



Berührungslose Oberflächenmessung in Produktion, Forschung & Entwicklung

Automotive Anwendungen / 26. testXpo 2017

FRT GmbH

Uwe Schosser

www.frtmetrology.com

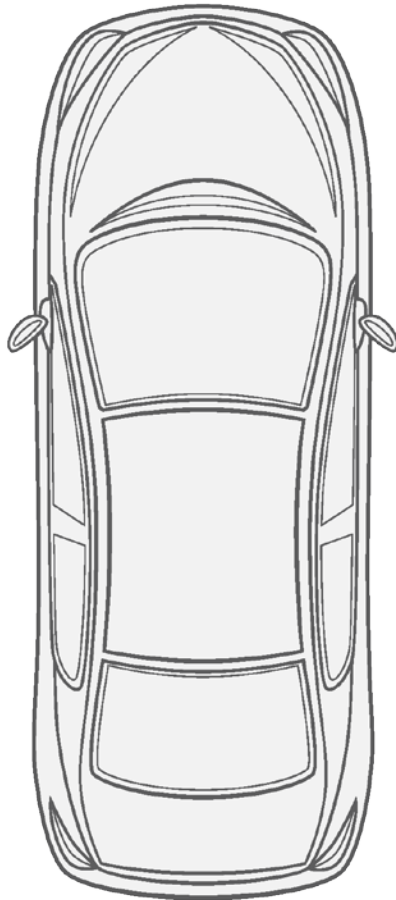
FRT – the art of metrology™

Kunst - das ist das Zusammenspiel von Handwerk, Wissen, Erfahrung, Kreativität und Leidenschaft!

- optische 3D-Oberflächenmesstechnik
- Messung von Rauheit, Topographie, Schichtdicke, etc.
- Multi-Sensor Technologie
- modulare Hardware Konfiguration
- schnelle und präzise Messungen
- exzellente Wiederholbarkeit und Reproduzierbarkeit
- In-house Sensor Entwicklung
- In-house Software Entwicklung
- Dienstleistungen

Wir bei der FRT GmbH verwandeln mehr als 20 Jahren Erfahrung, immer aktuelles Wissen und komplexe Technologien in kreative Lösungen für unsere Kunden!

Anwendungsgebiete in den Automotive Sektoren



FRT THE ART OF METROLOGY™

Interior

- Electronics
- Displays
- Slush Skins
- Dashboard

FRT THE ART OF METROLOGY™

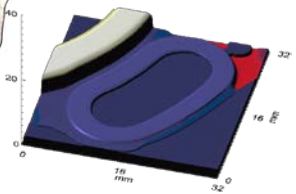
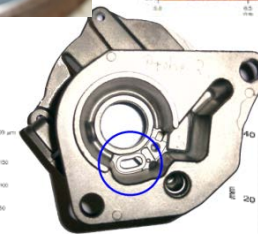
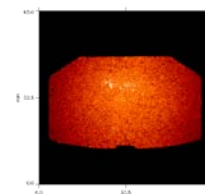
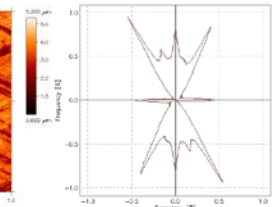
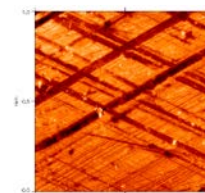
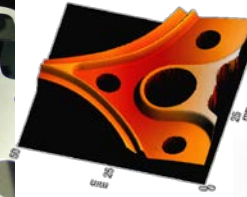
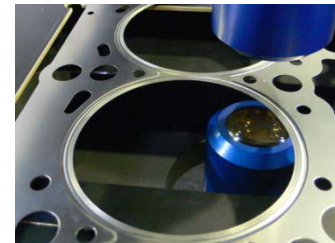
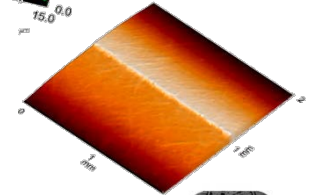
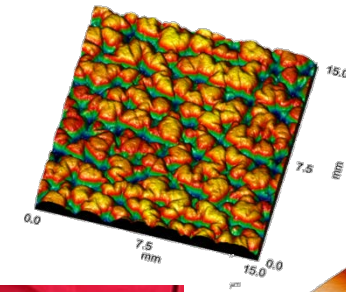
Exterior

- Lacquer
- Illumination
- Tires
- Brakes / Brake Discs

FRT THE ART OF METROLOGY™

Engine / Mechanics

- Cylinders
- Head Gaskets
- Cam Shafts and others
- Bearings
- Gears



Die MicroProf® Serie

Kompakt – Multi-Sensor – Modular – Standard



MicroProf® 100
Exponat der testXpo !

MicroProf® 200

MicroProf® 300

Erfüllt universell kundenspezifische Anforderungen!

MicroProf® Serie

Kompakte Messtechnik für Forschung,
Produktion und QS

	MicroProf® 100	MicroProf® 200	MicroProf® 300
xy-Travel *	150 mm x 100 mm	250 mm x 200 mm	415 mm x 305 mm
Multi-Sensor	X	X	X
TTV-Option	X	X	X
Tabletop Unit	X		
Standalone		X	X
Automation (optional)	X	X	X
Sample handling (optional)		X	X
Thermo Unit (optional)	X	X	X

