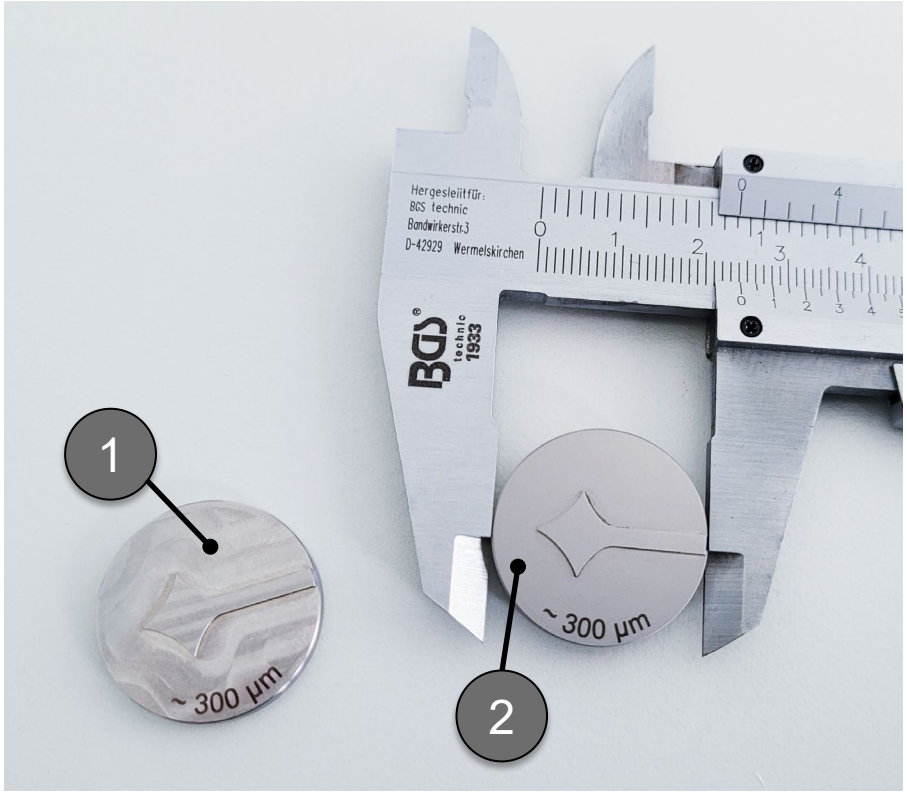
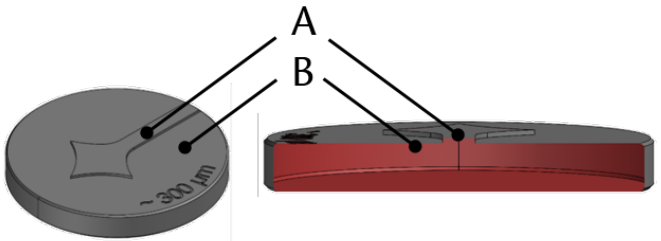
Feasibility Study - Extract

