

# Juvora

## JUVORA™ Dental Disc The Processing Guide



## The Processing Guide

Caution: US Federal Law restricts this device to sale by or on the order of a dentist.

### Instructions for Use and Safety Precautions:

The JUVORA™ Dental Disc shall only be processed in accordance with this manual and the instructions for use.

### Qualifications and Safety at Work:

The user has to be trained and skilled in dental technology and know the safety regulations for the application.

JUVORA recommend the use of eye protection, extraction units and a dust mask as is applicable for all standard dental milling procedures.

**IMPORTANT:** This manual covers the use of products from the following companies:

- 3M ESPE
- GC
- Kulzer
- Ivoclar Vivadent

Other possible combinations can be found in the chart at the end of this manual.

Any systems not referenced in this manual **MUST** be fully tested according to ISO 11405 Dental Materials – Testing of Adhesion to Tooth Structure, and with a resultant adhesive strength of >10 MPa.

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## Indications

For the manufacture of:

- i) Full and partial removable dentures and implant overdentures.
- ii) Copings, substructures, removable dentures, or frameworks for permanent and transitional anterior or posterior crowns, bridgework, and substructures that can be either cemented or uncemented restorations (e.g. telescopic restorations).

For a full list of warnings and contraindications, see instructions for use.

# Contents

## This manual describes:

- Preparation of the Model
- Construction and Design Guidance – per Application
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- Milling of the JUVORA™ dental disc
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- Veneering of JUVORA™ with Composite Systems
- List of Composite Veneering Systems
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Not all sections of this manual are applicable to all indications.

## Preparation of the Model

### Suggestions for Model Preparation:

#### Scanning Model:

The model for scanning can be made from gypsum and should have no reflective surface.

#### Veneering Model:

The model for veneering can be made from transparent acrylic.



#### Wax Model Construction:

Block out with wax – AVOID sharp edges. This makes it easier to fit the denture to the model after construction.

#### Scanning Considerations:

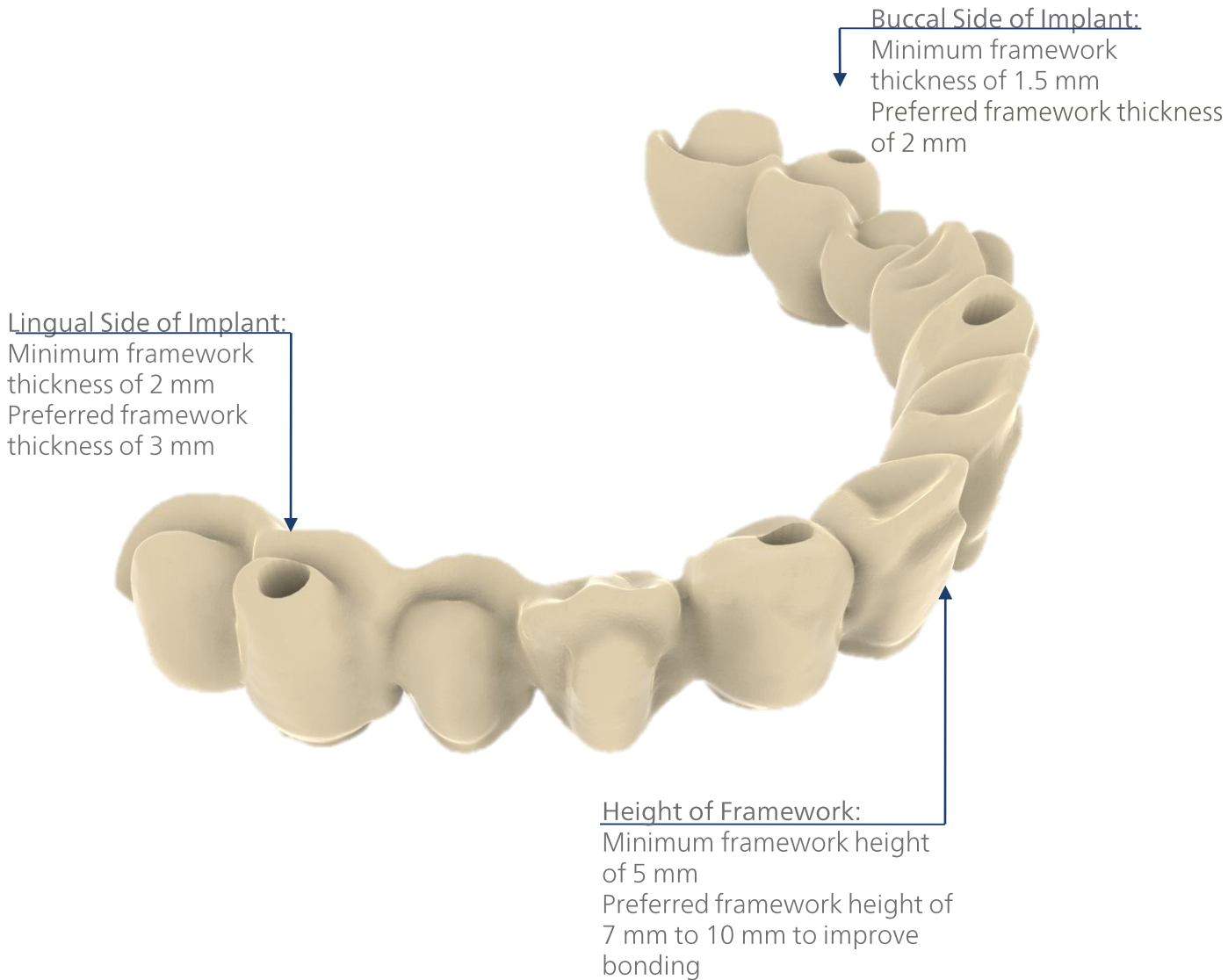
To achieve detailed scanning results:

Use high resolution.

A good polygon mesh (at least 1 million) is required as less than this will lead to inaccuracies.

