CONCEPTLASER
hofmann innovation group

The pioneers of LaserCUSING® technology

www.concept-laser.de

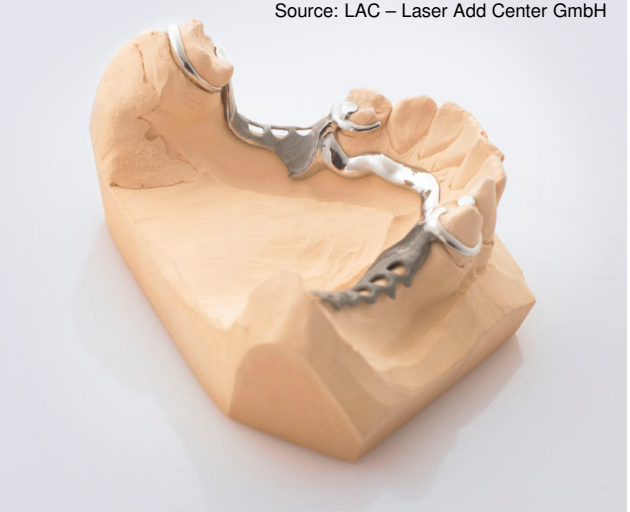
Concept Laser – Dental industry solution

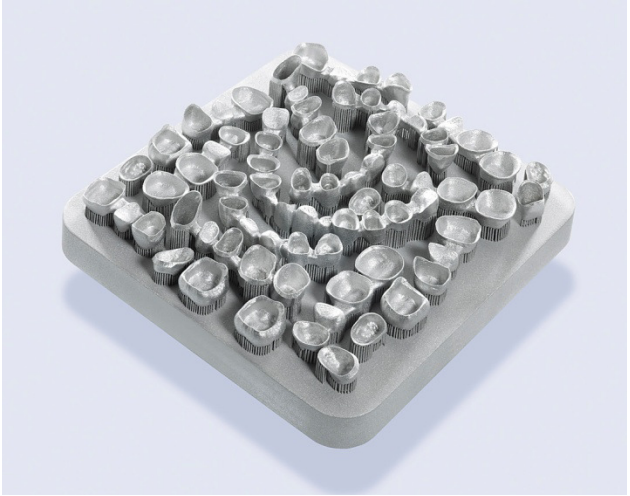
- Advantages of the LaserCUSING® process
- Front end software/ - interfaces
- Machine solutions
- Dental materials
- Manufacturing process
- Post treatment
- Evaluation of economic efficiency
- Examples of use
- References

Advantages

- Dentures with a constantly very good level of quality based on the use of a standardised manufacturing process
- Manufacturing of complex and filigree customized dental restorations and implants
- CE-certified materials for dental applications

Source: LAC – Laser Add Center GmbH





Software/ interfaces

Front End Software/ -interfaces

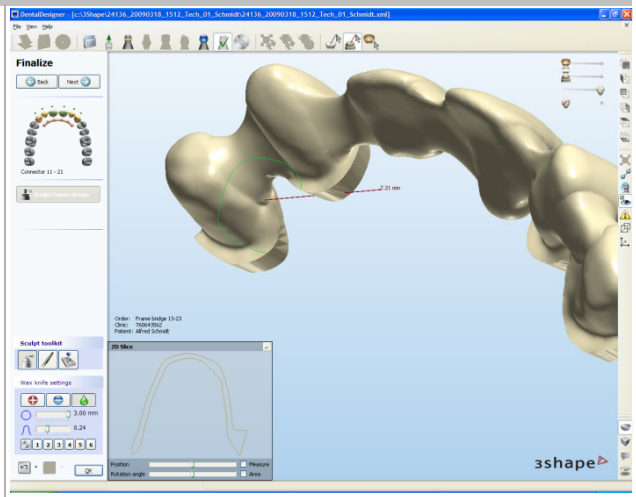
Scanning
Digitalizing of the plaster model by using a dental scanner (i.e. 3Shape Scanner)

