



Laser welding examples

## Laser welding in orthodontics



The welding of small parts in orthodontics 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 thicker parts (e.g. wires) to much thinner parts (e.g. bands).

To produce a good laser weld in the orthodontic field, the parts must be prepared so that they lie flat against one another. In particular, standard industrially produced parts such as the base on the Herbst hinge or the base of a buccal tube must be prepared with special burs to ensure that they lie flat against bands of different shapes and sizes. Only then is it possible to join these parts directly to one another without using filler material.

If the band and the wire 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 a protective argon atmosphere in order to prevent oxidation of the weld seam. This is essential to give the weld seam the strength it requires. The welding spots must have a metallic luster.

The various components used in orthodontics often have a shiny metallic surface, which in turn causes the laser beam to be reflected. Because of the elaborate finishing involved, these parts are not usually subjected to sand blasting.



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. The welding parameters stay the same.

In the following, various tasks are described step by step. The welding parameters vary from situation to situation.

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

**P. 4 – Example 1**

Welding a Herbst IV base to maxillary molar bands, mandibular cuspid or bicuspid bands.

**P. 6 – Example 2**

Welding a hyrax® screw to an upper maxillary molar band and bicuspid band with reinforcing remanium® wire.

**P. 8 – Example 3**

Welding a buccal tube to a molar band.

**P. 9 – Example 4**

Welding a double hook to a molar band.

**P. 10 – Example 5**

Repairing a broken labial arch.

**P. 12 – Example 6**

Manufacturing a Crozat appliance with remaloy® wires or remanium® wires.

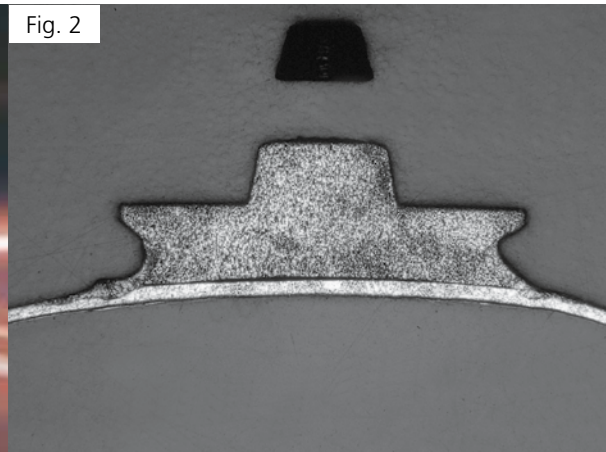
**P. 16 – Welding tables**

For Dentaaurum laser welding units

Area of application: Orthodontics

**P. 22 – Accessories for laser welding**

## Example 1.



Welding a Herbst IV (REF 607-115-00) base to maxillary molar bands on mandibular cuspid or bicuspid bands.

The underside of the pivot on the Herbst IV is ground to ensure that it lies flat on the band.

Welding power:      voltage:          approx. 230 V  
                         pulse duration: 2,5 – 3,0 ms  
                         diameter:          approx. 0.80 mm

A gap between the band and the pivot may open up in the area of the buccal fissure. In this area, it is necessary to work with remanium® wire  $\varnothing$  0.35 mm (REF 535-035-00) as filler material. Alternatively, the band can be bent to a slightly flatter angle.

If the pivot is welded to the band on the plaster model, the bands should be blocked out with wax from the inside (thickness approx. 1 - 2 mm) at the welding points before making the model.

The band must not touch the plaster at the point of welding.

