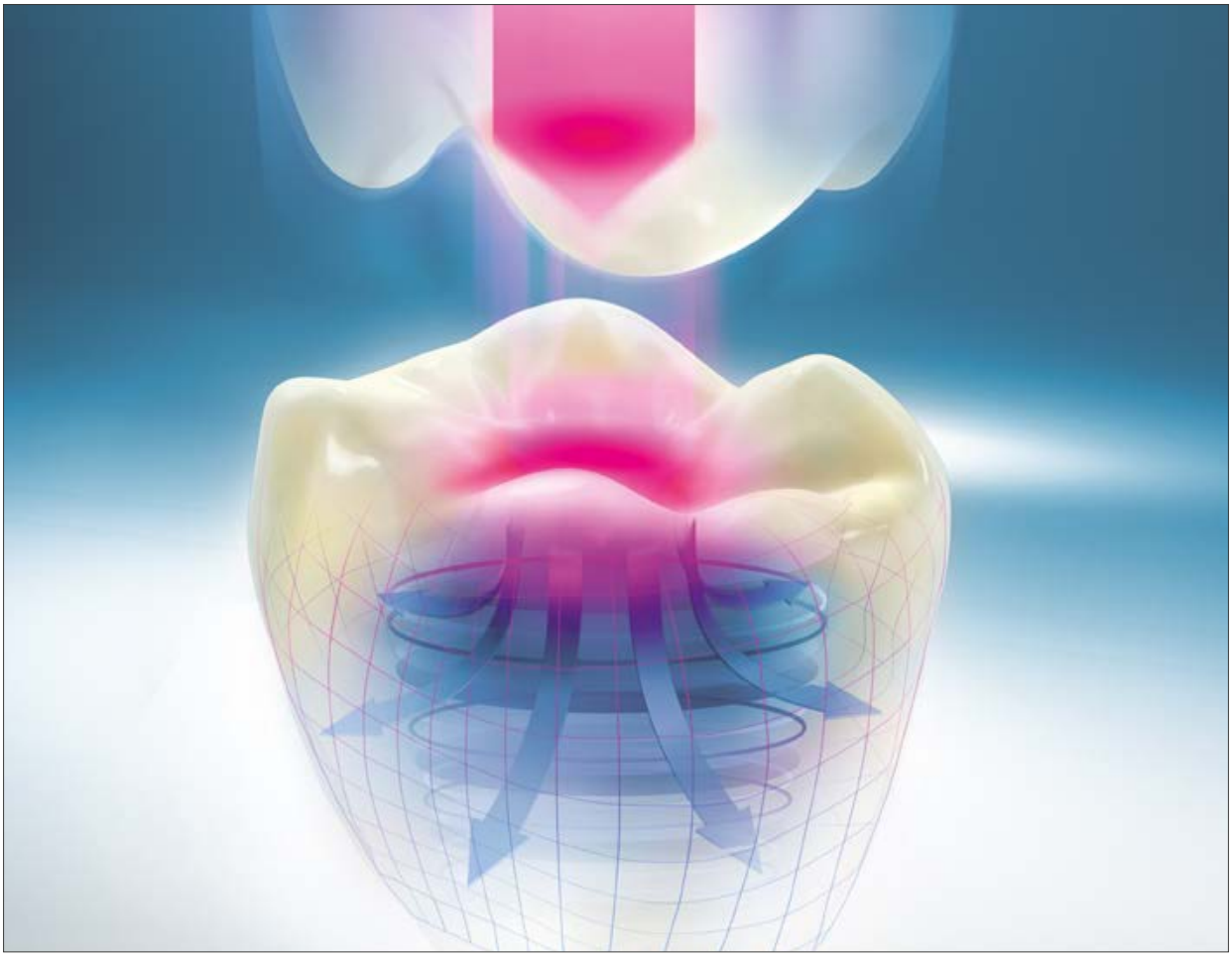
VITA ENAMIC®

Processing recommendation for CAD/CAM systems



VITA shade determination | VITA shade communication | VITA shade reproduction | VITA shade control

VITA – perfect match.

Machining mode: Milling – Block & Disc

- Information and tips
- Tools
- Machining strategy
- Parameters

Information

The information presented here, are intended as a recommendation.
Depending on the available CNC machines, CAM software, tools, etc. the information have to be adapted to your own production situation.
As a result, different results may obtained.

The development of the strategies and parameter was done with following system:

- imes-icore CORiTEC350i
- CAM Software: Hyperdent 8.2 Beta

According to this recommendation, a fully anatomical posterior tooth crown (tooth 26) can be finished in 26min (EM14 Block or 12mm Disc), with a good surface and fit.