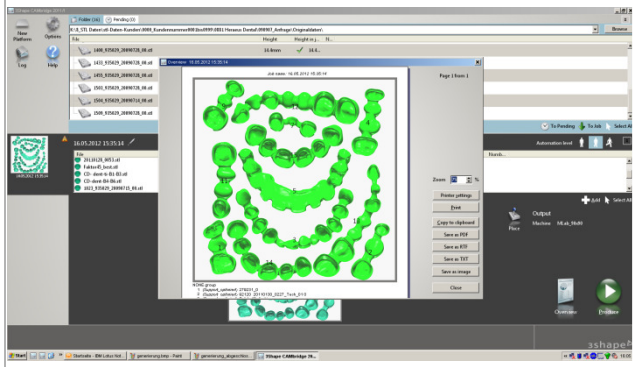
Designing
Construction of the dental restaurations by using a dental design software like:

- Dental Designer (3Shape)
- DWOS (dental wings)

Data preparation
Data preparation by using a software like:

- CAMbridge™ (3Shape)
- AutoFab Mlab (Marcam Engineering)





Software/ interfaces

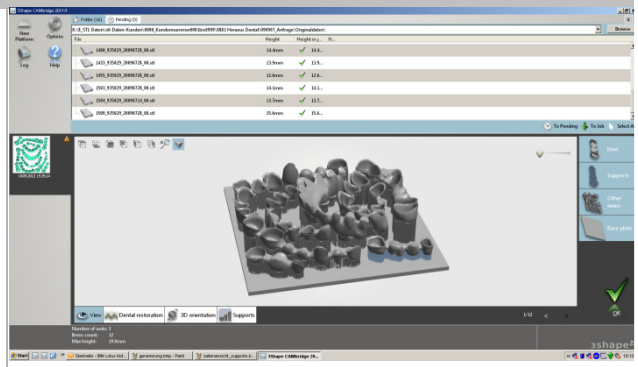
Example by using CAMbridge™ :

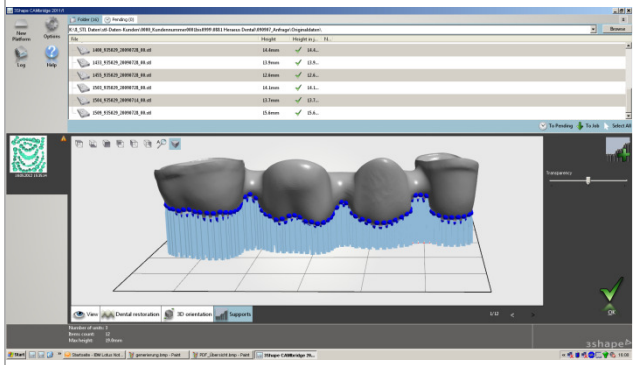
1. Automatic orientation
   Placement on the occlusal surface

2. Ideal placement (nesting) of the parts on build platform

3. Automatic support generation

4. Automatic slicing.





Data transfer
Via network or USB connection the build data can be transferred to the machine. After slicing the data the production can be started.

Machine solutions

Mlab cusing (R)

Target group: Laboratories
Build envelope: 50 x 50, 70 x 70, 90 x 90, z=80 mm
Laser system: 100 watt

M1 cusing

Target group: Laboratories/ Manufacturing center
Build envelope: 250 x 250 x 250 mm
Laser system: 200 watt / 400 watt

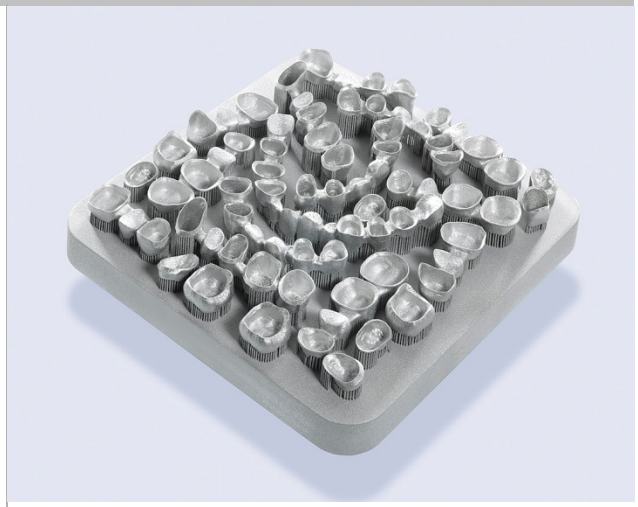
M2 cusing

Target group: Laboratories/ Manufacturing center/ processing titanium alloys
Build envelope: 250 x 250 x 280 mm
Laser system: 200 watt / 400 watt