Fig. 3

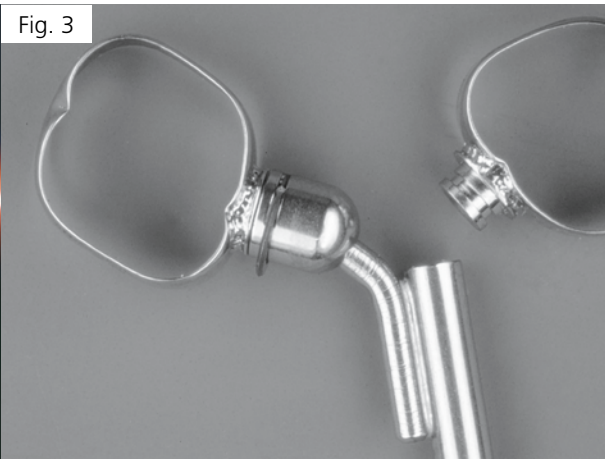
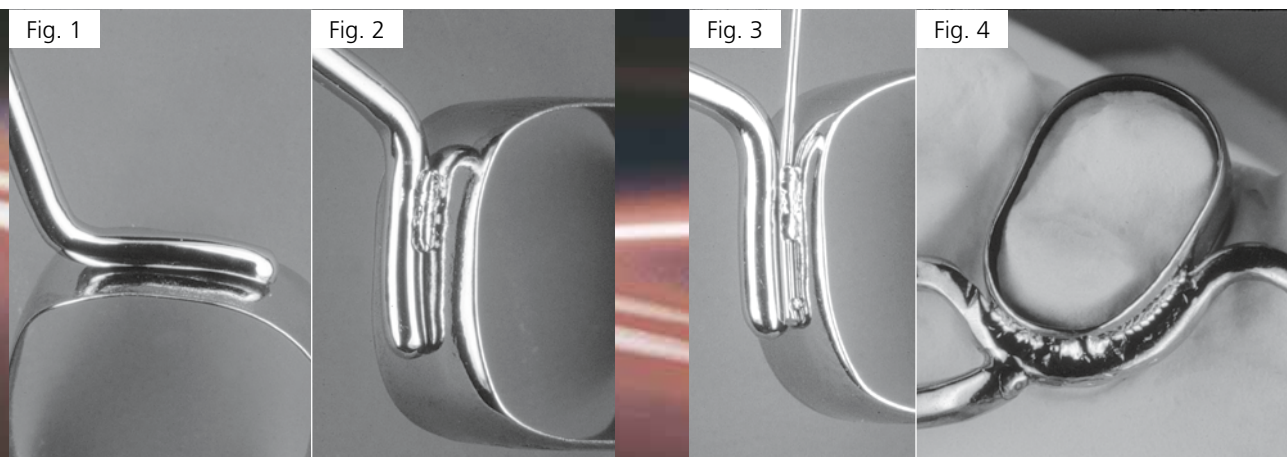


Fig. 4



## Example 2.



Welding a hyrax® screw (e.g. REF 602-833-10) to an upper maxillary molar band and bicuspid band with reinforcing remanium® wire  $\varnothing$  1.00 mm.

The reinforcing remanium® wire  $\varnothing$  1.00 mm is bent onto the molar band (fig. 1+2). It is advisable to grind the wire slightly flat with a grinding tool (see diagram).

Welding power:      voltage:      approx. 235 V  
                          pulse duration: 3.0 – 3.5 ms  
                          diameter:      approx. 0.80 mm

Larger gaps can be filled with remanium® wire  $\varnothing$  0.35 mm (REF 535-035-00) as filler material. First, the 0.35 mm wire is welded to the band and then to the 1.00 mm wire (fig. 3).

Welding power:      voltage:      approx. 220 V  
                          pulse duration: 2.0 ms  
                          diameter:      approx. 0.80 mm

The retention leg of the hyrax® screw is butt welded to the reinforcing wire (fig. 4).

Welding power:      voltage:      approx. 260 V  
                          pulse duration: 6.0 – 7.0 ms  
                          diameter:      approx. 0.80 mm