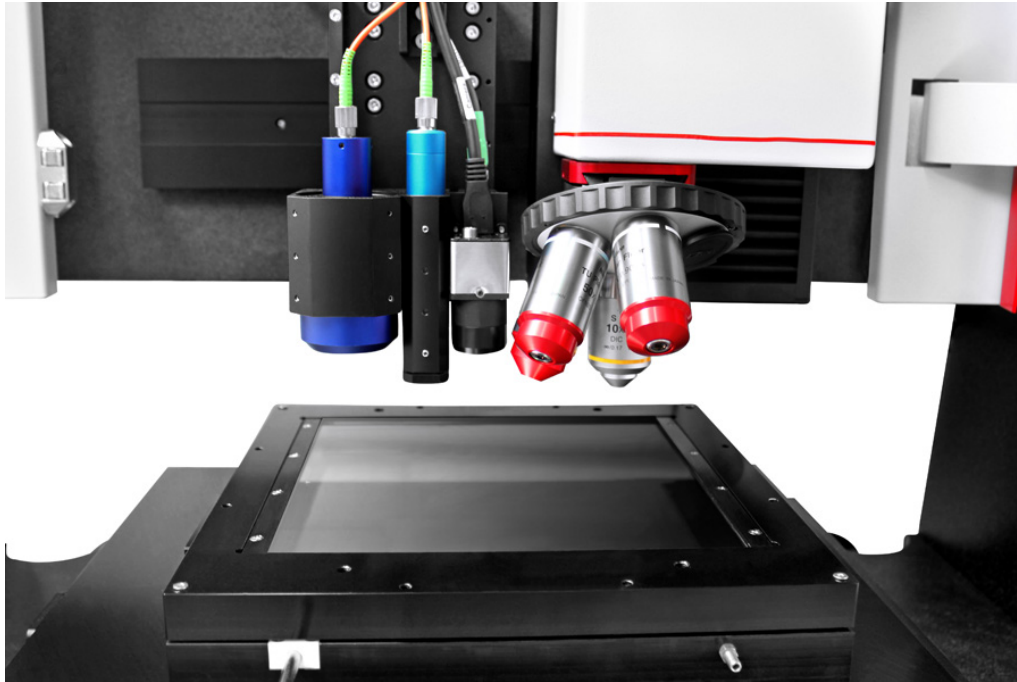
* larger travel ranges possible



Gleiche Messtechnik / verschiedene Systemgrößen

MicroProf® Serie

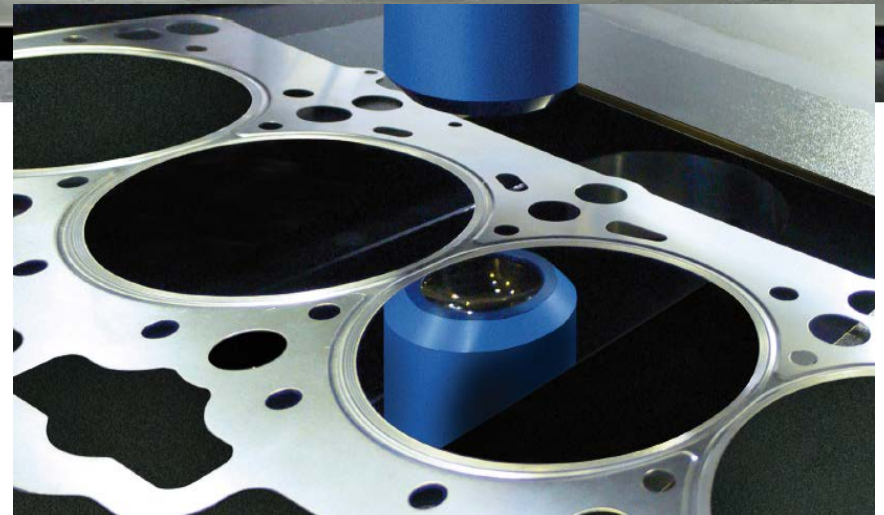
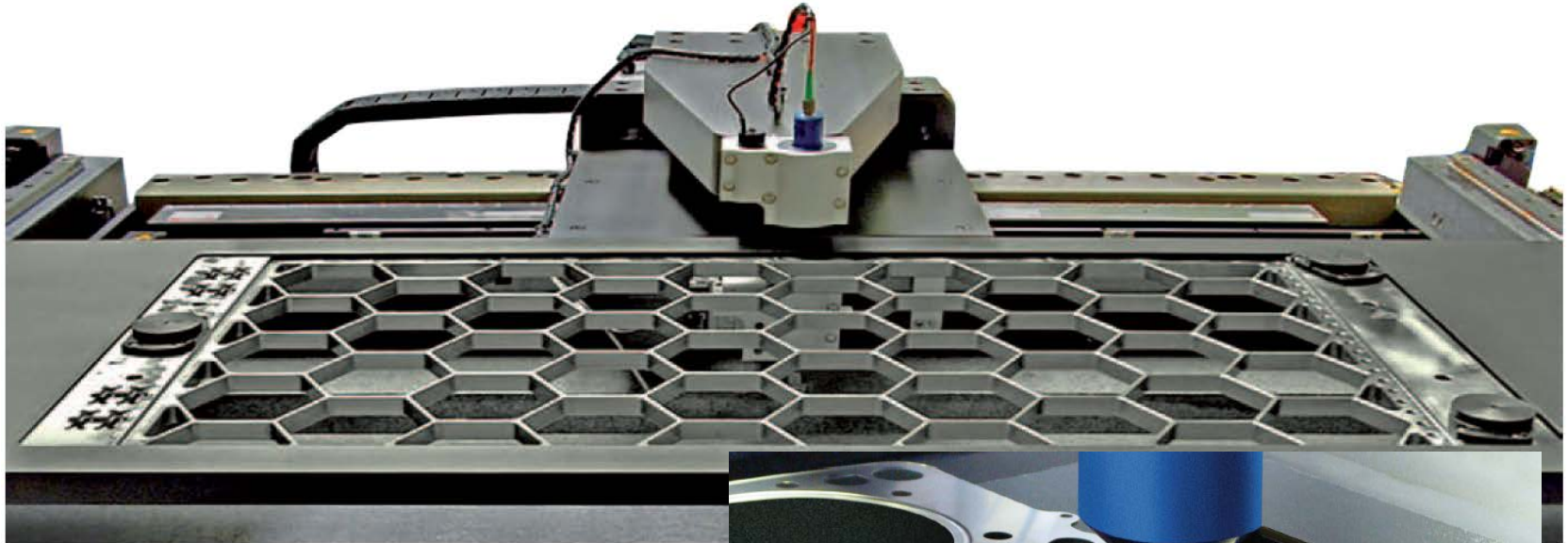
Kompakt – Multi-Sensor – Modular – Standard



MicroProf® TL für optische Messungen unter thermischer Last!

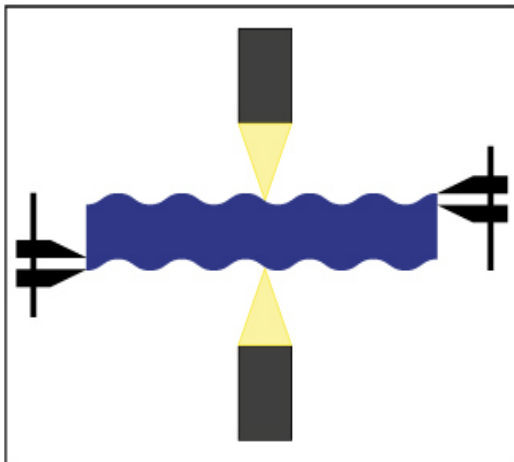
TL = Thermische Last

MicroProf® TTV für Zylinderkopfdichtungen (ZKD)



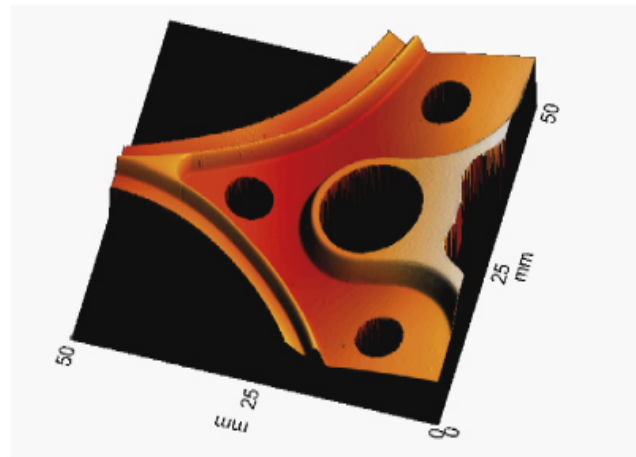
- große xy- Verfahrswege
- Messungen von Ober- und Unterseite
- Messungen der Dickenvariation
- Prüfung geometrischer Abmaße

TOPOGRAPHY TOP / BOTTOM



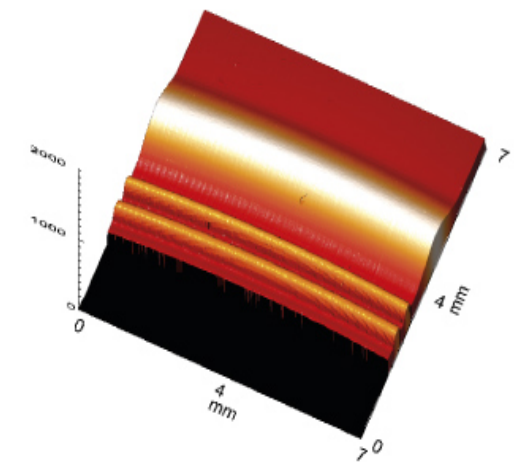
Simultaneous topography measurement on top and bottom side