Surface Metrology Measurement

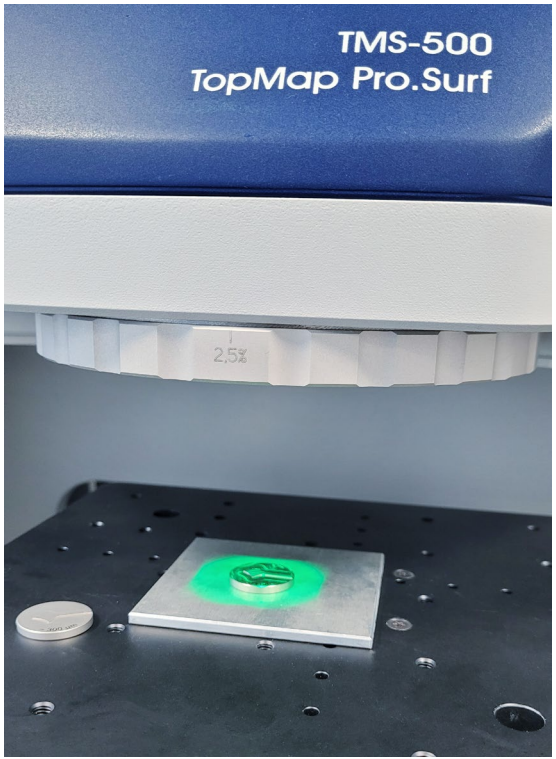
Measurement Task
Samples and Parameters

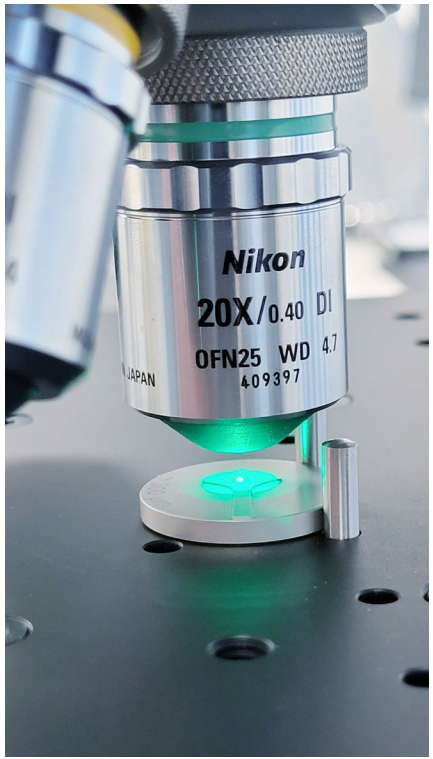


- Samples: Two coins which differ in surface finish
  - Coin 1: machined surface
  - Coin 2: surface finish
- Parameters of interest:
  - Flatness of both levels A and B individually
  - Step height and parallelism between levels A and B
  - Surface roughness parameter Sa



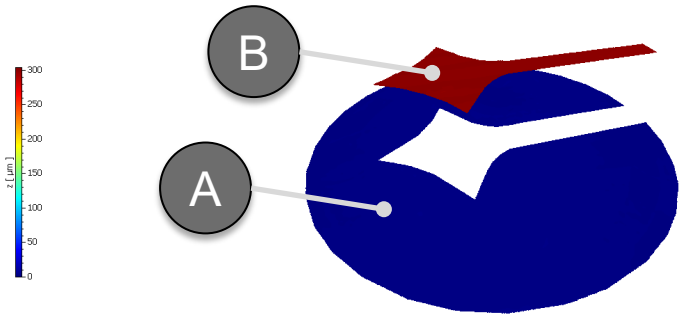
Measurement Setup
TopMap Pro.Surf and TopMap Micro.View

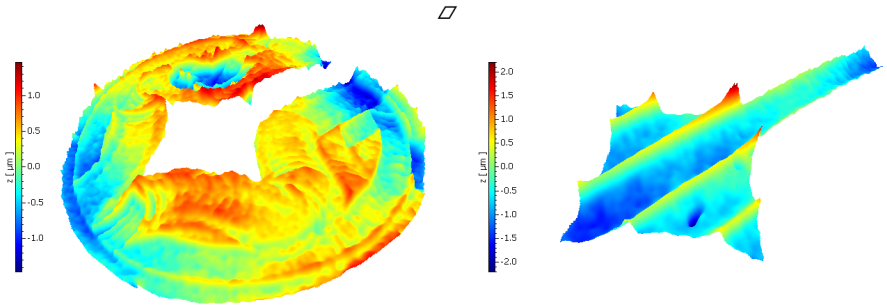




- The measurement of the different parameters places different demands on the lateral (xy) resolution of the measurement system.
- The TopMap Pro.Surf is used to measure flatness/parallelism/step height: The entire component is captured with one measurement in a few seconds.
- For roughness measurement, a higher lateral point density is required - this task is done by the TopMap Micro.View with 20x magnification.