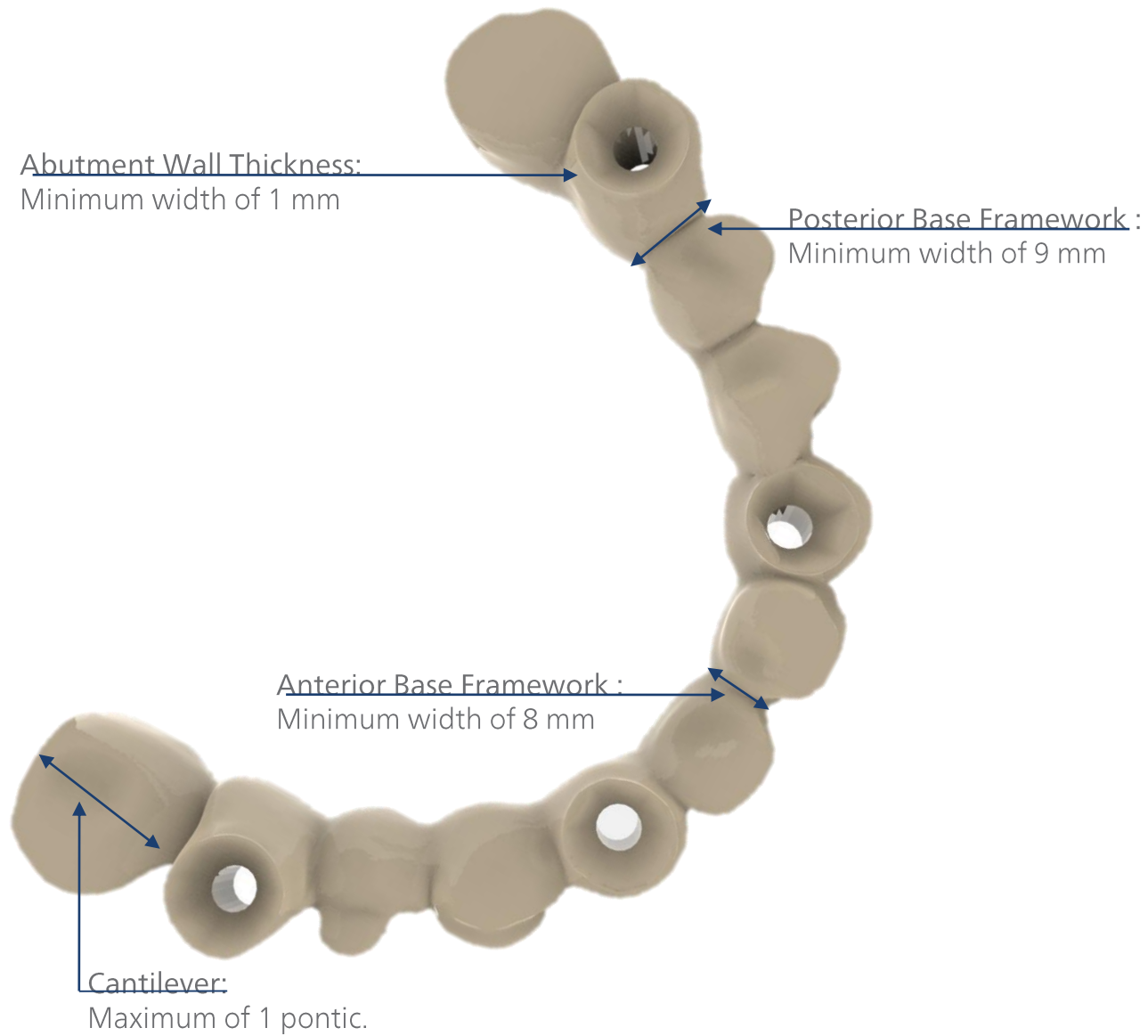
# Construction and Design Guidance Per Application

## Implant Dentures

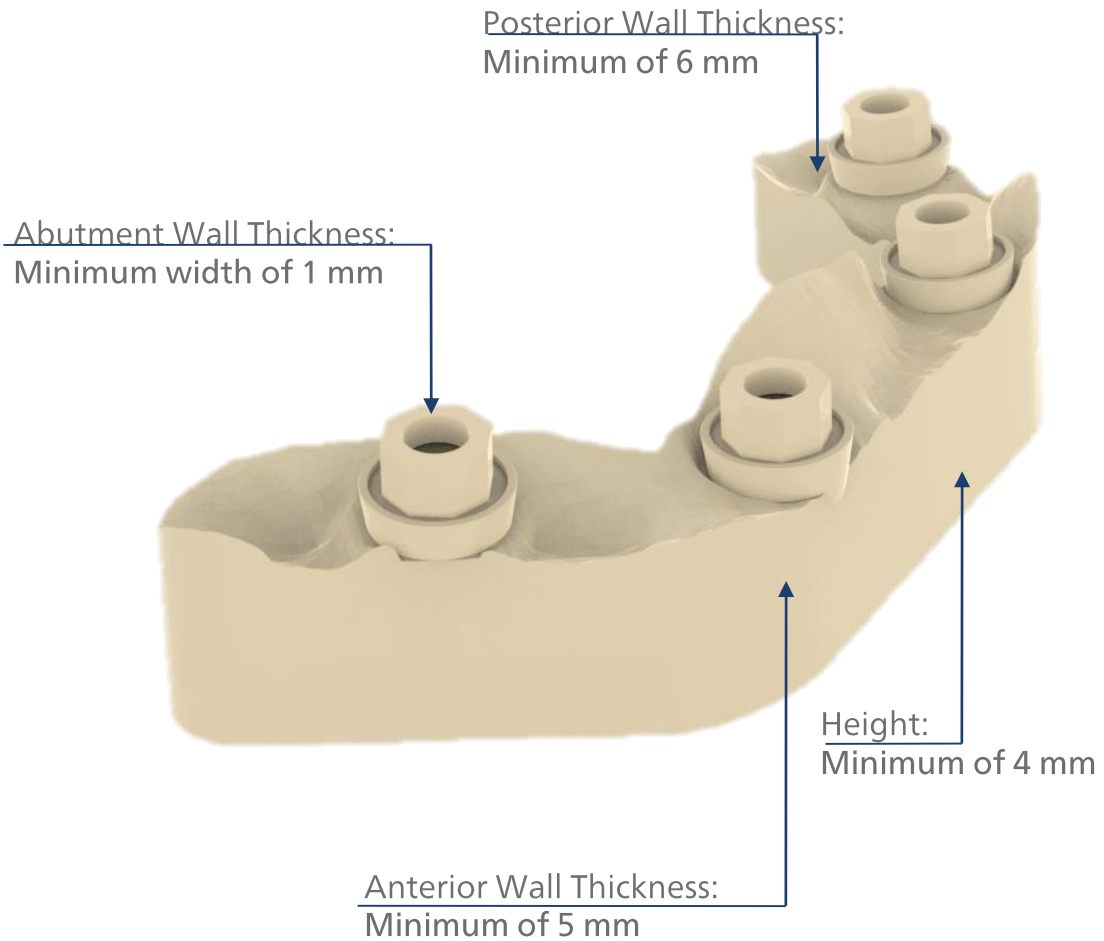


**Palatal Plate Protection:** Required to avoid damage/de-bonding between the framework and the veneering. Where possible avoid contact between the veneer and the antagonist and ensure contact in the anterior region of the Juvora framework.