Dental materials

LaserCUSING® material powered by DENTAURUM

Materials remanium® star CL and rematitan® CL stand for:



BIOFUNCTIONALITY

Meeting the intended purpose in a biological environment

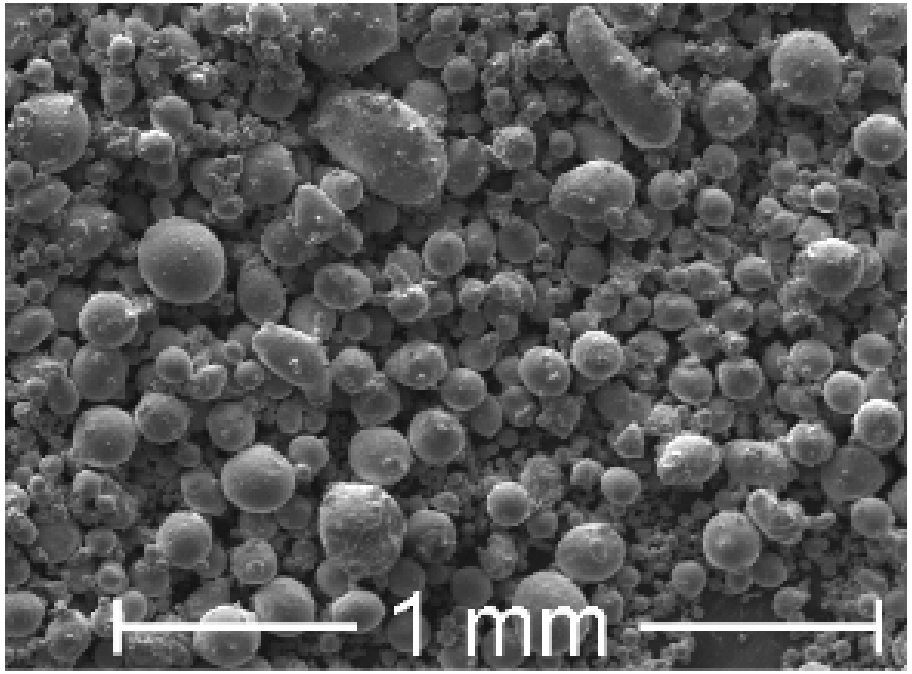
BIOCOMPATIBILITY

harmless material behaviour in a biological environment

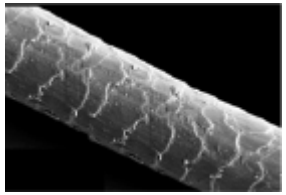
SAFETY

Dental materials

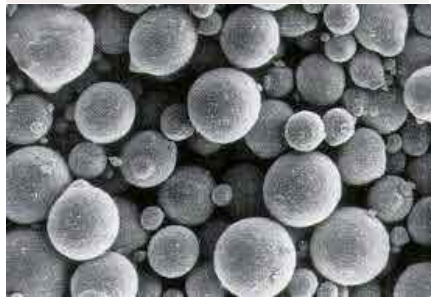
LaserCUSING® material powered by DENTAURUM



Source: DENTAURUM



Size of a single hair



Powder size 10µm - 40µm

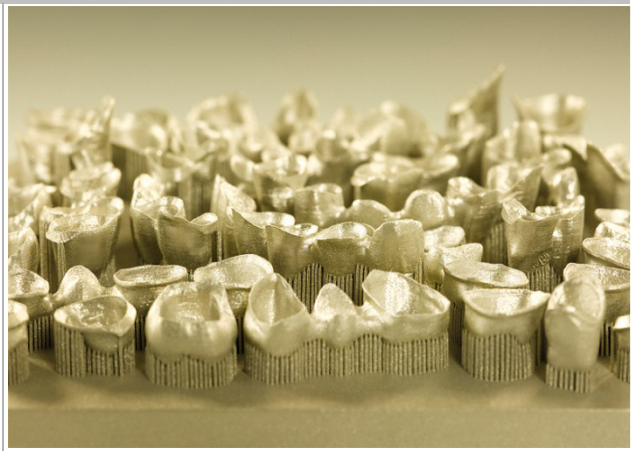
Gas atomized powder, oxide-free surfaces,
spherical 10-40 µm, for optimum size and size distribution,
highest packing density.