Measurement Results
Sample 1





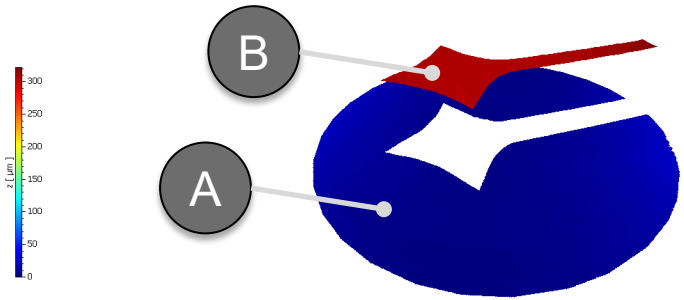
Characteristic: All Characteristics

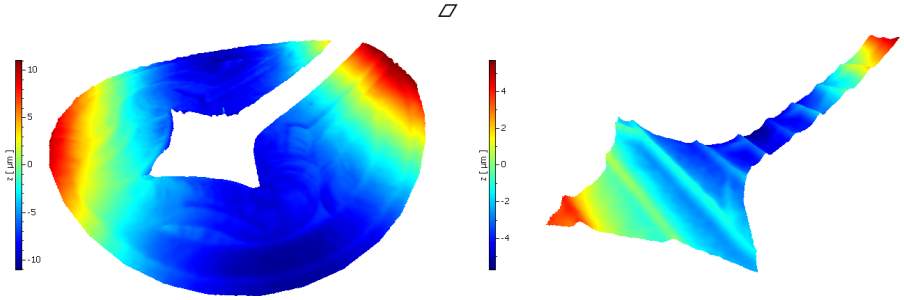
6 / 6

Evaluation	Region / Profile	Nominal Value	Tolerance	Value	Pass
Flatness (ISO 1101)	Level A	0 µm	+25 µm	2.7 µm	✓
Flatness (ISO 1101)	Level B	0 µm	+10 µm	3.8 µm	✓
Step Height	Level A -> Level B	300 µm	±5 µm	299.6 µm	✓
Parallelism	Level A -> Level B	0 µm	+20 µm	4.8 µm	✓
Angle Difference	Level A -> Level B	0 °	±0 °	0.006 °	
Step Height	Reference -> Level A	0 mm	±0 mm	3.015 mm	

- The measurement was divided into two sections for “Level A” and “Level B”. As an added value, the background (“Reference”) was also measured so that the total component height can be determined from the measurement, too.
- Process time: The time to complete the measurement and evaluation of all levels is around 22 seconds at the highest resolution. By limiting the measurement to levels A and B, a process time of between 8 and 12 seconds can be achieved by varying the height resolution.

