



MDA Forum 2017

Damping Seal – Eliminierung von Stick Slip Effekten bei berührenden Dichtungen

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Inhalt

- 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>

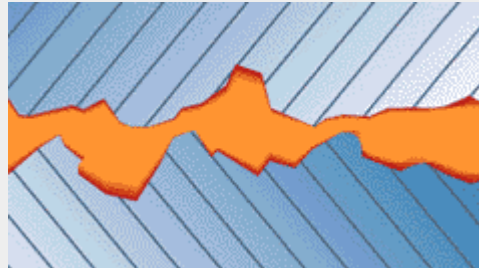
Grundlagen

Reibung

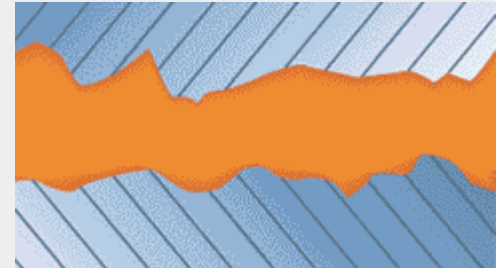
Trockenreibung



Mischreibung

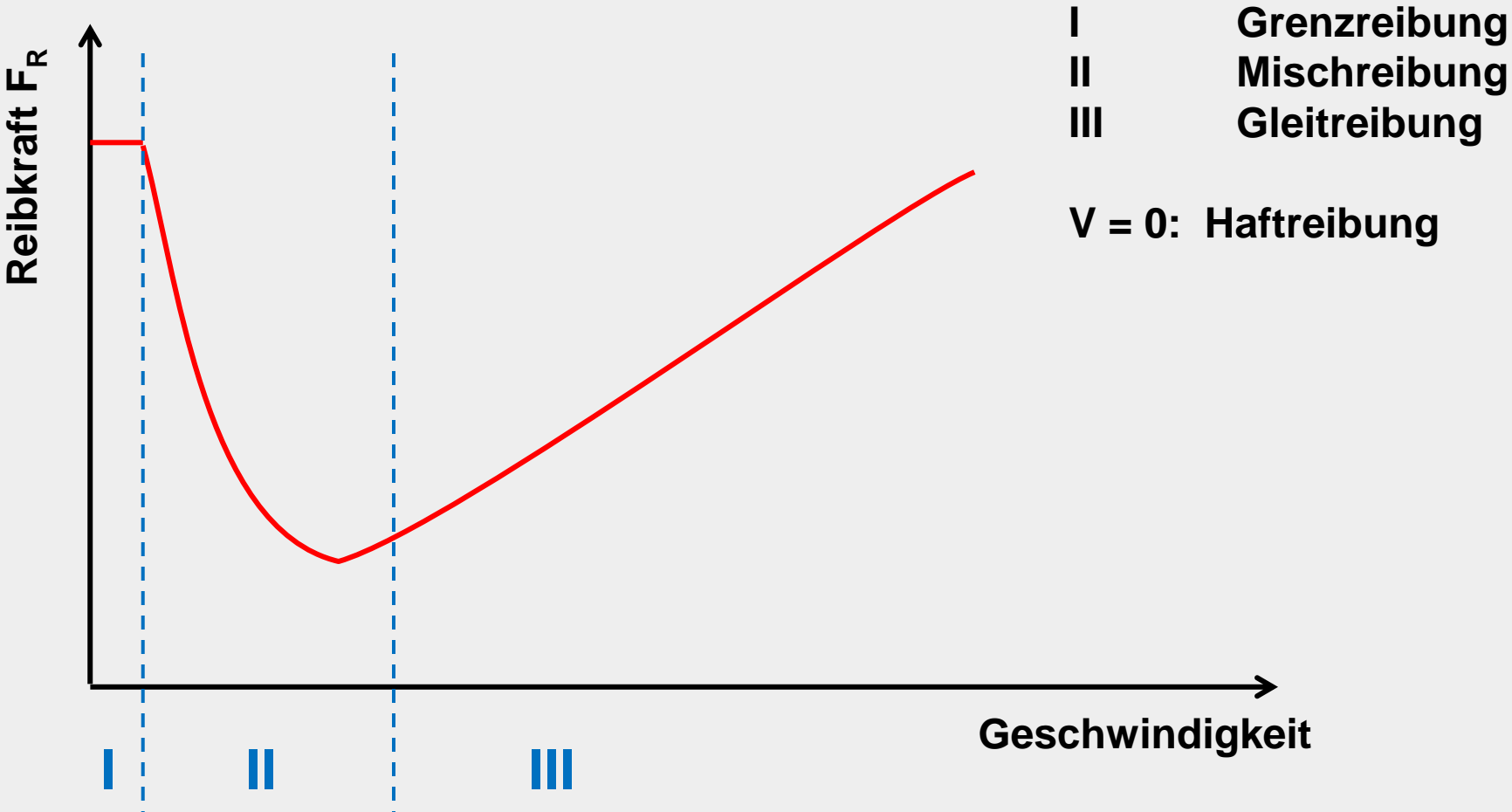


Flüssigkeitsreibung

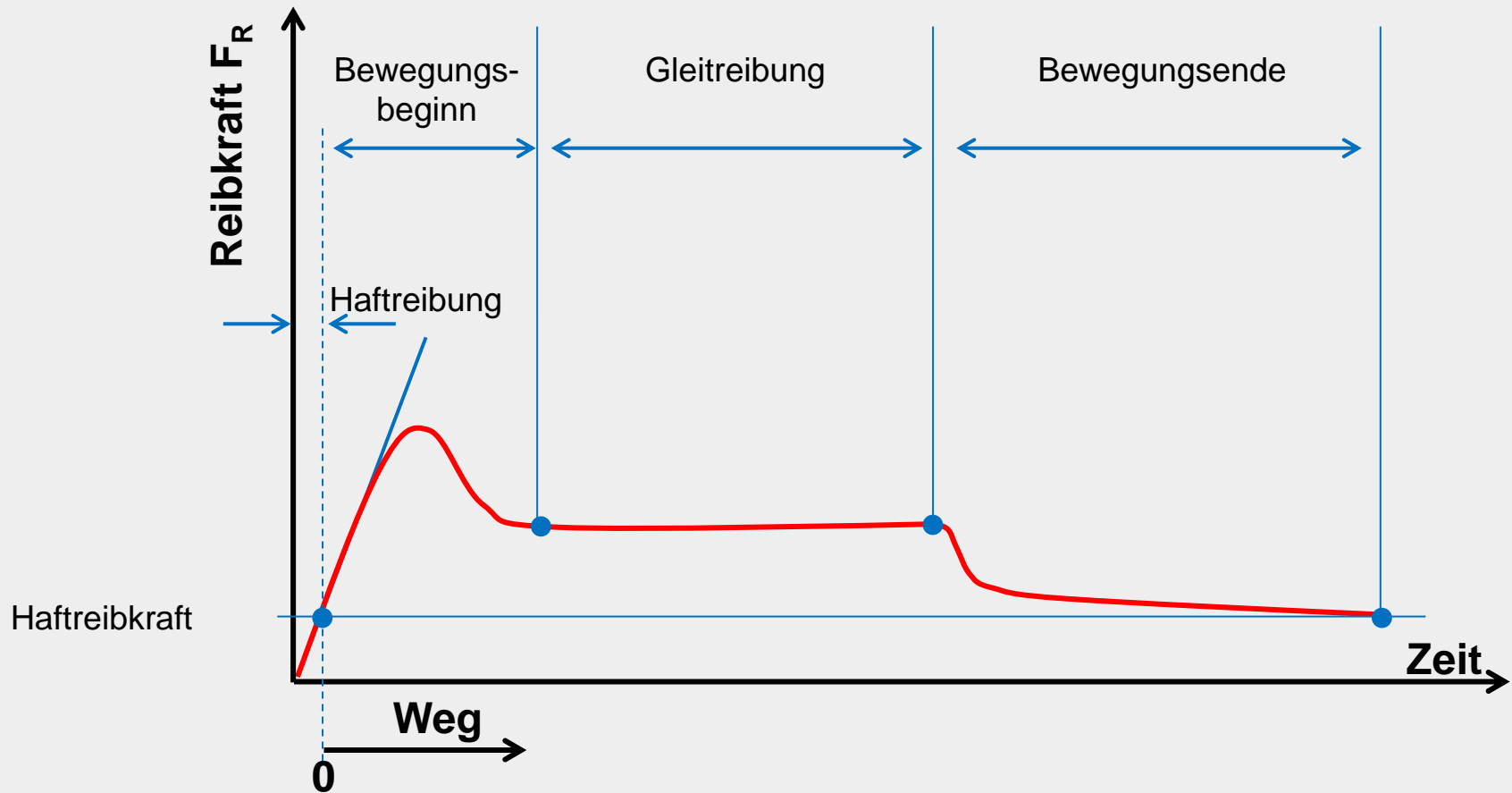


Bilder: aral.de

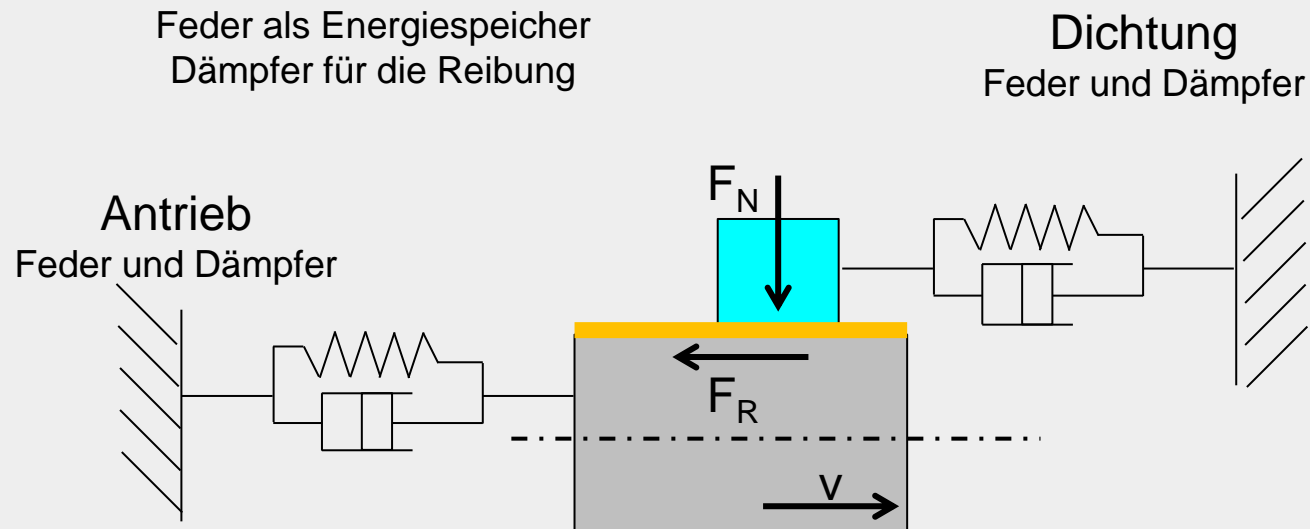
Stribeck-Kurve



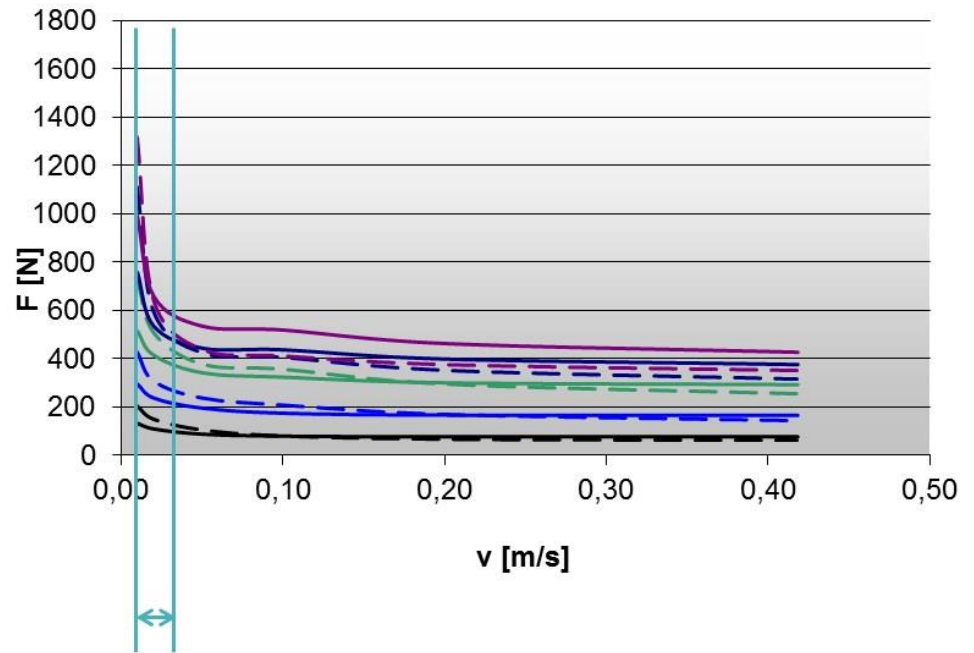
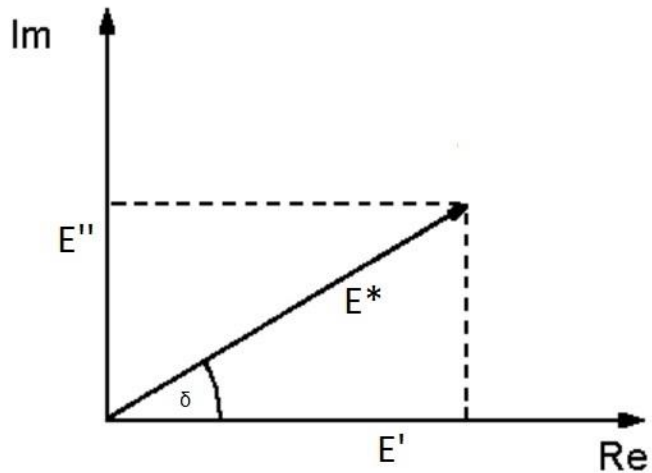
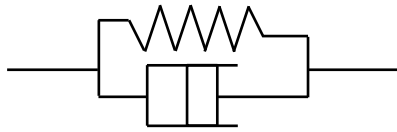
Theoretische Betrachtung-Zylinderbewegung



