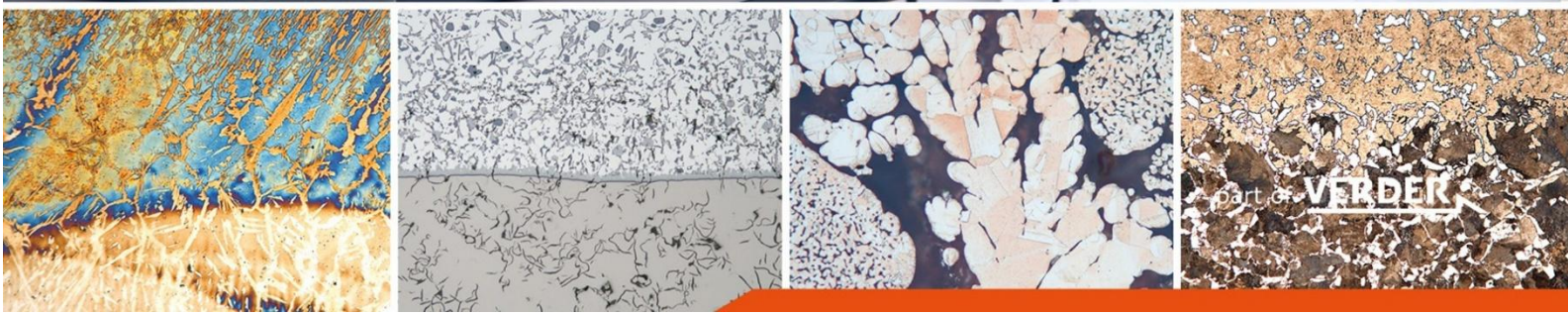


Application lab. report

Scratch test and layer measurement of a coated brass tap



QATM-Preparation method

Objective:

In this report a suitable preparation method was established for cutting, mounting, grinding, polishing and etching.

Two cast brass taps were examined: one without coating and one with a chromium-nickel coating.

The chromium-nickel layer was then measured, and a scratch test was also carried out on the coated tap.



Figure 1. Samples as received

QATM-Preparation method

Cutting

 Cutting			
Device	Cut-off wheel	Clamping tool	
QCUT 250 A	FS-A Aluminum oxide cut-off wheel	QATM standard	- QTOOL 80 - Clamping jaw cross prism
Cutting method			
Horizontal cut (X-axis)			
Parameters			
Feed speed	Pulse parameter	Cut-off disc rotational speed	
0,2 mm/s	-	3015 rpm	
Notes			
The samples can also be cut using an NF-A cutting disc with SiC abrasive particles. However, wear on the cutting disc is significantly higher than with the FS-A cutting disc. For this reason, we recommend the FS-A cutting disc with Aluminum oxide abrasive particles.			