Measurement Results
Sample 2





Characteristic: All Characteristics

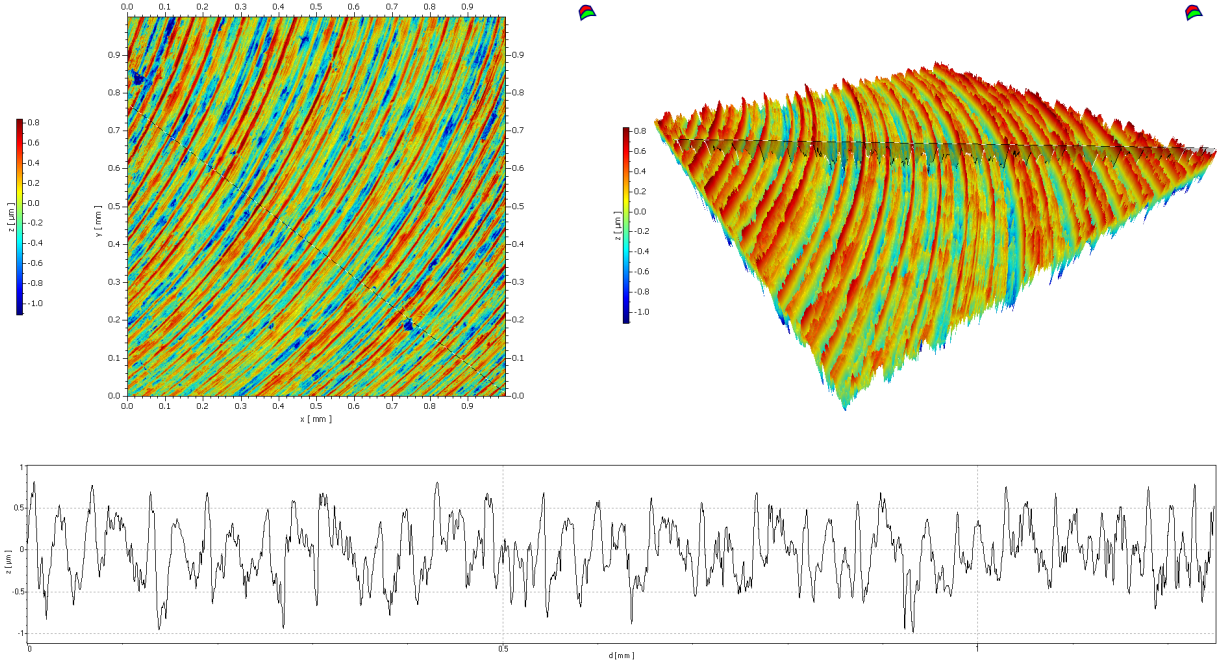
5 / 6

Evaluation	Region / Profile	Nominal Value	Tolerance	Value	Pass
Flatness (ISO 1101)	Level A	0 µm	+25 µm	21.7 µm	✓
Flatness (ISO 1101)	Level B	0 µm	+10 µm	10.1 µm	✗
Step Height	Level A -> Level B	300 µm	±5 µm	302.5 µm	✓
Parallelism	Level A -> Level B	0 µm	+20 µm	15.4 µm	✓
Angle Difference	Level A -> Level B	0 °	±0 °	0.031 °	
Step Height	Reference -> Level A	0 mm	±0 mm	2.980 mm	

- The measurement was divided into two sections for “Level A” and “Level B”. As an added value, the background (“Reference”) was also measured so that the total component height can be determined from the measurement, too.
- Process time: The time to complete the measurement and evaluation of all levels is around 22 seconds at the highest resolution. By limiting the measurement to levels A and B, a process time of between 8 and 12 seconds can be achieved by varying the height resolution.

Measurement Results
Sample 1

Polytec



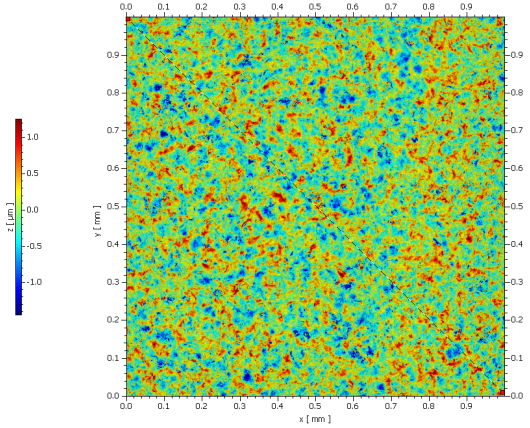
- An area of 1 mm x 1 mm is measured using a 20x objective
- The process time for the required stitching is 1 min 50 sec.

