



MDA Forum 2017

Damping Seal – Eliminierung von Stick Slip Effekten bei berührenden Dichtungen

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- Grundlagen
- Theoretische Betrachtung der Dichtstelle
- Untersuchungen an Stangendichtungen
- Untersuchungen an Kolbendichtungen
- Zusammenfassung und Ausblick

Schwingungen ...

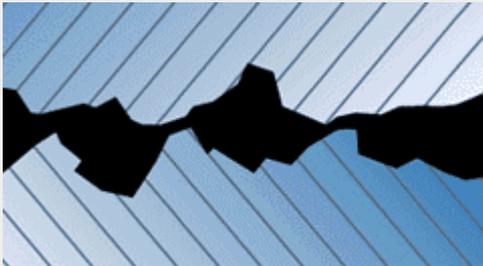


Quelle: <http://www.otz.de/web/zgt/leben/detail/-/specific/Experten-antworten-Wieso-singen-Glaeser-1979420094>

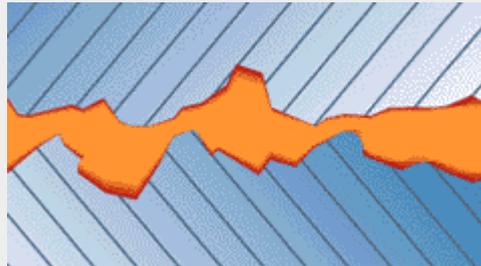
Grundlagen

Reibung

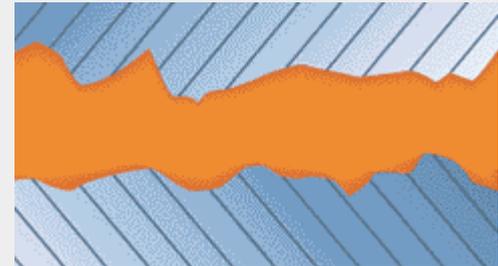
Trockenreibung



Mischreibung

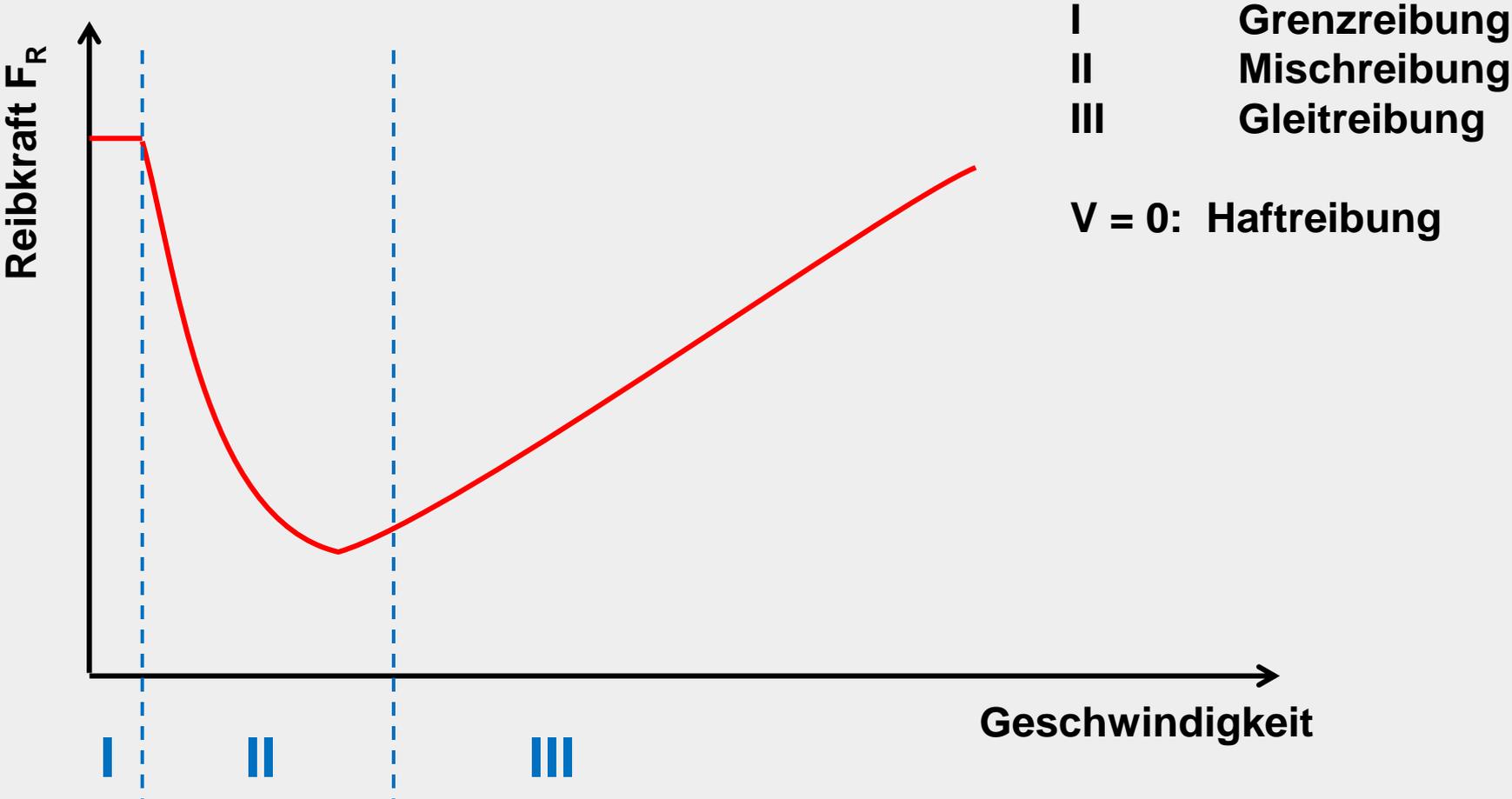


Flüssigkeitsreibung

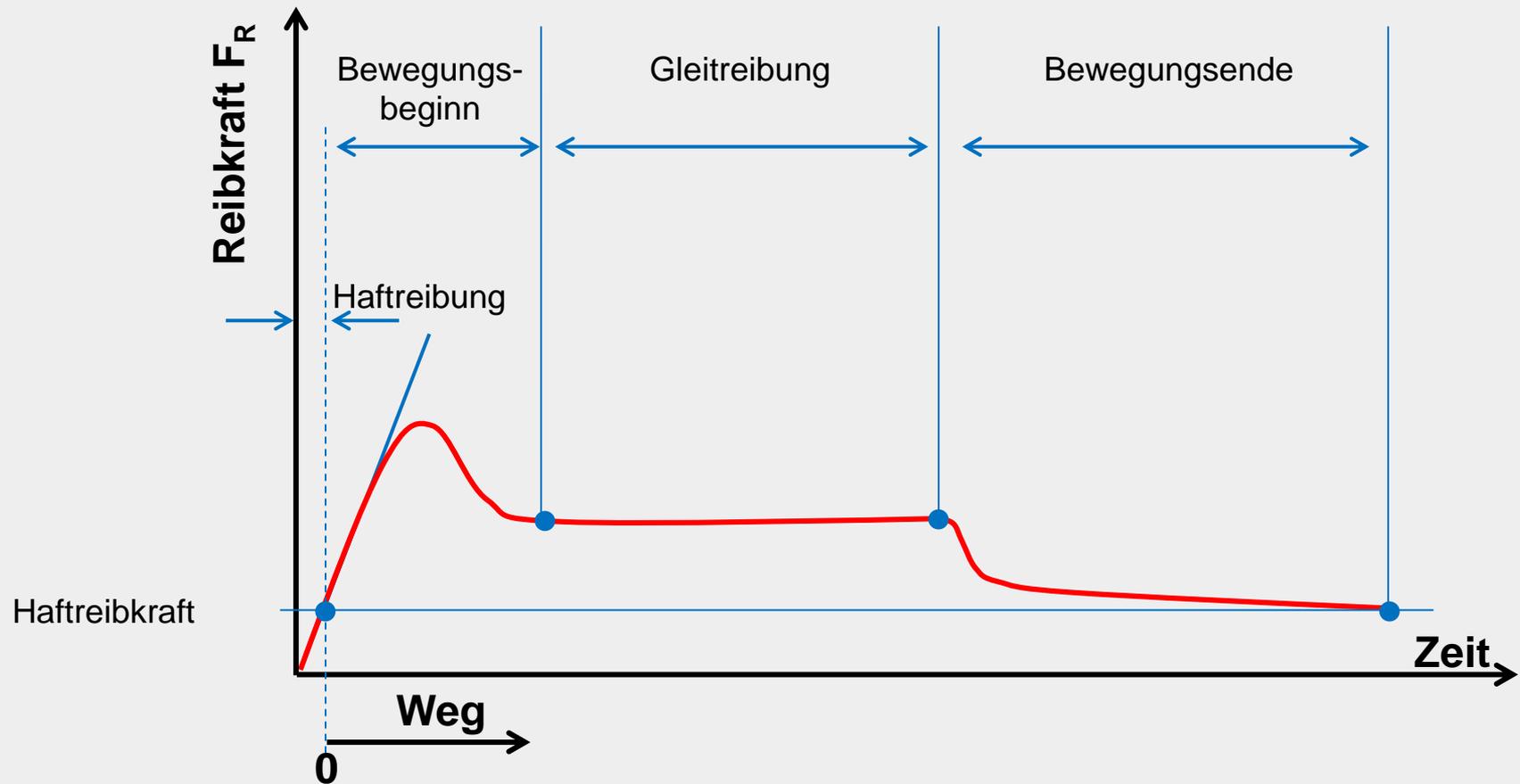


Bilder: aral.de

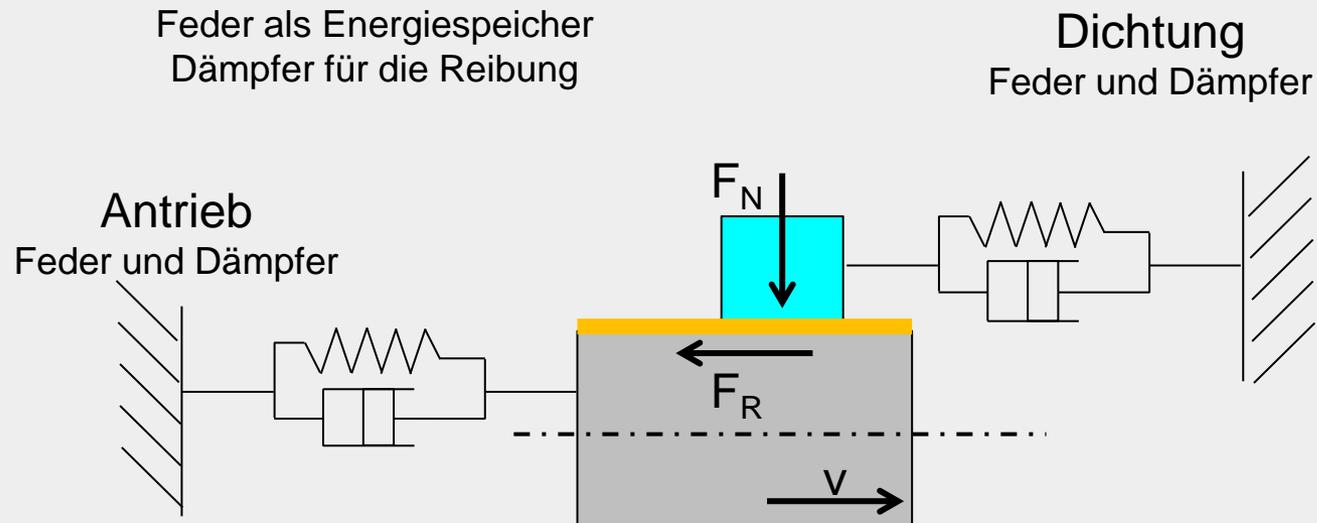
Stribeck-Kurve



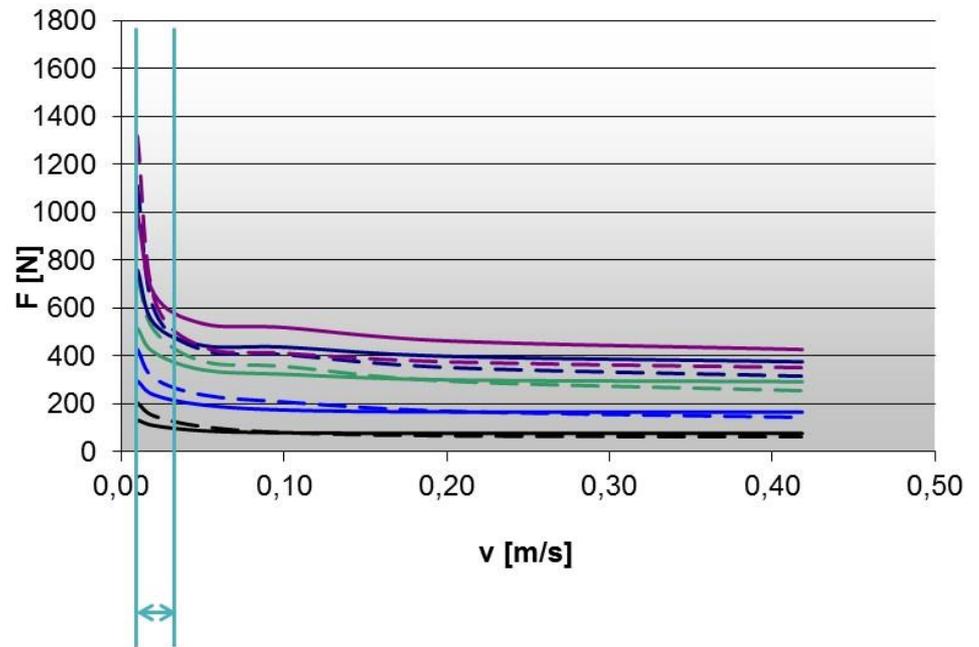
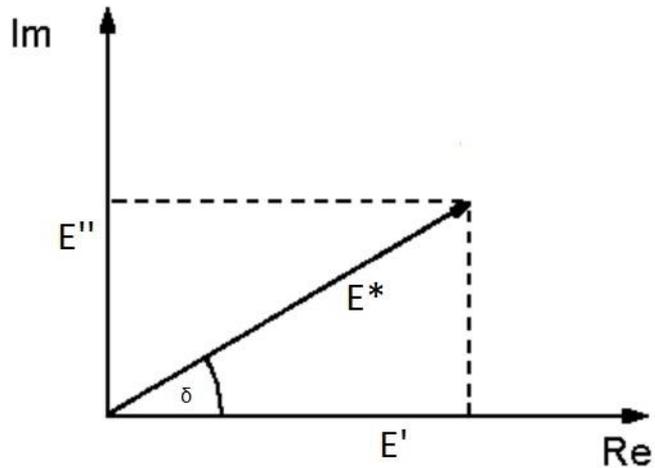
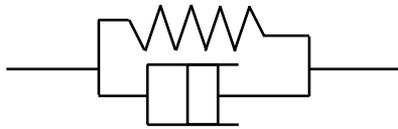
Theoretische Betrachtung-Zylinderbewegung