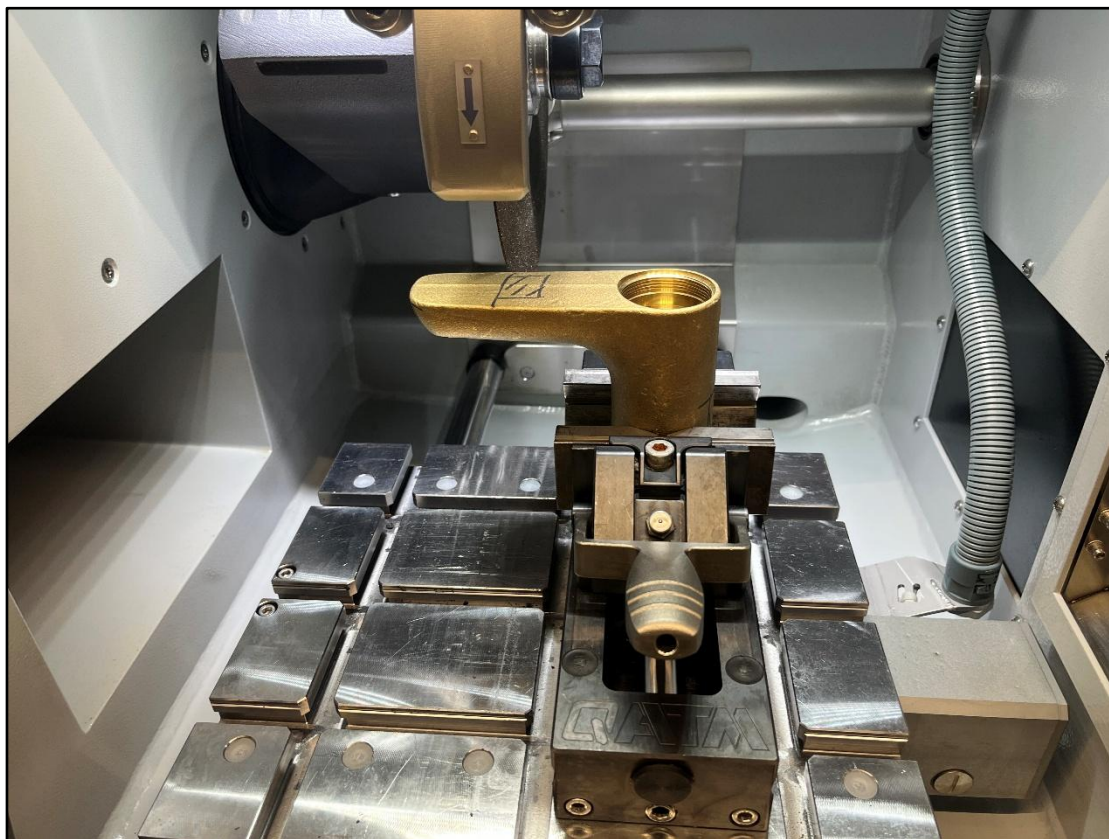


Figure 2. Clamping overview of the sample for the first cut. Here both cuts can be done with the parallel cutting without reclamping.

QATM-Preparation method



Figure 3. The sample after the first two cuts.



Figure 4. The cutting set-up for the second cut.

QATM-Preparation method



Figure 5. The cutting set for the third cut.

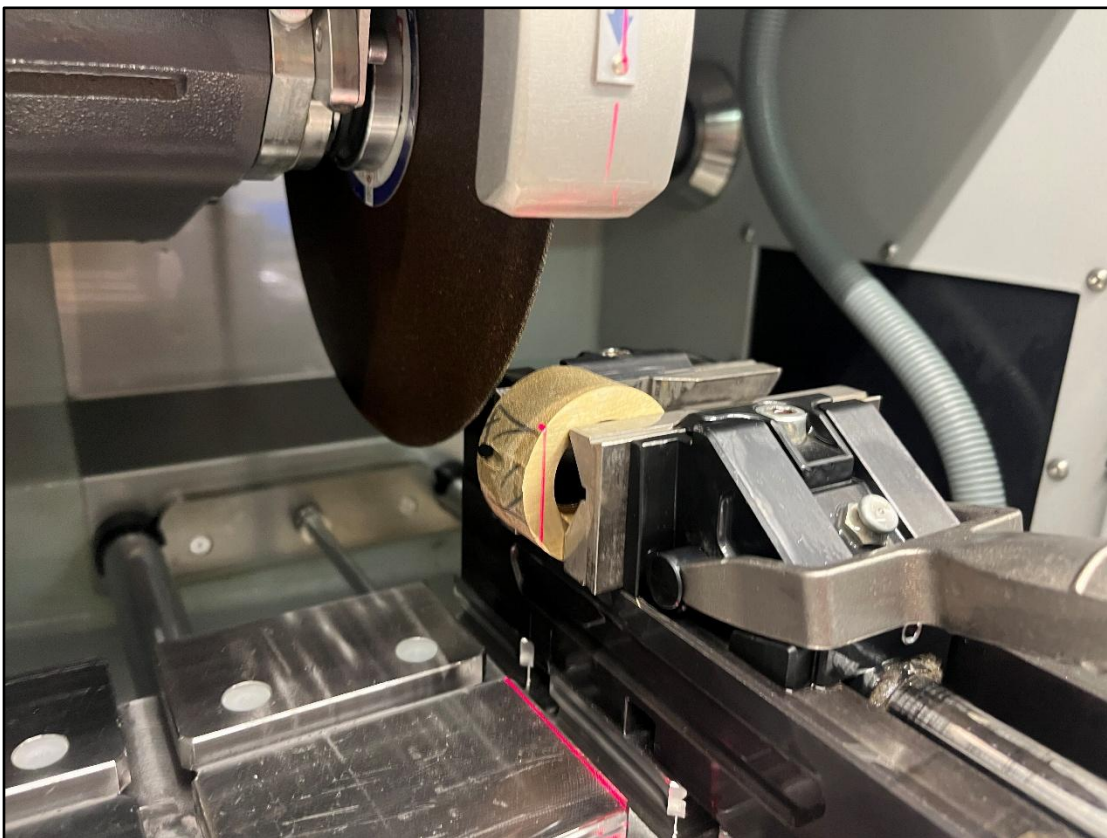


Figure 6. The cutting set for the fourth cut.

