

Processing of carbide drills



Table of contents

1. Job Definition	2
2. Parameters and machine data	4
2.1 Example: Uniform rounding of the cutting edge	5
Rounding of the cutting edges: Drill $\varnothing 10$	5
2.2 Examples for rounding of the cutting edges before - after	6
3. Some charts	7
3.1 Rounding of the main cutting edge and -corner	7
3.2 Speed	8
3.3 Amount of mountings	10
3.4 Immersion depth	10
3.5 Rounding of the cutting edge with different granules	11
3.6 Jaggedness	11
3.7 Example Processing	12
3.8 Polishing straight fluted drills	12

Processing of carbide drills

1. Job Definition

10 μm – 90 μm rounding of the cutting edge, depending on the application.



When rounding the cutting edge, the following needs to be considered:

- Rounding of the cutting edge larger than 60 μm , the cutting edge should be chamfered with a similar size than the desired radius. Best would be 10-20% smaller.
- The cutting corner should not be rounded more than 30% of the main cutting edge.
- To avoid a built-up edge, especially when processing titanium and aluminium, a polished tool is benefiting.
- Using HSC 1/300, a cutting edge of 16 μm can be achieved. The cutting corner will not be rounded more than that.
- Using HSC 4/400 or M4/300, a cutting edge of 10 μm can be achieved.
- In order that the bore hole stays straight, both main cutting edges shall be not more unequally rounded than $\pm 5\%$.
- In case you process the cutting tool in 100% clockwise direction, you can achieve a K-factor >1 .
- The influence of the parameters on rounding of the cutting edge and jaggedness in the OTEC machine is as follows:

Rounding of the cutting edge:

- process time: ca. 40%
- speed of rotor: ca. 30%
- speed of holders: ca. 20%
- direction of rotation: 10% (clockwise leads to more rounding)

Jaggedness:

- process time: ca. 15%
- speed of rotor: ca. 5%
- speed of holders: ca. 15%
- direction of rotation: 23% (counter clockwise leads to smoother surfaces)

Processing of carbide drills

Recommended rounding at the cutting edge(e.g.: drill, diameter 10 mm):

- Processing of wood: 4 to 6 μm
- Processing of aluminium 6 to 10 μm
- Processing of steel 4 μm x diameter of the tool

Typical process parameters:

Machine:	DF-3 Tools	
Media:	HSC 1/300	cutting edge radius up to 16 μm
	H4/400	cutting edge radius up to 12 μm
	TZM	cutting edge radius up to 30 μm
	TZMS	cutting edge radius up to 90 μm
Process time:	4 to 45 min.	

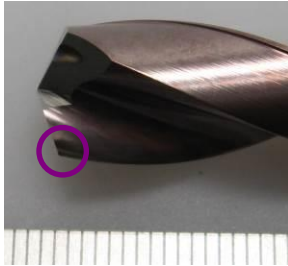
2. Parameters and machine data

Tool	Ø	Rounding of the cutting edge before processing (µm)	Rounding of the cutting edge after processing (µm)	Media	Speed Rotor [min-1]	Speed of holders [min-1]	Direction of the rotor	time (min.)	Angular holder	Immersion depth
Drill	4	5,1	9,5	HSC 1/300	45	96	50%-50%	8	-	max
Drill	5	2,8	11,7	HSC 1/300	45	96	50%-50%	10	-	max
Drill	5	7,8	31,5	TZM 2/3	45	20	50%-50%	20	-	max
Drill	7	5,7	55	TZMS 4/5	45	20	50%-50%	7	-	max
Drill	10	2,8	11,7	HSC 1/300	45	96	50%-50%	10	-	max
Drill	10	3,5	15	HSC 1/300	45	96	50%-50%	13	-	max
Drill	10	4,5	25	TZMS 4/5	45	20	50%-50%	2	-	max
Drill	10	3,7	40	TZMS 4/5	45	20	50%-50%	4	-	
Drill	12	6,7	21,8	TZMS 2/3	45	20	50%-50%	5	-	
Drill	12	6,7	26,8	TZMS 2/3	45	20	50%-50%	6	-	
Drill	12	6,7	36,8	TZMS 4/5	45	20	50%-50%	10	-	
Drill (droplets removal)				HSC 1/300	45	96	30 sec to the right, 120 sec to the left	2,5		max