# Implant Dentures



# Implant Bars



# Overdentures

Implant Bar:  
Overdentures must  
ALWAYS be supported by  
implant bars



Protection Plate:  
A Palatinal or Lingual  
protection plate is  
required for overdentures  
when a transpalatal bar  
(horizontal retainer) is not  
present

Framework Wall Thickness:  
Minimum wall thickness of  
2 mm on occlusal, lingual  
and buccal regions

**Palatinal Plate Protection:** Required to avoid damage/de-bonding between the framework and the veneering. Where possible avoid contact between the veneer and the antagonist and ensure contact in the anterior region of the Juvora framework.



## Removable Clasp Dentures

**Framework Wall Thickness:**  
Minimum wall thickness of 2 mm

### Clasps:

Minimum thickness for clasps in the shape of the drop of 2 mm (thickness) x 3 mm (height).

### Transpalatal bar:

Minimum framework thickness of 2 mm  
Minimum framework width of 8 mm

### Retention Plate Holes:

Maximum hole diameter of 2 mm  
Minimum distance between hole and external plate wall of 1 mm  
Minimum distance between adjacent holes of 2 mm

### T-Shape Reinforcement:

Required to provide strength and stability.  
Minimum diameter: 1.5 mm<sup>2</sup>

### Clasp undercut:

0.5 mm in the anterior region and 0.5-0.75 mm in the posterior region

### **Machining Tip:**

For higher stability whilst milling the clasps have to be connected with each other or with the framework. Double closed clasps can be used.

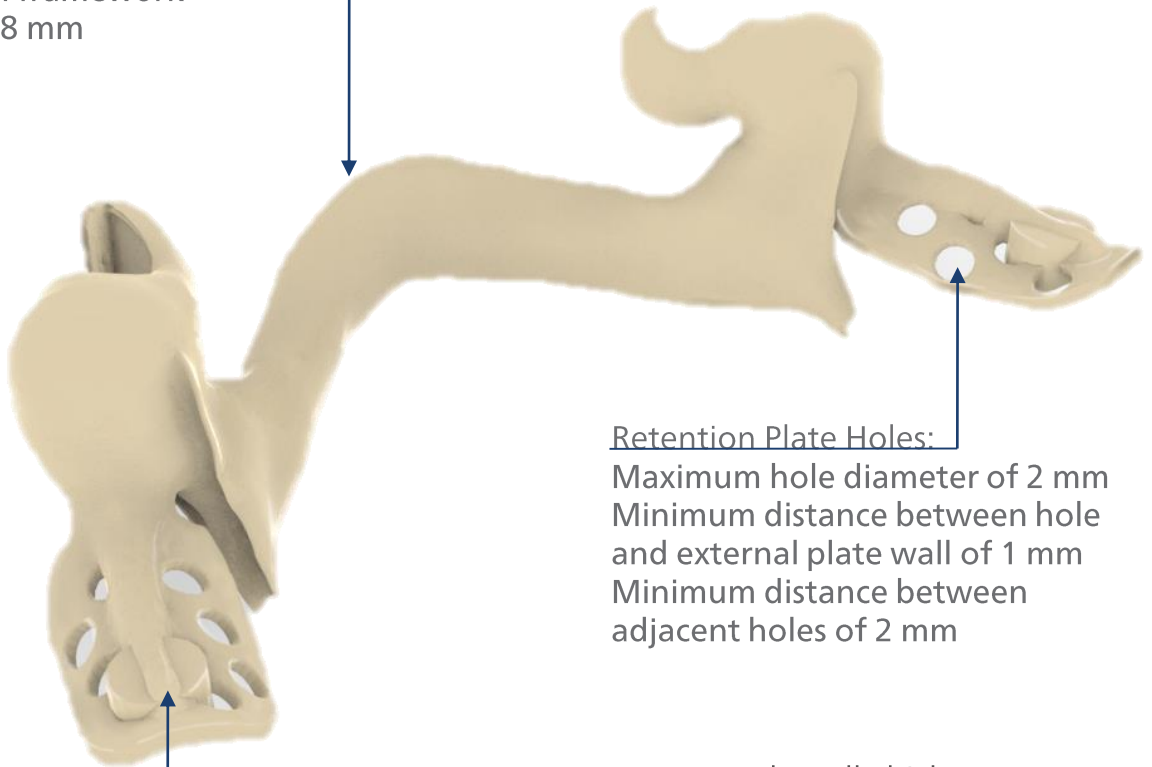
# Removable Telescope Dentures

## Lingual bar:

Minimum framework thickness of 2 mm  
Minimum framework width of 8 mm

## Retention Grooves:

Must have a smooth finish, round curvature and no indentations and sharp edges.  
Minimum width of 2 mm, minimum height 1.5 mm.



## Retention Plate Holes:

Maximum hole diameter of 2 mm  
Minimum distance between hole and external plate wall of 1 mm  
Minimum distance between adjacent holes of 2 mm

## T-Shape Reinforcement:

Required to provide strength and stability.  
Minimum diameter: 1.5 mm<sup>2</sup>

Framework Wall Thickness:  
Minimum wall thickness of 2 mm

## Attachment Piece:

To secure the attachment piece onto the framework attachment housing please use the primer bonding system recommended in the veneering table at the end of the document :  
Page 31