QATM-Preparation method

Hot mounting

 Mounting					
Device	Consumable	Heating time	Temperature	Pressure	Cooling time
QPRESS 40	EPO-black	4:00 min.	190°C	250 bars	3:30 min.
Filler or additional consumables	Heating power	Pressure mode	Cooling power		
Thermoplast Fill	100 %	One step	100 %		
Notes					
The samples can be mounted with two spoons of EPO-black and two spoons of Thermoplast Fill.					



Figure 7. The samples after hot mounting.

QATM-Preparation method

Grinding/Polishing

Device	Samples holder	Pressure mode					
QPOL Go 1	Z5445025	Single					
Step	MEDIUM		 RPM	 N	 min		
 Planar grinding	SiC-Paper self-adhesive P320 + X-TAP	H ₂ O	200	120 ▶▶	25	Till flat Ca. 2:30	
 Grinding	SiC-Paper self-adhesive P600 + X-TAP	H ₂ O	200	120 ▶▶	25	1:00	
 Grinding	SiC-Paper self-adhesive P1200 + X-TAP	H ₂ O	200	120 ▶▶	25	1:00	
 Polishing	Gamma	Dia. suspension Wb. Poly, 3µm + alc. Lubricant	150	120 ▶▶	25	6:00	
 Polishing	Gamma	Dia. suspension Wb. Poly, 1µm + alc. Lubricant	150	120 ▶▶	22	3:00	
 Fine polishing	OMEGA	Eposil F 0,1µm + H ₂ O ₂ (10:1)	100	80 ▶▶	20	2:30 (Rinsing time : 30 s)	
 Etching (chem.)	CU2 etching fluid					0:10	

Notes

- Pre-dosing for 3 µm und 1 µm: 3 s
Dosing interval and dosing duration for Dia. Suspension 3µm, 1µm:
Every 30 s for 1,3 s
- Dosing interval and dosing duration for lubricant:
Every 60 s for 1,3 s
- Dosing interval and Dosing duration for fine polishing suspension:
Every 15 s manually
- By using H₂O₂, we can produce scratch-free samples. If the use of H₂O₂ is not appropriate, it can be omitted.

