VITA CAD-Temp®

Recommodation for CNC machines

Machining mode : Milling

- **Information and tips**

- **Tools**

- **Machining strategy**

- **Parameters**

VITA

version: 13.07.16

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:

- DMG MORI Ultrasonic 20 (CNC 5 axis machine)
- CAM Software: Hyperdent V7.5

According to this recommendation, a fully anatomical posterior tooth crown (tooth 26) can be finished in 10 min, with a good surface and fit.

We recommend Tools from:

ZECHA Hartmetall - Werkzeugfabrikation GmbH
www.zecha.de

Tips for VITA CAD-Temp®

- VITA CAD-Temp® can be milled dry with air cooling or wet.

- Plunge into the material with a ramp (5-10 degree) or helically and use a reduced plunge feed (feed Z)

- The diameter of the restoration holding pin should range from 1.5 - 2 mm

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 chipping occurs, the feed speed and step should be lowered. Also the Oversize should be checked. Too much or too less oversize will also lead to chipping.
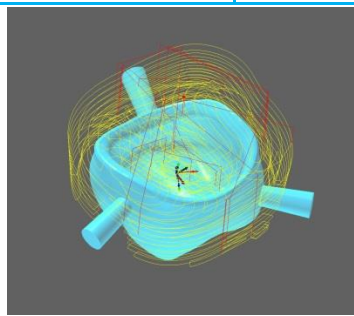
Recommended tools

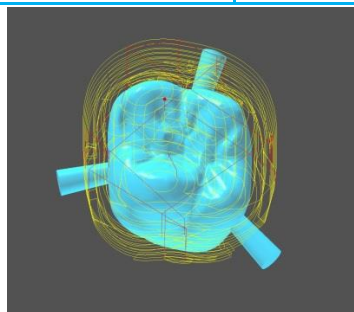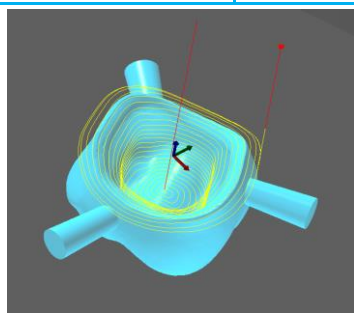| Diameter	Description	Manufacturer	Order-code
Ø 2 mm	Ball nose end mill, Diamond coated	Zecha	421.B2.200.100.200
Ø 1 mm	Ball nose end mill, Diamond coated	Zecha	421.B2.100.050.100

Tool life

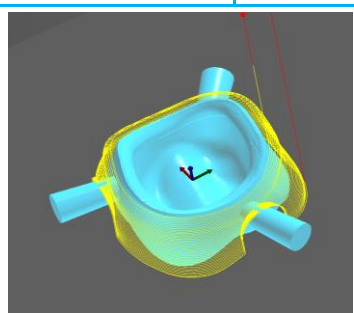| Tool	Units	Restoration
Ø 2 mm ball nose end mills	160+	Fully anatomical crown tooth 26
Ø 1 mm ball nose end mills	160+	Fully anatomical crown tooth 26

Order of machining
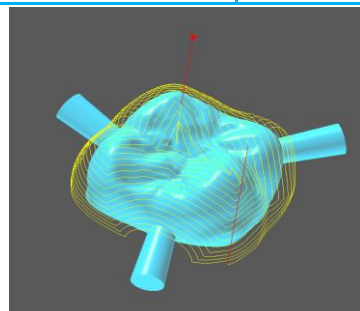
Step	Machining side	Machining	Tool
1	Cavity side	Roughing	Ø 2mm
2	Occlusal side	Roughing	Ø 2mm
3	Cavity side	Pre-finishing in cavity	Ø 2mm
4	Cavity side	Finishing outside cavity	Ø 2mm
5	Occlusal side	Pre-finishing	Ø 2mm
6	Cavity side	Residual material in cavity	Ø 1mm
7	Preparation margin	Finishing	Ø 1mm
8	Cavity side	Finishing in cavity	Ø 1mm
9	Occlusal side	Finishing, Fissures	Ø 1mm
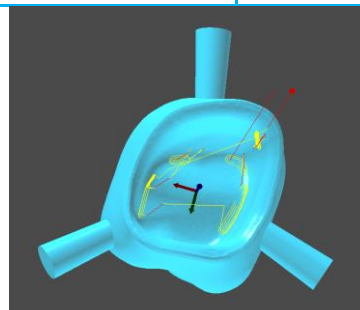
Step 1		Cavity side - Roughing				3+2 axis
	Tool	Ø 2mm				notes:
	Tolerance			0,01		
	Spindel speed	[n]	36000	rpm		
	Feed speed XY	[Vf]	2500	mm/min		
	Feed speed Z	[Vf]	1000	mm/min		
	Width of cut XY	[ae]	1,0	mm		
	Depth of cut Z	[ap]	1,0	mm		
	Oversize		0,15	mm		
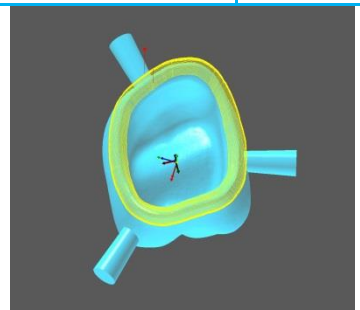
Step 2		Occlusal side - Roughing				3+2 axis
	Tool	Ø 2mm				notes:
	Tolerance			0,01		
	Spindel speed	[n]	36000	rpm		
	Feed speed XY	[Vf]	2500	mm/min		
	Feed speed Z	[Vf]	1000	mm/min		
	Width of cut XY	[ae]	1,0	mm		
	Depth of cut Z	[ap]	1,0	mm		
	Oversize		0,15	mm		
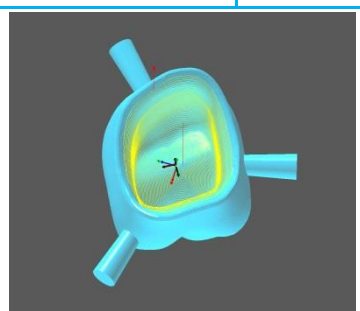
Step 3		Cavity side – Pre-finishing in Cavity				3+2 axis
	Tool	Ø 2mm				notes:
	Tolerance			0,01		
	Spindel speed	[n]	36000	rpm		
	Feed speed XY	[Vf]	1500	mm/min		
	Feed speed Z	[Vf]	800	mm/min		
	Width of cut XY	[ae]	0,5	mm		
	Depth of cut Z	[ap]	-	mm		
	Oversize		0,05	mm		
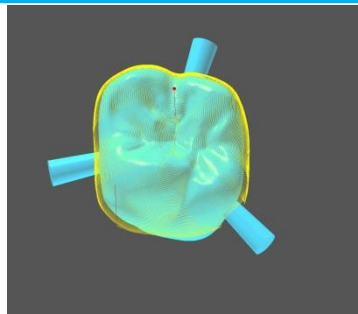
Step 4		Cavity side - Finishing outside Cavity				3+2 axis
	Tool	Ø 2mm				notes:
	Tolerance			0,01		
	Spindel speed	[n]	36000	rpm		
	Feed speed XY	[Vf]	1500	mm/min		
	Feed speed Z	[Vf]	800	mm/min		
	Width of cut XY	[ae]	0,2	mm		
	Depth of cut Z	[ap]	-	mm		
	Oversize		0,0	mm		