Schwingungstechnisches Modell eines Zylinders

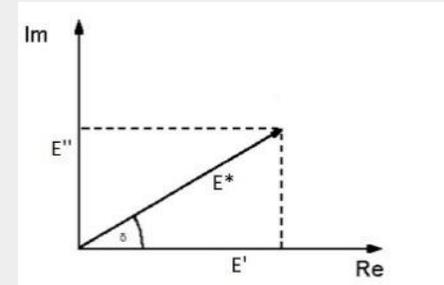


Materialverhalten

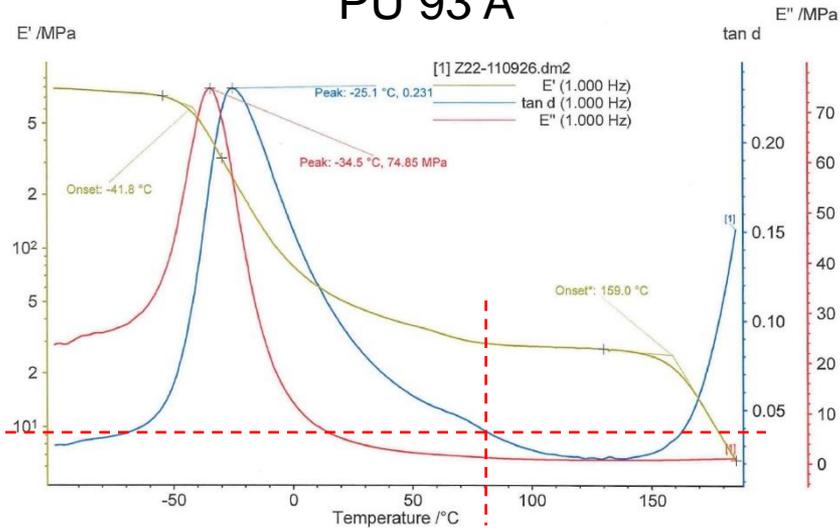


Großes ΔF erhöht die Neigung zu Stick-Slip

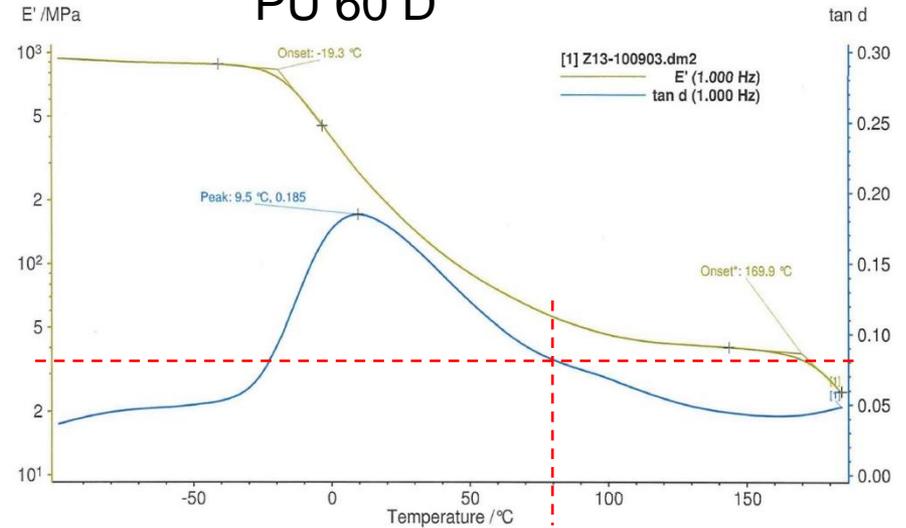
DMA – Messungen



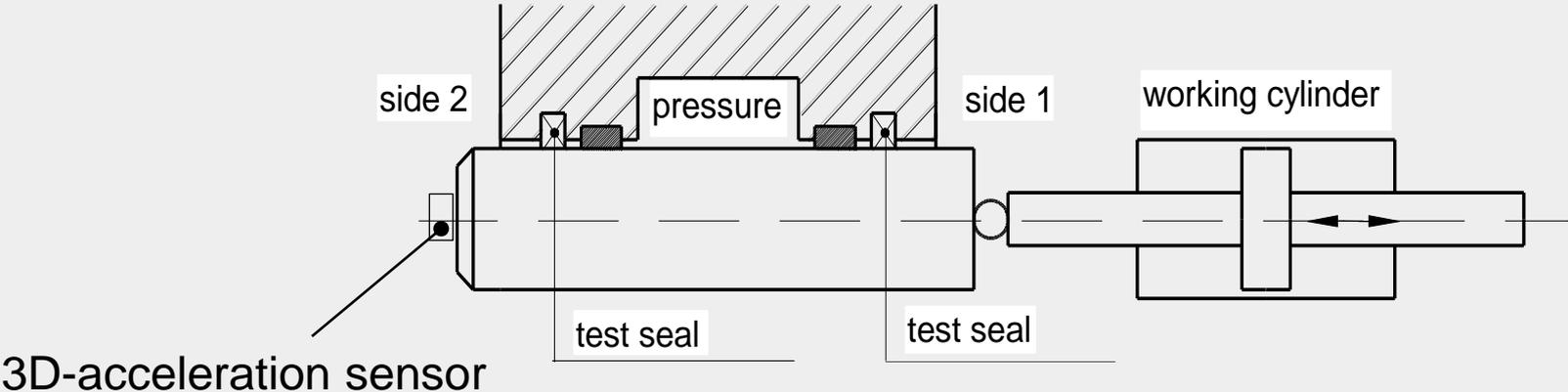
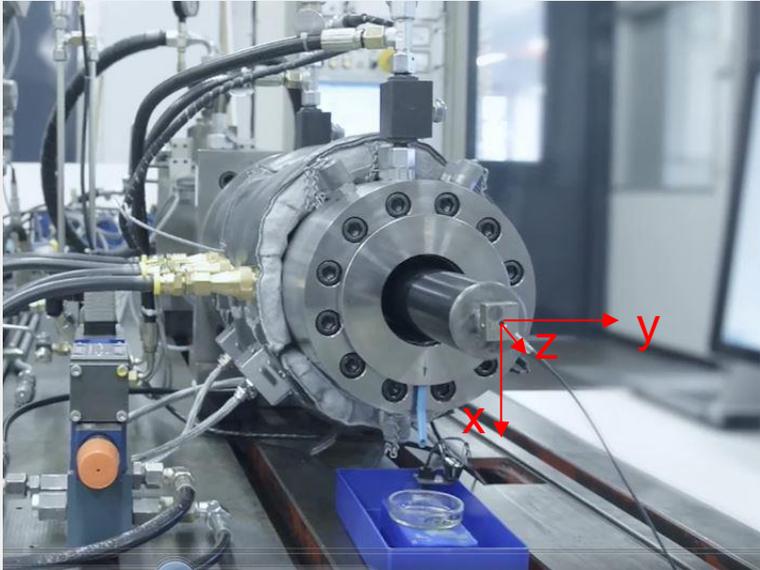
PU 93 A