QATM-Preparation method

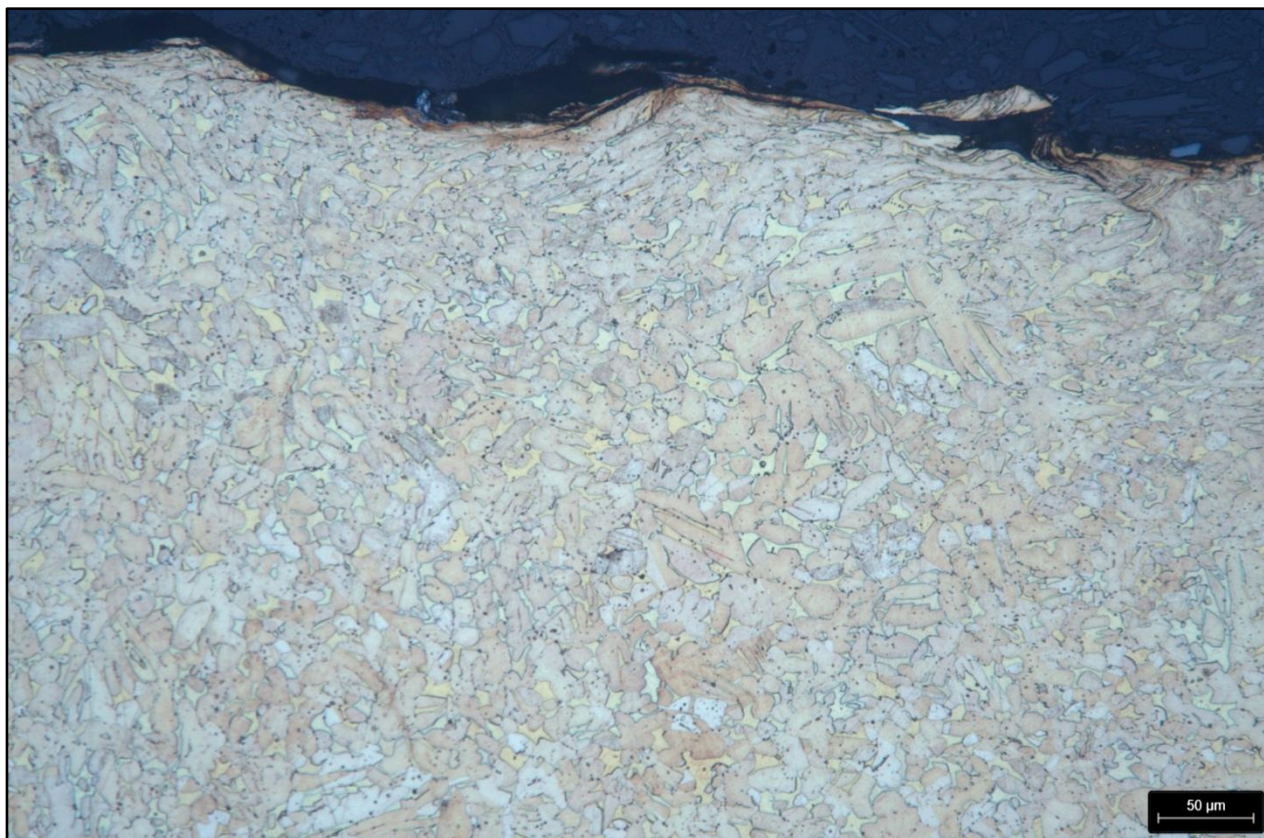


Figure 8. The microstructure of the brass sample without coating after etching – 200:1

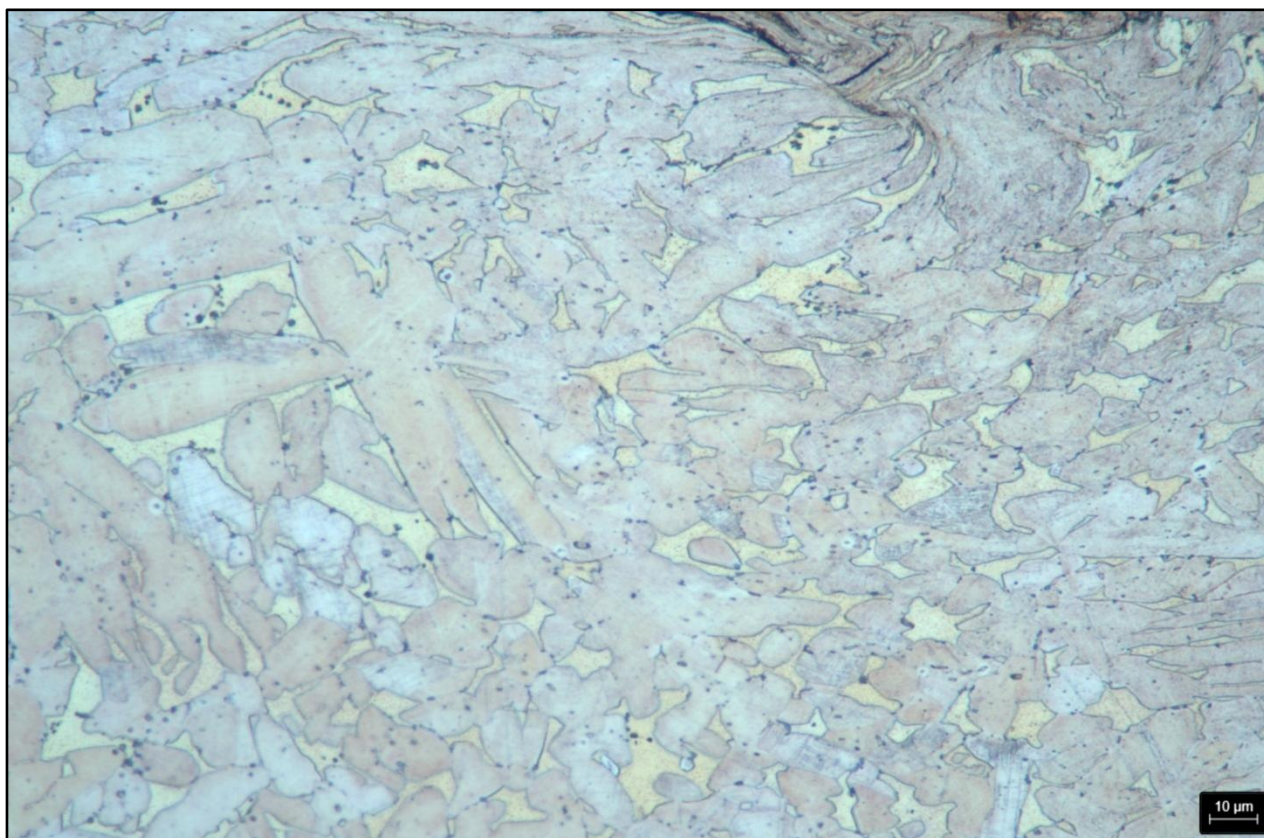


Figure 9. Figure 8 in higher magnification – 500:1

QATM-Preparation method



Figure 10. The coated samples after fine polishing in lower magnification to show the homogeneity of the coating after preparation – 100:1