Messungen an Ober- und Unterseite gleichzeitig



Cylinder head gasket, stopper geometry

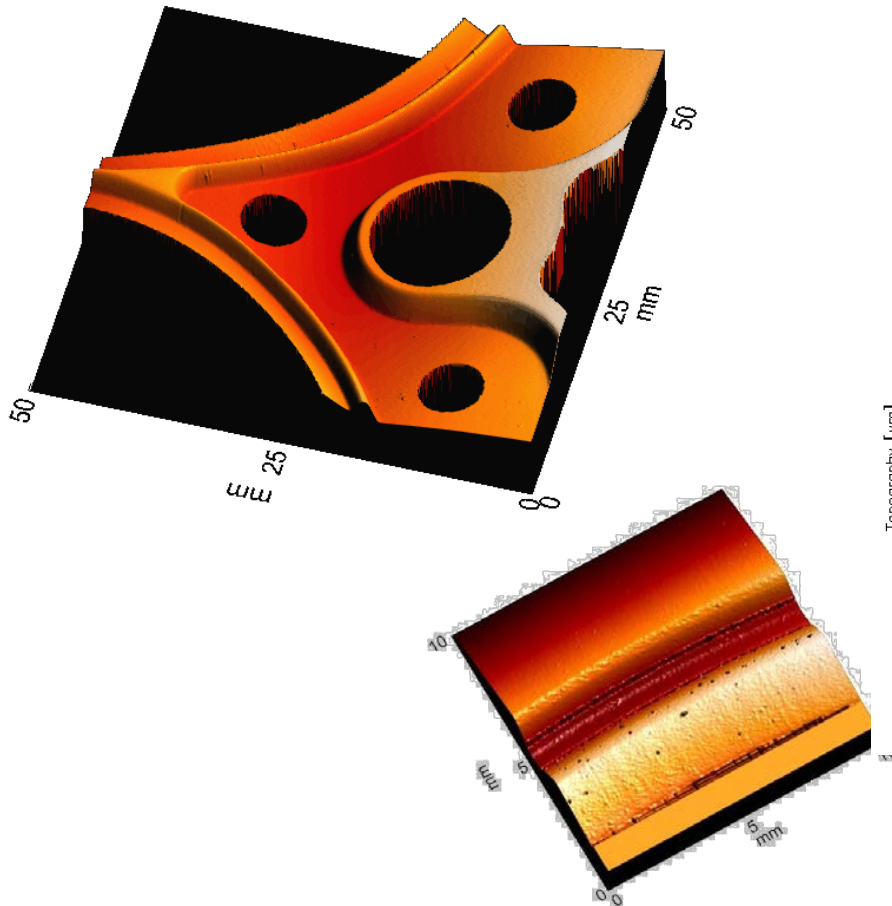
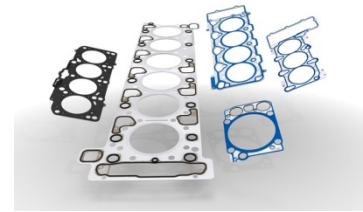
Messungen an Stoppergeometrie einer Zylinderkopfdichtung



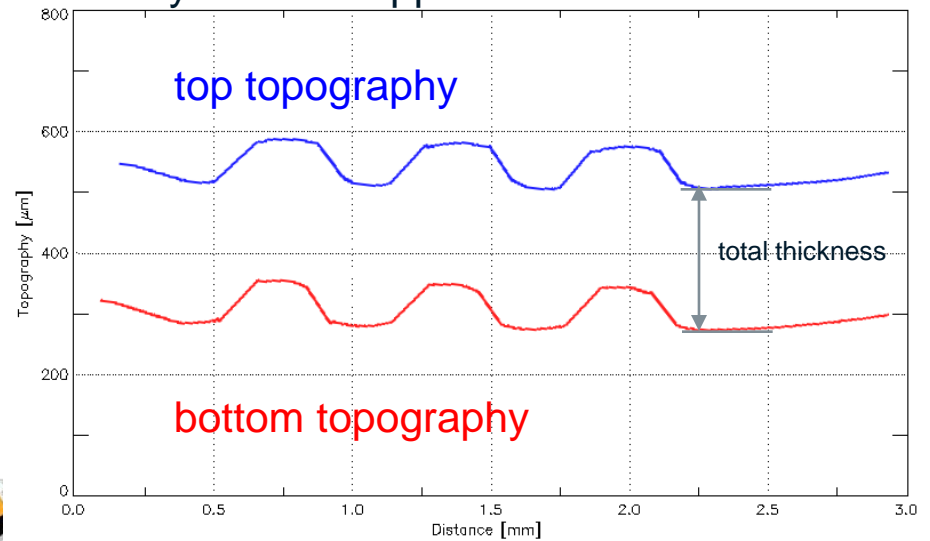
Cylinder head gasket, stopper geometry

Zylinderkopfdichtungen

Topografie der Ober- und Unterseite
sowie Dickenvariation (TTV)



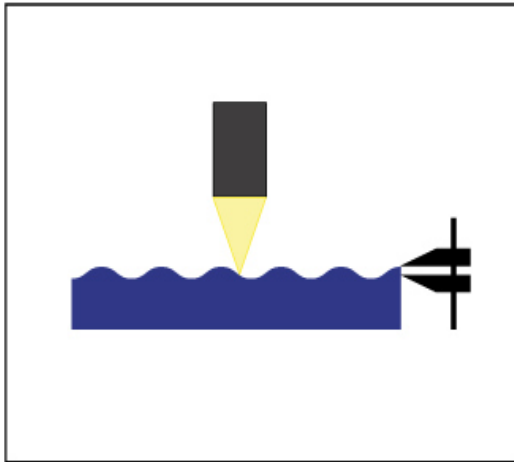
Analyse von Stopperstrukturen:



- schnelle und einfache Installation
- intuitive Steuer- und Messsoftware: FRT Acquire
- umfangreiche Analysefunktionen in FRT Mark III
- Messungen an Honstrukturen / Honwinkel

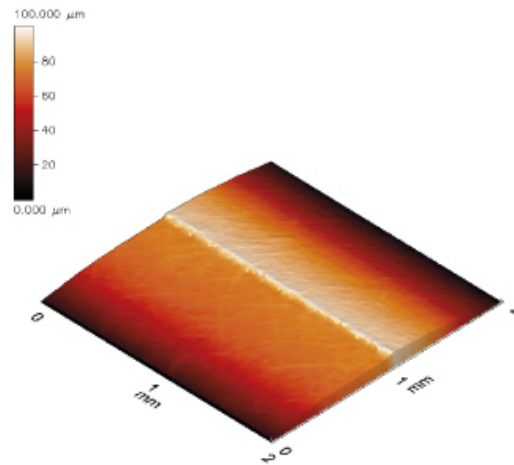


TOPOGRAPHY (SHAPE, STRUCTURE)