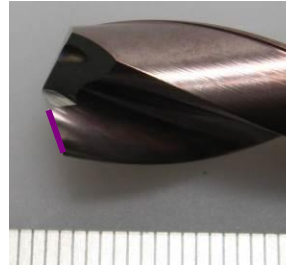
Processing of carbide drills

2.1 Example: Uniform rounding of the cutting edge

Measuring points



Cutting corner (SE)



main cutting edge (HS)

Rounding of the cutting edges: Drill $\varnothing 10$

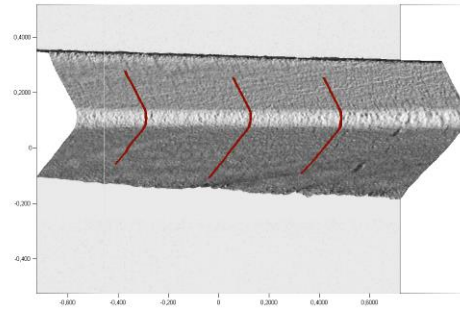
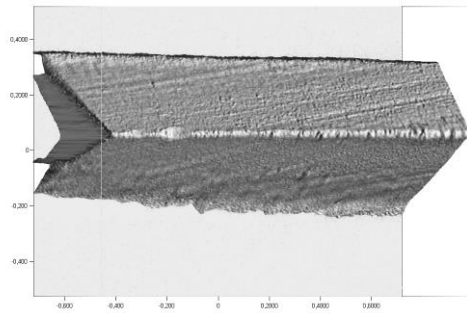
Condition	No	main cutting edge 1			main cutting edge 2		
		HS	SE	Jaggedness	HS	SE	Jaggedness
Before processing	-	4	11	0,6	4	11	0,6
After processing	1	23	28	0,2	21	27	0,5
After processing	2	21	32	0,6	19	31	0,7
After processing	3	20	34	0,4	19	34	0,7
After processing	4	18	28	0,5	19	30	0,4
After processing	5	22	30	0,3	21	28	0,4
After processing	6	21	20	0,5	21	23	0,5

Process parameters: DF-Tools with additional drive

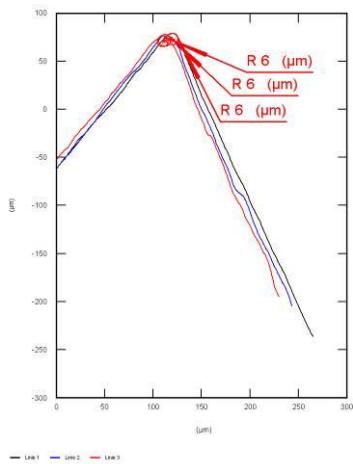
Processing of carbide drills

2.2 Examples for rounding of the cutting edges before - after

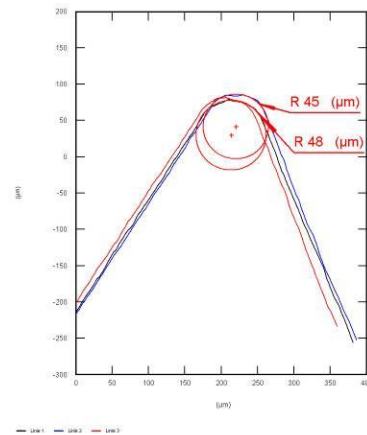
Processed in driven holder. Rotation: 50% clockwise, 50% counter clockwise.