Dental materials - remanium® star CL

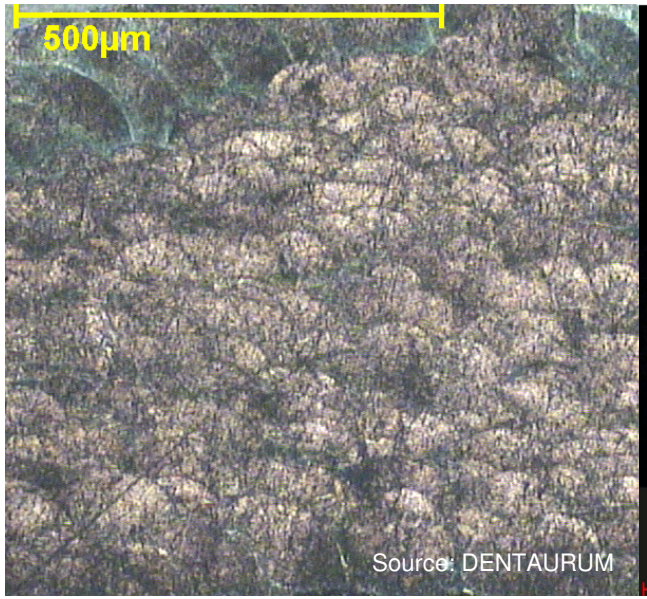
LaserCUSING® material powered by DENTAURUM

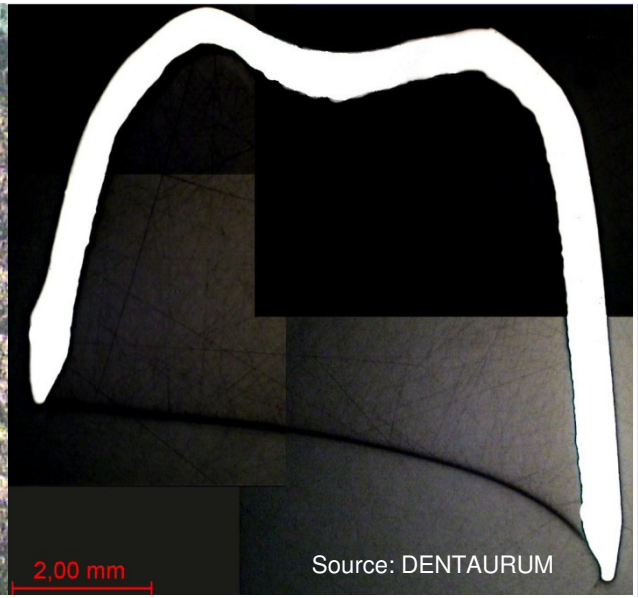
remanium® star CL

- CoCrW- alloy (powder) according to DIN EN ISO 9693 / DIN EN ISO 22674, Typ 5
- Certified alloy (CE 0483)
- Meets the requirements of ASTM standards
- Range of application:
  Crowns and bridges, frames for metal ceramic veneering, removable partials, primary – and secondary parts for combined restorations.



Dental materials





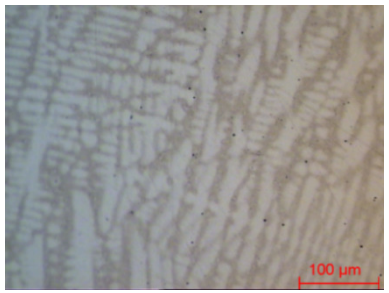
LaserCUSING® : Dense, fine microstructure without porosities (remanium® star CL)

Dental Materials - remanium® star CL

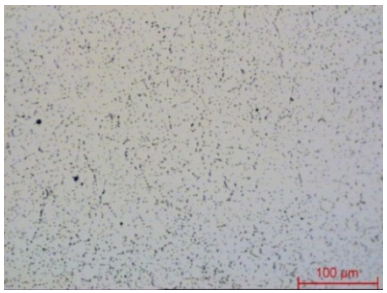
Mechanical Properties

	Casting	Milling Disk	Powder
Yield Strength $R_{P0,2}$	620 MPa	635 MPa	630 MPa
Tensile Strength R_m	845 MPa	1030 MPa	1046 MPa
Elongation at fracture A_5	10 %	10 %	10 %

