



Orthodontics

Laser welding examples

desktop Compact up to 2024

desktop Compact from 2024

Laser Welder SL10

Laser welding in orthodontics.

The welding of small parts and appliances 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, in part, very thick parts (e.g. wires) to extremely thin parts (e.g. bands).

To produce a good laser weld in orthodontics, the parts must be prepared so that they lie flat against one another. In particular, standard industrially produced parts such as the nut 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 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 orthodontics 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 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 for the desktop Compact laser and from 0.80 mm to 1.60 up to 2.00 mm for the Laser Welder SL10. The welding parameters remain 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

Weld a hyrax® screw with remanium® reinforcement wire onto the maxillary molar and premolar bands.

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Welding a buccal tube to a molar band.

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Welding a double hook to a molar band.

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for desktop Compact up to 2024, from 2024 and Laser Welder SL10

Area of application: Orthodontics

P. 22 – Accessories for laser welding

Example 1



Fig. 1

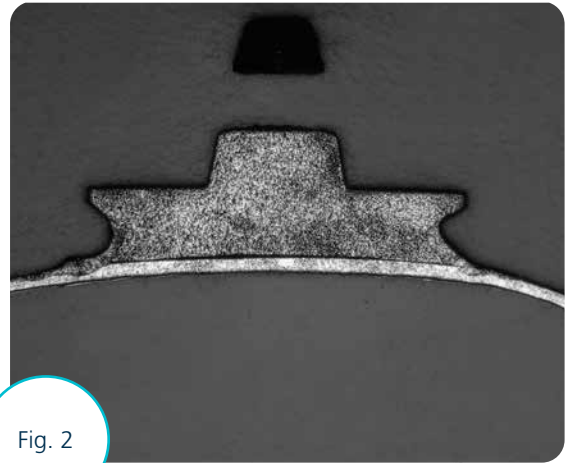


Fig. 2

Welding a Herbst IV base (REF 607-118-00) to maxillary molar bands, mandibular cuspid or bicuspids bands.

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

Laser output:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	215 V - 230 V	1 ms - 2 ms	0.8 mm
desktop Compact from 2024	1800 W - 1900 W	1 ms - 2 ms	0.8 mm
Laser Welder SL10	220 V - 230 V	1 ms - 3 ms	0.8 mm

A gap between the band and the base 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 a filler material. Alternatively, the band can be bent to a slightly flatter angle.

If the base is welded to the band on the stone model, the bands should be blocked out with wax from the inside (thickness approx. 1.00 mm – 2.00 mm) at the welding points before making the model.

The band must not touch the dental stone at the point of welding.



Fig. 3



Fig. 4



Example 2



Fig. 1

Fig. 2

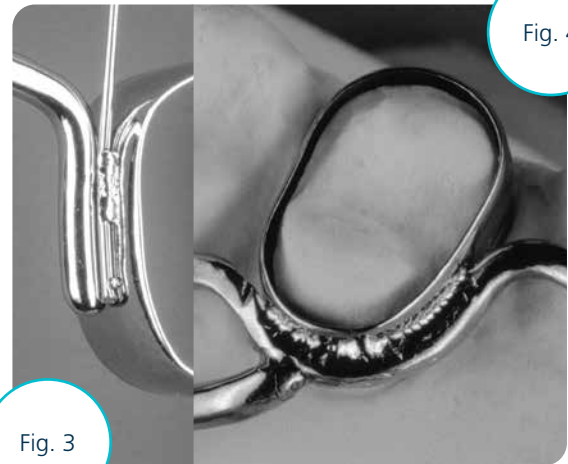


Fig. 3

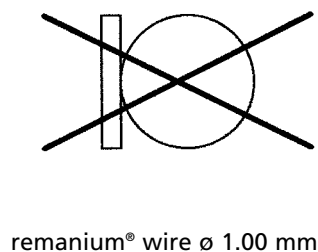
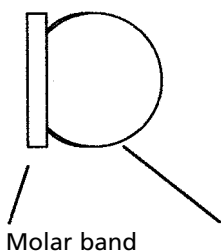
Fig. 4

Weld hyrax® screw (e.g. REF 602-833-10) with a remanium® reinforcement wire \varnothing 1.00 mm onto the maxillary molar and premolar bands.