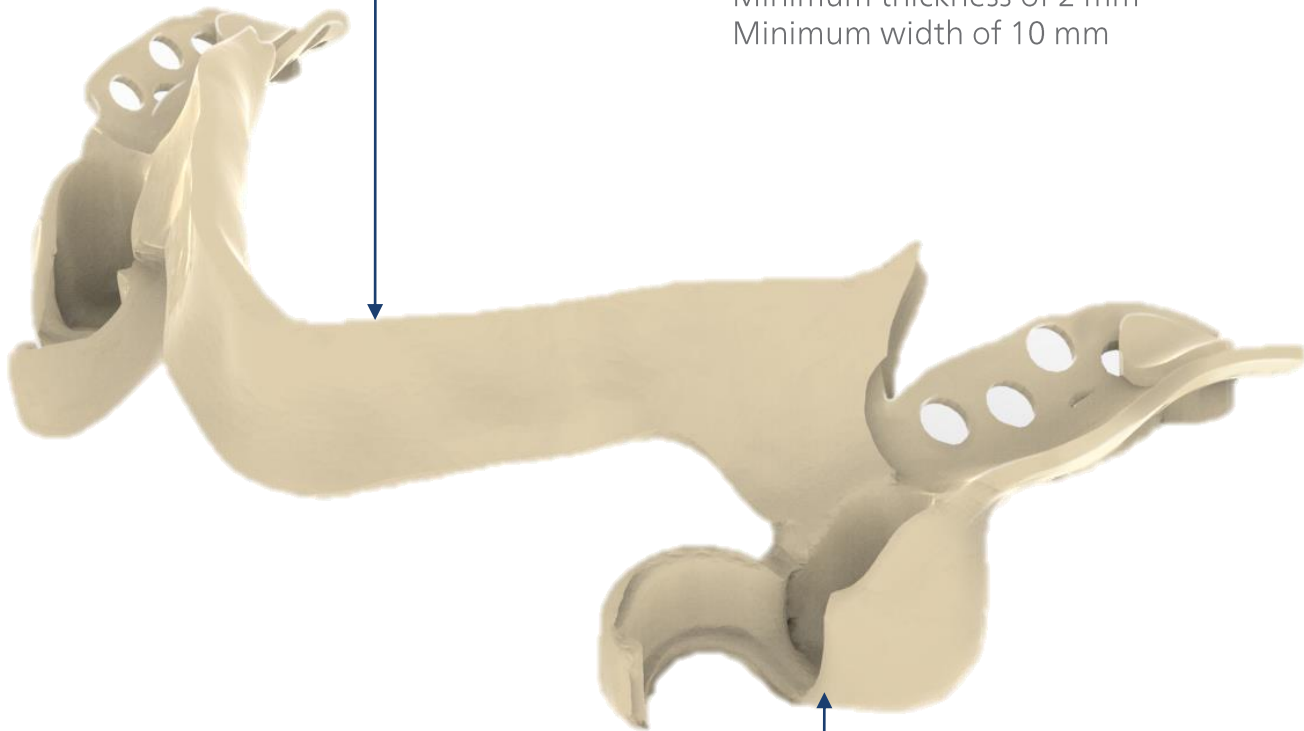
## Removable Attachment Dentures

### Lingual Bar (lower):

Minimum thickness of 2 mm  
Minimum width of 5 mm

### Transpalatal Bar (upper):

Minimum thickness of 2 mm  
Minimum width of 10 mm



### Connector Housing:

Wall thickness minimum for each area:  
Occlusal : 1 mm EXCEPT in fully anatomic where thickness should be greater than 1.5 mm  
Buccal: 2 mm  
Lingual: 2 mm  
Palatinal: 2 mm

### Attachment Piece:

To secure the attachment piece onto the framework attachment housing please use the primer bonding system recommended in the veneering table at the end of the document : Page 31

# Removable Telescope Dentures

**Retention Plate Framework:**  
Minimum thickness of 2 mm.  
Minimum width of 8 mm

**Retention Grooves:**  
Must have smooth finish,  
round curvature with no  
indentations or sharp edges  
Minimum groove width of 2  
mm and height of 1.5 mm.

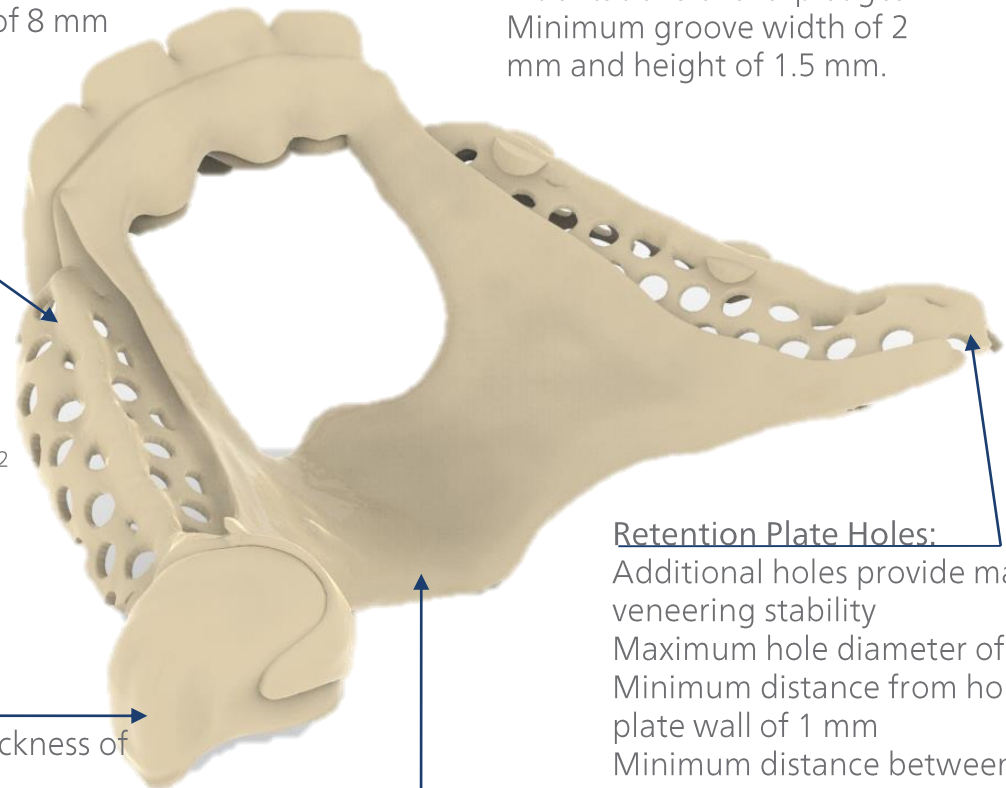
**T-Shape Reinforcement:**  
Necessary to  
assure stability  
and strength of  
framework  
Minimum  
diameter: 1.5 mm<sup>2</sup>

**Occlusal Region:**  
Minimum wall thickness of  
1.5 mm.

**Retention Plate Holes:**  
Additional holes provide maximum  
veneering stability  
Maximum hole diameter of 2 mm  
Minimum distance from hole to  
plate wall of 1 mm  
Minimum distance between holes  
of 2 mm