Before processing



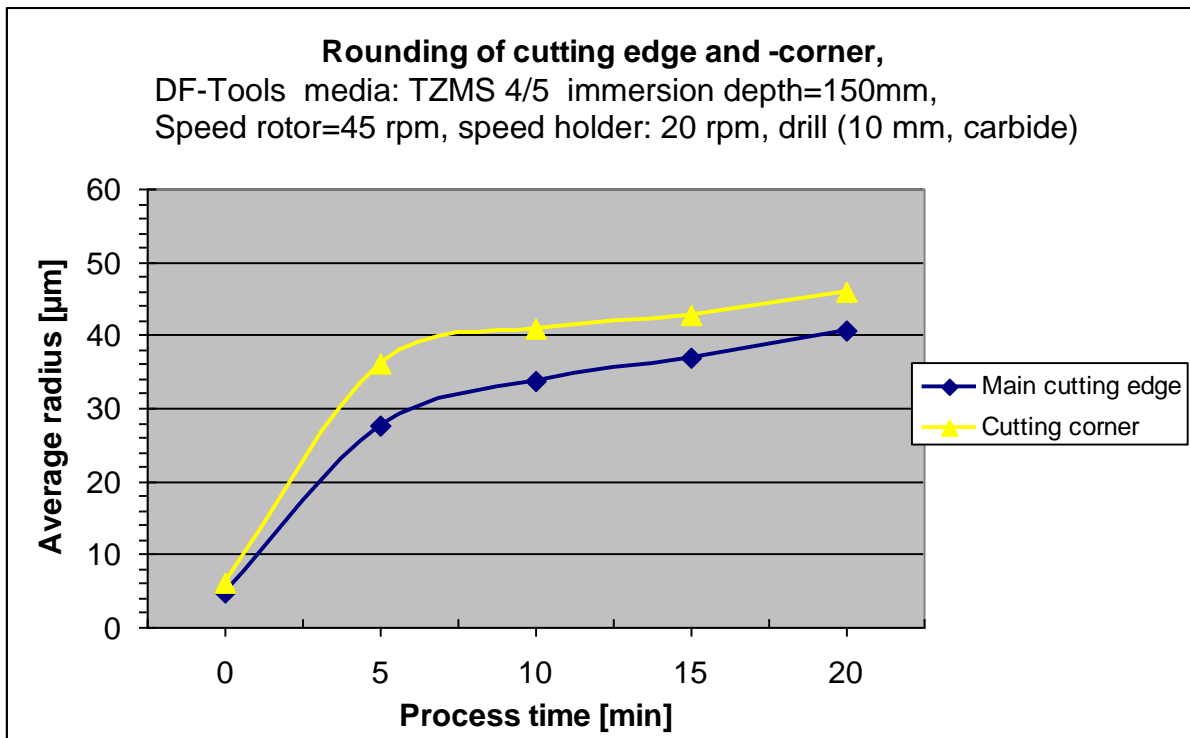
After processing



For processing aluminium, a tool polished with H4/400 was found very benefiting.