Schwingungstechnisches Modell eines Zylinders

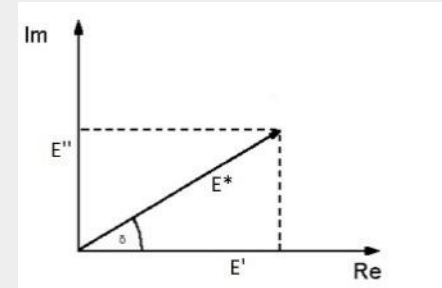


Materialverhalten

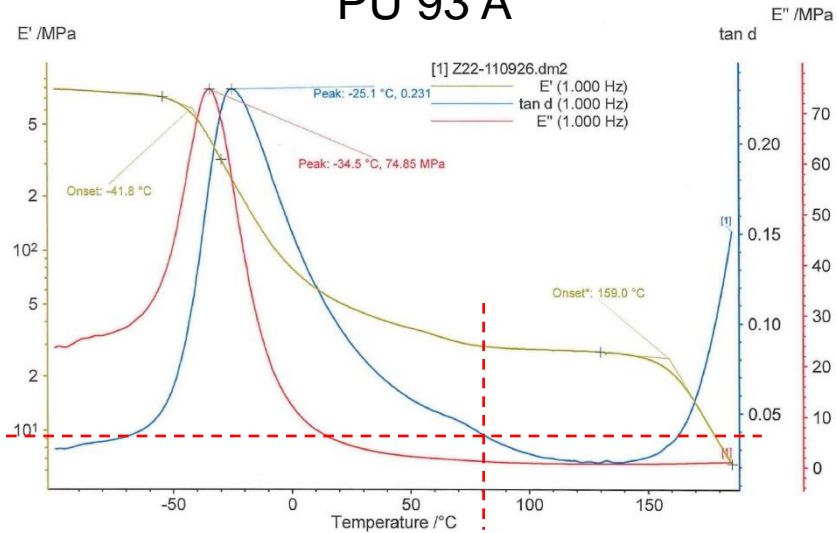


Großes ΔF erhöht die Neigung zu Stick-Slip

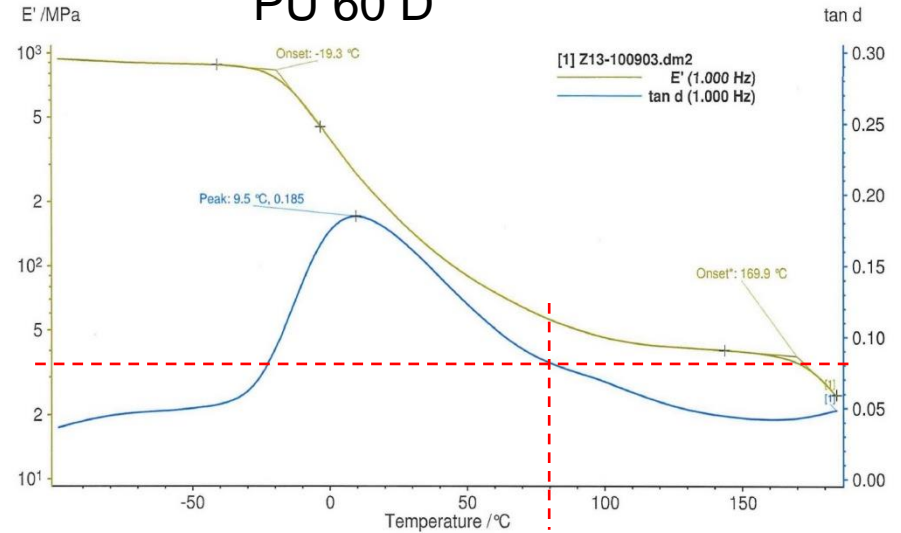
DMA – Messungen



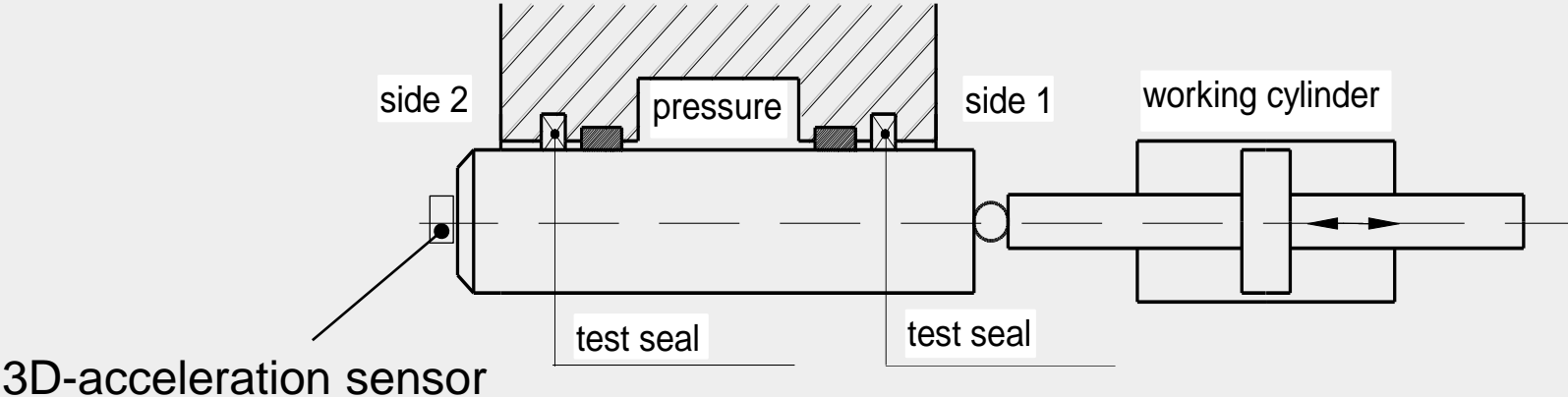
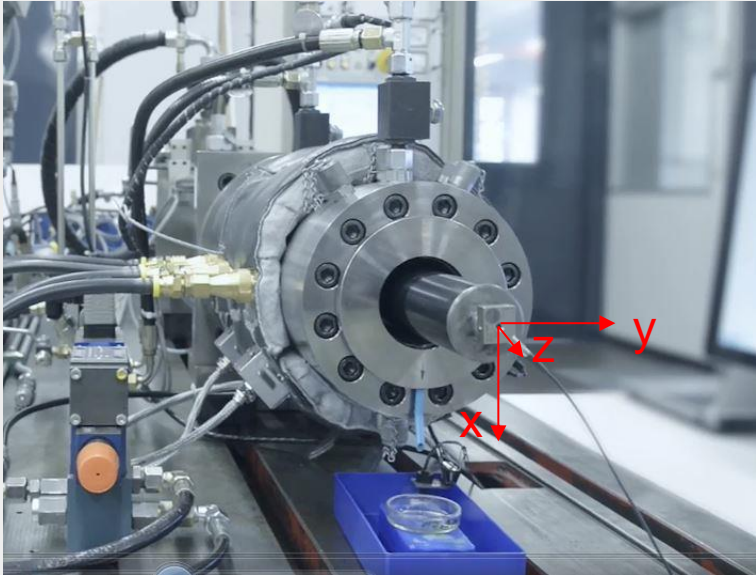
PU 93 A



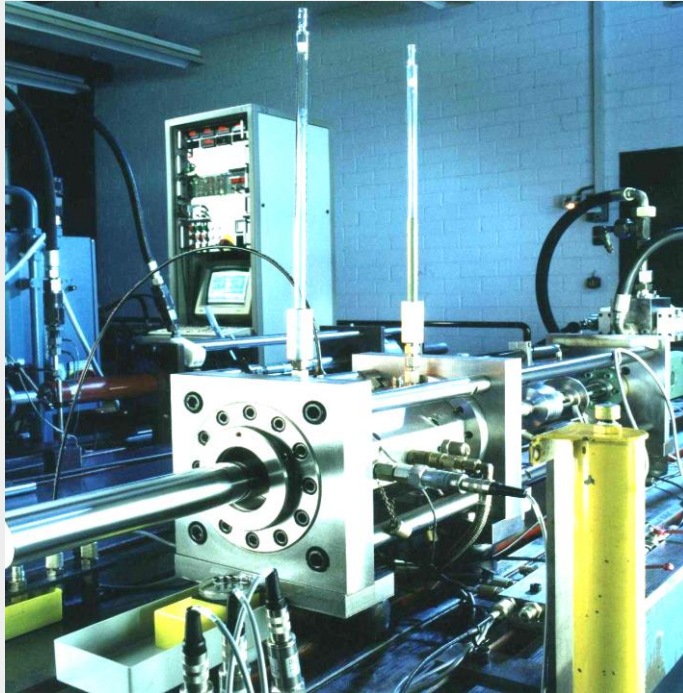
PU 60 D



Versuchsaufbau



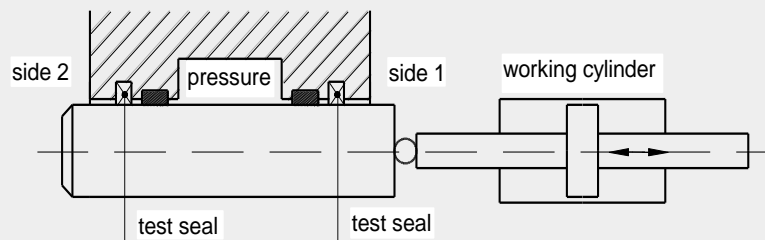
Versuchsablauf