**Transpalatal Bar:**  
Minimum thickness of 2  
mm. Minimum width of 10  
mm

**Framework Wall Thickness:**  
Minimum wall thickness of 2  
mm



# Removable Telescope Dentures

## Lateral Region of Secondary Telescope

Crown:  
Minimum wall thickness of 2 mm

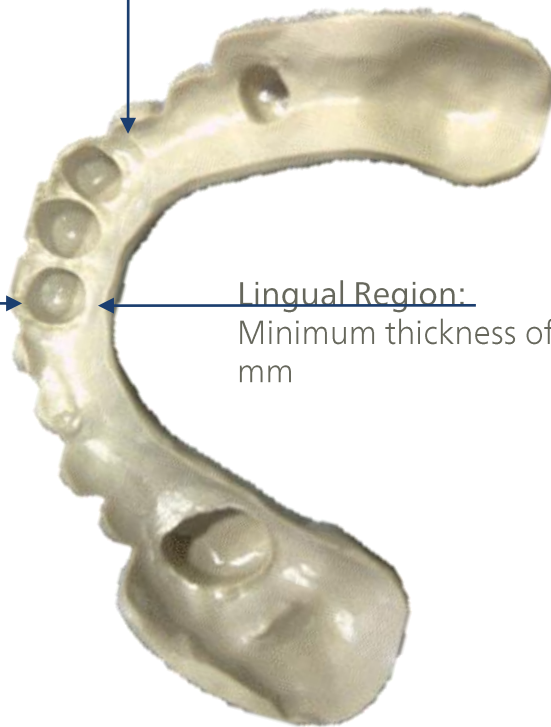
## Buccal Area of Secondary Telescope

Crown:  
Preferably 1 mm thickness  
Minimum thickness of 0.7 mm

## Lingual Region:

Minimum thickness of 2 mm

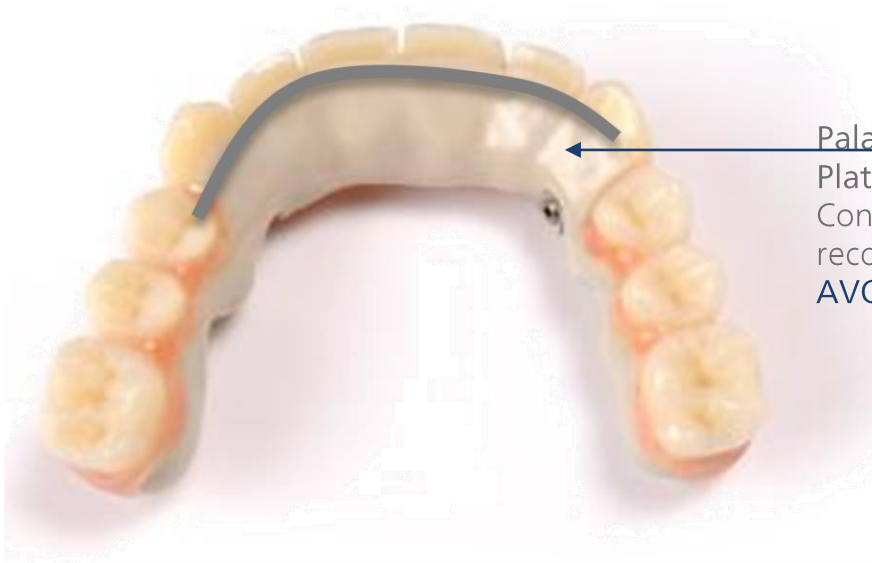
Wall Thickness  
Between Adjacent  
Secondary Telescope  
Crown:  
Preferably greater  
than 1 mm thickness  
Minimum thickness of  
0.7 mm.



## Removable Telescope Dentures

Removable telescope dentures without transpalatal bar (horizontal retainer) – requires the designing of a palatinal protection plate (for upper jaw denture) or lingual protection plate for (for lower jaw denture).

Palatinal protection plate is required to avoid damage or de-bonding between the framework and the veneering. The antagonist should only make contact in the anterior region with the JUVORA™ material, and not at the juncture between JUVORA and the veneering material.



Palatinal/Lingual Protection

Plate:

Contact with JUVORA framework  
recommended

**AVOID** contact with veneer

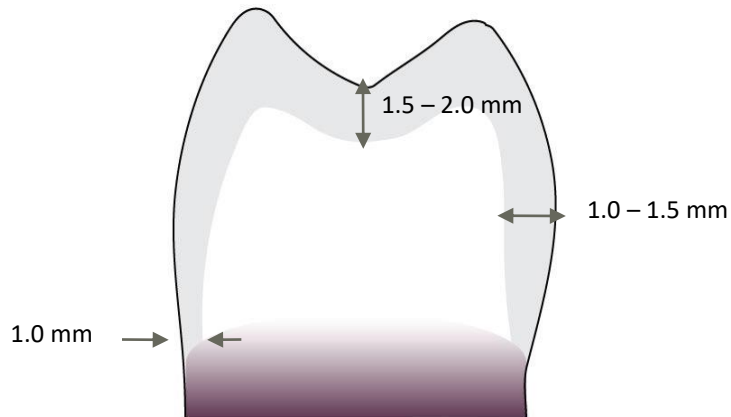
## Crown & Bridge Master Table

JUVORA™ Framework	Anatomical Crown	Crown for Veneering	Anatomical Posterior 3-Unit Bridge – Maximum 1 Pontic	Posterior 3-Unit Bridge for Veneering – Maximum 1 Pontic
Minimum Wall Thickness - Circumferential	1 mm	0.7 mm	1 mm	0.7 mm
Minimum Wall Thickness – Occlusal	1.5 mm	0.8 mm	1.5 mm	0.8 mm
Minimum Crown Margin	1 mm	-	-	-
Minimum Connector Dimension	-	-	16 mm <sup>2</sup>	16 mm <sup>2</sup>

## Fully Anatomical Crowns



JUVORA™ PEEK framework	Anatomical crown
Minimum wall thickness circumferential	1 mm
Minimum wall thickness occlusal	1.5 mm
Minimum Crown margin	1 mm
Connector dimension	-



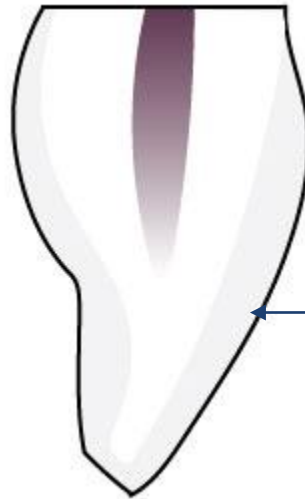
Follow accentuated chamfer preparation – provides a larger material surface spreading the pressure to the preparation. AVOID – Chamfer and Shoulder preparation as these will weaken the framework