We recommend Tools from:

FRANKEN GmbH & Co. KG, Fabrik für Präzisionswerkzeuge
Tools for the Dental Industry

Tips for VITA Enamic®

Avoid vertically or fast plunge movements. It is important that the tool always plunge slow and soft into the material.

- We recommend to grind VITA ENAMIC wet
- Plunge into the material with a ramp or helically (5 degree) and use a reduced plunge feed (feed Z)
- The diameter of the restoration holding pins should be 1,0 -1,5 mm (2-3 pins per Restauration)
- If there is just one holding pin than the diameter should be 3,0 - 3,5 mm

CVD Tools

The tip of the tool cutting edge, can chip a little bit after the first restorations.
This is no problem and will not affect the function of the tool.
The increasing wear of the tool can cause more chipping of the tool edge.
As long as the dimensional accuracy of the restorations are within the tolerance range, the tool can still be used.

In order to maintain a high tool life, the cutting speed should be Vc = 210-220 m/min.

Strategy

- A two side machining and 3+2 strategies are sufficient in most cases.
- In order to maintain a good fit, even by restoration with undercuts, the last finishing of the cavity should be done with a 5 axis strategy.
- In order to maintain a good occlusal fit, the complete occlusal side should be finished with max. a ø1.2mm tool (or less). A special finishing of the fissures isn`t necessary.
- If a smaller tool is used after a bigger one, it can be necessary to use a roughing strategy to remove remaining material. Tool life and process reliability are increased this way.

Recommended tools

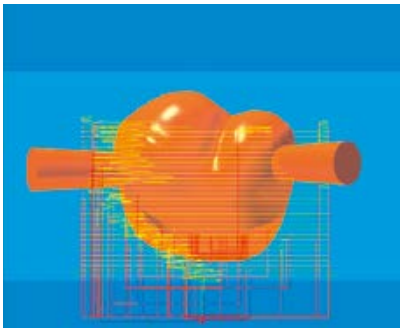
Diameter	Description	Manufacturer	Order-code	Max. Blank Depth
Ø 3 mm	CVD-D ball nose end mills	Emuge-Franken	2895.300614	18 mm
Ø 2 mm	CVD-D ball nose end mills	Emuge-Franken	2895.200614	
Ø 1 mm	CVD-D ball nose end mills	Emuge-Franken	2895.100604	

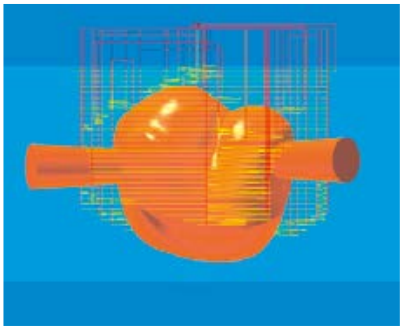
Tool life

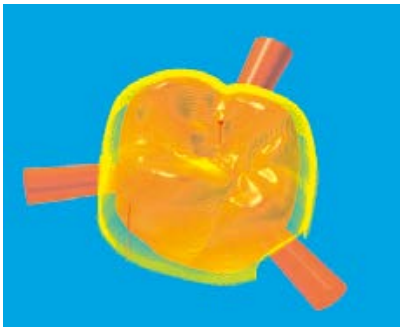
Tool	Units	Restoration
Ø 3 mm CVD-D ball nose end mills	150	Fully anatomical crown tooth 26
Ø 2 mm CVD-D ball nose end mills	>150	Fully anatomical crown tooth 26
Ø 1 mm CVD-D ball nose end mills	>150	Fully anatomical crown tooth 26

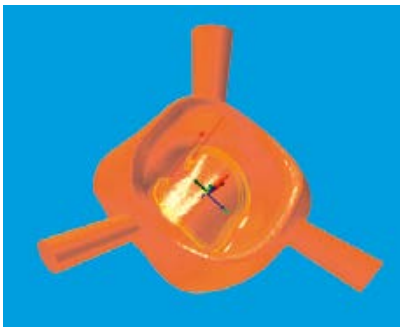
Order of machining

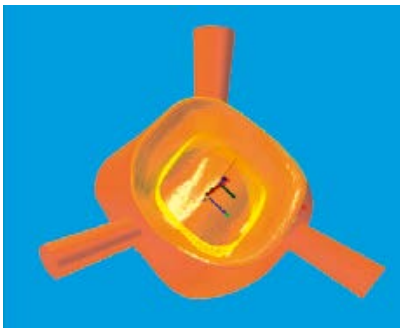
Step	Machining side	Machining	Tool
1	Cavity side	Roughing	Ø 3mm
2	Occlusal side	Roughing	Ø 3mm
3	Occlusal side	Pre-finishing	Ø 2mm
4	Cavity	Residual material	Ø 2mm
5	Cavity	Pre-finishing	Ø 2mm
6	Cavity, outside	Finishing	Ø 2mm
7	Okklusalseite	Finishing, Fissures	Ø 1mm
8	Cavity	Residual material	Ø 1mm
9	Preparation margin	Finishing	Ø 1mm
10	Cavity	Finishing in cavity	Ø 1mm