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

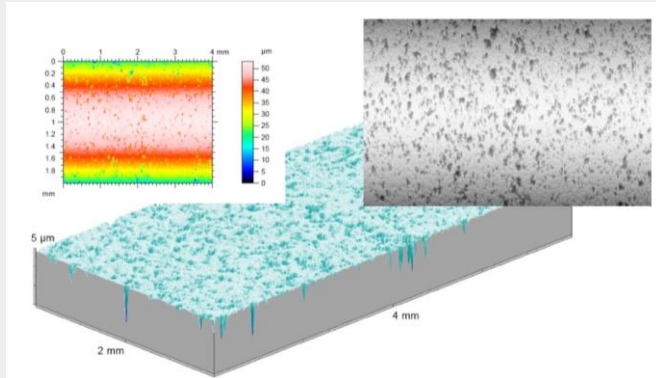
The complete test is divided into 5 parts, including different velocities pressure levels and temperature. The idea behind is to compare the friction before (A/B) and after (D/E) the endurance test (C).

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

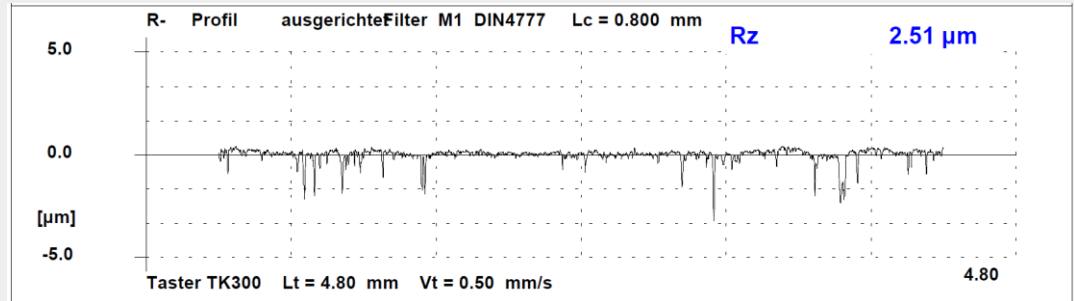
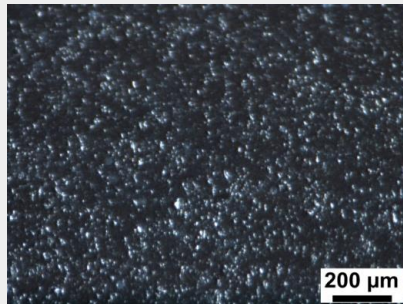


The output of the test will be friction, wear (rod and seal), leakage.