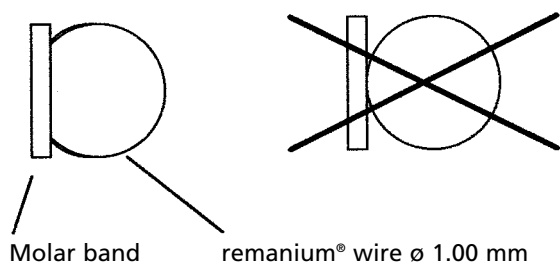


Fig. 5

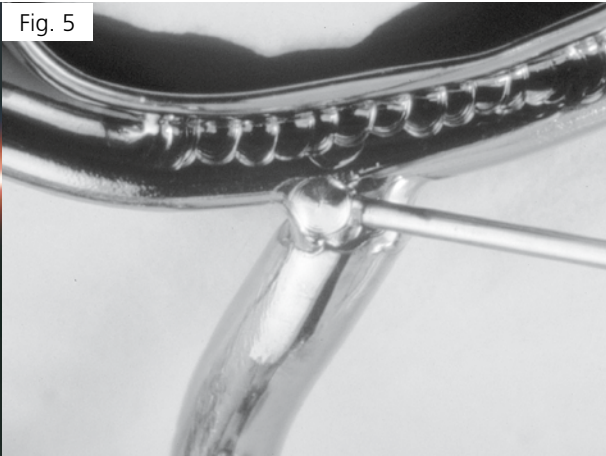
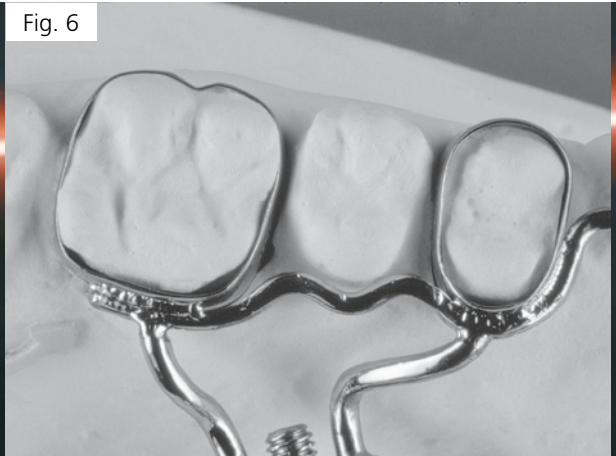


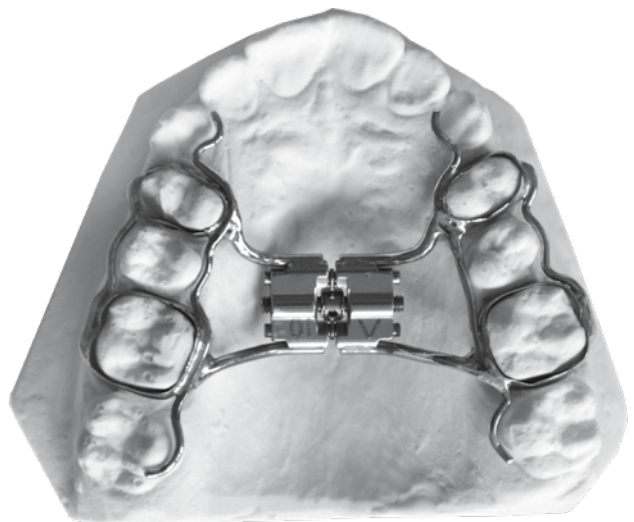
Fig. 6



The weld is then strengthened with remanium® wire  $\varnothing$  0.35 mm (REF 535-035-00) (fig. 5).

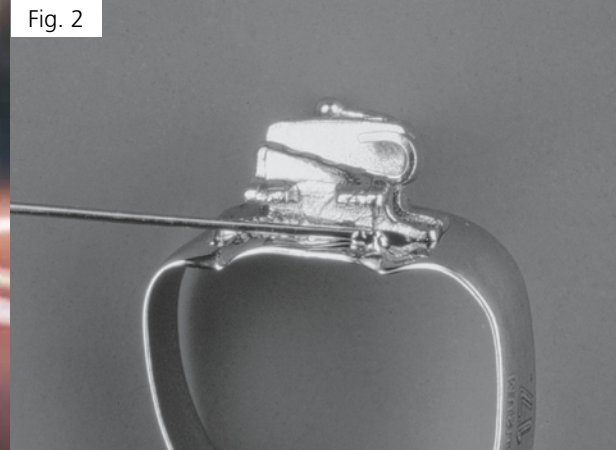
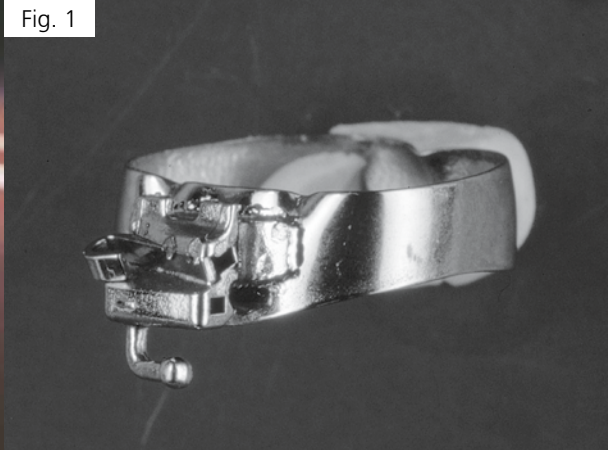
Welding power:      voltage:      approx. 260 V  
                         pulse duration: 3.5 – 4.5 ms  
                         diameter:      approx. 0.80 mm