Step 5	Occlusal side – Pre-finishing				3+2 axis	
	Tool	Ø 2mm			notes:	
	Tolerance		0,01			
	Spindel speed	[n]	36000	rpm		
	Feed speed XY	[Vf]	1500	mm/min		
	Feed speed Z	[Vf]	800	mm/min		
	Width of cut XY	[ae]	0,5	mm		
	Depth of cut Z	[ap]	-	mm		
	Oversize		0,05	mm		

Step 6	Cavity side - Residual material in Cavity				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]	500	mm/min		
	Width of cut XY	[ae]	0,2	mm		
	Depth of cut Z	[ap]	0,1	mm		
	Oversize		0,0	mm		

Step 7	Preparation margin - 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]	500	mm/min		
	Width of cut XY	[ae]	0,1	mm		
	Depth of cut Z	[ap]	-	mm		
	Oversize		0,0	mm		

Step 8	Cavity side - Finishing in Cavity				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]	500	mm/min		
	Width of cut XY	[ae]	0,1	mm		
	Depth of cut Z	[ap]	-	mm		
	Oversize		-0,01	mm		

Step 9	Occlusal side - Finishing, Fissures			3+2 axis
	Tool	Ø 1mm		notes:
	Tolerance		0,01	0,01
	Spindel speed	[n]	40000	rpm
	Feed speed XY	[Vf]	1500	mm/min
	Feed speed Z	[Vf]	500	mm/min
	Width of cut XY	[ae]	0,1	mm
	Depth of cut Z	[ap]	-	mm
	Oversize		0,0	mm

VITA

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	[rpm]	$n = \dfrac{Vc * 1000}{\pi * d}$
Width of cut XY	*Width of cut*	ae	[mm]	
Depth of cut Z	*Depth of cut*	ap	[mm]	
	Feed per cutting edge	fz	[mm]	$fz = \dfrac{Vf}{n * z}$
	Cutting speed	Vc	[m/min]	$Vc = \dfrac{\pi * d * n}{1000}$

Secrecy

We point out that, according to the declaration of intent and secrecy, both parties committed themselves to treat business and company secrets and any other confidential information of the other party confidentially - whether they are of a technical or commercial nature and regardless of the way they have been disclosed - including all documents, drawings and records of data, and not to disclose them to any third parties.

The obligation to maintain secrecy shall not apply if confidential information was already known to the recipient of the information or the public or if such information was disclosed to him or the public through no fault of the recipient of the information; the recipient of the information shall be obliged to furnish proof.

The obligation to maintain secrecy shall remain in force after termination of the cooperation as long as the information has not been disclosed by a third party.

Exclusion of liability

VITA Zahnfabrik H. Rauter GmbH & CO KG reserves the right not to be responsible for the topicality, correctness, completeness or quality of the information provided. Liability claims regarding damage caused by the use of any information provided, including any kind of information which is incomplete or incorrect, will therefore be rejected.

Our products should be used according to the working instructions. We cannot be held liable for damages resulting from incorrect handling or usage. The user is furthermore obliged to check the product before use with regard to its suitability for the intended area of application.