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

Laser output:

	Voltage/output	Pulse duration	Diameter
desktop Compact up to 2024	215 V - 230 V	1 ms - 2 ms	0.8 mm
desktop Compact from 2024	1800 W - 1900 W	1 ms - 2 ms	0.8 mm
Laser Welder SL10	220 V - 230 V	1 ms - 3 ms	0.8 mm



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

Laser output:

	Voltage/output	Pulse duration	Diameter
desktop Compact up to 2024	215 V - 230 V	1 ms - 2 ms	0.8 mm
desktop Compact from 2024	1800 W - 1900 W	1 ms - 2 ms	0.8 mm
Laser Welder SL10	220 V - 230 V	1 ms - 3 ms	0.8 mm

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

Laser output:

	Voltage/output	Pulse duration	Diameter
desktop Compact up to 2024	220 V - 240 V	2 ms - 4 ms	0.8 mm
desktop Compact from 2024	1900 W - 2100 W	1 ms - 3 ms	0.8 mm
Laser Welder SL10	240 V - 260 V	4 ms - 8 ms	0.8 mm

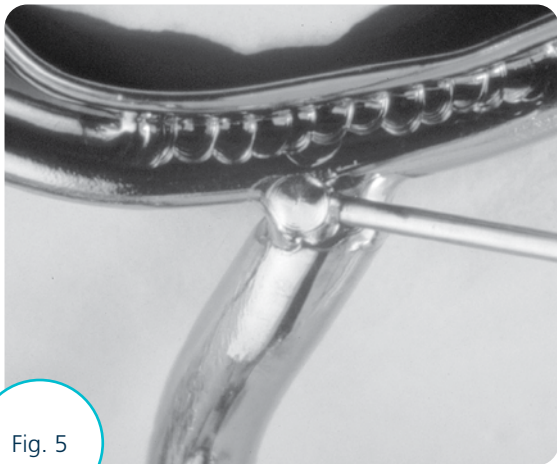


Fig. 5



Fig. 6

The weld should then be strengthened with remanium® wire \varnothing 0.35 mm (REF 535-035-00) (Fig. 5).

If welding is carried out on the stone model, the bands should be blocked out with wax from the inside (thickness approx. 1.00 mm-2.00 mm) at the welding points before making the model. Before the actual welding operation, the wax is removed with a steam cleaner to prevent direct contact between the bands and the dental stone (Fig. 6).

Laser output:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	220 V - 240 V	2 ms - 4 ms	0.8 mm
desktop Compact from 2024	1900 W - 2100 W	1 ms - 3 ms	0.8 mm
Laser Welder SL10	240 V - 260 V	4 ms - 8 ms	0.8 mm

Completed hyrax® appliance.



Example 3



Fig. 1

Welding a buccal tube to a molar band.



Fig. 2

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

Laser output:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	215 V - 230 V	1 ms - 2 ms	0.8 mm
desktop Compact from 2024	1800 W - 1900 W	1 ms - 2 ms	0.8 mm
Laser Welder SL10	220 V - 230 V	1 ms - 3 ms	0.8 mm

Example 4

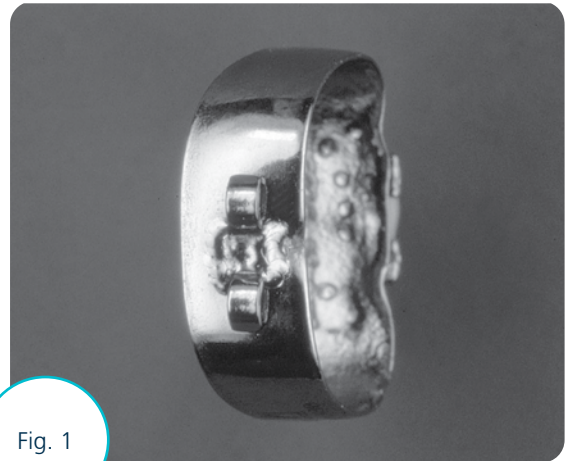


Fig. 1

Welding a double hook to a molar band.