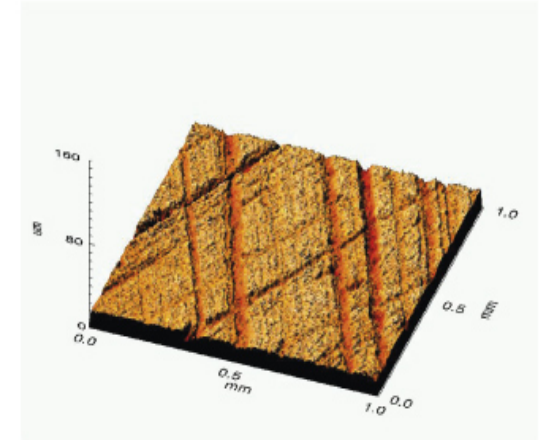
Standard topography measurement

Topografie



Surface of a car door handle

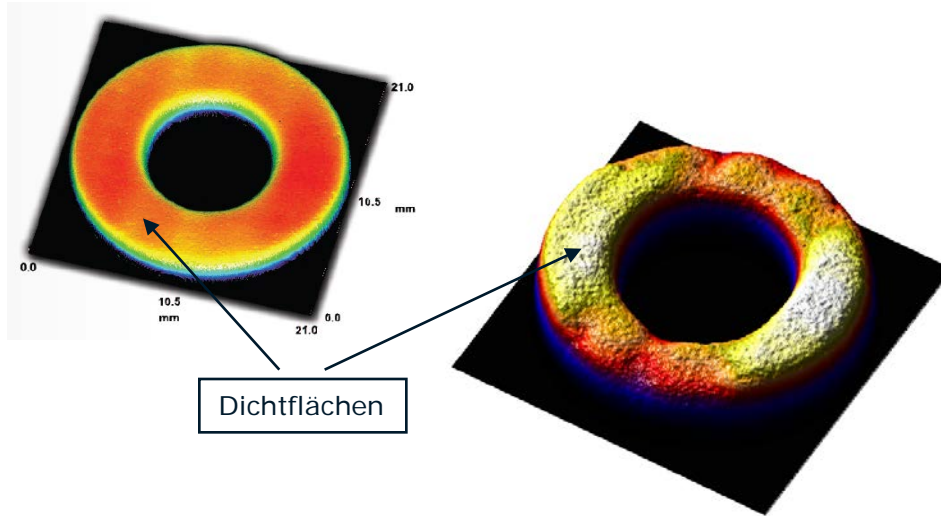
Topografie/ Lackstufen



Honing structure on a cylinder surface

Honwinkel –
MicroProf® Zylinder

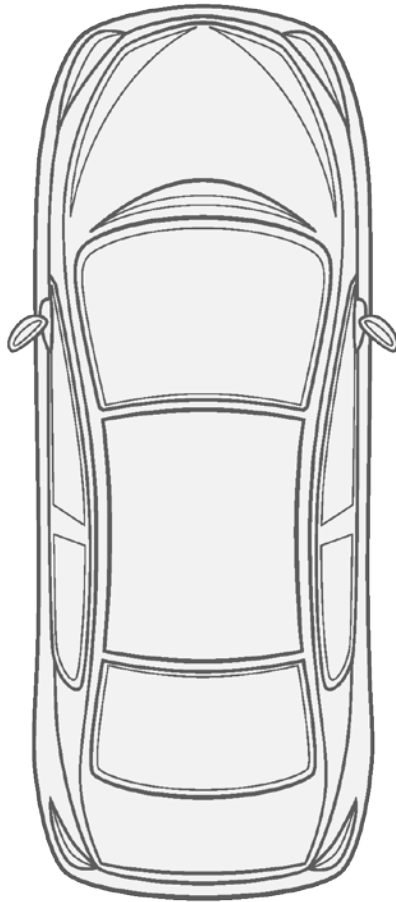
Für rotationssymmetrische Bauteile mit hohen Ebenheitsanforderungen



- 500 mm Rundtisch
- Drehwinkel 360°
- Multi-Sensor Installationen möglich
- luftgelagerter Tisch / Portalaufbau
- sehr präziser Ablauf in allen Komponenten
- Ebenheitsmessungen < 1 µm



Weitere Anwendungsgebiete in den Automotive Sektoren



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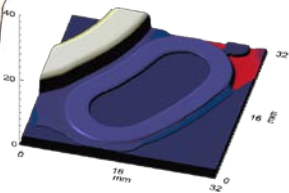
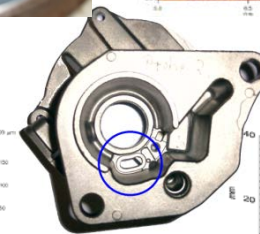
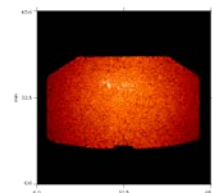
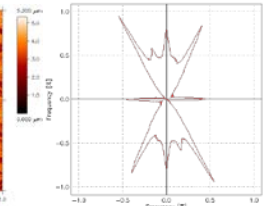
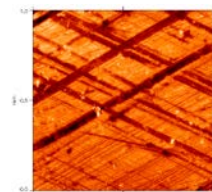
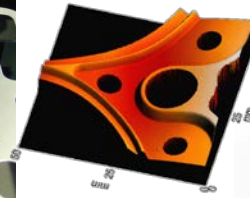
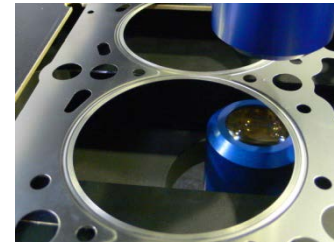
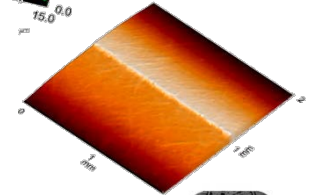
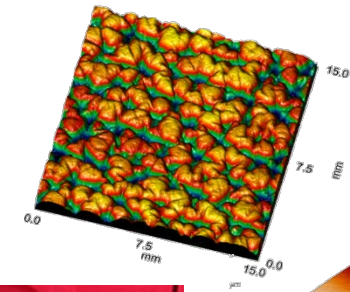
Exterior

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- Brakes / Brake Discs

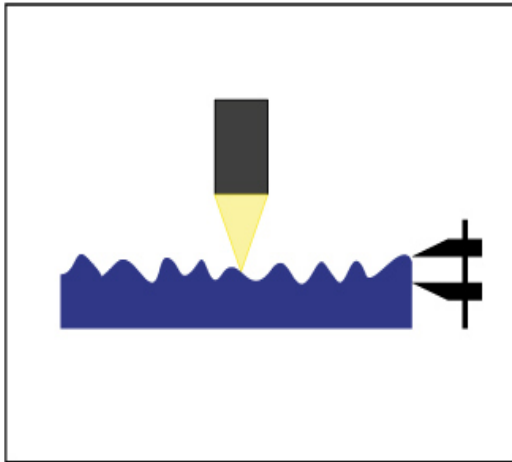
FRT THE ART OF METROLOGY™

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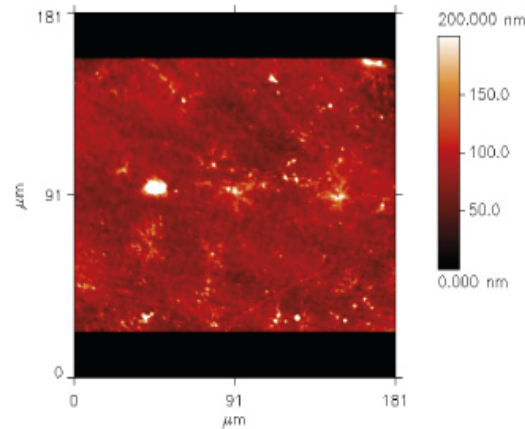


ROUGHNESS



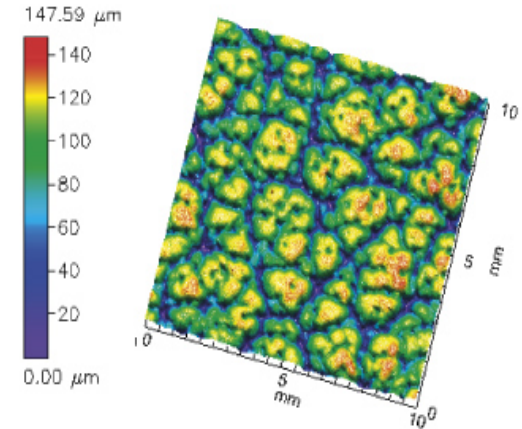
DIN/ISO-compliant roughness and waviness measurement

Rauheit nach DIN



Steering angle sensor (Leopold Kostal GmbH & Co.KG)

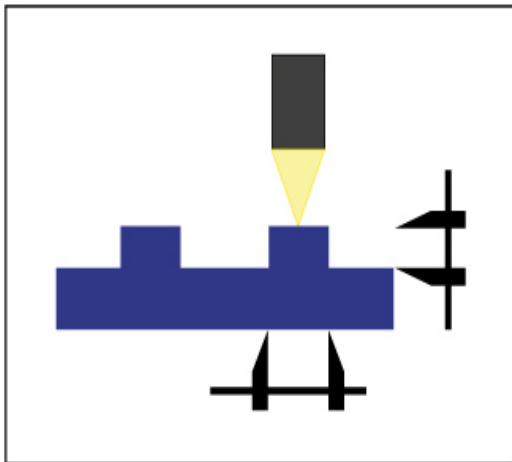
Kundenspezifische Lösung
am Lenkrad



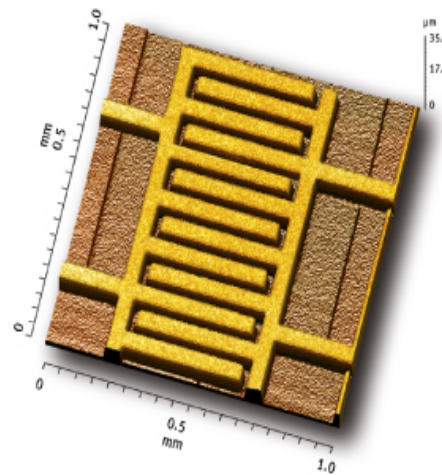
Artificial leather surface,
 $S_a = 12,540 \mu\text{m}$