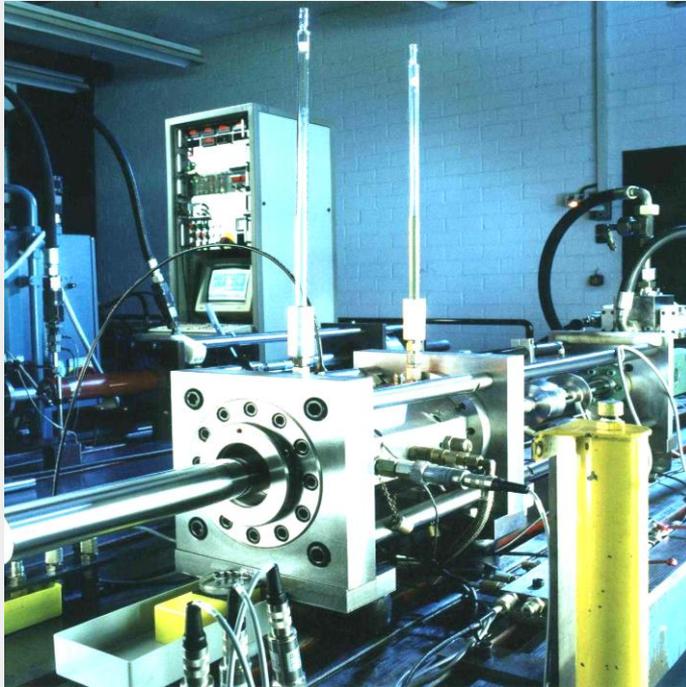
PU 60 D



Versuchsaufbau



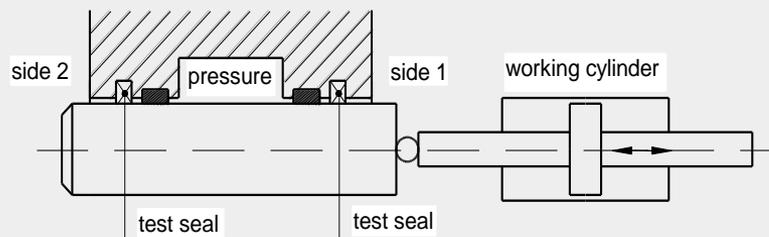
Versuchsablauf



Druck: 0/2,5/5/10/15 und 20 MPa
 (konstant)
Geschwindigkeit: 0,01/0,02/0,05/0,1/0,2 und 0,4 m/s
 (konstant)
Hub: 50, 100 und 250 mm
Zeit: ~86,000 cycles
Temperatur: 30° und 50°C
Medium: Shell Tellus 46

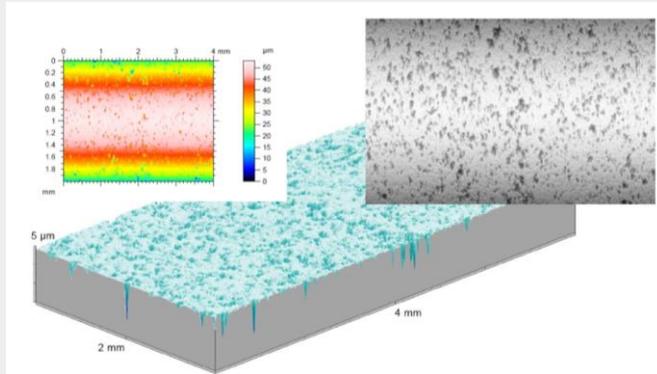
The complete test is divided into 5 parts, including different velocities pressure levels and temperature. The idea behind is to compare the friction before (A/B) and after (D/E) the endurance test (C).

PART	REPEAT	DISTANCE
A	1	702 m
B	1	702 m
C	5	40500 m
D	1	702 m
E	1	702 m

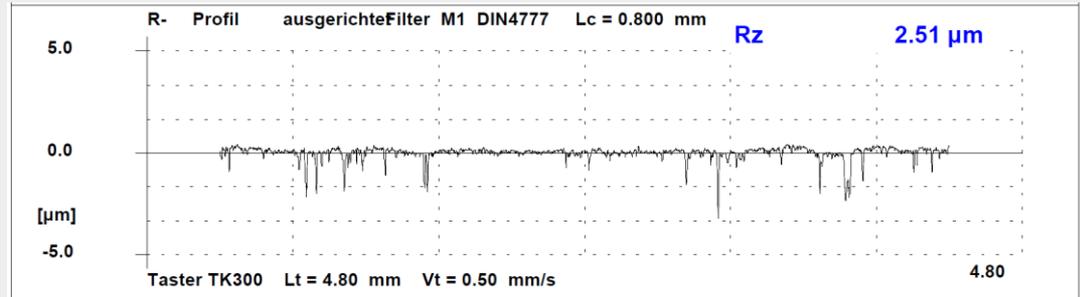
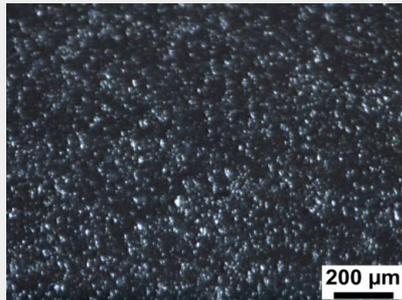


The output of the test will be friction, wear (rod and seal), leakage.