## Crowns for Veneering



JUVORA™ PEEK framework	Crown for veneering
Minimum wall thickness circumferential	0.7 mm
Minimum wall thickness occlusal	0.8 mm
Crown margin	-



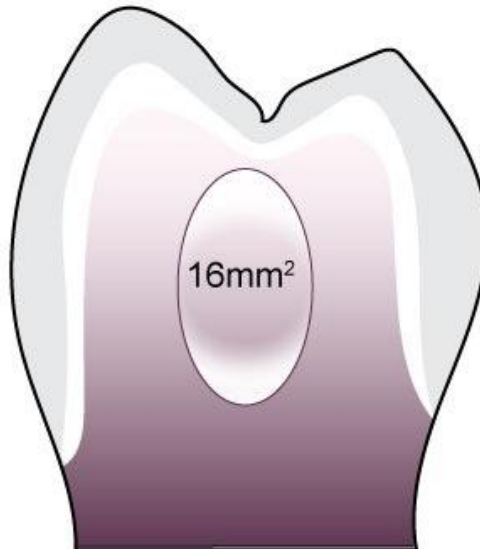
Veneer Thickness:  
1.2 mm – 1.5 mm

## Fully Anatomical Bridge 3-Unit

JUVORATM PEEK framework	Anatomical Posterior 3-Unit Bridge – Maximum 1 Pontic
Minimum wall thickness circumferential	1 mm
Minimum wall thickness occlusal	1.5 mm
Minimum connector dimension	16 mm <sup>2</sup>

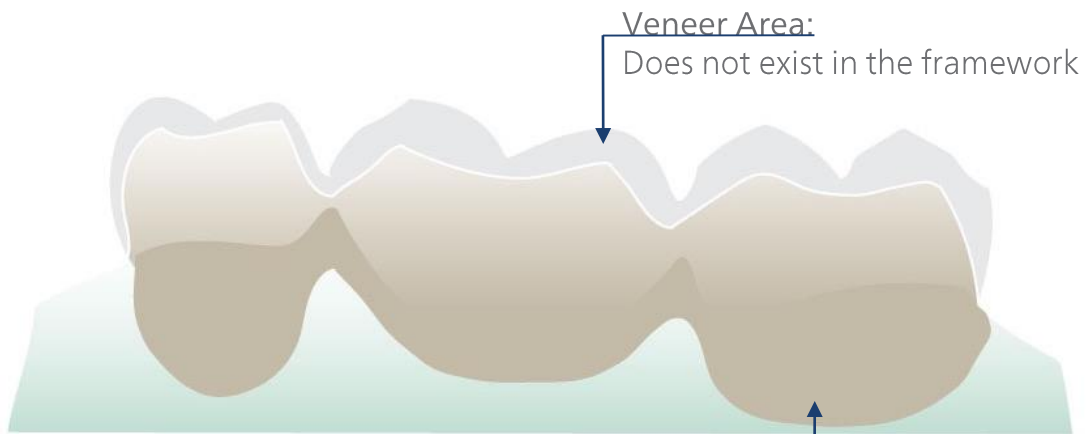
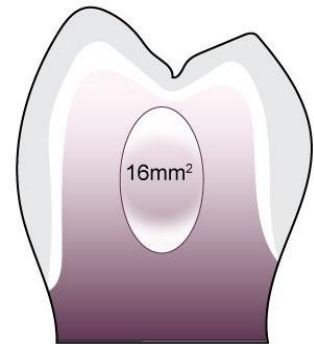


Posterior Connection Area:  
Minimum of 16 mm<sup>2</sup>



## 3-Unit Bridge for Veneering (Maximum 1 Pontic)

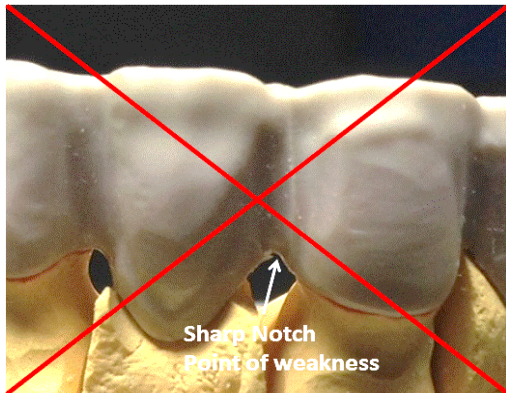
JUVORA™ PEEK framework	Posterior 3-Unit Bridge for Veneering – Maximum 1 Pontic
Minimum wall thickness circumferential	0.7 mm
Minimum wall thickness occlusal	0.8 mm
Minimum connector dimension	16 mm <sup>2</sup>



**Cusp Reinforcement and Pontic Basal Area:**  
MUST NOT be veneered.  
High polish only

**Design Guidance:** 3-unit bridge frameworks MUST be constructed in anatomically reduced design with reinforcing the composite cups. When veneering the frameworks the pontic basal area MUST NOT be covered with the veneering material.

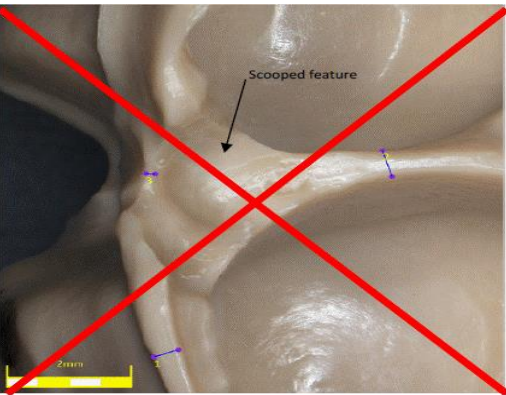
## Important Design Considerations for JUVORA Frameworks



### Notches in Framework:

Where possible AVOID introducing notches into the JUVORA framework. Creating a notch creates a point of weakness within the framework.

If unavoidable notches must not be present on areas with a thickness less than 2 mm and must have an angle greater than 45 degrees.



### Scooped Features:

Scooped features can weaken the JUVORA framework.

ENSURE that such a feature is not adjacent to a thin wall thickness.



### Grooves:

Groove features can act as stress concentrators and can weaken the JUVORA framework.

ENSURE that such a feature is not adjacent to a thin wall thickness.

### Key Design Focus:

If the guidance on framework design with regard to avoiding introduction of notches and/or minimum wall thickness is not followed, then failure can occur.