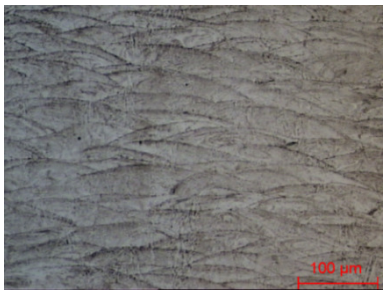
Source: DENTAURUM



Cast



Milled



LaserCUSING®

Dental Materials - rematitan® CL

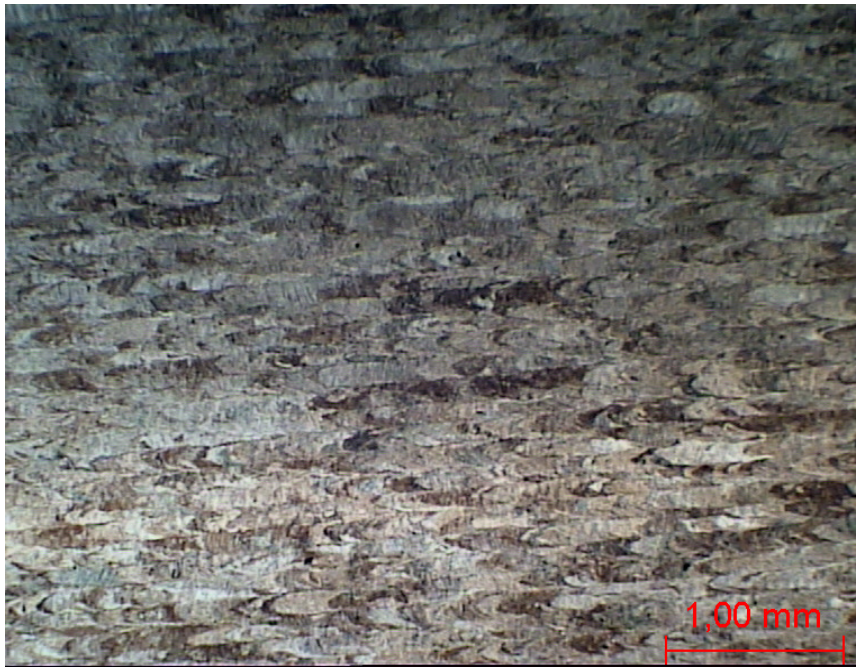
LaserCUSING® material powered by DENTAURUM

rematitan® CL

- Ti-alloy (powder) according DIN EN ISO 9693 / DIN EN ISO 22674, Typ 4
- Certified alloy (CE 0483)
- Meets the requirements of ASTM standards
- Range of application:
  Crowns and bridges, frames for metal ceramic veneering, removable partials, primary – and secondary parts for combined restorations, implant supraconstructions.

Dental Materials - rematitan® CL

Titanium alloy of implant quality



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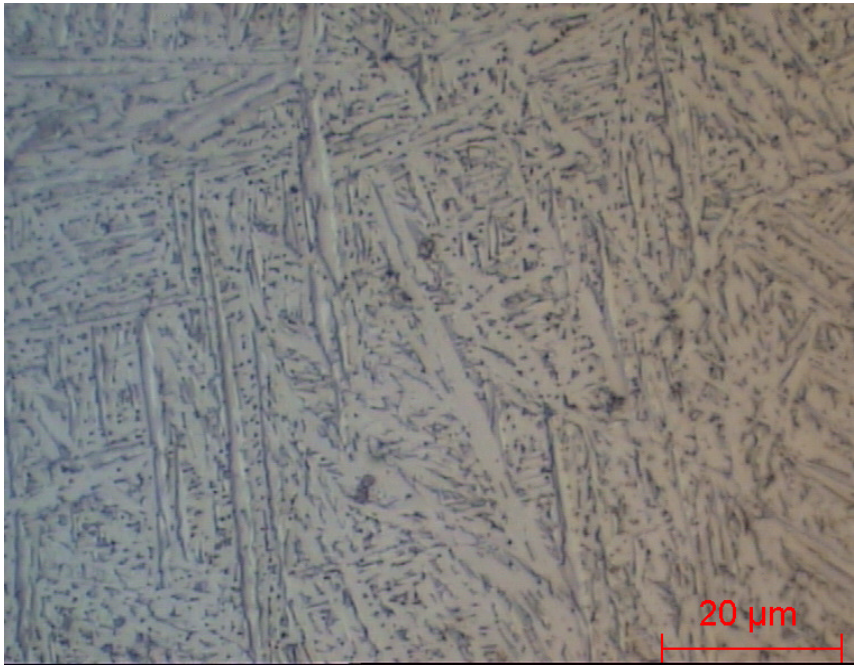