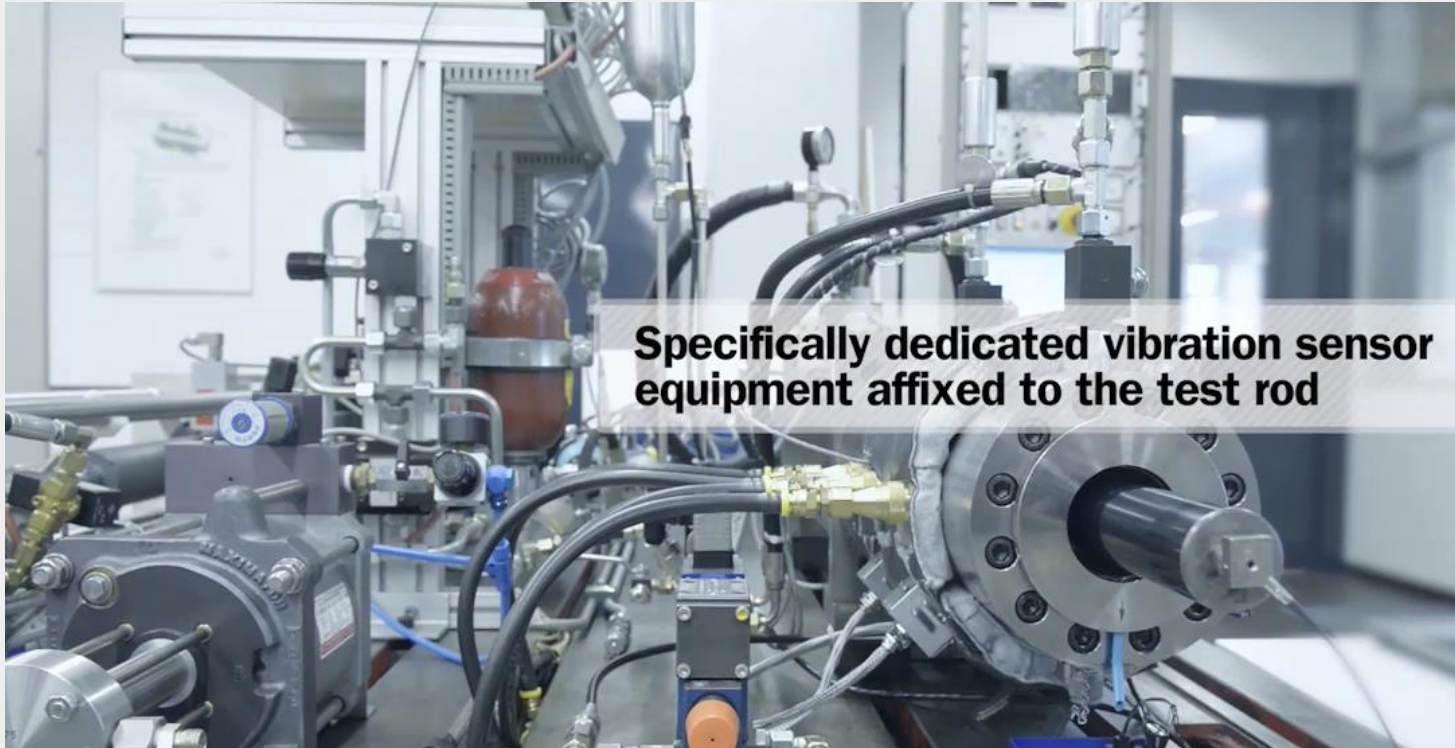
Gegenlauffläche Al₂O₃



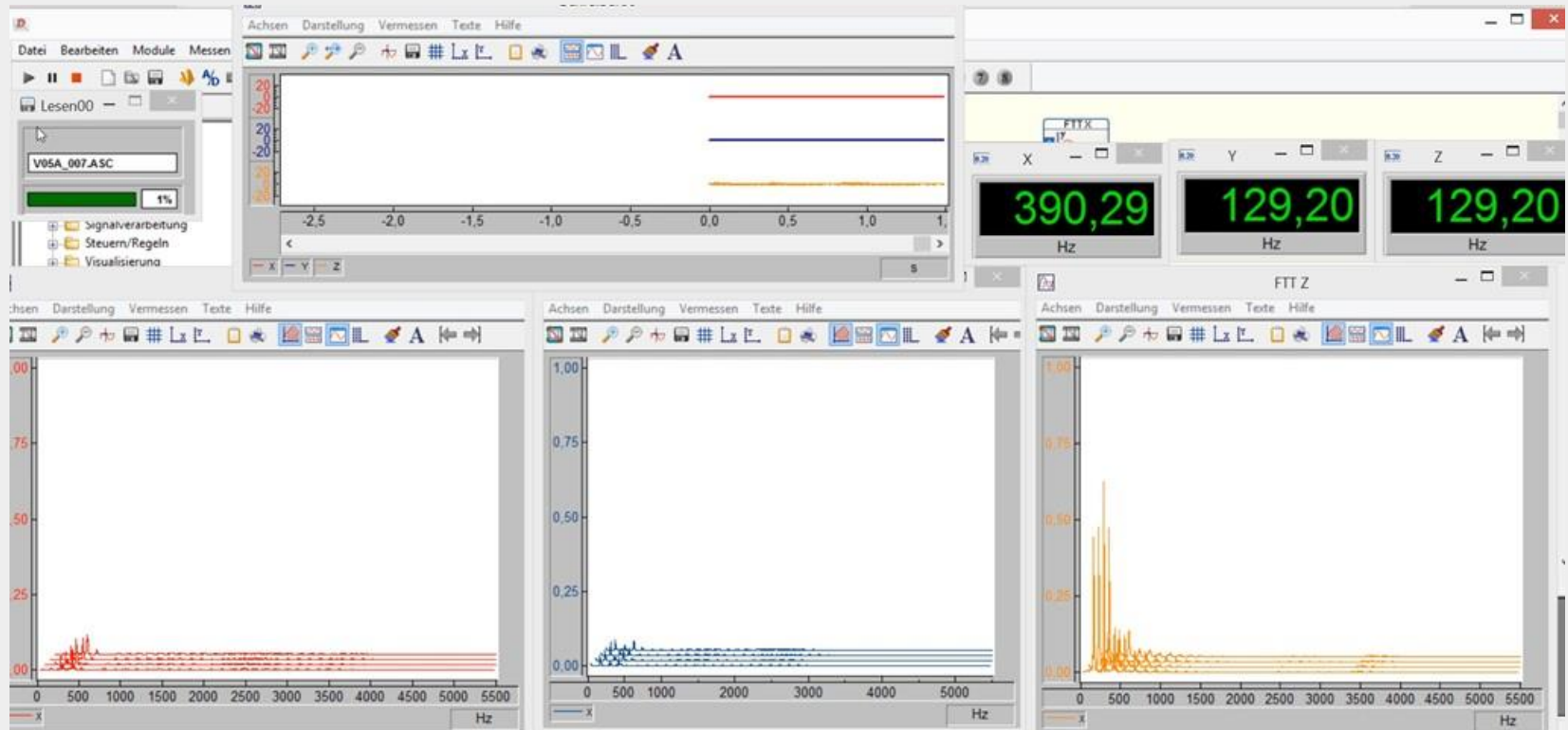
| | | | |
|------|---------|------|---------|
| Pt | 6.55 μm | Rpk* | 0.14 μm |
| Wt | 1.66 μm | Rpk | 0.10 μm |
| Ra | 0.19 μm | Rk | 0.37 μm |
| Rz | 2.51 μm | Rvk* | 3.20 μm |
| Rmax | 3.64 μm | Rvk | 0.81 μm |
| Rt | 3.66 μm | Mr1 | 5.5 % |
| | | Mr2 | 80.4 % |