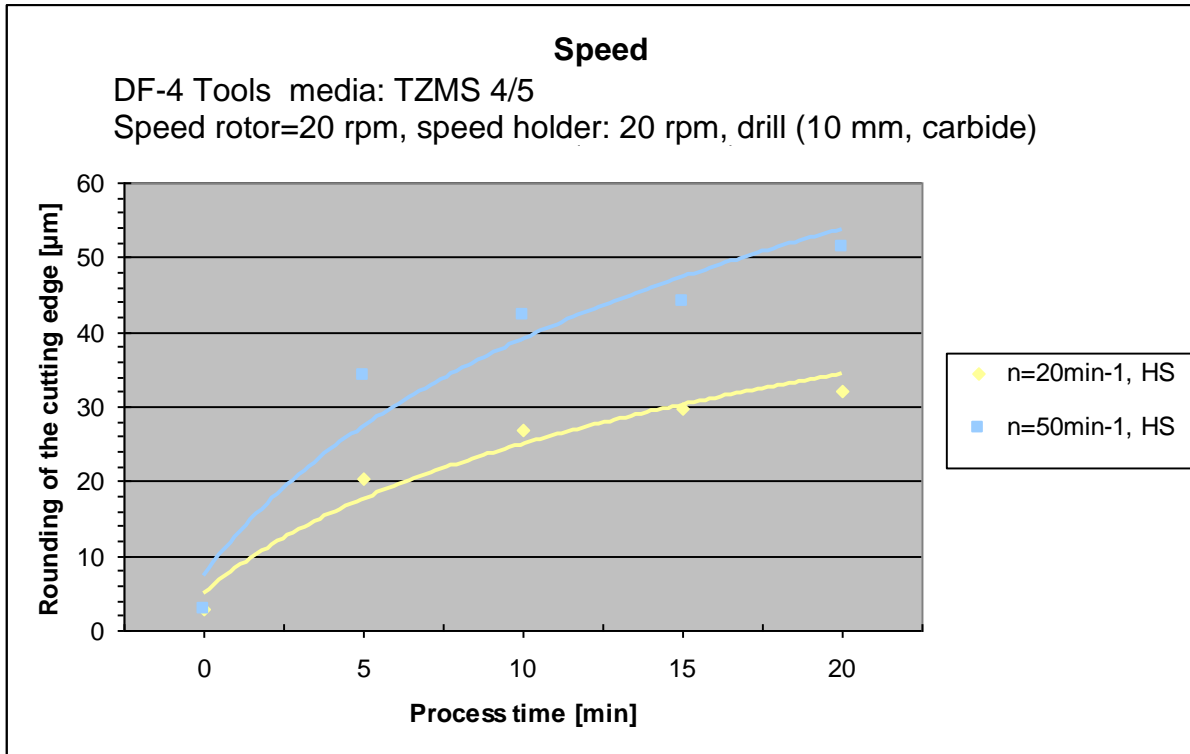
3. Some charts

3.1 Rounding of the main cutting edge and -corner



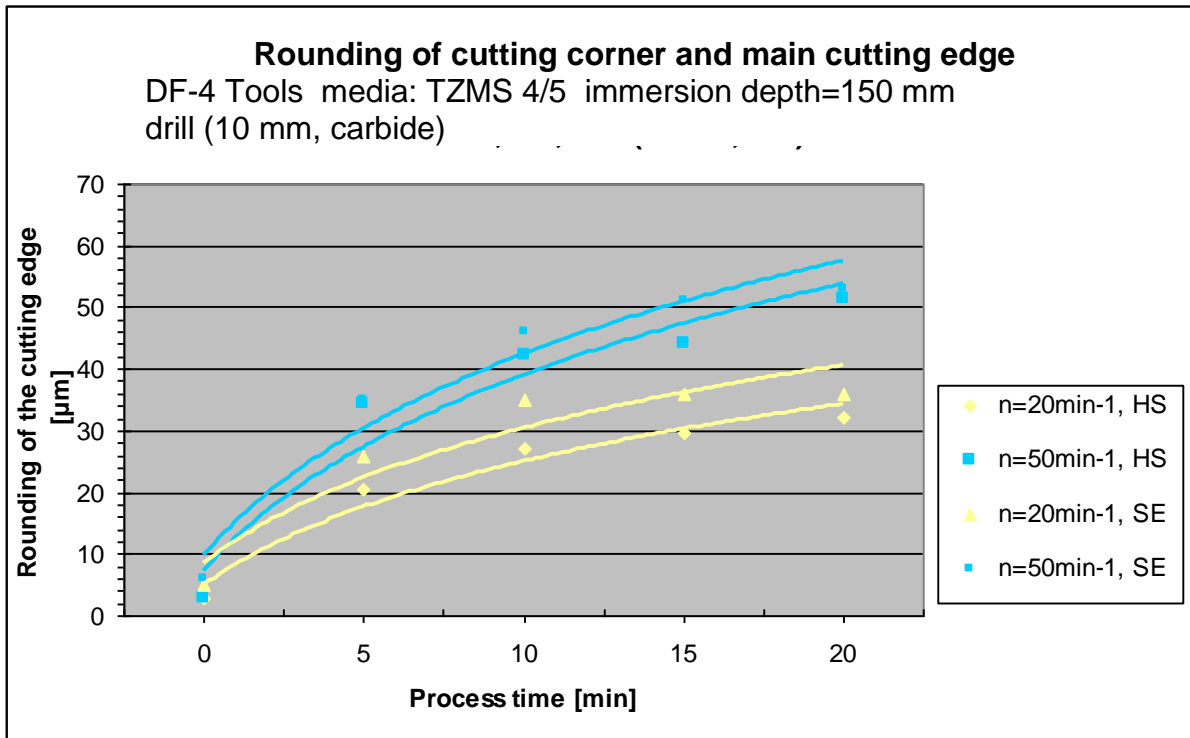
Processing of carbide drills

3.2 Speed



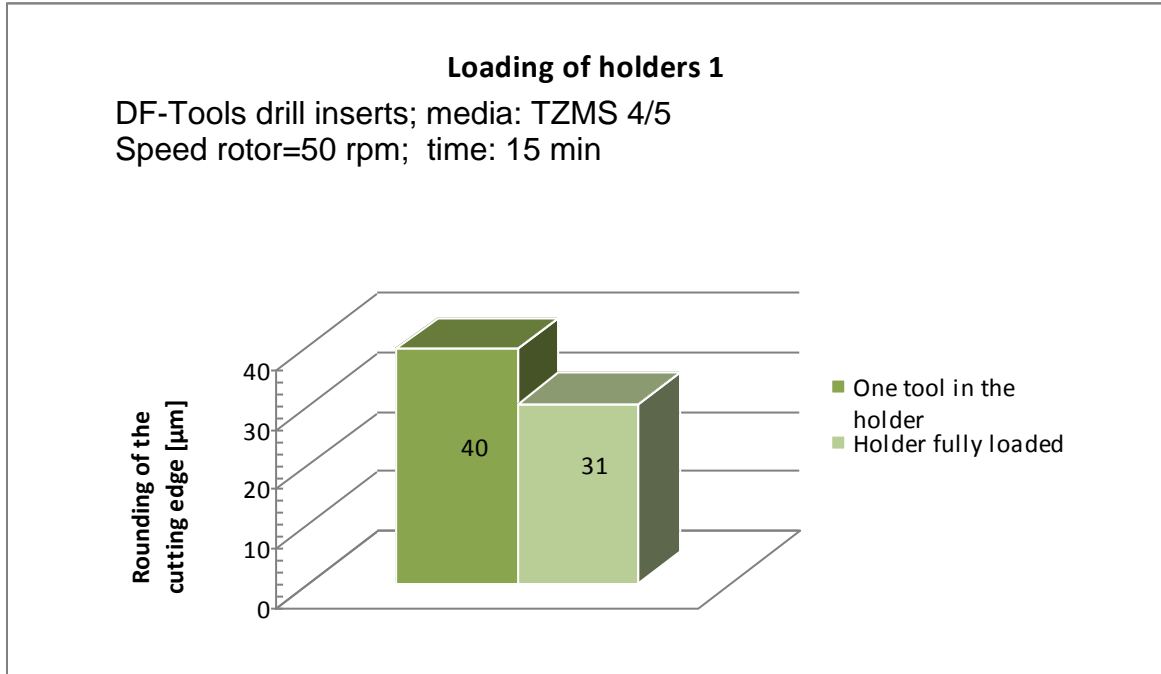
HS....main cutting edge