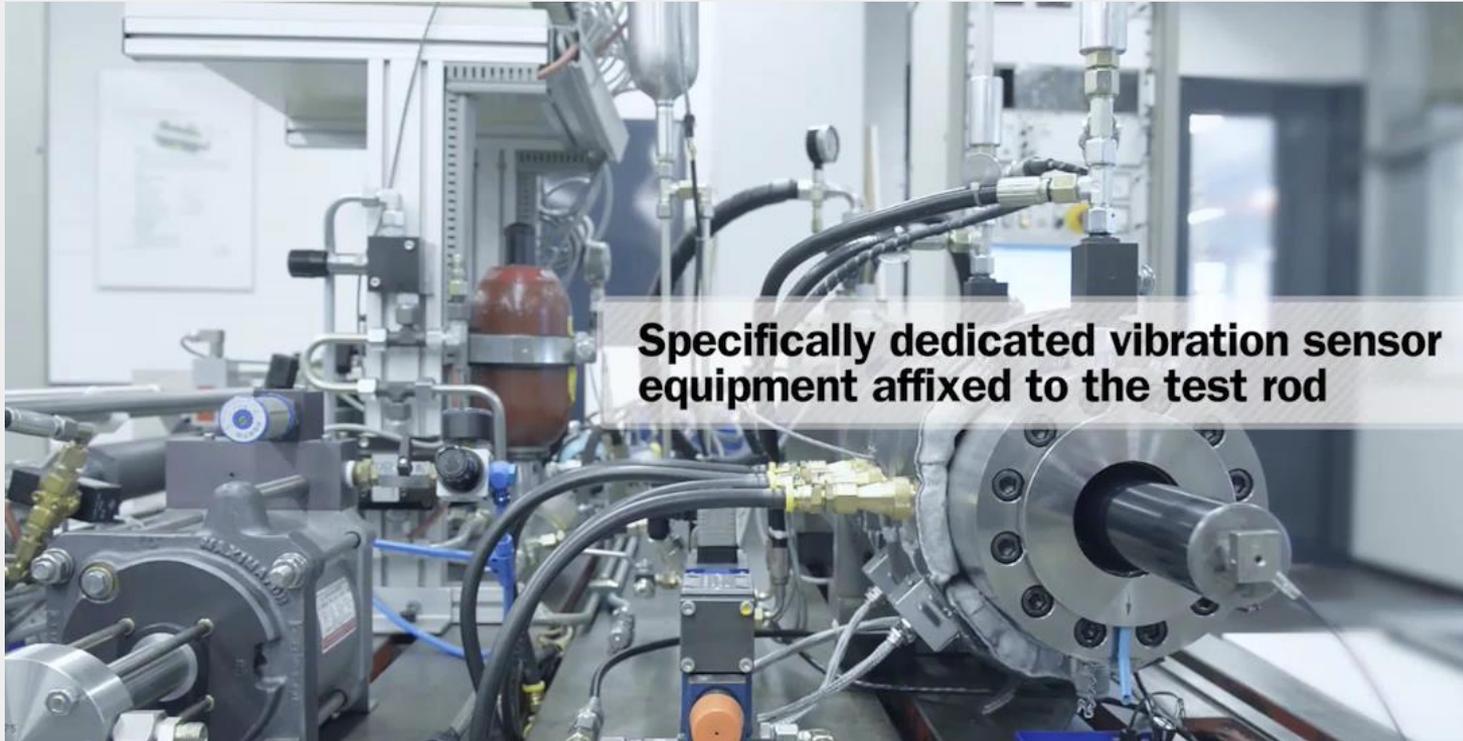
Gegenlauffläche Al₂O₃



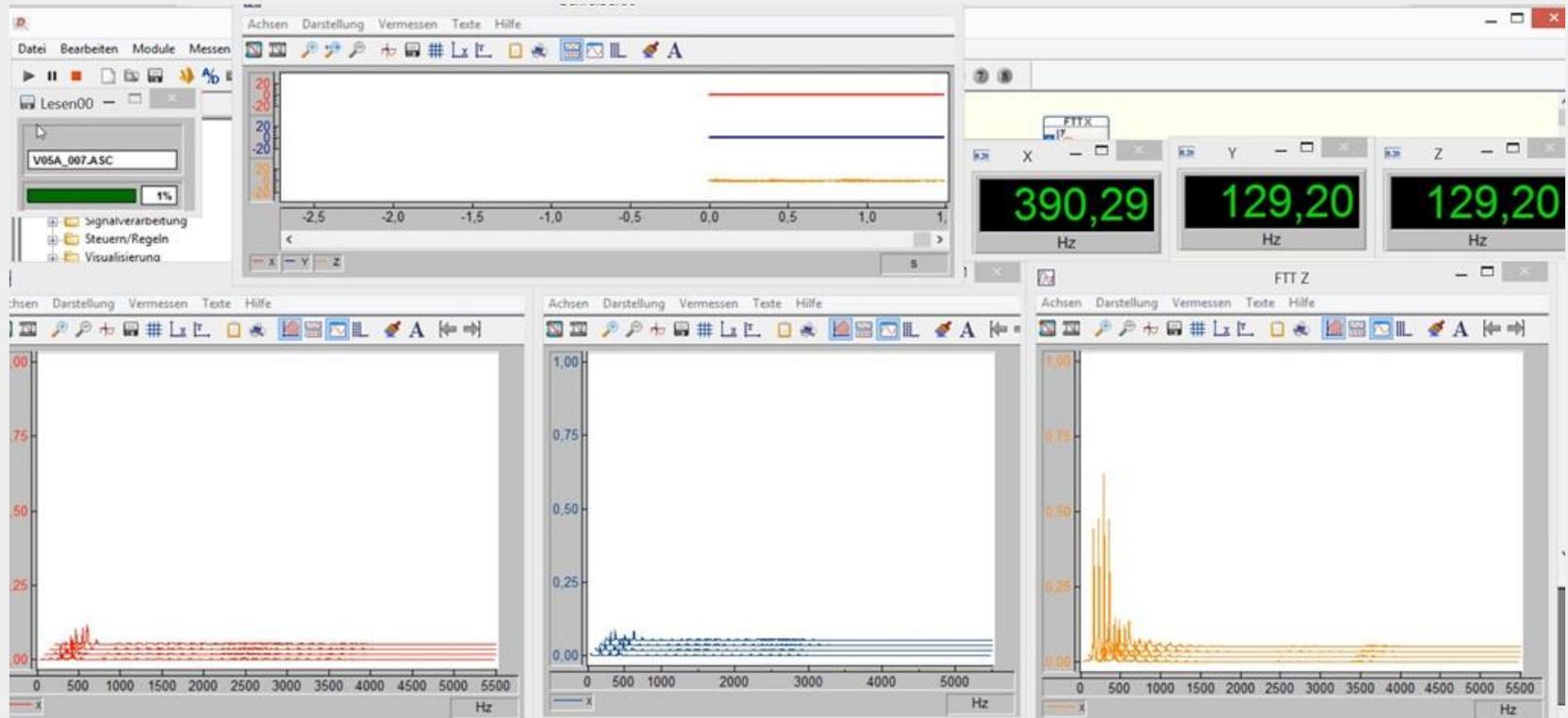
Pt	6.55 μm	Rpk*	0.14 μm
Wt	1.66 μm	Rpk	0.10 μm
Ra	0.19 μm	Rk	0.37 μm
Rz	2.51 μm	Rvk*	3.20 μm
Rmax	3.64 μm	Rvk	0.81 μm
Rt	3.66 μm	Mr1	5.5 %
		Mr2	80.4 %