Laser output:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	215 V - 230 V	1 ms - 2 ms	0.8 mm
desktop Compact from 2024	1800 W - 1900 W	1 ms - 2 ms	0.8 mm
Laser Welder SL10	220 V - 230 V	1 ms - 3 ms	0.8 mm

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



Example 5

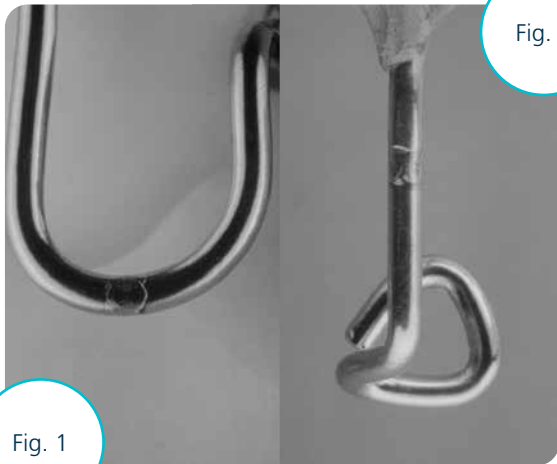


Fig. 1

Fig. 2

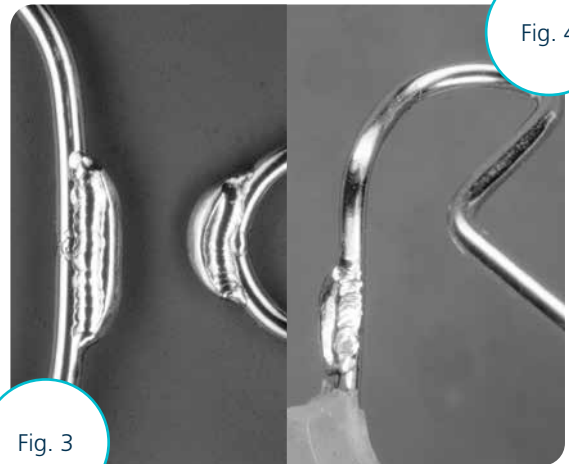


Fig. 3

Fig. 4

Repairing a broken labial bow.

First the fracture is butt welded.

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

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

Laser output:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	220 V - 240 V	2 ms - 4 ms	0.8 mm
desktop Compact from 2024	1900 W - 2000 W	1 ms - 3 ms	0.8 mm
Laser Welder SL10	240 V - 260 V	3 ms - 6 ms	0.8 mm

Laser output:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	220 V - 240 V	2 ms - 4 ms	0.8 mm
desktop Compact from 2024	1900 W - 2000 W	1 ms - 3 ms	0.8 mm
Laser Welder SL10	240 V - 260 V	3 ms - 6 ms	0.8 mm

For smoothing:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	220 V - 240 V	2 ms - 4 ms	1.20 mm
desktop Compact from 2024	1900 W - 2000 W	1 ms - 3 ms	1.20 mm
Laser Welder SL10	240 V - 260 V	3 ms - 6 ms	1.6 mm -2.0 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

Manufacturing a Crozat appliance
remaloy® wires \varnothing 0.70 mm – 1.50 mm,
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 values after laser welding.



Fig. 2

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

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



Fig. 3



Fig. 4

Incorrect!

The gap between the individual wire elements is too wide.

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

Laser output:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	220 V - 240 V	2 ms - 4 ms	0.8 mm
desktop Compact from 2024	1900 W - 2100 W	1 ms - 3 ms	0.8 mm
Laser Welder SL10	240 V - 260 V	4 ms - 8 ms	0.8 mm

For smoothing:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	220 V - 240 V	2 ms - 4 ms	1.20 mm
desktop Compact from 2024	1900 W - 2100 W	1 ms - 3 ms	1.20 mm
Laser Welder SL10	240 V - 260 V	4 ms - 8 ms	1.6 mm - 2.00 mm



Example 6



Fig. 1

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



Fig. 2

Welded Jackson clasp on the stone model (Fig. 6).

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

Laser output:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	220 V - 240 V	2 ms - 4 ms	1.20 mm
desktop Compact from 2024	1900 W - 2100 W	1 ms - 3 ms	1.20 mm
Laser Welder SL10	240 V - 260 V	4 ms - 8 ms	1.6 mm - 2.00 mm