Topografie
Kunstledernarbung

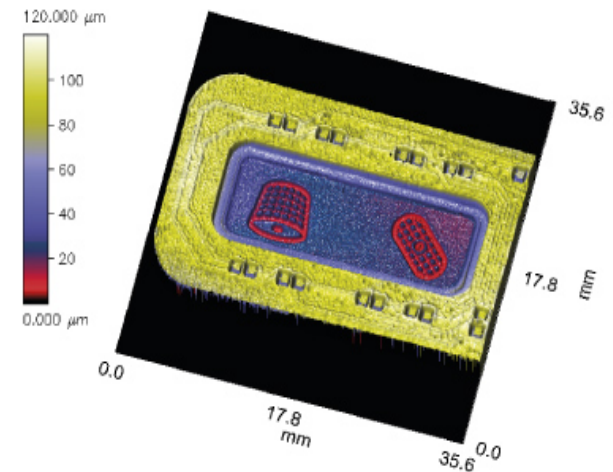
STEP HEIGHT / WIDTH



Step height and width measurement



Automotive sensor, finger height and width



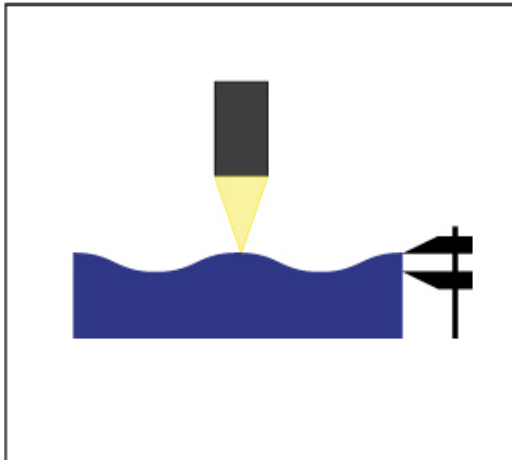
Illumination unit, stamping depth and width

Messungen an Stufenhöhen
und Stufenbreiten

Geometrie an Sensoren

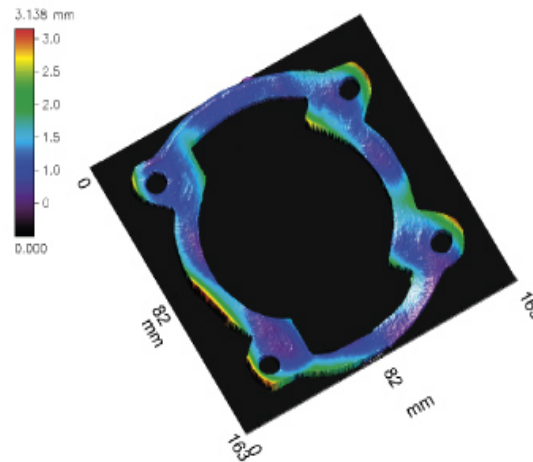
Merkmale an Beleuchtungselementen

FLATNESS



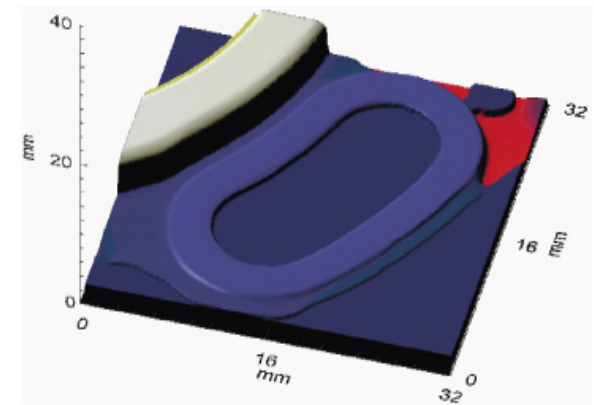
Flatness measurement

Ebenheitsmessung



Cylinder base gasket,
determination of flatness

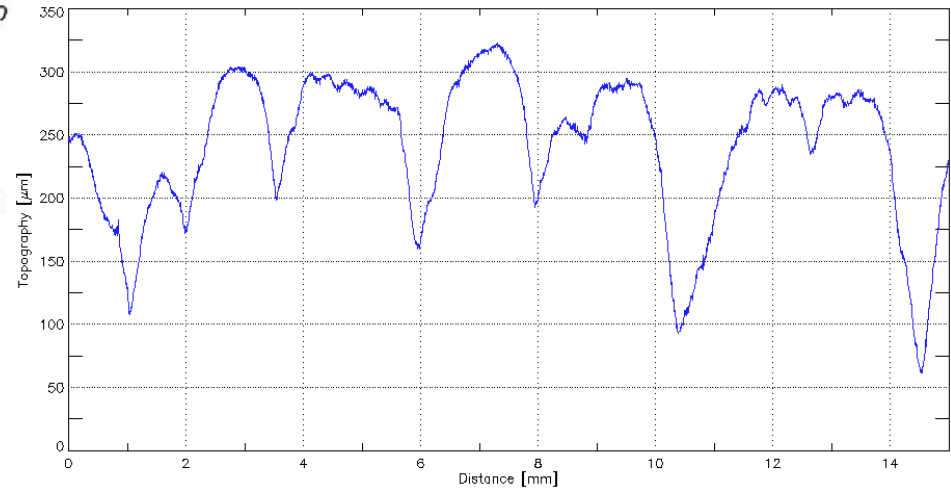
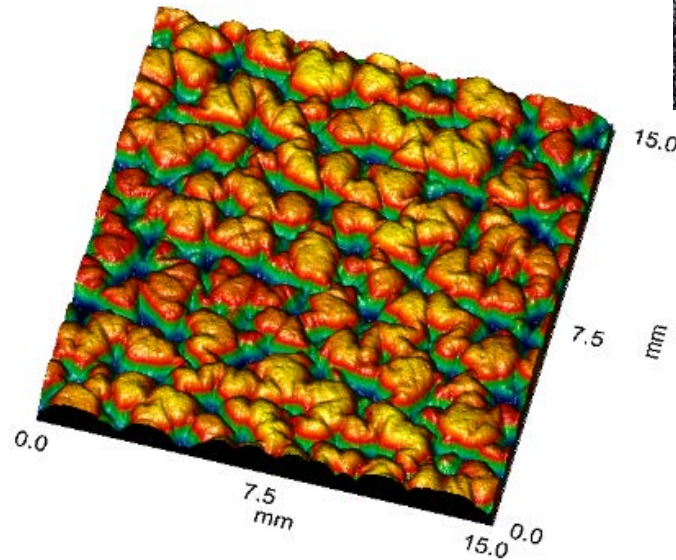
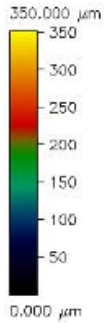
Messung: Ebenheit an
Dichtungselementen