## Recommendations Regarding the Construction of Collateral Parts

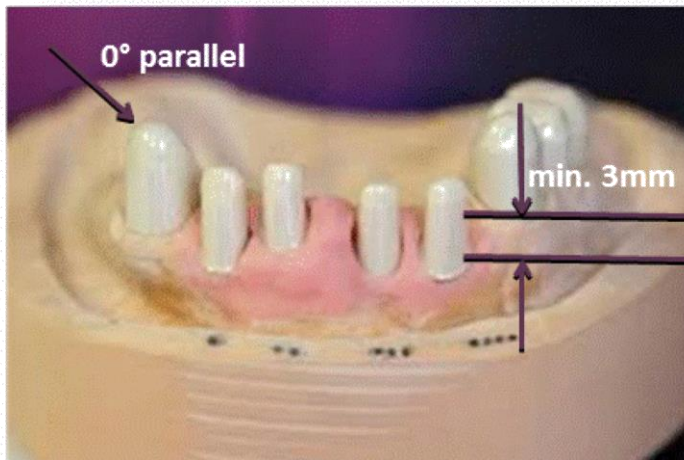
### Construction:

Primary Parts: Primary telescopes and attachments

Parallelism:  $0^\circ$  parallel

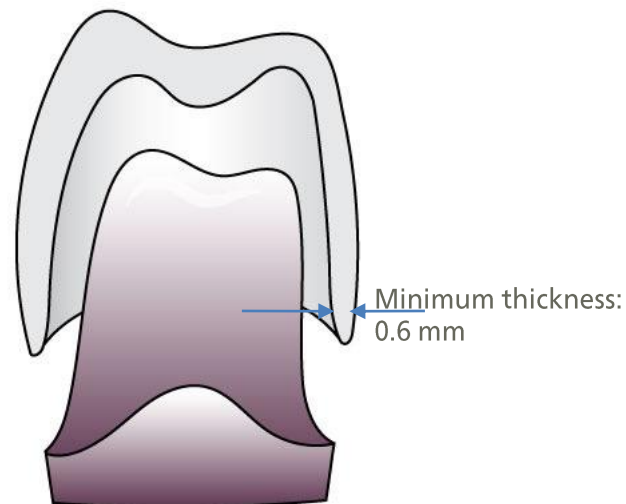
No cone

Height of the friction: minimum 3 mm



Zirconium is recommended as the material for primary telescope crowns.

For the secondary telescope crowns produced from a material which is not JUVORA™ (for example gold) a **minimum wall thickness of 0.6 mm** is recommended.



# Milling of the JUVORA™ Dental Disc

## Machine Selection:

JUVORA Dental Discs can only be processed on suitable milling machines with suitable milling programs. JUVORA recommends adaptation of the CAM software by your software manufacturer. For an exact fit, JUVORA recommends a 5-axis milling machine of stable construction. The following systems are suitable for the milling of the JUVORA Dental Disc: KaVo Dental, KaVo Everest® CAD/CAM system; WIELAND Dental, ZENOTEC select; Deckel-Maho-Gildemeister (DMG), Ultrasonic Gildemeister 20-5 axis simultaneously.

## Cooling:

JUVORA recommends cooling the milling head either with compressed air or cooling fluids.

## Time Taken:

Milling time should be approximately 2 hours depending upon size and design

## Tool Speed:

It is advisable to keep tool speed above 15,000 rpm to avoid heat generation on the surface of the disc. Operating at lower tool speeds may lead to stresses which in turn can cause dimensional inaccuracies, problems with patient fit and potential framework failure under loading.

## Tool Selection:

JUVORA recommend the use of silicon carbide or diamond tipped tooling.

## Milling Machine Set-Up

### Instructions

Use a 5-axis milling machine to enable a milling angle of 15°

Use silicon carbide or diamond tipped tooling

Use diamond tipped tooling

Clearance Angle (°)

5 - 15

15 - 30

Rake Angle (°)

6 - 10

6 - 10

Cutting Speed (RPM)

Up to 15000

Up to 15000

Coolants

Compressed air

Compressed air

Feed may be up to 0.5 mm/tooth

# Finishing of the JUVORA™ milled framework

## Cutting Out the Prosthesis

- 1) Upon removal from the milling machine - carefully remove the connection bars with a fine bur



- 2) We recommend the use of grinding instruments which are suitable for soft materials
- 3) Closed retention holes can be opened with a fine bur

## Positioning of the Teeth

- 1) Use modelling wax to hold the teeth in situ. Teeth will be veneered later (Veneering of the teeth is explained in the veneering section).
- 2) Application of the transparent silicon aids fixation of the teeth during light curing.





## Recommended Surface Preparation

- 1) Sandblasting of the framework (Rocatec plus, pressure: 3 bar, distance: 1 cm), please see manufacturer's guidance.



- 2) Sandblasting of the teeth with Aluminium Oxide – pressure: 3 bar, distance: 1 cm.

## Application of Silane and Preparation of Pre-Manufactured Teeth

- 1) In this manual the silane 3M ESPE Sil is used.
- 2) A thin application of silane is recommended. Drying time should be between 5 to 30 minutes maximum.



- 3) The teeth are then glued to the silicone ready for veneering.



## Application of Foundation Opaque

- 1) Apply the Foundation Opaque thinly and evenly to avoid “puddles”.
- 2) Polymerisation of the opaque  
**Time of polymerization** of the opaque: **3 Minutes**  
**Wavelength** for polymerization: **380 to 450 Nm**
- 3) After polymerisation a smooth, shiny surface should be achieved. In case of insufficient coverage add another layer.



## Application of Colored Opaque

- 1) Apply the **pink** colored opaque thinly and evenly in 2 layers to avoid “puddles”.
- 2) Apply the **tooth** colored opaque thinly and evenly in 2 layers to avoid “puddles”.
- 3) Polymerization of the opaque  
**Time of polymerization** of the opaque: **3 Minutes**  
**Wavelength** for polymerization: **380 to 450 Nm**
- 4) After polymerisation a smooth, shiny surface should be achieved.

## Dentine and Gingiva Flow – Application of Pre-Manufactured Teeth

- 1) The dentine flow should be applied to the model (framework and teeth in silicone) initially from the occlusal side followed by a short polymerization.



- 2) The gingiva flow is then applied from the buccal side (following removal of silicone) followed by a short polymerization.
- 3) Apply the Air Barrier and complete a final polymerization according to the thickness of the layer (5 to 10 minutes).