Processing of carbide drills

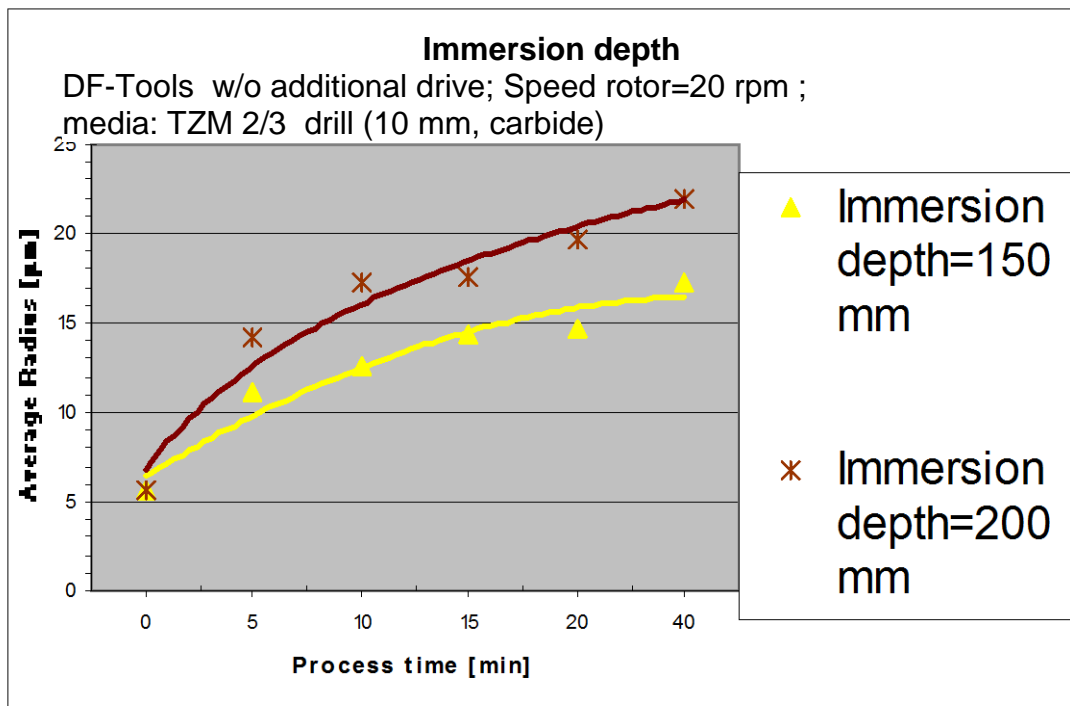


Processing of carbide drills

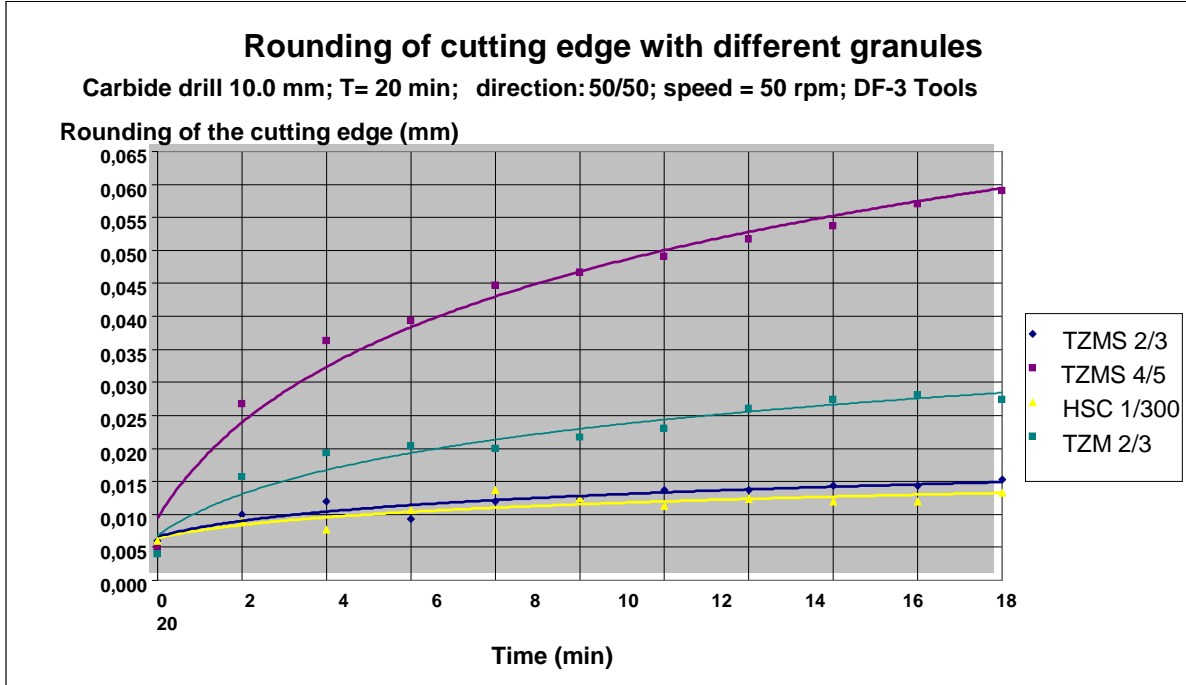
3.3 Amount of mountings



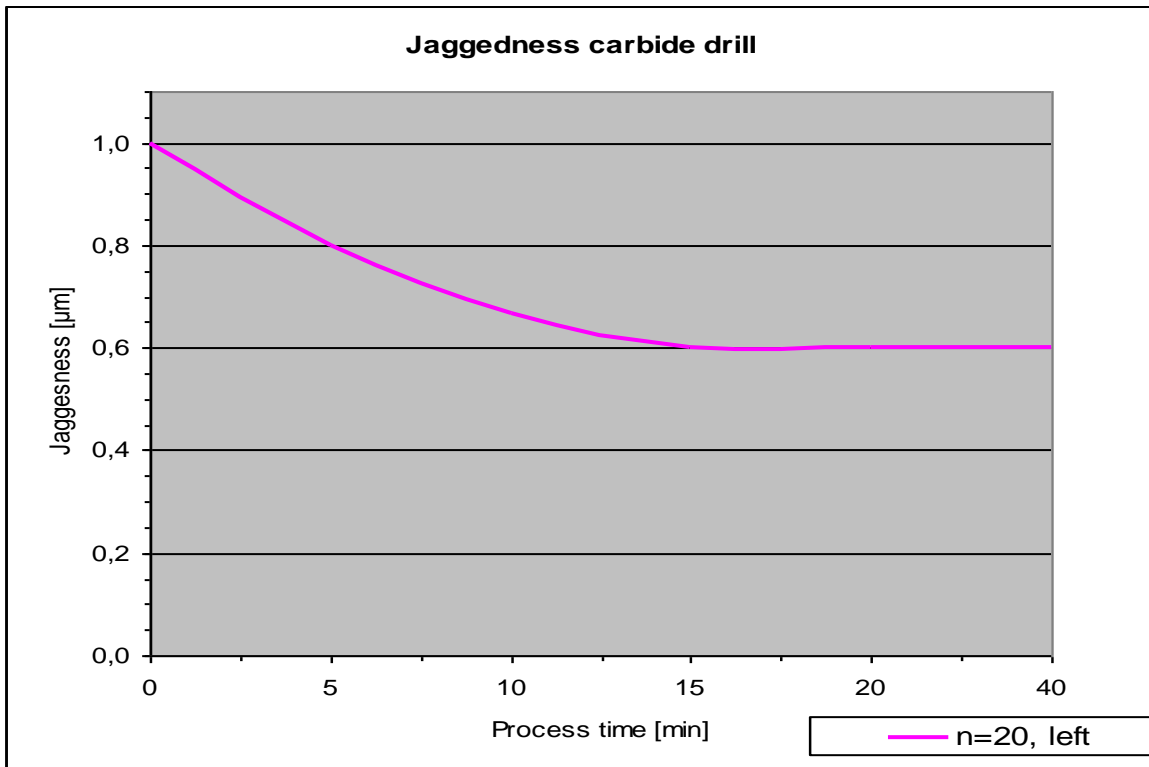
3.4 Immersion depth



3.5 Rounding of the cutting edge with different granules