Sealing surface of a pump hous-
ing, determination of flatness

Kunstledernarbenungen

Topografie, Struktur & Rauheit

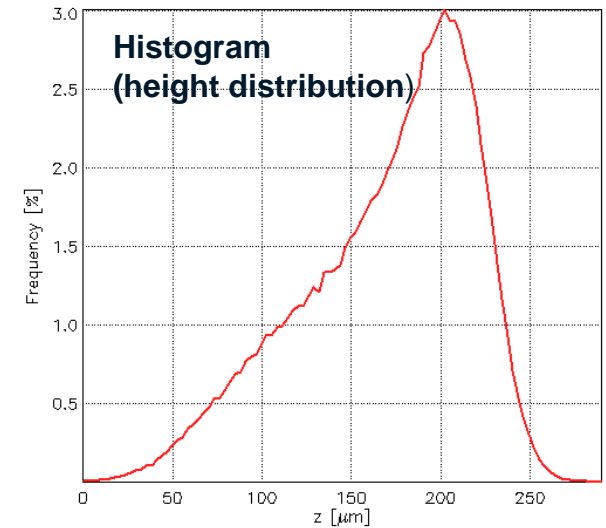
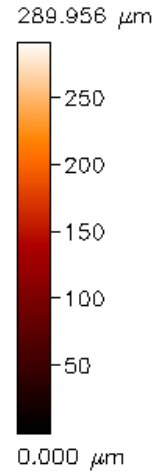
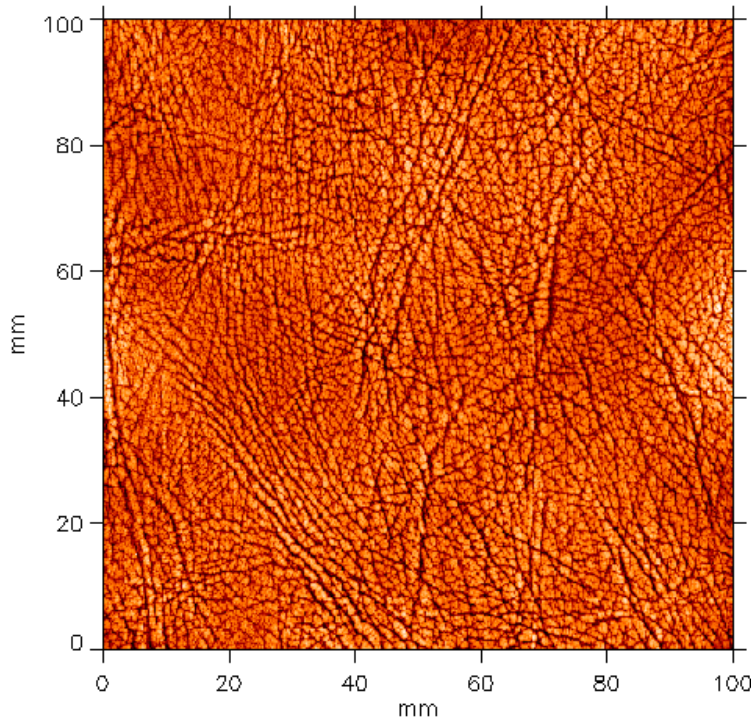


3D Flächenrauheit:
(DIN EN ISO 25178)

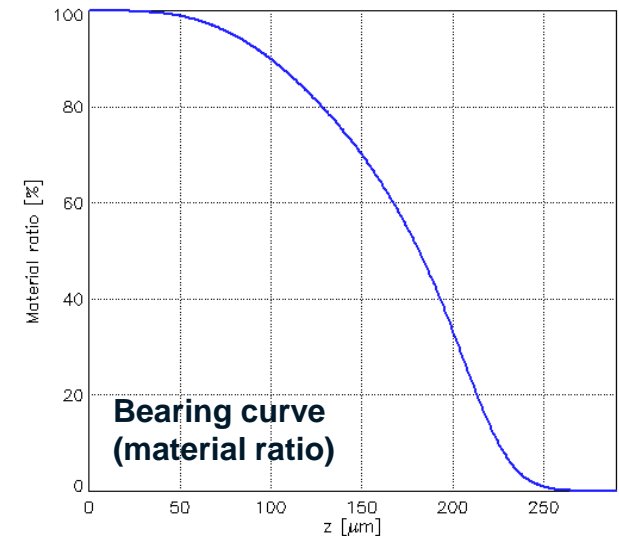
Sa	Sq	Sz
34,2 µm	41,8 µm	191,6 µm

Kunstledernarbungen

Topografie, Struktur & Rauheit



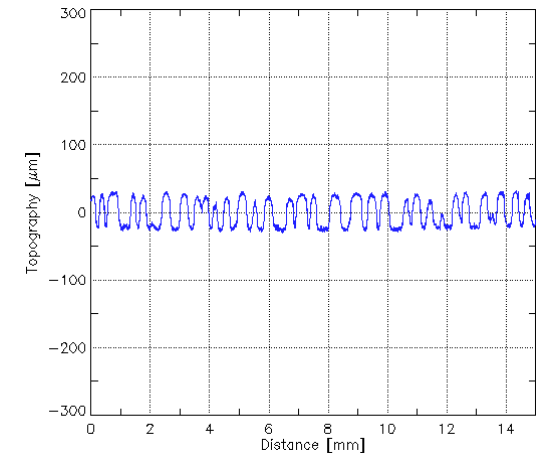
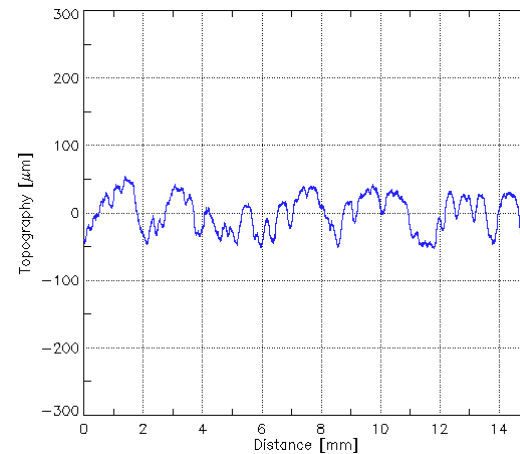
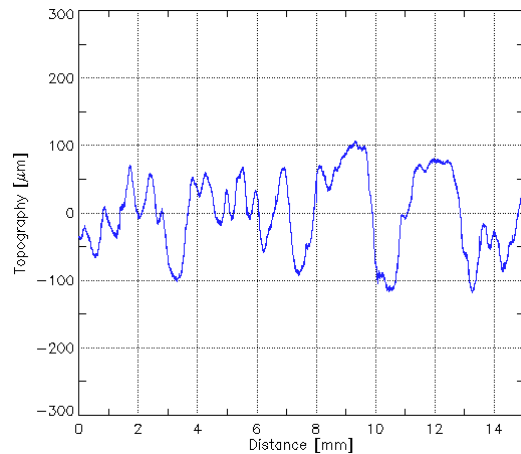
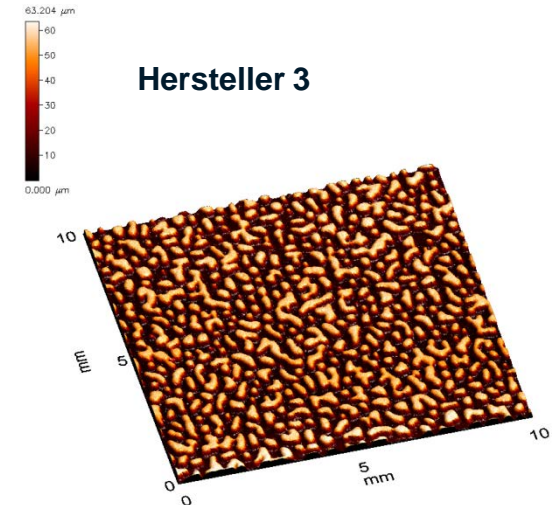
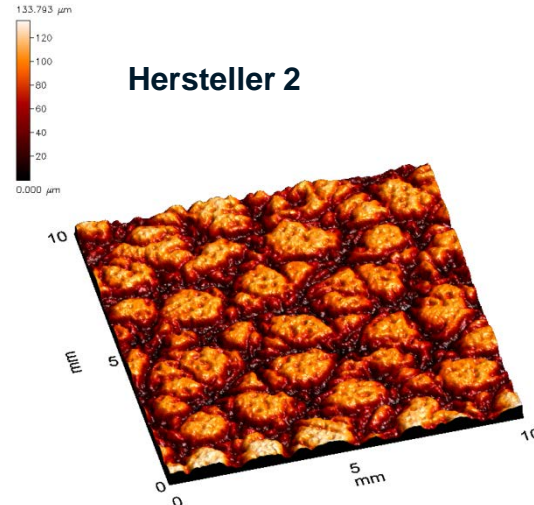
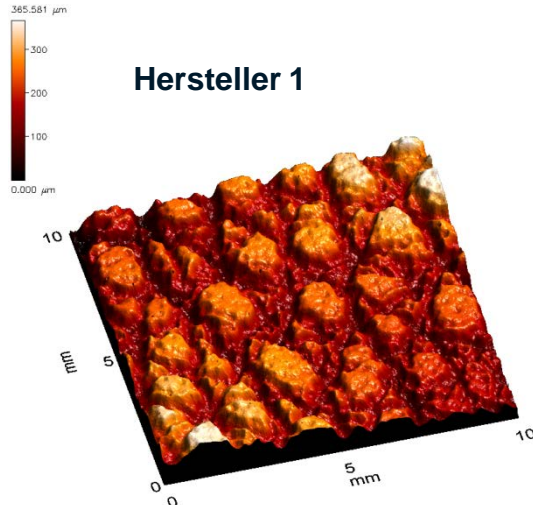
Höhenhistogramm