Figure 11. The coated samples after fine polishing – 200:1

QATM-Preparation method



Figure 12. The coated sample microstructure after etching – 200:1

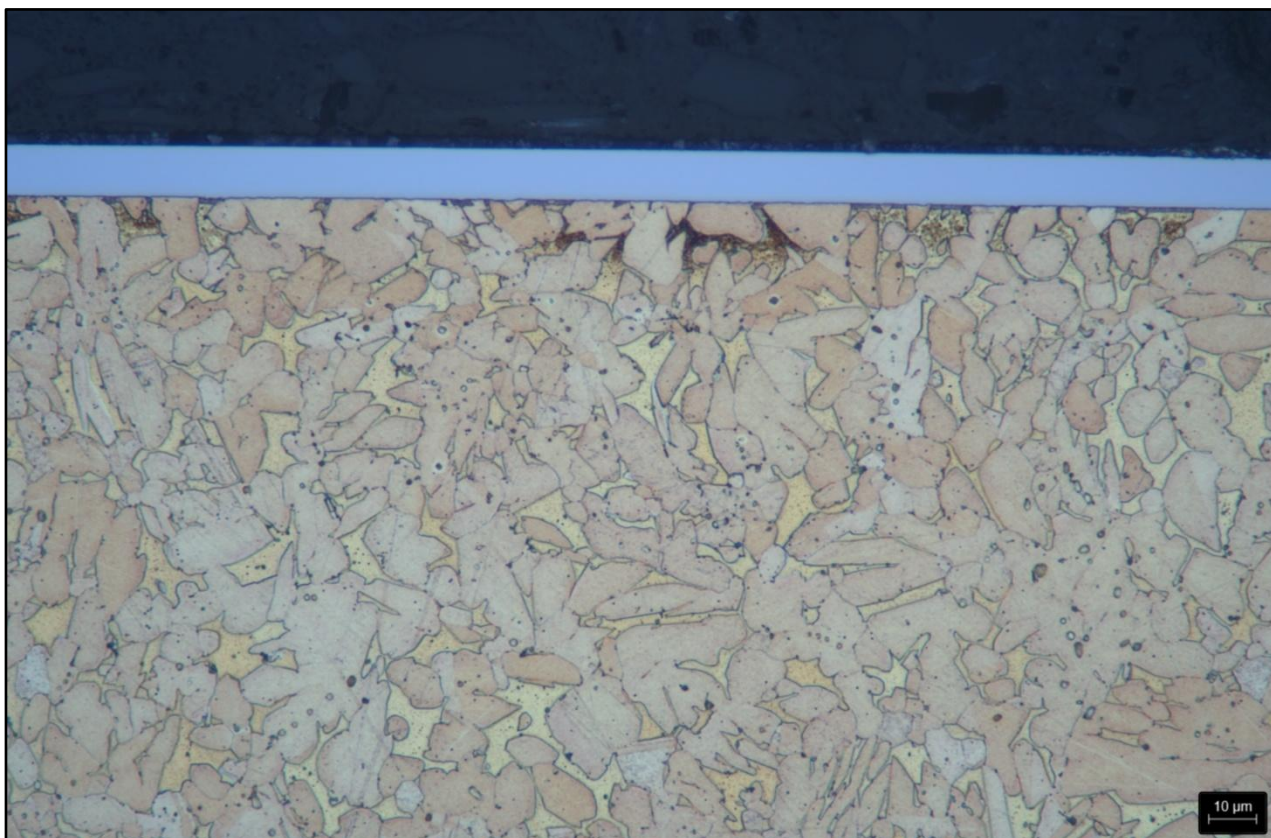


Figure 13. The coated sample microstructure after etching – 500:1

QATM- Preparation method

Consumables and accessories used:

	Consumables and accessories	Item description	Item number
Cutting	Cut-off disc	FS-A 300	95012536
	Cutting coolant	KKS-Standard	95014281
	Filter system	Filter	95017308
	Clamping tool	QTOOL 80	Z2231203
	Clamping tool	Cross prism for QTOOL 80	02231246
Mounting	Hot mounting material	EPO-Black	95011990
	Hot mounting material	Thermoplast Fill	95018076
	Mounting aid	Dosing spoon	92001716
Grinding	Sample holder	Sample holder L	Z5445025
	SiC-paper	SiC-Paper self-adhesive P320	92001647
	SiC-paper	SiC-Paper self-adhesive P600	92001649
	SiC-paper	SiC-Paper self-adhesive P1200	92001652
	Adapter disc	X-TAP 250 mm	95017020
Polishing	Polishing cloth	GAMMA	95017589
	Diamond suspension	Dia. Suspension wb. Poly 3 µm	92004799
	Diamond suspension	Dia. Suspension wb. Poly 1 µm	92004798
	Lubricant	Alc. Lubricant	95000901
	Polishing cloth	OMEGA	95005780
	Diamond suspension	EPOSIL F	92002536
Etching	Etchant	CU2 etching fluid	92004222

Conclusion:

The brass tap with and without coating can be cut without any problem with QCUT 250 A and FS-A Al₂O₃ cut-off wheel.

The hot mounting with EPO-black is highly recommended which can support the coating and at the end the results are very satisfying.

The grinding and polishing can be done with QPOL Go1. For grinding using SiC-paper with a solid adaptor disc like X-Tap can be done to not damage the coating and to avoid rounding the coating at the edge. To use the automatic dosing for fine polishing, QPOL Plus 1 machine is recommended.

The etching can be done with CU2 etching fluid which is the QATM solution for copper samples.

The following pages show the results of the scratch test and measurement of the chromium-nickel coating.

✓ ● Sample



Result: 0,51 N

✓ Scratch test

Result: Lc1: 0,51 N 0,06 mm
Result: Lc2: 2,29 N 0,29 mm
Result: Lc3: 10,79 N 1,35 mm
Result: Lc4: 51,65 N 6,46 mm
Result: Lc5: 78,95 N 9,87 mm

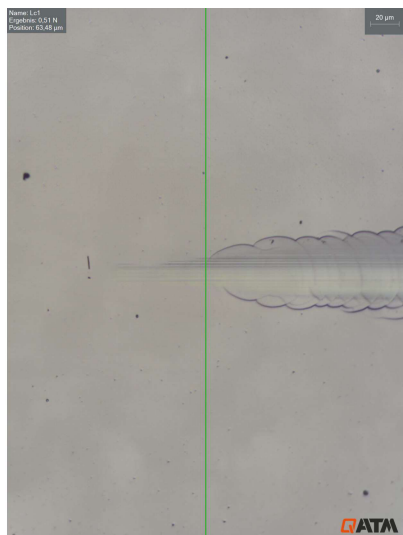
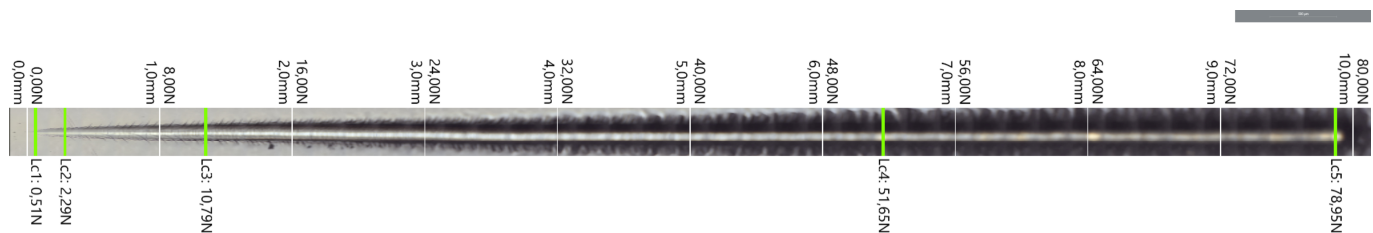
Scratch test data

Procedure:	Progressive load scratch test	Date:	13.07.2026 12:18
Initial load:	0,00 N	Final load:	80,00 N
Scratch speed:	10,00 mm/min	Loading rate:	80,00 N/min
Scratch length:	10,00 [µm]	Lens:	20x HQ
Scratch tool:	Rockwell Diamond 120° R0.2		