Source: DENTAURUM

LaserCUSING® : Dense, fine microstructure without porosities (rematitan® CL)

Dental Materials - rematitan® CL

Mechanical Properties

	ISO 22674 Typ 4 min.	ASTM B348 Grade 23	Typical LaserCUSING® after heat treatment
Yield strength $R_{P0,2}$	360 MPa	759 MPa	950 MPa
Tensile Strength R_m	n.b.	828 MPa	1005 MPa
Elongation at fracture A_5	2 %	10 %	12 %

Source: DENTAURUM

Dental Materials - rematitan® CL

Corrosion behaviour of rematitan® CL

Universität Tübingen
Zentrum für Zahn-, Mund- und Kieferheilkunde

UKT

Zertifikat

Prüfung der Korrosionsbeständigkeit

Legierung: *Rematitan® CL*
Titan-Legierung

Zusammensetzung: Ti 90 Al 6 V 4
(Masse-%)

Hersteller: Dentaurum GmbH & Co. KG
Turnstr. 31 / 75228 Ispringen

Prüfung: Die Legierung wurde gemäß der internationalen Norm DIN EN ISO 10271:2006 "Dentale metallische Werkstoffe - Korrosionsprüfverfahren" zur Bestimmung der Korrosionsbeständigkeit geprüft.

Korrosionstest:

Die Prüfung erfolgte durch analytische Bestimmung der Metallionenabgabe mittels ICP-OES nach 7-tägigem Tauchversuch in einer Lösung aus 0,1 mol/L Milchsäure und 0,1 mol/L Natriumchlorid.

Testergebnis: Die Metallionenabgabe der Legierung "Rematitan CL" (LOT U/009) ergab einen mittleren Wert von 0,00141 mg/cm²/7d.

Tübingen, 11.03.2011

Zentrum für Zahn-, Mund- und Kieferheilkunde
Sektion Medizinische Werkstoffkunde & Technologie
Osiandersraße 2-8
72076 Tübingen

Prof. Dr. J. Geis-Gerstorfer

Source: DENTAURUM

Corrosion resistance: acc. to standards ISO 10271 and ISO 22674* (static immersion test)

1,41 µg/cm²
(by LaserCUSING®)

*Max. permissible ion release acc. to ISO 22674: 200 µg/cm²/7d

Manufacturing process

Post treatment

1. Heat treatment

After finishing the manufacturing process a heat treatment under argon atmosphere is required.

Heat treatment oven N7/H

Heat treatment at 1150°C is necessary:

- To receive necessary microstructure and properties
- To relax resudal stress of parts
- To avoid cracking of porcelaine coating (at 900°C).

Post treatment

2. Removing from the build platform

1. After heat treatment the dental restorations have to be removed from the build platform by using a cutting disk, a band saw or wire cutting.

2. The support structures itself can be broken away manually right after.

Post treatment

3. Smoothing

Afterwards the surface of the units has to be finished manually with a handpiece.

Smoothing of the surface with a handpiece

Post treatment

4. Microblasting/ shot peening

At the end the surface has to be finished by using microblasting/ shot peening.

Overall time required for complete post treatment of one unit: approx. 2 minutes

Microplasting of a 4 unit bridge

Dental Materials – ceramic coating

CARMEN®

CARMEN® CCS COMPACT CERAMIC SYSTEM

Overview about the alloys VITA tested in combination with VITA VMK Master®

- Remanium Secura
- Remanium Star
- Remanium 2000+
- Remanium Star CL

Overview about the alloys VITA tested in combination with VITA VM 13

- Remanium Star
- Remanium CS
- Remanium CSe
- Remanium Secura
- Remanium Star CL

All commercial available ceramic alloys that are suitable for WAK 14,1 x 10^{-6}/K.
Dentaurum recommends CARMEN® and CCS.