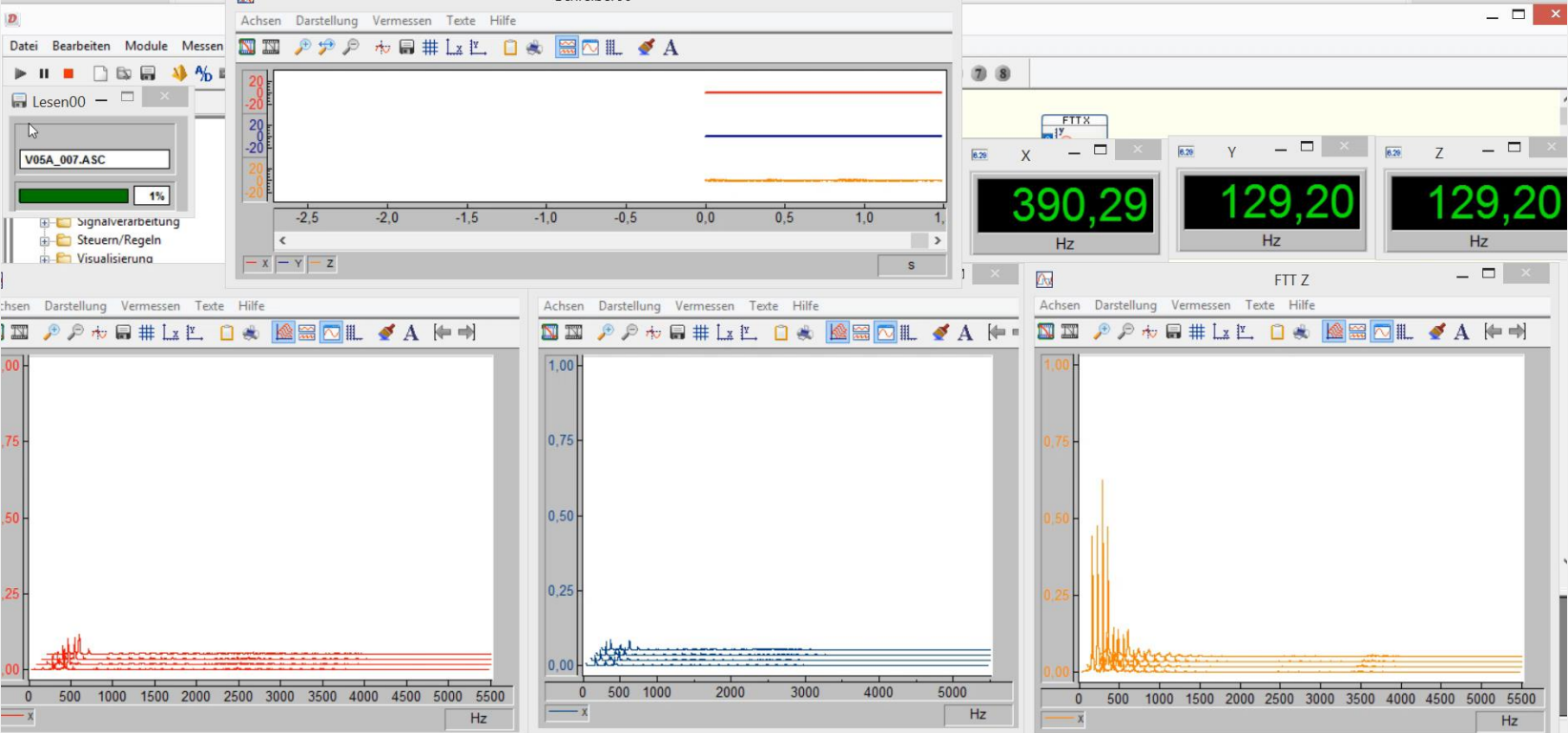
Prüfablauf



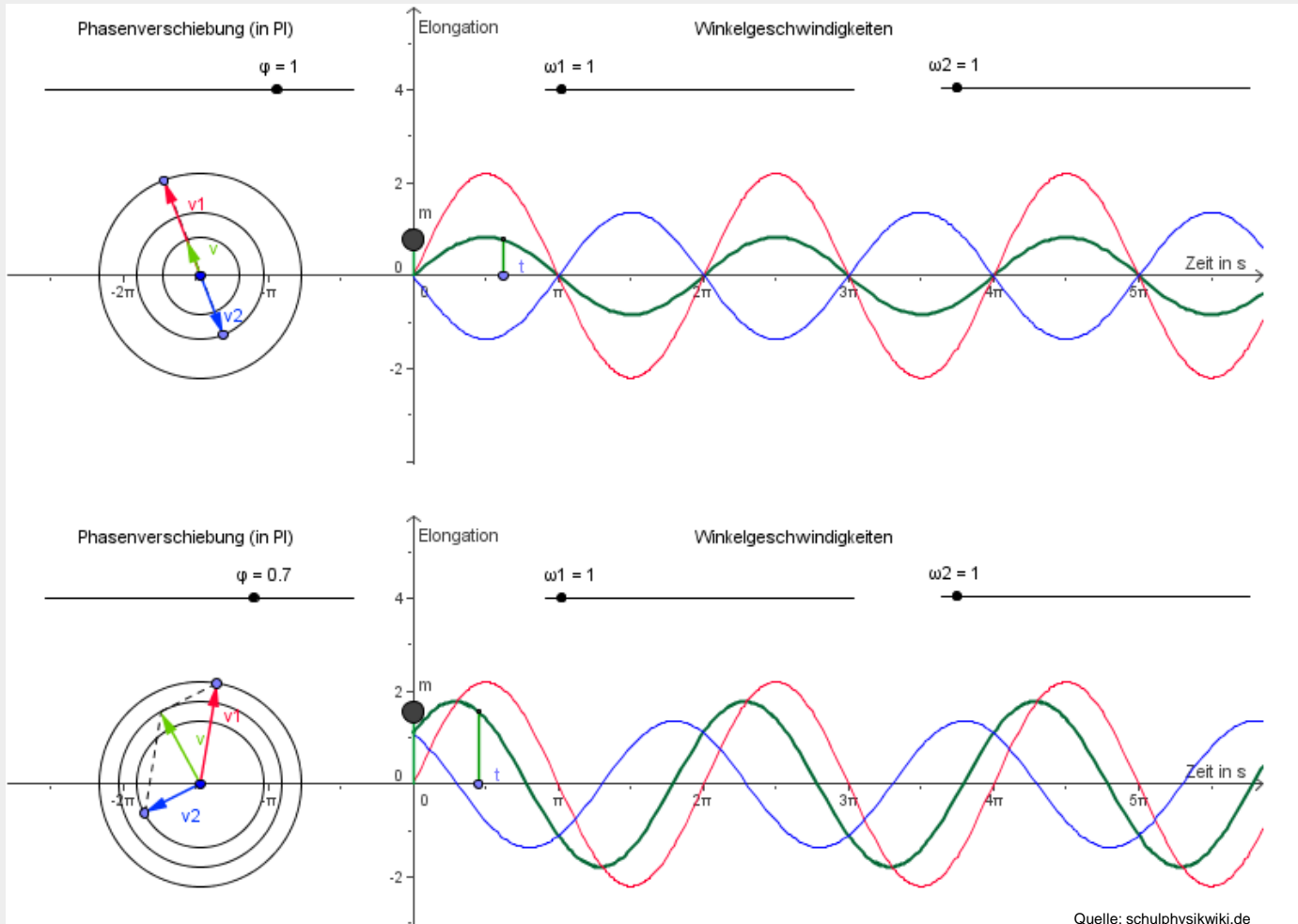
Geräuschbildung durch Stick Slip