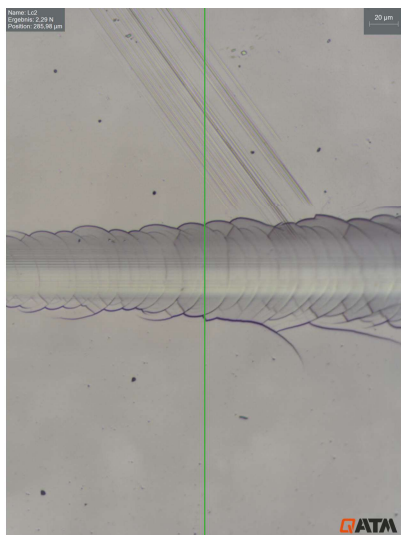
Scratch test points

St. No.	Scratch Lc points	Lc load [N]	Lc length [µm]	Lens	X-Pos. [µm]	Y-Pos. [µm]	Description
✓ 1	Lc1	0,51	0,06	20x HQ	0,00	0,00	
	Lc2	2,29	0,29	20x HQ			
	Lc3	10,79	1,35	20x HQ			
	Lc4	51,65	6,46	20x HQ			
	Lc5	78,95	9,87	20x HQ			

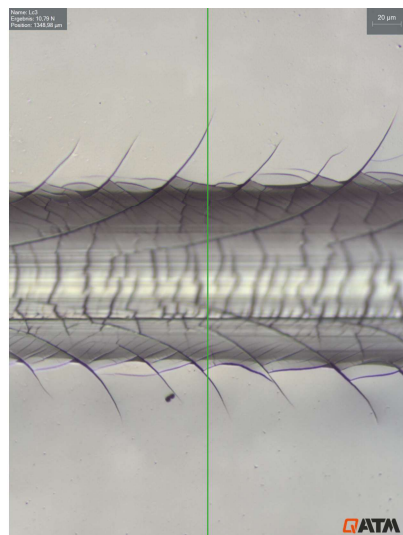
Scratch test points



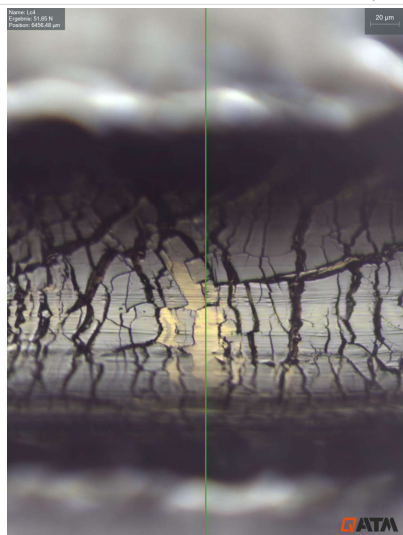
✓ Lc1 0,51 N 0,06 µm



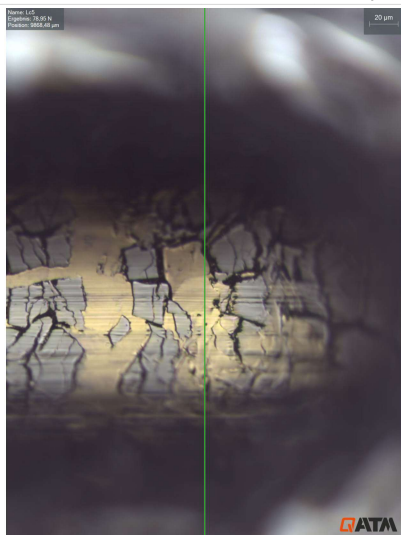
✓ Lc2 2,29 N 0,29 µm



✓ Lc3 10,79 N 1,35 µm



✓ Lc4 51,65 N 6,46 µm

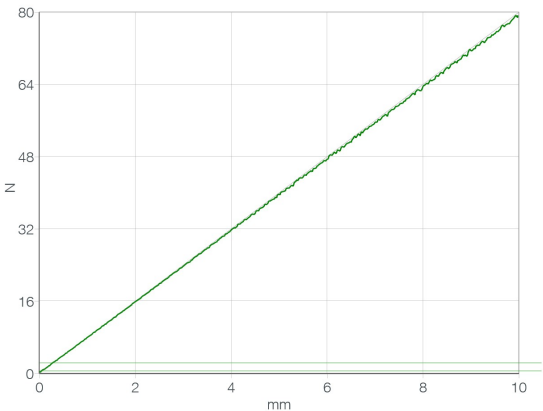


✓ Lc5 78,95 N 9,87 µm

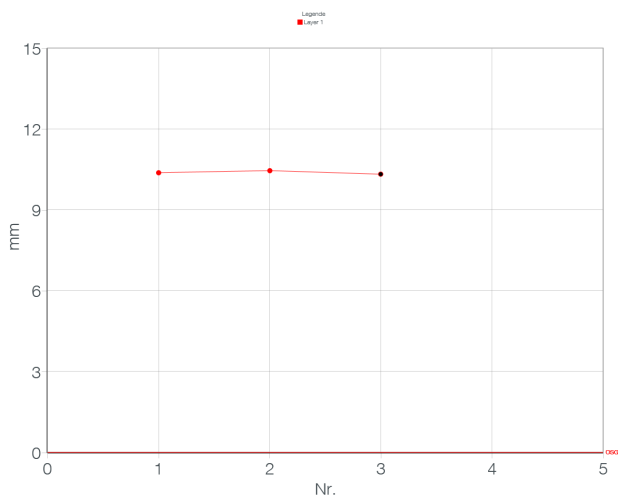
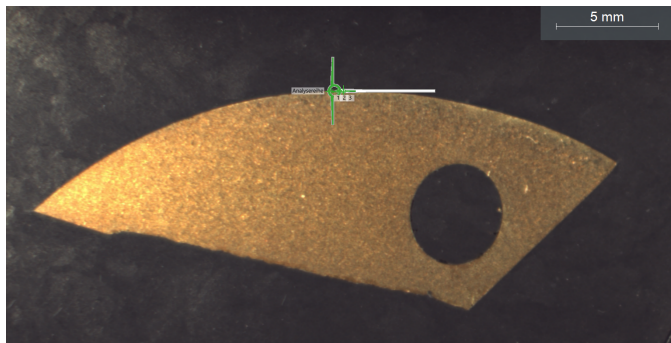
Scratch Test Series Graph

St. No.	Scratch Result Image
---------	----------------------