If welding is carried out on the plaster model, the bands should be blocked out with wax from the inside (thickness approx. 1 – 2 mm) at the welding points before making the model. Before the actual welding operation, the wax is removed with a steam jet to prevent direct contact between the bands and the plaster (fig. 6).



Completed hyrax® appliance.

## Example 3.



Welding a buccal tube to a molar band.

Welding power:      voltage:      approx. 230 V  
                         pulse duration: approx. 3.0 ms  
                         diameter:      approx. 0.80 mm

remanium® wire  $\varnothing$  0.35 mm (REF 535-035-00) is used as filler material to bridge a larger gap on the buccal fissure.



## Example 4.

Fig. 1



Welding a double hook to a molar band.

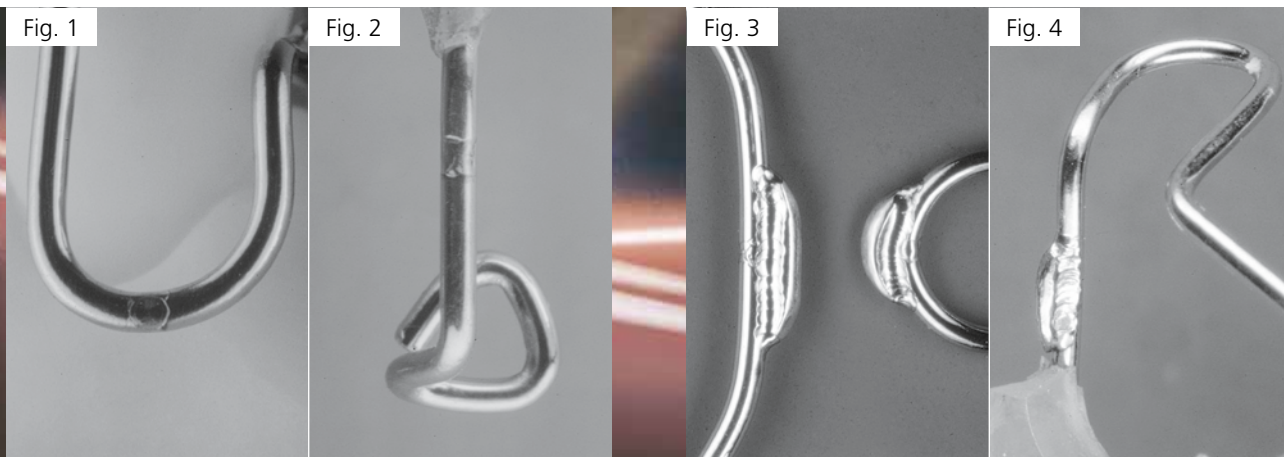
Welding power: voltage: approx. 230 V

pulse duration: 3.0 ms

diameter: approx. 0.80 mm

remanium® wire  $\varnothing$  0.35 mm (REF 535-035-00) is used as filler material to bridge a larger gap on the buccal fissure.

## Example 5.



### Repairing a broken labial arch.

First the fracture is butt welded.

Welding power:      voltage:      approx. 225 V  
                         pulse duration: 2.0 – 3.0 ms  
                         diameter:      approx. 0.80 mm

Following this, a short piece of spring-hard remanium® wire  
ø 0.70 mm (REF 524-070-00) is welded on as double  
reinforcement parallel to the activation direction.

This way, the spring effect of the labial arch remains intact,  
allowing it to be activated.