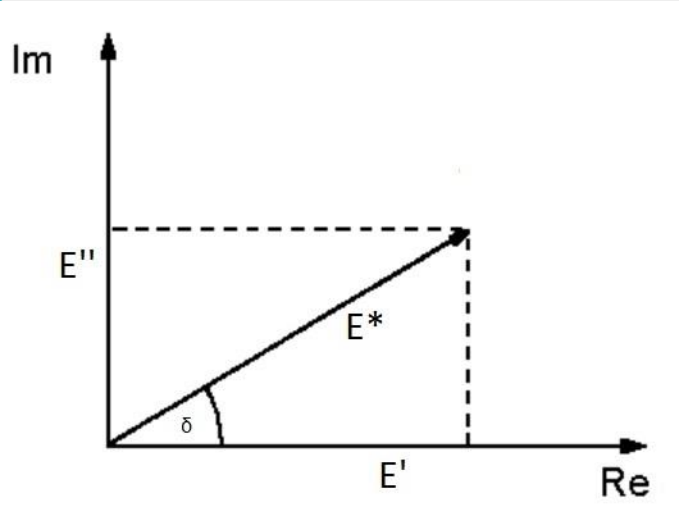
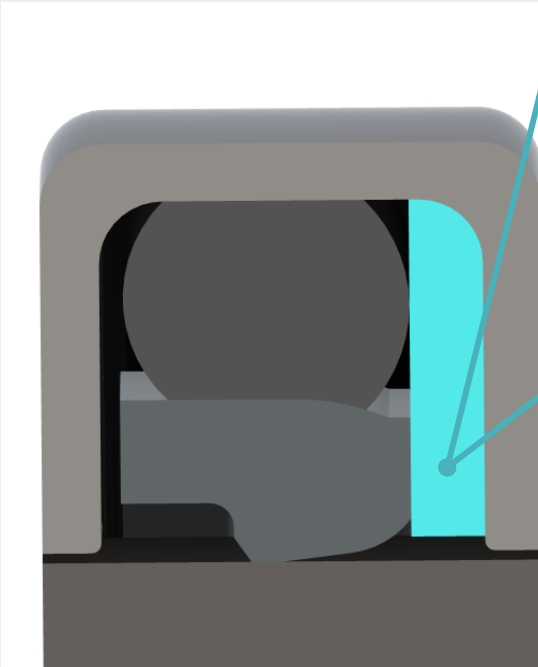
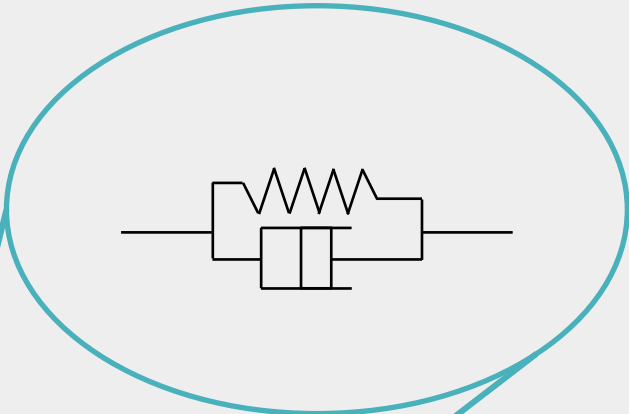
Geräuschbildung durch Stick Slip



