting	REF 090-404-00	1 set
Armrest cushion	REF 090-513-10	2 pieces
Maintenance and service contract – annual maintenance carried out by Dentaurum	REF 099-400-00	
Training in laser safety for prosthetic dentistry – on site in Ispringen or locally		

**Accessories for laser technology**

CoCr welding wire, $\varnothing$ 0.25 mm	REF 528-215-10	1 piece
CoCr welding wire, $\varnothing$ 0.35 mm	REF 528-210-10	1 piece
CoCr welding wire, $\varnothing$ 0.50 mm	REF 528-200-10	1 piece
NiCr welding wire, $\varnothing$ 0.50 mm	REF 528-220-00	1 piece
rematitan® wire on coils Ti, round, $\varnothing$ 0.40 mm	REF 528-039-50	1 piece
rematitan® wire on coils Ti, round, $\varnothing$ 0.70 mm	REF 528-040-50	1 piece
rematitan® straight wire Ti, round, $\varnothing$ 1.00 mm	REF 528-041-00	10 pieces
rematitan® straight wire Ti, round, $\varnothing$ 1.20 mm	REF 528-042-00	10 pieces
rematitan® straight wire Ti, round, $\varnothing$ 1.50 mm	REF 528-050-00	1 piece
rematitan® straight wire Ti, rolled 0.50 mm x 1.50 mm	REF 528-043-00	10 pieces
Titanium disc holder	REF 090-525-00	1 piece
Titanium disc	REF 090-526-00	5 pieces
Paralas	REF 090-520-00	1 piece

➔ Further accessories for laser technology can be found in the current Prosthetics catalog.







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