Welding power:      voltage:      approx. 245 V  
                         pulse duration: 3.0 – 5.0 ms  
                         diameter:      approx. 0.80 mm

Fig. 5

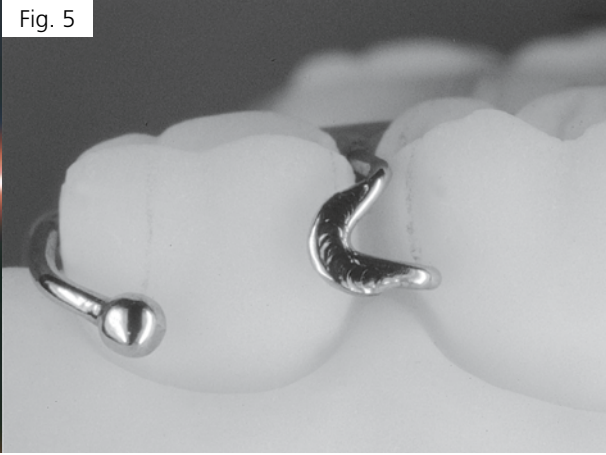


Fig. 6



The remanium® wire welded on as reinforcement is then slightly rounded off with a rubber polisher.

## Example 6.

Fig. 1



Fig. 2



Manufacturing a Crozat appliance with remaloy® wires  $\varnothing$  0.70 mm – 1.50 mm or remanium® wires  $\varnothing$  0.70 mm – 1.50 mm.

To make curved Crozat appliances, it is possible to use either remaloy® wires or remanium® wires. In their unannealed state, remaloy® wires can be bent easily into shape. If greater strengths are required, remanium® wires with graded strengths can be used. Because of the small area affected by heat, remanium® wires achieve up to 80% of their original strength value after laser welding.

When bending and waxing the individual wire elements into place, it must be ensured that they have good surface contact at the welding points and that no gaps exist.

Fig. 3

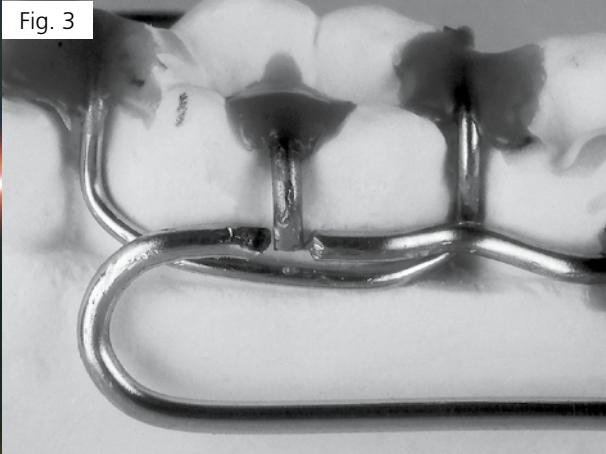
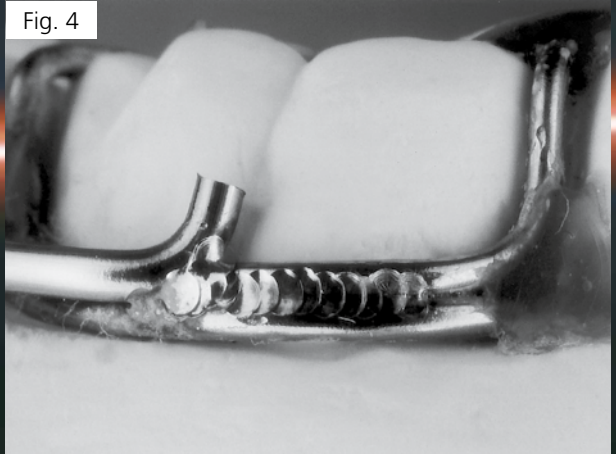


Fig. 4



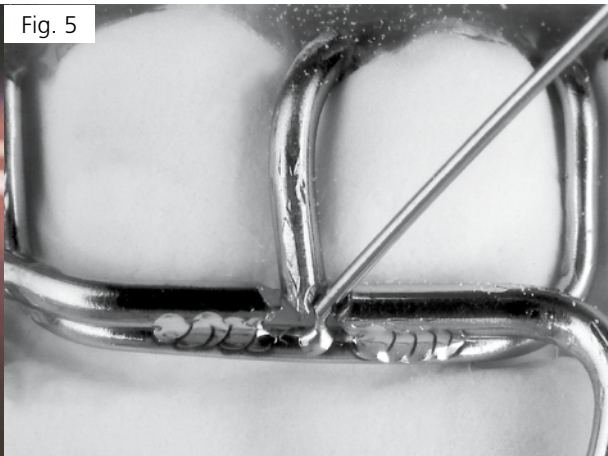
**Incorrect!**

The gap between the individual wire elements is too big.