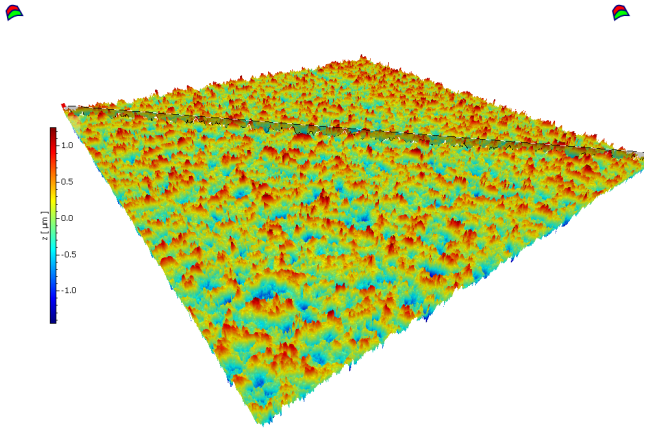
Evaluation	Value
Sa (ISO 25178)	0.27 µm
Sq (ISO 25178)	0.34 µm
Sz (ISO 25178)	1.95 µm
Ssk (ISO 25178)	-0.32
Sku (ISO 25178)	3.24
Sk (ISO 25178)	1.01 µm
Spk (ISO 25178)	0.27 µm
Svk (ISO 25178)	0.44 µm
Str (ISO 25178)	0.12
Sdr (ISO 25178)	22.57 %

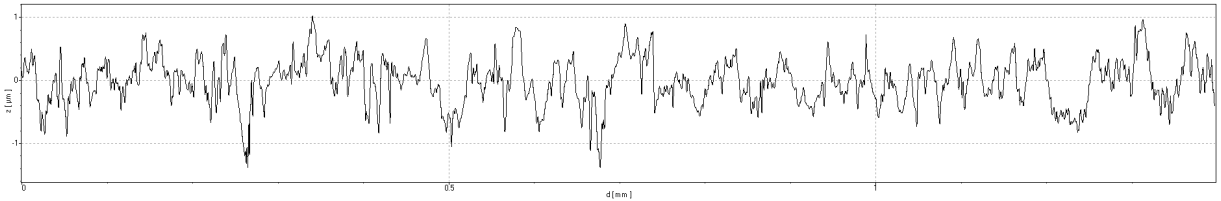
S-Filter: 2.5 µm ; L-Filter: 0.8 mm

Measurement Results
Sample 2

Polytec







- An area of 1 mm x 1 mm is measured using a 20x objective
- The process time for the required stitching is 1 min 50 sec.

Evaluation	Value
Sa (ISO 25178)	0.30 µm
Sq (ISO 25178)	0.38 µm
Sz (ISO 25178)	2.70 µm
Ssk (ISO 25178)	-0.22
Sku (ISO 25178)	4.40
Sk (ISO 25178)	1.05 µm
Spk (ISO 25178)	0.47 µm
Svk (ISO 25178)	0.58 µm
Str (ISO 25178)	0.93
Sdr (ISO 25178)	38.87 %

S-Filter: 2.5 µm ; L-Filter: 0.8 mm

Measurement Results
Sample 1 and Sample 2

Polytec

Sample 1

Evaluation	Value
Sa (ISO 25178)	0.27 µm
Sq (ISO 25178)	0.34 µm
Sz (ISO 25178)	1.95 µm
Ssk (ISO 25178)	-0.32
Sku (ISO 25178)	3.24
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Spk (ISO 25178)	0.27 µm
Svk (ISO 25178)	0.44 µm
Str (ISO 25178)	0.12
Sdr (ISO 25178)	22.57 %

Sample 2

Evaluation	Value
Sa (ISO 25178)	0.30 µm
Sq (ISO 25178)	0.38 µm
Sz (ISO 25178)	2.70 µm
Ssk (ISO 25178)	-0.22
Sku (ISO 25178)	4.40
Sk (ISO 25178)	1.05 µm
Spk (ISO 25178)	0.47 µm
Svk (ISO 25178)	0.58 µm
Str (ISO 25178)	0.93
Sdr (ISO 25178)	38.87 %

Even though the surfaces look different, both samples predominantly have very similar roughness properties. The difference between the two surfaces can be determined using the parameters Str and Sdr, which are a measure of the isotropy (Str) and complexity (Sdr) of the surface.