Traglastkurve

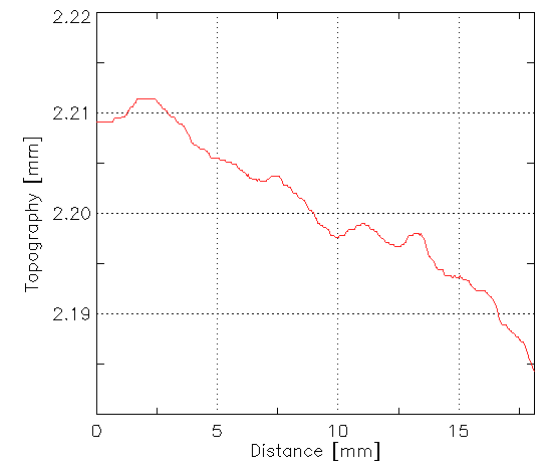
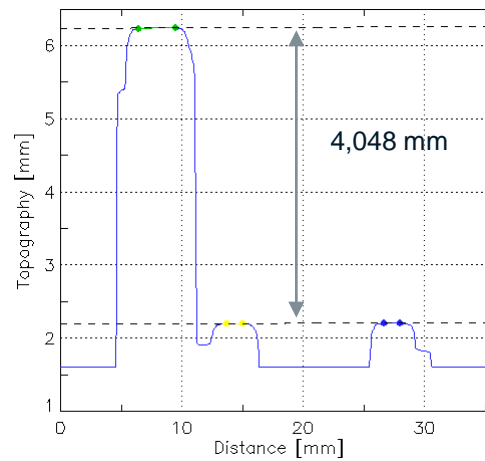
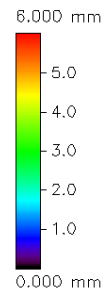
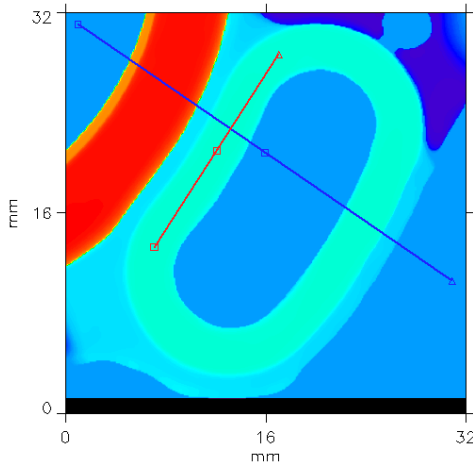
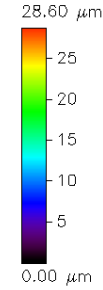
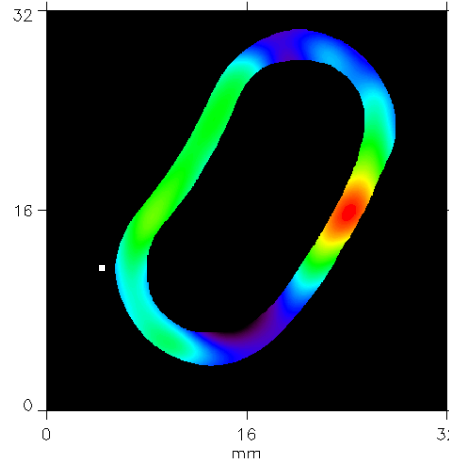
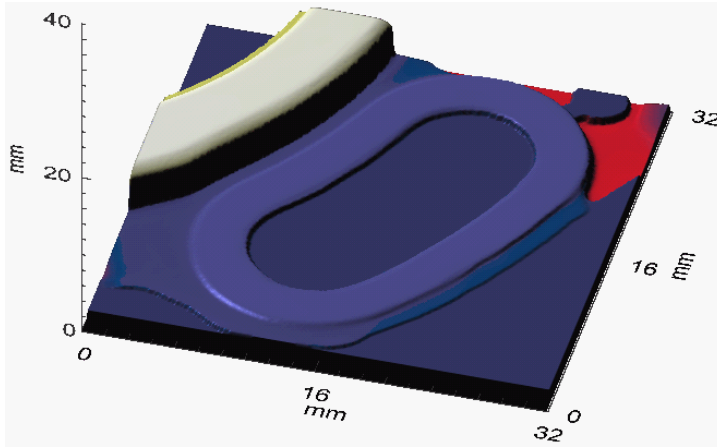
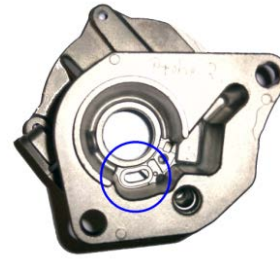
Kunstledernarbungen

Vergleich der Oberflächenhaptik



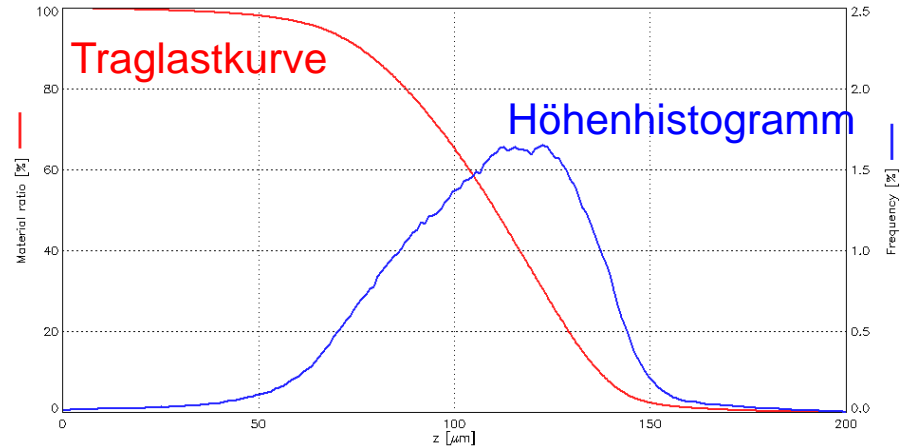
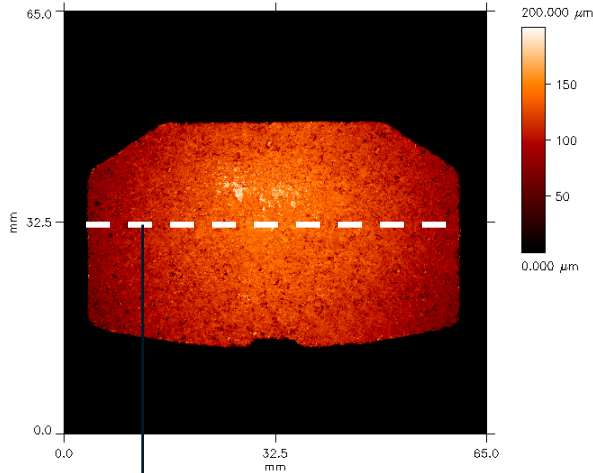
Dichtflächen