When prepared correctly, the wires can be welded directly to one another.

Welding power:      voltage:      approx. 260 V  
                                 pulse duration: 3.0 – 4.0 ms  
                                 diameter:      approx. 0.80 mm

## Example 6.



If a gap still remains, remanium® wire  $\varnothing$  0.35 mm (REF 535-035-00) can be used as filler material.

Welding power:      voltage:      approx. 245 V  
                                 pulse duration: 3.0 – 4.0 ms  
                                 diameter:      approx. 0.80 mm

This is “dripped” from the tip into the gap to form a weld bead.

Welded Jackson clasp on the plaster model (fig. 6).

Fig. 7



Fig. 8



The welding point can still be smoothed with a “soft” power setting.

Welding power:      voltage:      approx. 240 V  
                         pulse duration: 2.0 – 4.0 ms  
                         diameter:      approx. 0.80 mm

Completed laser welded Crozat appliance.

# Welding table for Dentaurem laser welding units

## Field of application: Orthodontics



Example number	Task
1	Manufacturing a Herbst appliance
2	Manufacturing a palatal expansion appliance
	Welding a Quad Helix to bands
	Manufacturing an individual gap retainer
	Welding a lingual/palatal arch to bands
	Welding a lingual/palatal sheath to a band
6	Manufacturing a Crozat appliance
	Manufacturing a Nance appliance

Stage 1

Stage 2

Stage 3

Stage 1

or Stage 1

Stage 2



	Recommended materials and application	Welding parameters		
		Voltage V	Pulse duration ms	Diameter Ø
	Herbst I, Herbst VI or Herbst TS hinge Molar bands upper/lower Premolar bands upper/lower	approx. 220	2.5 – 3.5	approx. 0.80 mm
	hyrax® screws Molar bands upper and premolar bands upper remanium® wire, spring hard Ø 0.9 mm or 1.00 mm			
	Wire Ø 1.00 mm on band	approx. 235	3.0 – 3.5	approx. 0.80 mm
	Retention leg on wire Ø 1.00 mm	approx. 260	6.0 – 7.0	approx. 0.80 mm
	Reinforce with wire Ø 0.35 mm	approx. 260	3.5 – 4.5	approx. 0.80 mm
	Quad Helix, pre-formed Molar bands upper/lower	approx. 225	3.0 – 3.5	approx. 0.80 mm
	remanium® wire Ø 0.80 mm Molar bands upper	approx. 225	3.0 – 3.5	approx. 0.80 mm
	Orthorama® lingual/palatal arch remaloy® wire Ø 0.90 mm remanium® wire, spring hard Ø 0.35 mm Molar bands upper	approx. 225	3.0 – 3.5	approx. 0.80 mm
	Lingual/palatal sheaths Molar bands	approx. 220	3.0 – 3.5	approx. 0.80 mm
	remaloy® wires Ø 0.70 – 1.50 mm	approx. 260	3.0 – 4.0	approx. 0.80 mm
	remanium® wire Ø 0.70 – 1.50 mm	approx. 260	3.0 – 4.0	approx. 0.80 mm
	Reinforce with wire Ø 0.35 mm	approx. 245	3.0 – 4.0	approx. 0.80 mm
	remaloy® wire Ø 0.90 mm on palatal molar bands remanium® wire Ø 0.90 mm	approx. 225 approx. 225	3.0 – 3.5 3.0 – 3.5	approx. 0.80 mm approx. 0.80 mm