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

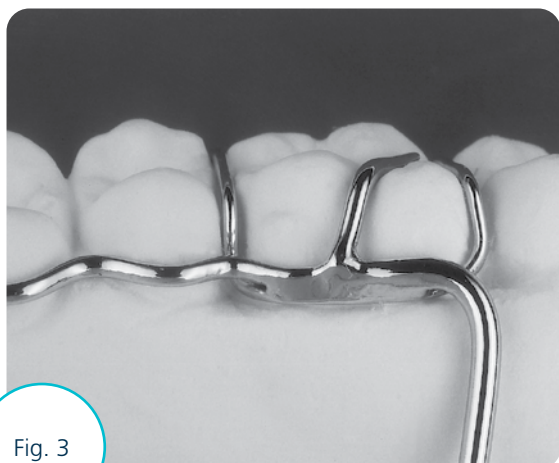


Fig. 3

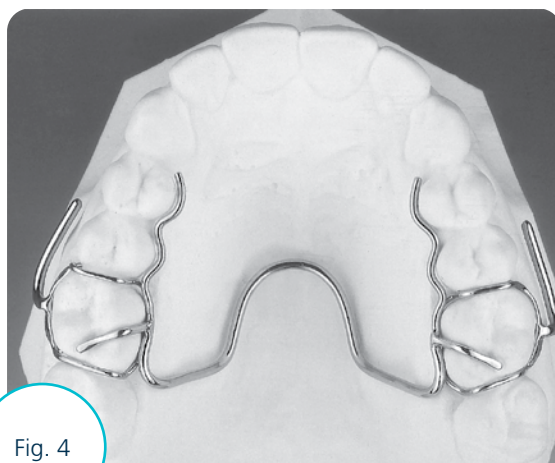


Fig. 4

Laser output:

	Voltage/ output	Pulse duration	Diameter
desktop Compact up to 2024	220 V - 240 V	2 ms - 4 ms	1.20 mm
desktop Compact from 2024	1900 W - 2100 W	1 ms - 3 ms	1.20 mm
Laser Welder SL10	240 V - 260 V	4 ms - 8 ms	1.60 mm - 2.00 mm

Completed laser welded Crozat appliance.



Welding chart for Area of use: Orthodontics

	Task	Recommended materials and application
1	Manufacturing a Herbst appliance	Herbst I, Herbst VI or Herbst TS hinge double welded molar bands for upper / lower jaw double welded premolar bands upper / lower jaw
2	Manufacturing a palatal expansion appliance	hyrax® screw Molar band upper jaw and premolar band lower jaw remanium® wire, spring hard \varnothing 0.90 mm or 1.00 mm
	Step 1	Wire \varnothing 1.00 mm on band
	Step 2	Retention leg on wire \varnothing 1.00 mm
	Step 3	Reinforce with wire \varnothing 0.35 mm
	Welding a Quad Helix to bands	Quad Helix, pre-formed Molar band upper/lower
	Manufacturing an individual gap retainer	remanium® wire \varnothing 0.80 mm Molar bands upper
	Welding a lingual/ palatal arch to bands	Orthorama® lingual/palatal arch remaloy® wire \varnothing 0.90 mm remanium® wire, spring hard \varnothing 0.35 mm Molar band upper
	Welding a lingual/palatal sheath to a band	Lingual-/ Palatal sheath Molar band

desktop Compact up to 2024			desktop Compact from 2024			Laser Welder SL10		
Welding parameters			Welding parameters			Welding parameters		
Voltage V	Pulse duration ms	Diameter ø in mm	Output W	Pulse duration ms	Diameter ø in mm	Voltage V	Pulse duration ms	Diameter ø in mm
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8

Welding chart for Area of use: Orthodontics

No.	Task	Recommended materials and application
	Welding a hook for elastics to a facebow or a lip bumper	Ball retainer clasp 0.70 mm Reinforce with wire \varnothing 0.35 mm
	Welding a stop to a round or rectangular arch, stainless steel	Stop tube, slotted on round arch on rectangular arch
	Welding a hook for elastics to a round or rectangular arch	Pre-formed hook or ball retainer clasp \varnothing 0.70 mm on round arch on rectangular arch
	Welding a cross tube on a round or square arch, stainless steel	Cross tube on round arch on rectangular arch
	Welding a round tube to an Adams clasp for holding a facebow	Tubes – stainless steel e.g. \varnothing 1.20 mm
	Manufacturing a customized bonded retainer Manufacturing a customized lingual retainer	remaloy® wire \varnothing 0.70 mm mesh base, small
	Manufacturing a customized hook on a prewelded or bonded bracket/buccal tube	Ball retainer clasp \varnothing 0.70 mm
	Manufacturing a Kahn spur on a facebow	Step 1 Step 2
	Manufacturing a spike for the bonding technique Spikes on lingual bow	Step 1 Step 2
	Welding a customized spring to a labial bow	remanium® wire \varnothing 0.70 mm, spring hard