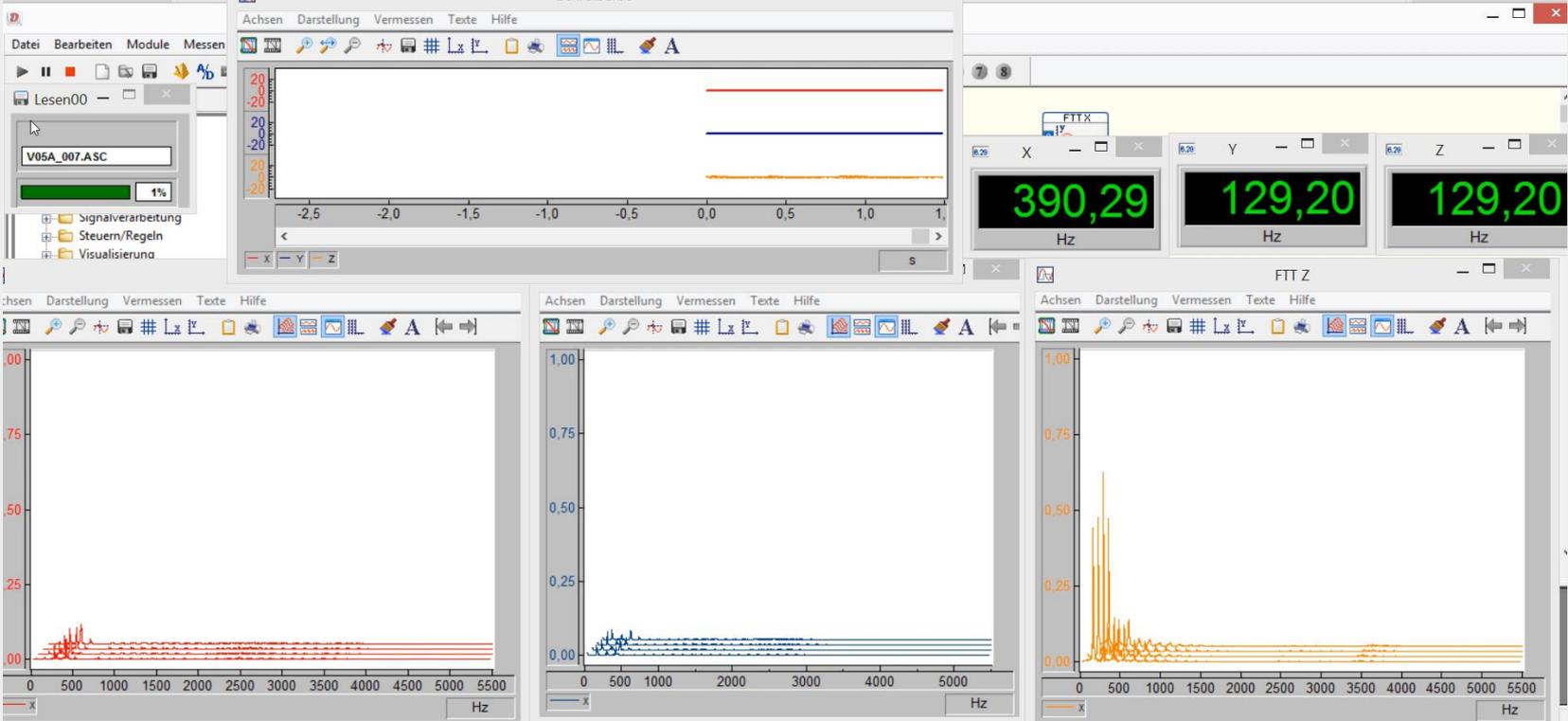
Prüfablauf



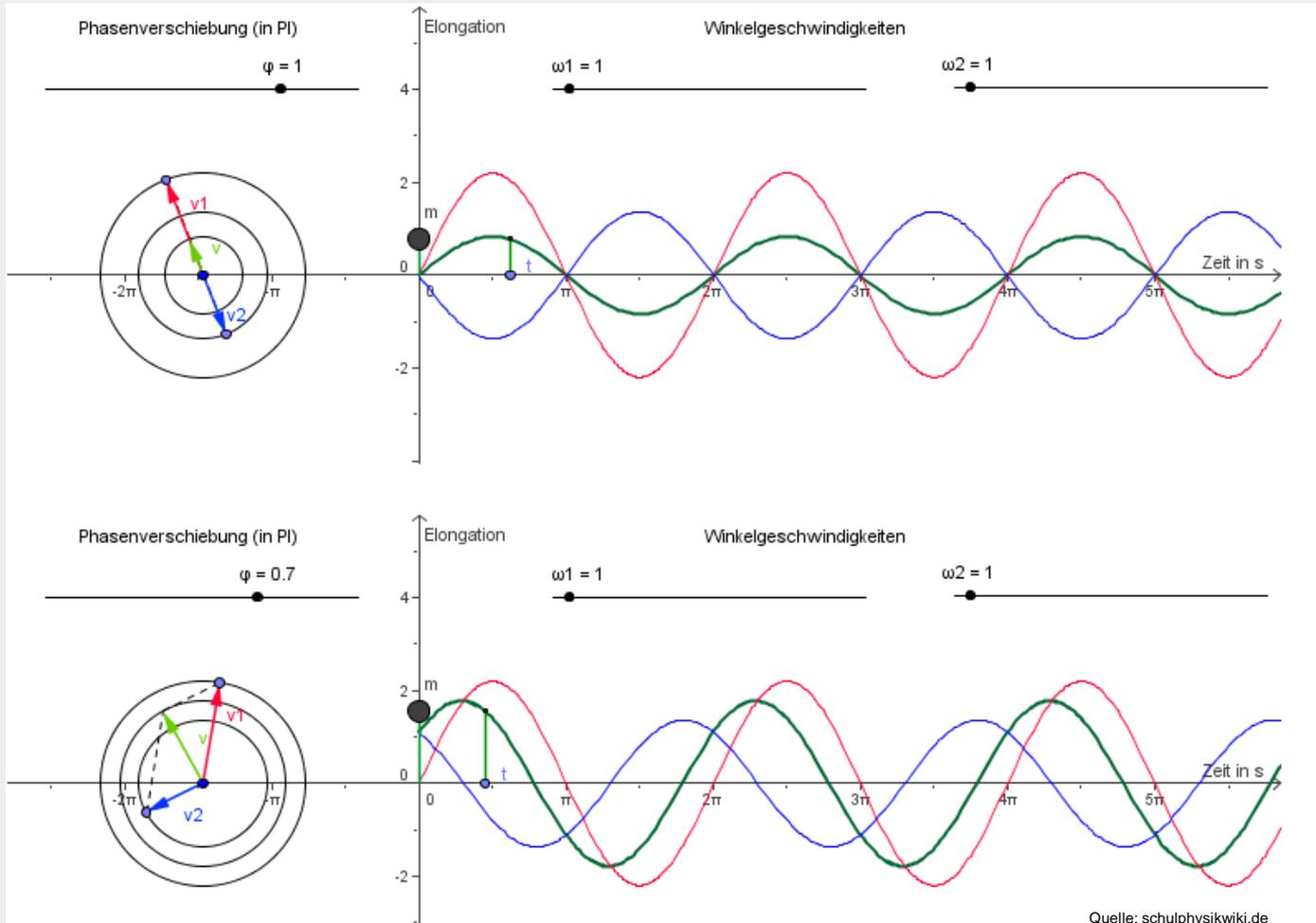
Geräuschbildung durch Stick Slip



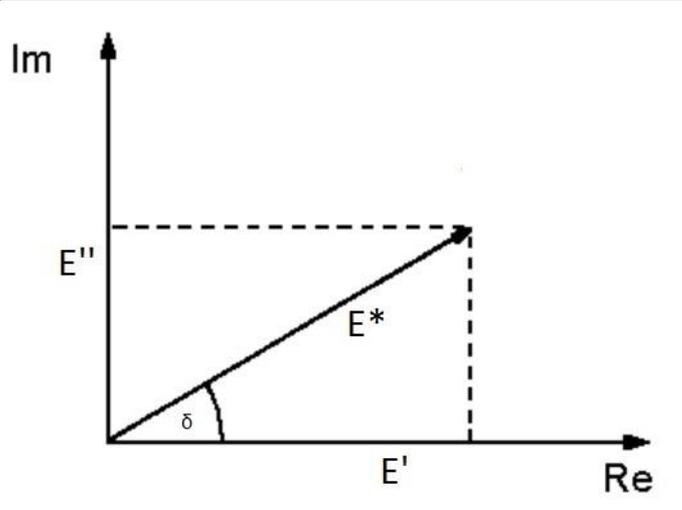
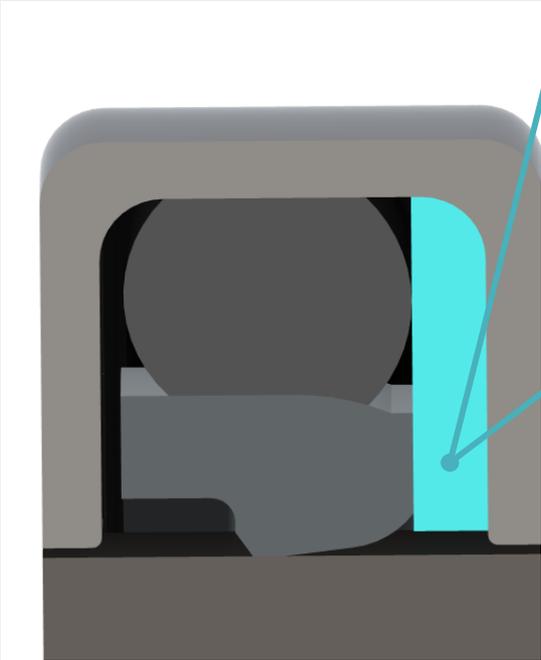
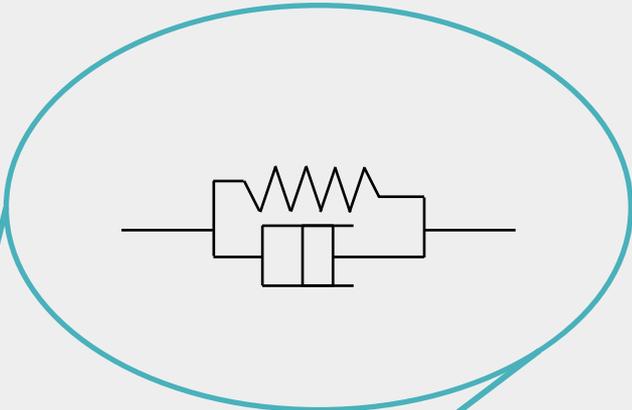
Geräuschbildung durch Stick Slip