## Corrections

- 1) Sandblast using Aluminium oxide. Pressure: 3 bar, Distance: 1 cm.
- 2) Steam clean
- 3) Apply the composite primer.
- 4) Light cure for 5 Minutes
- 5) Apply the required material depending upon the correction.
- 6) Short Polymerization.
- 7) Repeat steps 5 and 6 as required.
- 8) Final polymerization: 5 to 10 Minutes.

## Veneering of JUVORA™ with milled Zirconia crowns

- Surface treatment of the single zirconia crowns – Sandblasting (Al<sub>2</sub>O<sub>3</sub>, 2bar, 120µm)
- Surface treatment of the Juvora framework – Sandblasting (Al<sub>2</sub>O<sub>3</sub>, 2bar, 50µm)
- Application of the bounding primer – Scotchbond Universal Adhesive, 3M ESPE
- Application of the dental cement – RelyXUltimate, 3M ESPE
- Insertion of the Zirconia crowns onto the Juvora framework
- Application of the gum coloured opaque - GC Gum Opaque, GC
- Application of the gum veneer - GC Reline Soft, GC
- Final polymerization and Polishing – Ceramic rubber polishing instruments & diamond polishing paste



## Veneering of JUVORA™ with Acrylic Systems

- Surface treatment of the Juvora framework – Sandblasting (Al<sub>2</sub>O<sub>3</sub>, 2bar, 50µm)
- Application of the bounding primer – Signum connector, Kulzer
- Application of the opaque – Signum opaque F, Kulzer
- Acrylic veneer – PalaXpress, Kulzer
- Application of the acrylic veneer utilizing a pressure polymerisation unit – Palamat Elite, Kulzer
- Finish and Polishing – Tungsten burs, silicone rubber, sand paper and polish with pumice paste & Universal Polishing paste, Ivoclar Vivadent



## Veneering of JUVORA™ with Composite Systems

- Surface treatment of the Juvora framework – Sandblasting (Al<sub>2</sub>O<sub>3</sub>, 2bar, 50µm)
- Application of the bounding primer – GC Metal Primer II, GC
- Application of the opaque paste - GC opaquer, GC
- Application of the dentin veneer – GC Gradia, GC
- Application of the gum coloured opaque - GC Gum Opaque, GC
- Application of the gum veneer - GC Reline Soft, GC
- Final polymerization and Polishing – Ceramic rubber polishing instruments & diamond polishing paste



## List of Composite Veneering Systems

System	Surface Treatment	Bonding Primer	Opaque Paste	Dentin Veneer	Shear Bond Strength (MPa) – After 90 days aging
GC Gradia	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	Bredent, Visiolink	GC opaquer	GC Gradia	27.3
3M ESPE, Sinfony	3M ESPE, Rocatec Pre, Plus	3M ESPE, ESPE Sil	3M ESPE, Sinfony	3M ESPE, Sinfony	27.1
Bredent/Visioline	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	Bredent, Visiolink	Combo lign	Crea.lign	24.2
Shofu, Ceramage	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	ML Primer	Pre/Opake	Shofu, Ceramage	21.1
GC Gradia	3M ESPE, Rocatec Plus	3M ESPE, ESPE Sil	GC opaquer	GC Gradia	21.0
GC Gradia	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	GC Metal primer II	GC opaquer	GC Gradia	19.6
3M ESPE, Sinfony	3M ESPE, ocatec Plus	3M ESPE, ESPE Sil	3M ESPE, Sinfony	3M ESPE, Sinfony	19.6
Ivoclar, SR Adoro	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	Ivoclar, SR Link	Ivoclar, SR Opaquer	Ivoclar, SR Adoro	17.9
Heraeus Kulzer/Signum	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	Metallbond I and II	Opaquer F	Heraeus, Signum	14.6
Shofu, Solidex	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	Shofu, Photo Primer	Shofu, Flow Opaquer	Shofu, Solidex	14.3
3M ESPE, Clearfill/Sinfony	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	Clearfill, Alloy Primer	Clearfill, Opaquer	3M ESPE, Sinfony	13.0
Schuetz, A+B Composite	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	Schuetz, Bonding Fluid	Schuetz, Paste	Schuetz, A+B Composite	12.7
Heraeus, Signum	Al <sub>2</sub> O <sub>3</sub> /2 bar/50 µm	Heraeus, Signum Connector	Heraeus, Opaquer	Heraeus, Signum	11.7

## List of Cement Systems

System	Surface Treatment	Bonding Primer	Cement	Shear Bond Strength (MPa) After 90 days ageing
RelyXUltimate, 3M ESPE	Al <sub>2</sub> O <sub>3</sub> /2bar/50µm	Scotchbond Universal Adhesive, 3M ESPE	RelyXUltimate, 3M ESPE	21.2
RelyXUnicem, 3M ESPE	Al <sub>2</sub> O <sub>3</sub> /2bar/50µm	Scotchbond Universal Adhesive, 3M ESPE	RelyXUnicem, 3M ESPE	20.6

The shear bond strength between JUVORA and the cement system was determined in accordance to ISO TR 11405.

System	Surface Treatment	Bonding Primer	Cement	Performance under chewing simulation testing 50N 1.2x10 <sup>6</sup> cycles , TC 3000x5°C/55°C
Variolink II, Ivoclar-Vivadent	Rocatec Pre, 3M ESPE	Heliobond, Ivoclar-Vivadent	Variolink II, Ivoclar-Vivadent	No decementations were observed with a diverse range of frameworks

## Surface treatment - Plasma

Plasma treatment is a technology that potentially could be used to enhance the bonding of dental systems to the PEEK polymer surface, as showed by M. Weppler in *Plasmatechnologie - das Multitalent für neue zahntechnische Anwendungen*, *Quintessenz Zahntechnik* 2015; 41(6): 700-716.

Plasma technology could be used in combination with other surface treatment techniques such as grit blasting.



## Safety Information

While machining the JUVORA™ Dental Disc, the following safety precautions are recommended:

- Dust mask or dust extraction
  - Personal protective equipment (eye protection, gloves)
- 

## Storage Information

The JUVORA Dental Disc should be stored in dry conditions and exposure to direct sunlight should be avoided. The PEEK-OPTIMA® polymer from which the JUVORA Dental Disc is made is stable and can be stored for an extended period (10 year shelf life). It has a working temperature range from cryogenic up to 250 °c and hence the storage temperature range for the JUVORA Dental Disc is any ambient temperature and humidity.

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## Additional Information

For additional information contact:

[info@juvoradental.com](mailto:info@juvoradental.com)

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