✓ 1



Surface-Layer-Thickness



Result: **Layer 1** 10,4 μm

Analysis points:

No.	Coating name	Thickness [μm]	X-Pos. [μm]	Y-Pos. [μm]	Point name
1	Layer 1	10,4	479,846	-36,266	
2	Layer 1	10,5	773,745	-33,002	
3	Layer 1	10,3	1067,644	-29,738	

Statistic:

	Coating thickness	Measuring lines/image	Cross-section lengths/image
Layer 1			

Mittelwert

0,010 mm

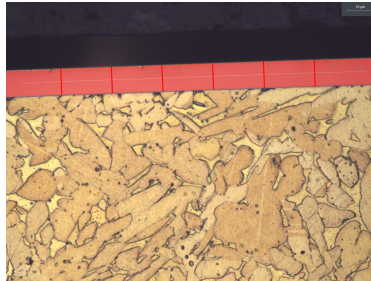
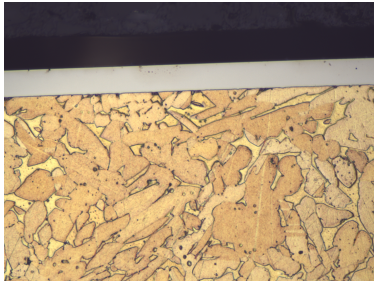
Lens: 50x HQ

Norms: DIN EN ISO 1463

Date: 29.07.2026 10:25:01

Coating thickness images:

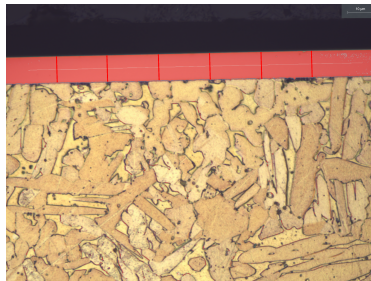
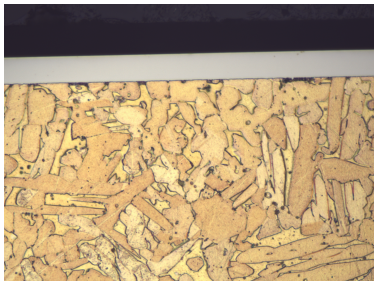
1



■ Layer 1

10,4 µm

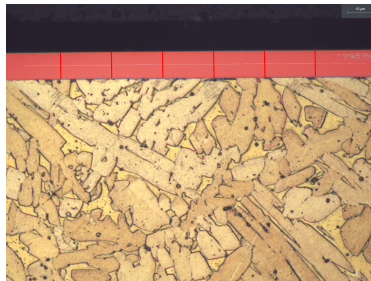
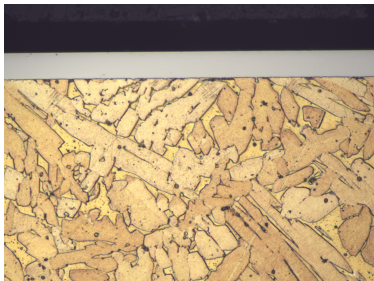
2



■ Layer 1

10,5 µm

3



■ Layer 1

10,3 µm