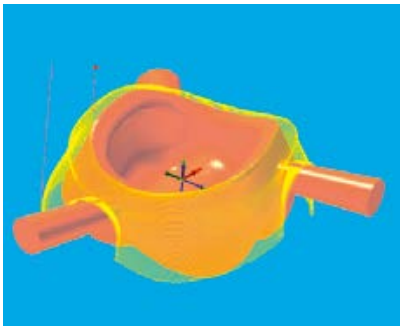
Step 1	Cavity side - Roughing				3+2 axis
	Tool	Ø 3mm			notes:
	Tolerance		0,01		
	Spindel speed	[n]	23000	rpm	
	Feed speed XY	[Vf]	2000	mm/min	
	Feed speed Z	[Vf]	500	mm/min	
	Width of cut XY	[ae]	0,9	mm	
	Depth of cut Z	[ap]	0,3	mm	
	Oversize		0,05	mm	

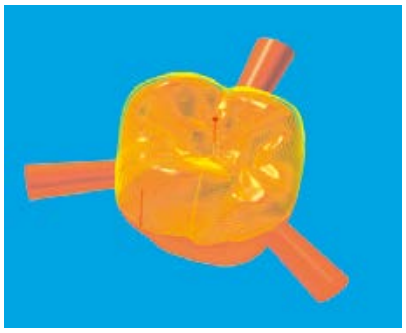
Step 2	Occlusal side - Roughing				3+2 axis
	Tool	Ø 3mm			notes:
	Tolerance		0,01		
	Spindel speed	[n]	23000	rpm	
	Feed speed XY	[Vf]	2000	mm/min	
	Feed speed Z	[Vf]	500	mm/min	
	Width of cut XY	[ae]	0,9	mm	
	Depth of cut Z	[ap]	0,3	mm	
	Oversize		0,05	mm	

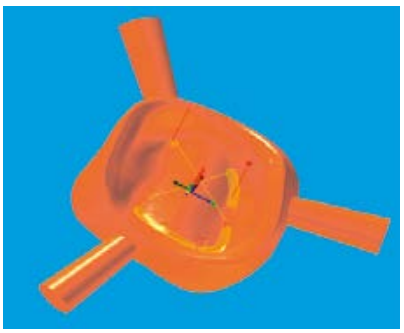
Step 3	Occlusal side - Pre-finishing				3+2 axis
	Tool	Ø 2mm			notes:
	Tolerance		0,01		
	Spindel speed	[n]	35000	rpm	
	Feed speed XY	[Vf]	1500	mm/min	
	Feed speed Z	[Vf]	1000	mm/min	
	Width of cut XY	[ae]	0,1	mm	
	Depth of cut Z	[ap]	-	mm	
	Oversize		0	mm	

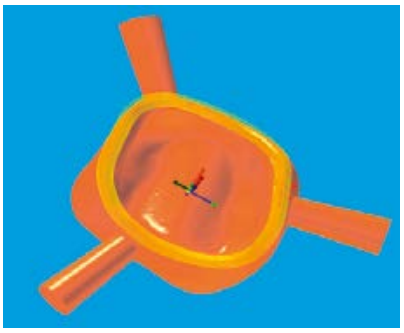
Step 4	Cavity - Residual material				3+2 axis
	Tool	Ø 2mm			notes:
	Tolerance		0,01		
	Spindel speed	[n]	35000	rpm	
	Feed speed XY	[Vf]	1000	mm/min	
	Feed speed Z	[Vf]	500	mm/min	
	Width of cut XY	[ae]	0,4	mm	
	Depth of cut Z	[ap]	0,1	mm	
	Oversize		0,05	mm	