# Welding table for Dentaurem laser welding units

## Field of application: Orthodontics



Example number	Task	
	Welding a hook for elastics to a face bow or a lip bumper	Stage 1 Stage 2
	Welding a stop to a round or rectangular arch, stainless steel	
	Welding a hook for elastics to a round or rectangular arch	
	Welding a cross tube on a round or square arch, stainless steel	
	Welding a round tube to an Adams clasp for holding a face bow	
	Manufacturing a customized bonded retainer Manufacturing a customized lingual retainer	
	Manufacturing a customized hook on a prewelded or bonded bracket/buccal tube	
	Manufacturing a Kahn spur on a face bow	Stage 1 Stage 2
	Manufacturing a spike for the bonding technique Spikes on lingual arch	Stage 1 Stage 2
	Welding a customized spring to a labial arch	
	Welding a hook for elastics to a face mask	Stage 1 Stage 2
	Welding a stop to a round or rectangular arch, stainless steel	Stage 1 Stage 2

	Recommended materials and application	Welding parameters		
		Voltage V	Pulse duration ms	Diameter Ø
	Ball retainer clasp 0.70 mm	approx. 230	4.0	approx. 0.80 mm
	Reinforce with wire Ø 0.35 mm	approx. 220	3.0	approx. 0.80 mm
	Stop tube, slotted on round arch	approx. 225	3.0	approx. 0.80 mm
	Stop tube, slotted on rectangular arch	approx. 220	3.0	approx. 0.80 mm
	Pre-formed hook or ball retainer clasp Ø 0.70 mm on round arch	approx. 220	2.5 – 3.0	approx. 0.80 mm
	on rectangular arch	approx. 220	2.5 – 3.0	approx. 0.80 mm
	Cross tube on round arch	approx. 220	3.0	approx. 0.80 mm
	on rectangular arch	approx. 220	3.0	approx. 0.80 mm
	Tubes – stainless steel e.g. Ø 1.20 mm	approx. 220	3.0	approx. 0.80 mm
	remaloy® wire Ø 0.70 mm Mesh base, small	approx. 210	3.5	approx. 0.80 mm
	Ball retainer clasp Ø 0.70 mm	approx. 225	3.5	approx. 0.80 mm
	remanium® wire Ø 0.90 mm – end to end	approx. 250	7.0	approx. 0.80 mm
	Reinforce with wire Ø 0.35 mm	approx. 220	3.0	approx. 0.80 mm
	remanium® wire Ø 0.90 mm on mesh base	approx. 210	3.0	approx. 0.80 mm
	Lingual arch and remanium® wire Ø 0.90 mm	approx. 240	3.0	approx. 0.80 mm
	Reinforce with wire, Ø 0.35 mm	approx. 230	5.0	approx. 0.80 mm
	remanium® wire Ø 0.70 mm, spring hard	approx. 250	3.0	approx. 0.80 mm
	Ball retainer clasp Ø 0.90 mm	approx. 235	4.0	approx. 0.80 mm
	Reinforce with wire Ø 0.35	approx. 220	5.0	approx. 0.80 mm
	Knurled nut	approx. 220	3.0	approx. 0.80 mm
	Reinforce with wire Ø 0.35 mm	approx. 220	3.0	approx. 0.80 mm

# Welding table for Dentaureum laser welding units

## Field of application: Orthodontics



Example number	Task	
	Welding an additional retention to an expansion screw for improved anchoring in acrylic	
	Welding of a wire to an expansion screw, e.g. as a spring	Stage 1 Stage 2 or Stage 2
	Manufacturing an acrylic-free expansion appliance for upper or lower jaw	
5	Repairing a labial arch / an Adams clasp, etc.	Stage 1 Stage 2
	Manufacturing a stop on face bow / lip bumper	
	Welding a post hook on round or rectangular arch, upper and lower jaw, stainless steel	
	Repairing a hyrax® screw with broken retention leg	Stage 1 Stage 2 or Stage 2
3	Welding a buccal tube to a molar band	
4	Welding a double hook to a molar band	
	Modifying a palatal arch bar, Orthorama® system	
	Modifying two tension screws (Geller system)	