Welding chart for Area of use: Orthodontics

No.	Task	Recommended materials and application
	Welding an additional retention to an expansion screw for improved anchoring in acrylic	remanium® wire ø 0.90 mm
	Welding of a wire to an expansion screw, e.g. as a spring	Step 1 remanium® wire ø 0.80 mm – end to end Stage 2 Reinforce with wire ø 0.35 mm or Stage 2 remanium® wire ø 0.80 mm – planar
	Manufacturing an acrylic-free expansion appliance for upper or lower jaw	hyrax® screw mini Molar band upper / lower
5	Repairing a labial bow / an Adams clasp, etc.	Step 1 remanium® wire ø 0.70 mm – end to end Step 2 Doubling with wire ø 0.70 mm
	Manufacturing a stop on facebow / lip bumper	Stop tube ø 1.15 mm
	Welding a post hook on round or rectangular arch / upper and lower jaw Stainless steel	Ball retainer clasp ø 0.70 mm On round arch / upper and lower jaw On rectangular arch / upper and lower jaw
	Repairing a hyrax® screw with broken retention leg	Step 1 End to end Step 2 Reinforce with wire ø 0.35 mm or Stage 2 Weld in a planar manner
3	Welding a buccal tube to a molar band	Molar band, upper/lower jaw Buccal tube
4	Welding a double hook to a molar band	Molar band, upper/lower jaw Lingual /palatal hook
	Modifying a palatal bar, Orthorama® system	remanium® wire ø 0.50 mm, spring hard
	Modifying two traction screws (Geller system)	Retraction screw

desktop Compact up to 2024			desktop Compact from 2024			Laser Welder SL10		
Welding parameters			Welding parameters			Welding parameters		
Voltage V	Pulse duration ms	Diameter ø in mm	Output W	Pulse duration ms	Diameter ø in mm	Voltage V	Pulse duration ms	Diameter ø in mm
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
215 - 230	1.0 - 2.0	approx. 0.8	1800 - 1900	1.0 - 2.0	approx. 0.8	220 - 230	1.0 - 2.0	approx. 0.8
220 - 240	2.0 - 4.0	approx. 0.8	1900 - 2100	1.0 - 3.0	approx. 0.8	240 - 260	3.0 - 6.0	approx. 0.8

Welding chart for Area of use: **Orthodontics**

remaloy® straight wire

round, 0.70 mm / 28, hard	REF 528-070-00	10 pieces
round, 0.80 mm / 31, hard	REF 528-080-00	10 pieces
round, 0.90 mm / 36, hard	REF 528-090-00	10 pieces
round, 1.00 mm / 39, hard	REF 528-100-00	10 pieces
round, 1.10 mm / 43, hard	REF 528-110-00	10 pieces
round, 1.20 mm / 47, hard	REF 528-120-00	10 pieces
round, 1.30 mm / 51, hard	REF 528-130-00	10 pieces
round, 1.50 mm / 59, hard	REF 528-150-00	10 pieces
half round, ø 1.50 mm x 0.75 mm / 59 x 30, spring hard	REF 528-155-00	10 pieces
half round, ø 1.75 mm x 0.90 mm / 69 x 36, spring hard	REF 528-158-00	10 pieces
rectangular rounded, ø 1.92 x 0.90 mm / 76 x 36, spring hard	REF 528-159-00	10 pieces

CoCr welding wire

ø 0.25 mm	REF 528-215-10	1 piece
ø 0.35 mm	REF 528-210-10	1 piece
ø 0.50 mm	REF 528-200-10	1 piece
NiCr welding wire		
ø 0.50 mm	REF 528-220-00	1 piece

rematitan® wire		
rematitan® wire on coils Ti, round, ø 0.40 mm	REF 528-039-50	1 piece
rematitan® wire on coils Ti, round, ø 0.70 mm	REF 528-040-50	1 piece
rematitan® straight wire Ti, round, ø 1.00 mm	REF 528-041-00	10 pieces
rematitan® straight wire Ti, round, ø 1.20 mm	REF 528-042-00	10 pieces
rematitan® straight wire Ti, round, ø 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
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

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







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