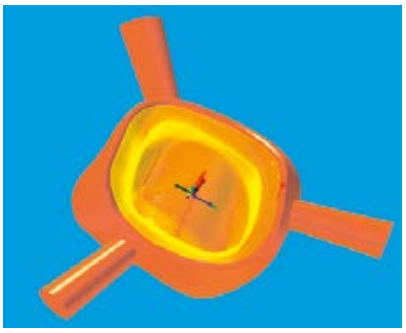
Step 5	Cavity - Pre-finishing			3+2 axis
	Tool	Ø 2mm		notes:
	Tolerance	0,01		
	Spindel speed	[n]	35000	rpm
	Feed speed XY	[Vf]	1500	mm/min
	Feed speed Z	[Vf]	1000	mm/min
	Width of cut XY	[ae]	0,2	mm
	Depth of cut Z	[ap]	-	mm
	Oversize		0	mm

Step 6	Cavity, outside - Finishing			3+2 axis
	Tool	Ø 2mm		notes:
	Tolerance	0,01		
	Spindel speed	[n]	35000	rpm
	Feed speed XY	[Vf]	1500	mm/min
	Feed speed Z	[Vf]	1000	mm/min
	Width of cut XY	[ae]	0,1	mm
	Depth of cut Z	[ap]	-	mm
	Oversize		0	mm

Step 7	Occlusal side - Finishing, Fissures			3+2 axis
	Tool	Ø 1mm		notes:
	Tolerance	0,01		
	Spindel speed	[n]	40000	rpm
	Feed speed XY	[Vf]	1500	mm/min
	Feed speed Z	[Vf]	1000	mm/min
	Width of cut XY	[ae]	0,12	mm
	Depth of cut Z	[ap]	-	mm
	Oversize		0	mm

Step 8	Cavity - Residual material			5 axis
	Tool	Ø 1mm		notes:
	Tolerance	0,01		
	Spindel speed	[n]	40000	rpm
	Feed speed XY	[Vf]	1000	mm/min
	Feed speed Z	[Vf]	500	mm/min
	Width of cut XY	[ae]	0,2	mm
	Depth of cut Z	[ap]	0,1	mm
	Oversize		0	mm

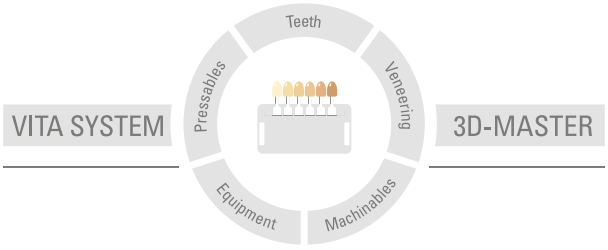
Step 9	Preparation margin - Finishing			5 axis
	Tool	Ø 1mm		notes:
	Tolerance	0,01		
	Spindel speed	[n] 40000	rpm	
	Feed speed XY	[Vf] 1200	mm/min	
	Feed speed Z	[Vf] 1000	mm/min	
	Width of cut XY	[ae] 0,1	mm	
	Depth of cut Z	[ap] -	mm	
	Oversize	0	mm	

Step 10	Cavity - Finishing			5 axis
	Tool	Ø 1mm		notes:
	Tolerance	0,01		
	Spindel speed	[n] 40000	rpm	
	Feed speed XY	[Vf] 1500	mm/min	
	Feed speed Z	[Vf] 1000	mm/min	
	Width of cut XY	[ae] 0,12	mm	
	Depth of cut Z	[ap] -	mm	
	Oversize	0	mm	

Formulas for cutting data calculation

Expression used in text	Term	Symbol	Formula
Feed speed XY Feed speed Z	Feed speed	Vf [mm/min]	$Vf = fz * z * n$
Spindle speed	Spindle speed	n [U/min]	$n = \frac{Vc * 1000}{\pi * d}$
Width of cut XY	Width of cut	ae [mm]	
Depth of cut Z	Depth of cut	ap [mm]	
	Feed per cutting edge	fz [mm]	$fz = \frac{Vf}{n * z}$
	Cutting speed	Vc [m/min]	$Vc = \frac{\pi * d * n}{1000}$

More information about **VITA CAD/CAM** MATERIALS is available at: www.vita-zahnfabrik.com/cadcam



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VITA Zahnfabrik has been certified and the following products bear the CE mark:
CE 1024

VITA

VITA Zahnfabrik H. Rauter GmbH & Co.KG
Spitalgasse 3 · D-79713 Bad Säckingen · Germany
Tel. +49(0)7761/562-0 · Fax +49(0)7761/562-299
Hotline: Tel. +49(0)7761/562-222 · Fax +49(0)7761/562-446
www.vita-zahnfabrik.com · info@vita-zahnfabrik.com
facebook.com/vita.zahnfabrik

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