Phasenverschiebung



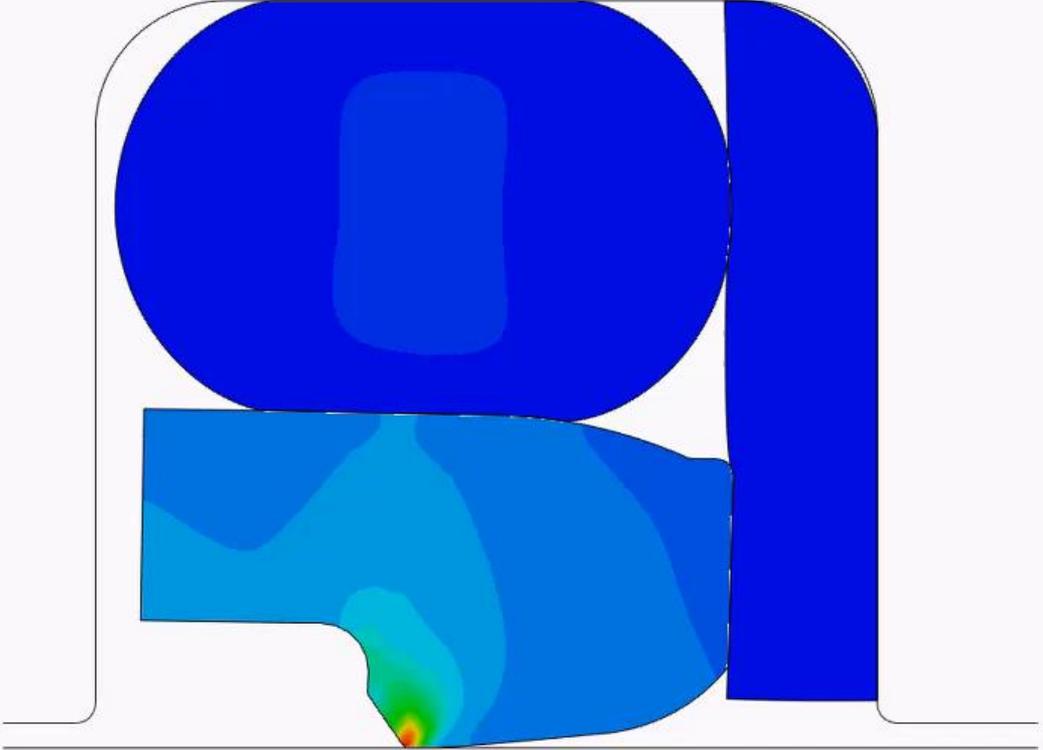
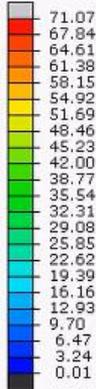
Stangendichtungen



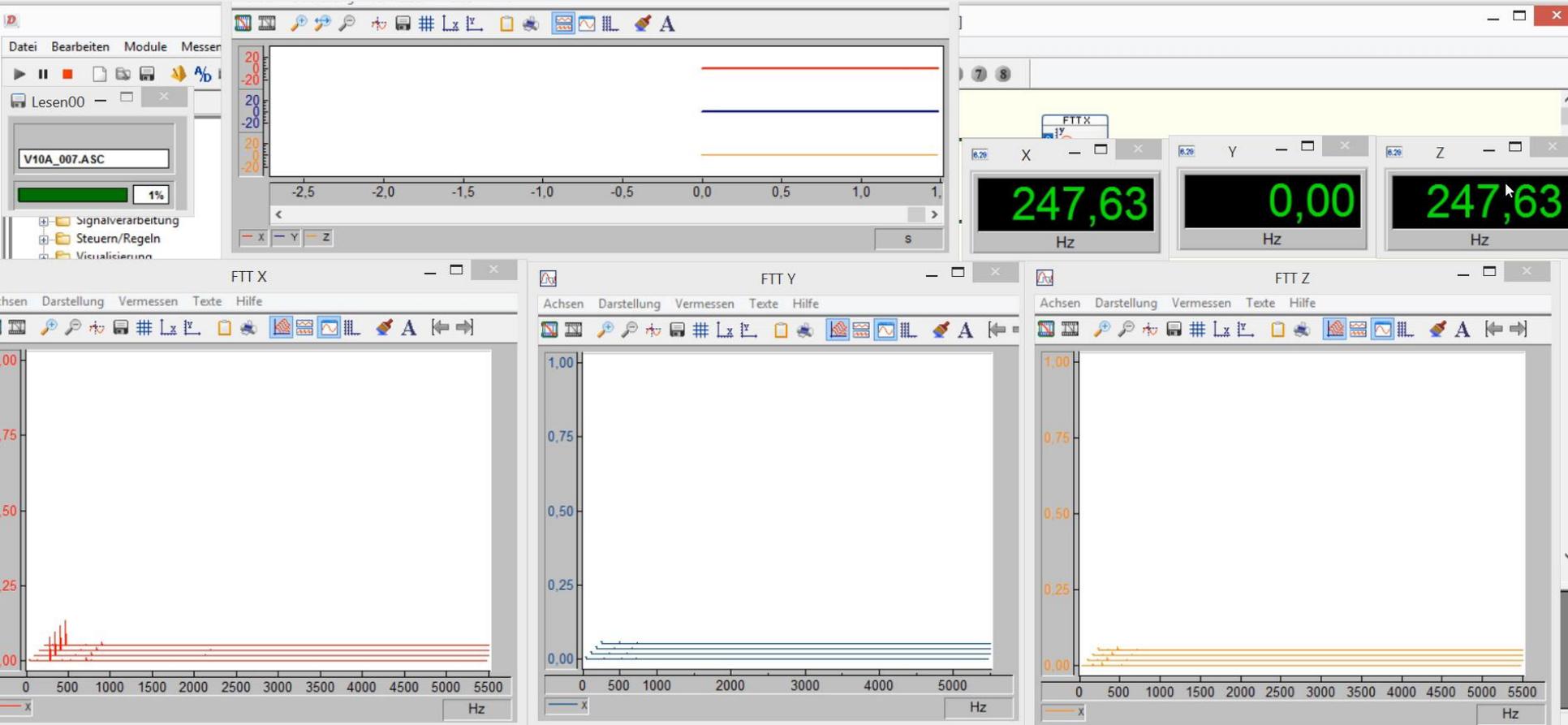
FEA

Step: Assembly Frame: 102
Total Time: 1.000000

S, Mises
(Avg: 75%)