	Recommended materials and application	Welding parameters		
		Voltage V	Pulse duration ms	Diameter Ø
	remanium® wire Ø 0.90 mm	approx. 230	4.5	approx. 0.80 mm
	remanium® wire Ø 0.80 mm – end to end	approx. 250	6.0	approx. 0.80 mm
	Reinforce with wire Ø 0.35 mm	approx. 220	3.0	approx. 0.80 mm
	remanium® wire Ø 0.80 mm – planar	approx. 250	6.0	approx. 0.80 mm
	hyrax® screw, mini Molar bands, upper/lower jaw	approx. 225	3.0 – 3.5	approx. 0.80 mm
	remanium® wire Ø 0.70 mm – end to end	approx. 225	2.0 – 3.0	approx. 0.80 mm
	Doubling with wire Ø 0.70 mm	approx. 245	3.0 – 5.0	approx. 0.80 mm
	Stop tube Ø 1.15 mm	approx. 250	3.0 – 3.5	approx. 0.80 mm
	Ball retainer clasp Ø 0.70 mm On round arch, upper and lower jaw	approx. 215	3.0	approx. 0.80 mm
	On rectangular arch, upper and lower jaw	approx. 215	3.0	approx. 0.80 mm
	End to end	approx. 260	7.0	approx. 0.80 mm
	Reinforce with wire Ø 0.35 mm	approx. 220	3.0	approx. 0.80 mm
	Weld in a planar manner	approx. 260	7.0	approx. 0.80 mm
	Molar band, upper/lower jaw Buccal tube	approx. 230	3.0	approx. 0.80 mm
	Molar band, upper/lower jaw Lingual /palatal hook	approx. 230	3.0	approx. 0.80 mm
	remanium® wire Ø 0.50 mm, spring hard	approx. 220	3.0	approx. 0.80 mm
	Tension screw	approx. 250	6.0	approx. 0.80 mm

## Accessories for laser technology.



remaloy® straight wire		
round, ø 0.70 mm / 28, length each 380 mm	REF 528-070-00	10 pieces
round, ø 0.80 mm / 31, length each 380 mm	REF 528-080-00	10 pieces
round, ø 0,90 mm / 36, length each 380 mm	REF 528-090-00	10 pieces
round, ø 1.00 mm / 39, length each 380 mm	REF 528-100-00	10 pieces
round, ø 1.10 mm / 43, length each 380 mm	REF 528-110-00	10 pieces
round, ø 1.20 mm / 47, length each 380 mm	REF 528-120-00	10 pieces
round, ø 1.30 mm / 51, length each 380 mm	REF 528-130-00	10 pieces
round, ø 1.50 mm / 59, length each 380 mm	REF 528-150-00	10 pieces
half round, ø 1.50 x 0.75 mm / 59 x 30, length each 380 mm	REF 528-155-00	10 pieces
half round, ø 1.75 x 0.90 mm / 69 x 36, length each 380 mm	REF 528-158-00	10 pieces
rectangular rounded, ø 1.92 x 0.90 mm / 76 x 36, length each 380 mm	REF 528-159-00	10 pieces
CoCr welding wire		
ø 0.25 mm / 10, length 2 m	REF 528-215-10	1 piece
ø 0.35 mm / 14, length 2 m	REF 528-210-10	1 piece
ø 0.50 mm / 20, length 2 m	REF 528-200-10	1 piece
NiCr welding wire		
ø 0.50 mm / 20, length 2 m	REF 528-220-00	1 piece



rematitan®		
wire on coils, ø 0.40 mm / 16, length 2 m	REF 528-039-50	1 piece
wire on coils, ø 0.70 mm / 28, length 2 m	REF 528-040-50	1 piece
straight wire, ø 1.00 mm / 39, length each 100 mm	REF 528-041-00	10 pieces
straight wire, ø 1.20 mm / 47, length each 100 mm	REF 528-042-00	10 pieces
straight wire, ø 1.50 mm / 59, length 50 mm	REF 528-050-00	1 piece
straight wire, ø rolled 0.25 x 3.0 mm / 10 x 118, length each 100 mm	REF 528-044-00	10 pieces
straight wire, ø rolled 0.5 x 1.5 mm / 20 x 59, length each 100 mm	REF 528-043-00	10 pieces
Titanium disc holder	REF 090-525-00	1 piece
Titanium disc	REF 090-526-00	5 pieces
TX-Flex separating disc, extremely thin	REF 130-511-00	25 pieces
rematitan® Finishing kit	REF 135-500-00	1 set
Electrically adjustable stand	REF 090-574-00	1 piece
Argon fitting for laser	REF 090-404-00	1 assort.
Armrest cushion	REF 090-513-10	2 pieces

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

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