Examples of use

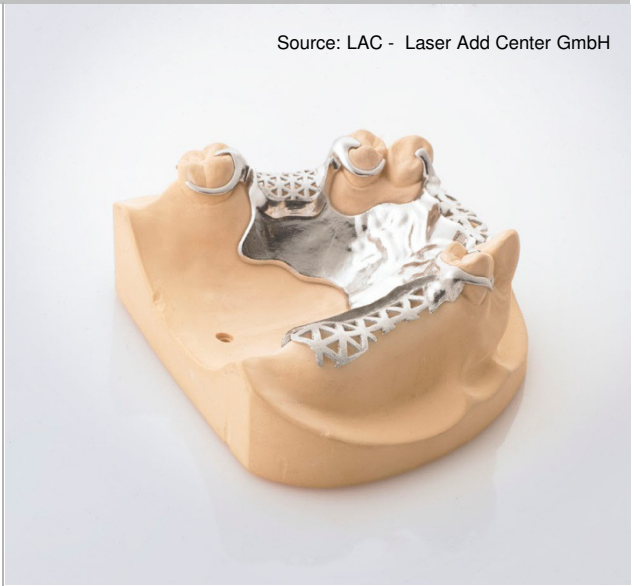
Case study 1: Removable partial

Machine:	M2 cusing
Laser:	Fibre laser 200 W
Material:	remanium® star CL
Customer:	LAC – Laser Add Center GmbH

Advantages of removable partials manufactured with LaserCUSING®:

- Brace elements can be made much more delicate, while retaining sufficient mechanical properties → greater aesthetic advantage and benefit for the patient
- Reduction of rework time to 0,5 hour
- Shortening of the delivery time to 1-2 working days
- Economic manufacturing possible

Source: LAC - Laser Add Center GmbH



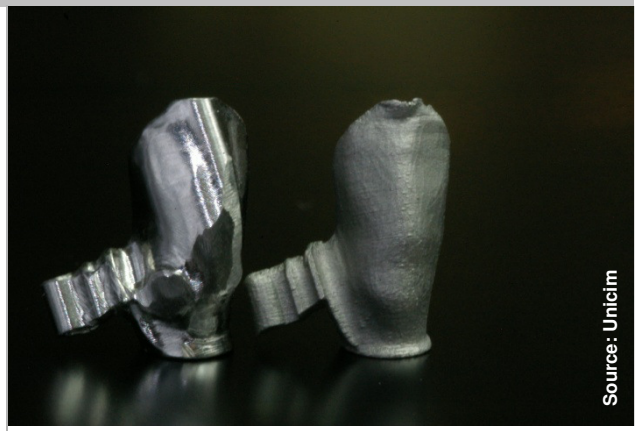
Examples of use

Case study 2: Attachments

Machine:	Mlab cusing
Laser:	Fiber laser 100 W
Material:	remanium® star CL
Customer:	Unicim

The advantages of a laser melted attachment in comparison with a milled attachment based on the example of the Mini-SG PLUS attachment:

- The milling paths are visible with milled frameworks and the layers are visible with frameworks that have been fabricated generatively. Both attachments must be adjusted.



Examples of use

- With regard to the accuracy of fit, both crowns fit flush, with zero play on the implant and without requiring fitting adjustments.

- The matrix of the attachment can be pressed on perfectly with the LaserCUSING® framework and already provides the required friction. Attempts to place the milled attachment on the matrix fail.

Cause:
Residual material remains in the angle of the corners when milling, if a right-angle is milled using a 1mm (radius 0.5mm) cutter. As there is a corner angle in the original matrix, correct placement of the two units is impossible.

References

Germany
Wieland Dental + Technik
LAC- Laser Add Center
Laufer Zahntechnik
CADSPEED
Paape Zahntechnik
Prodental Zentralverwaltung
Smart microparts
b.Tec GmbH Dental-Depot

Europe
M-Tec Dental
Solo-Tech Dental Fraescenter
Dental Technician Laboratory
Dentware
IDI Evolution
Nuova Franco Suisse Italia
Unicim

Asia
Chengdu Dent
JinDa

USA
The Argen Corporation