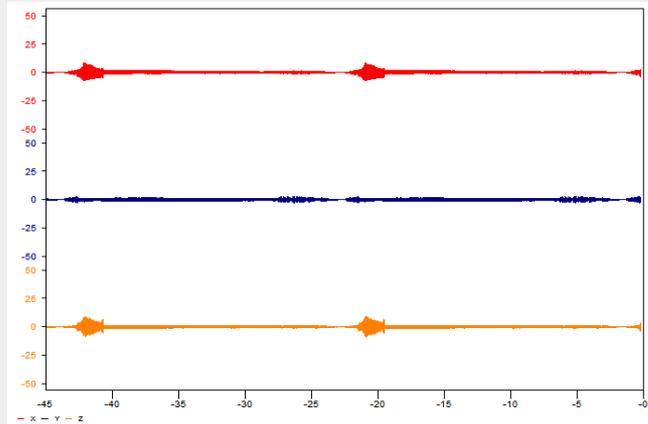
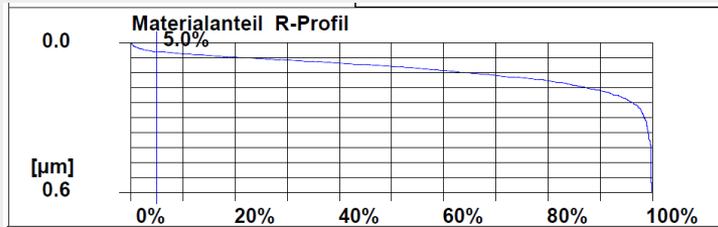
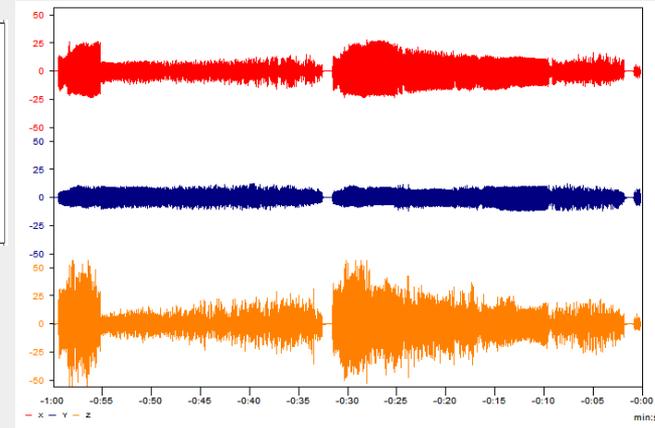
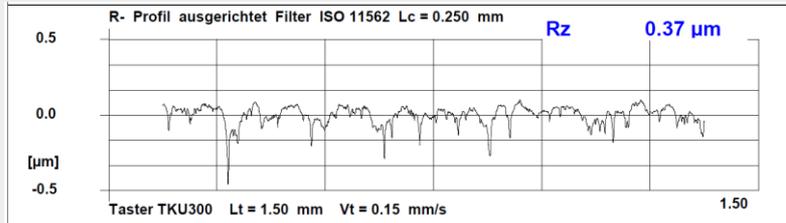


Stangendichtung mit Dämpferelement



Kolbendichtungen

ohne Dämpfung



mit Dämpfung



Rpk 0.02 µm

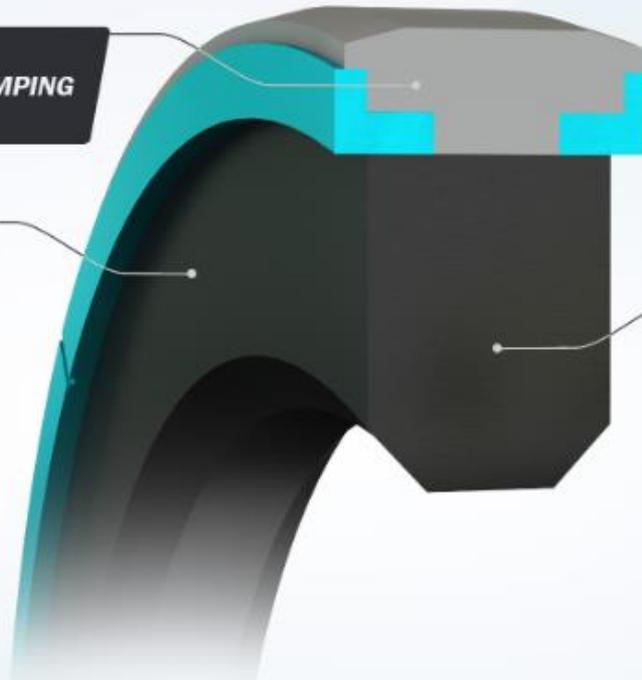


Glyd Ring[®] PD

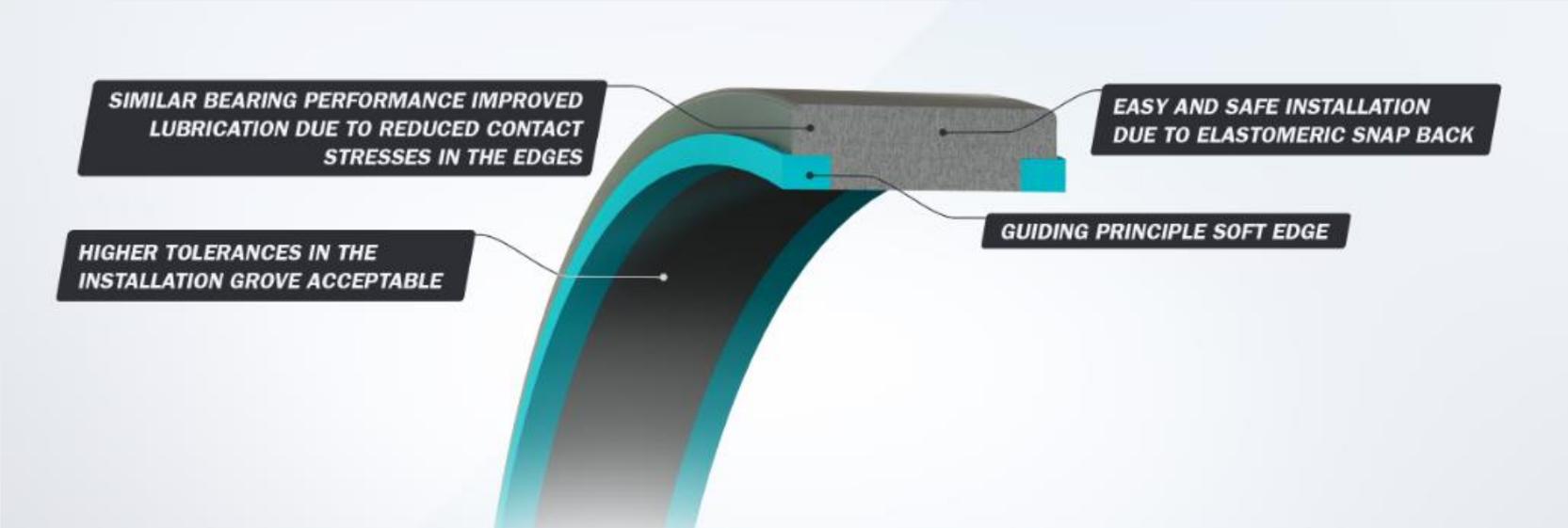
**NO STICK-SLIP ON START-UP DUE TO
TRELLEBORG SEALING SOLUTIONS DAMPING
TECHNOLOGY**

**STABLE AND RELIABLE POSITIONING
IN STANDARD GLAND FOR PISTON
AND ROD SEALS**

**EASIER INSTALLATION
FROM ELASTOMERIC SNAP BACK**



Soft Edge



Zusammenfassung und Ausblick

- Eliminieren von Stick - Slip Effekten
- Reduzieren von Anfahrreibung
- Weniger Energieverbrauch
- Erhöhte Robustheit bei schwingungssensiblen Anwendungen
- Erhöhte Robustheit gegenüber Rauheitsanforderungen bei Nutflanken.



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