3.6 Jaggedness



Processing of carbide drills

3.7 Example Processing

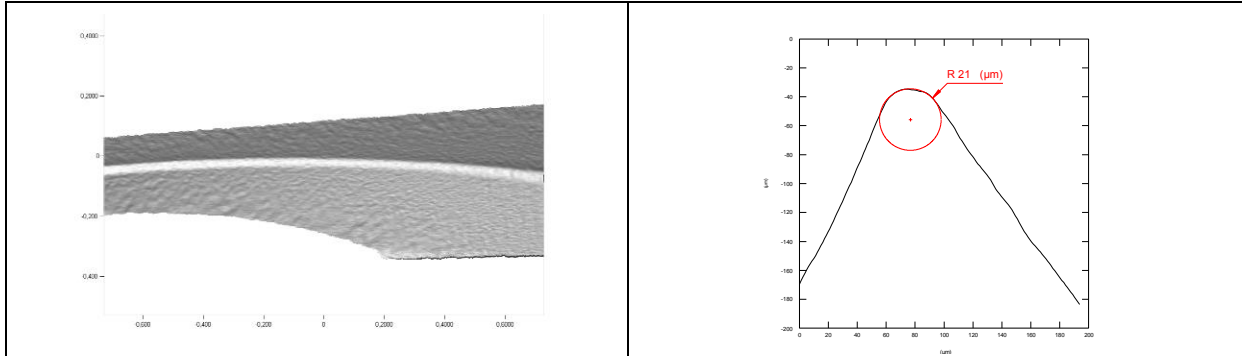
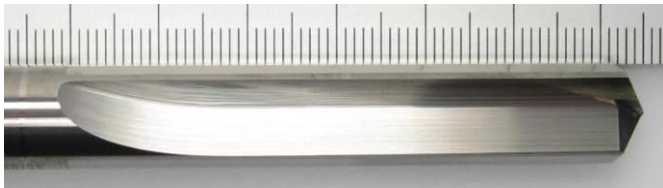


Figure 1: Drill, 8mm, cutting edge 21µm, before processing

3.8 Polishing straight fluted drills

Process time for polishing is around 15 to 30min.



Media: H4/400

Machine DF-3 Tools with angled holders

Tool	Time [min]	Speed Rotor [rpm]	Speed holders [rpm]	Sense of direction		Immersion depth [mm]	Direction	
				Normal	Counter		Left	Right
10 mm	15	45	10	x		max	100%	