Strukturen und Ebenheit

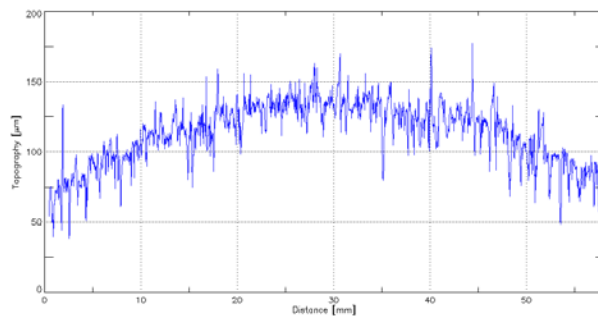


Bremsbeläge

Lösung für Oberflächenstruktur & Rauheit



2D Profil

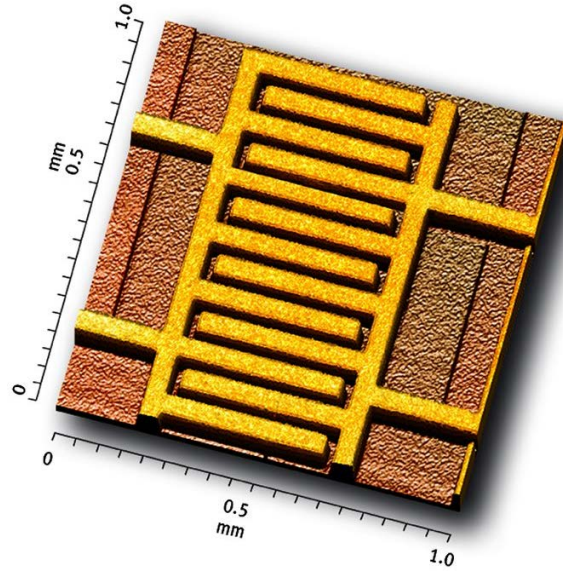
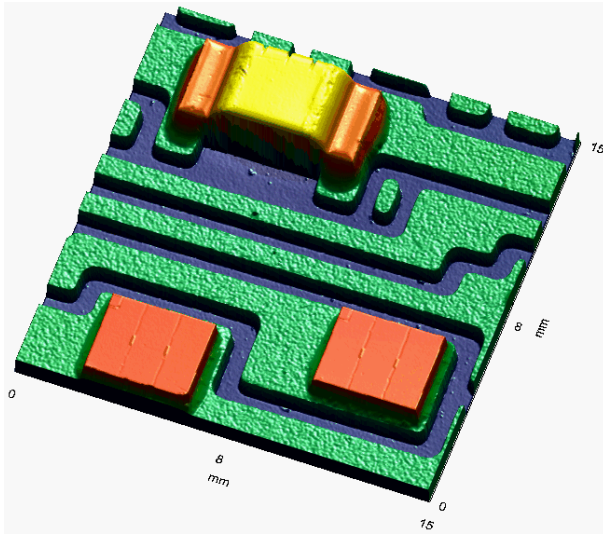


Rauheitsparameter:

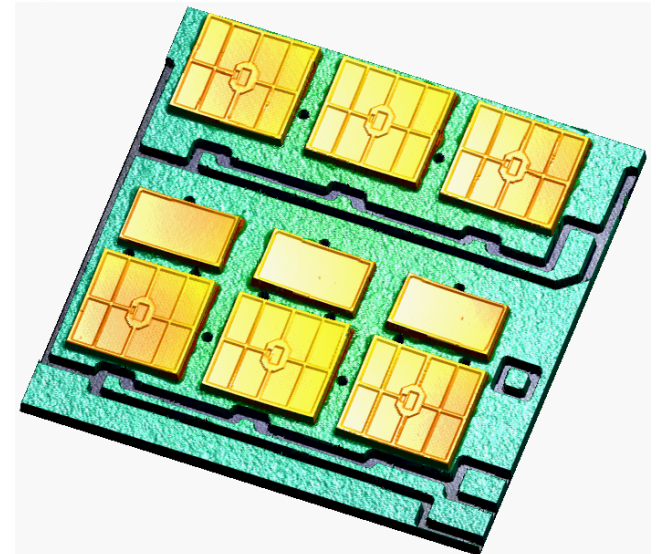
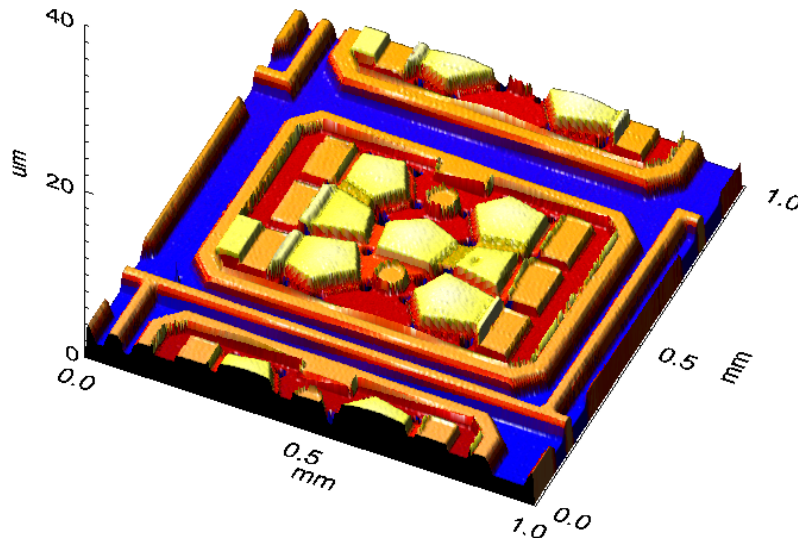
<u>Ra</u> :	8.25 μm	<u>Rk</u> :	21.35 μm
<u>Rq</u> :	11.78 μm	<u>Rpk</u> :	10.05 μm
<u>Rz(ISO)</u> :	91.24 μm	<u>Rvk</u> :	21.23 μm
<u>Rz(DIN)</u> :	80.45 μm	<u>Mr1</u> :	11.37 %
<u>Rmax</u> :	111.68 μm	<u>Mr2</u> :	85.26 %
<u>Rp</u> :	39.32 μm	<u>V0</u> :	1.57 μm ³ / μm ²
<u>Rv</u> :	82.77 μm	<u>Rmr(c)</u> :	0.06 % (c = 1.6 μm)
<u>Rt</u> :	122.08 μm	<u>RL0</u> :	41.34 mm
<u>Rsk</u> :	-1.49	<u>RLr</u> :	1.03
<u>Rku</u> :	9.35	<u>RΔa</u> :	0.18
<u>RPC</u> :	29.75 / cm		

MEMS und rein elektronische Komponenten

(MEMS = Micro-Electro-Mechanical Systems)



μm
35.0
17.5
0



FRT Referenzen / Auszug Automotive



BOSCH



ESCHMANNSTAHL



voestalpine

PEGUFORM

VICTOR REINZ®
SEALING PRODUCTS

SMP
Samvardhana Motherson Peguform

DAIMLER



SEAT



Audi



KRATZER

BENECKE-KALIKO

- **Lösungen aus einer Hand**
 - **Messsensoren – Messsysteme – Mess- und Analysesoftware – Support & Dienstleistung**
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