Phasenverschiebung



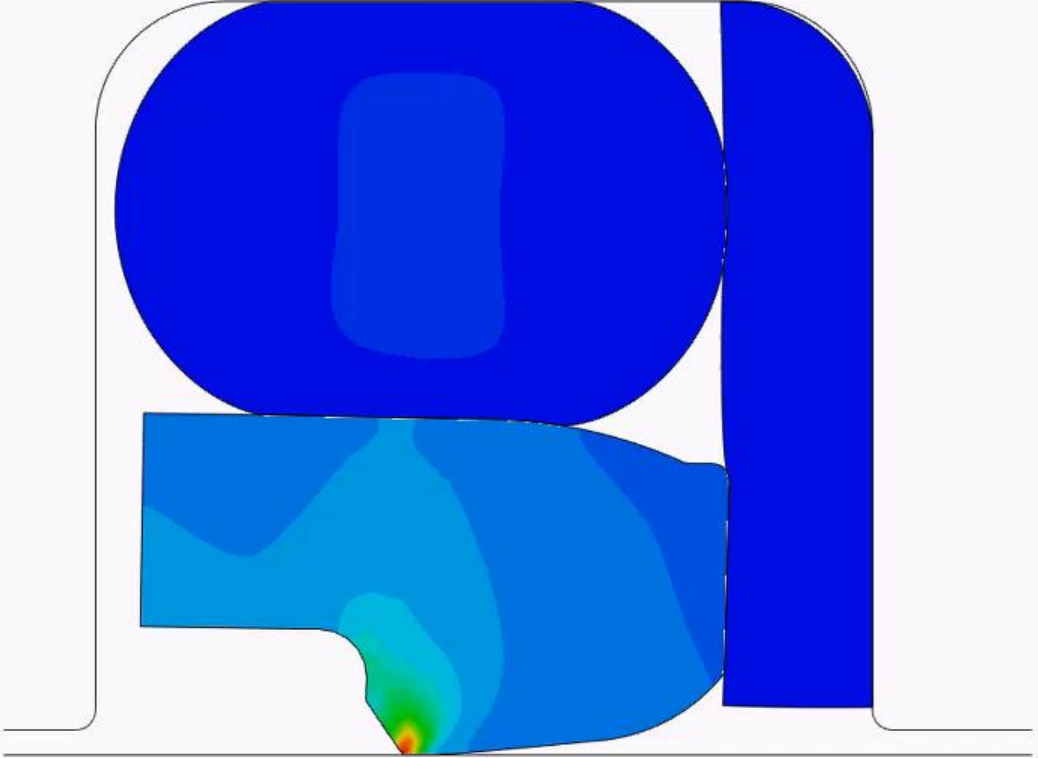
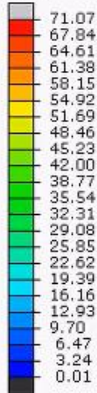
Stangendichtungen



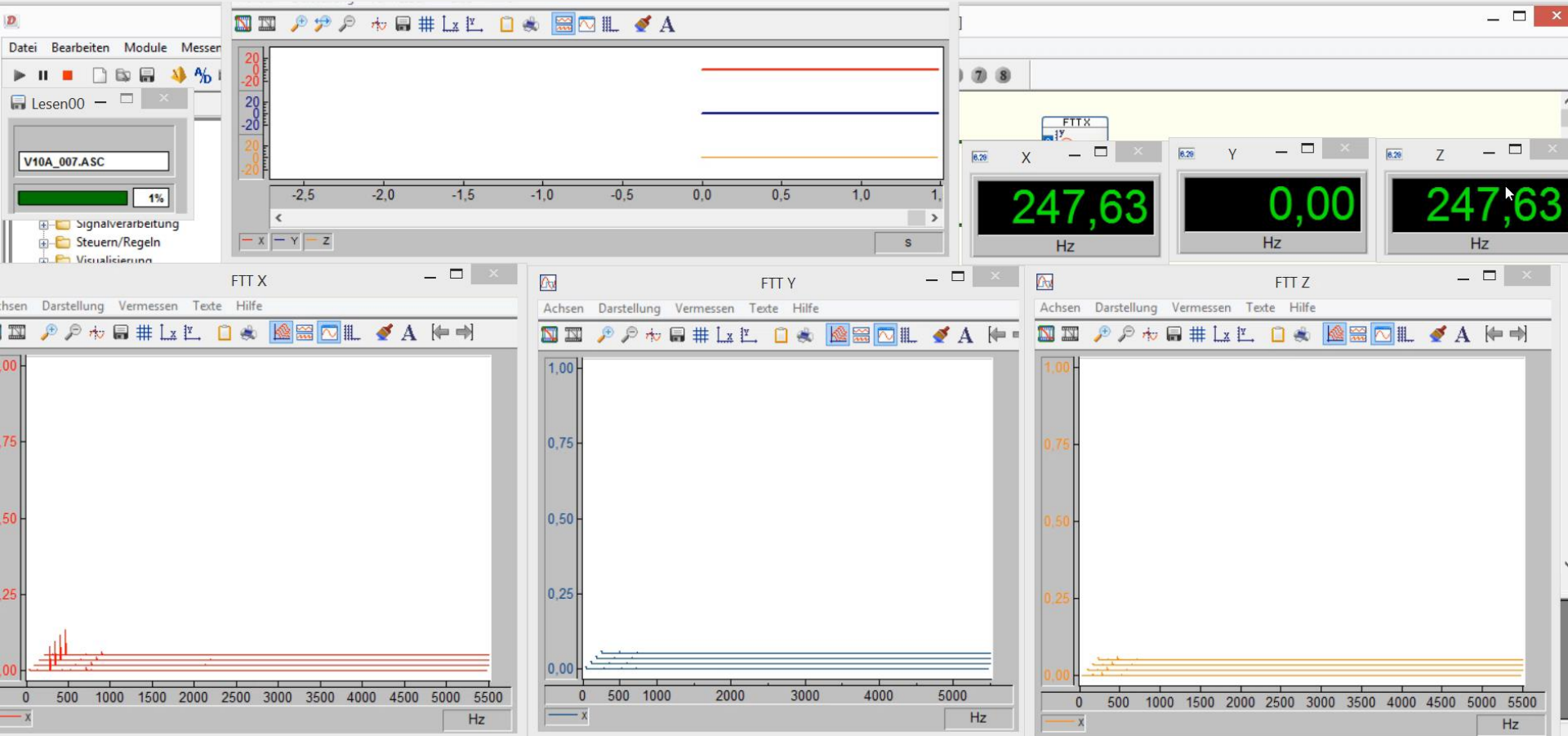
FEA

Step: Assembly Frame: 102
Total Time: 1.000000

S, Mises
(Avg: 75%)

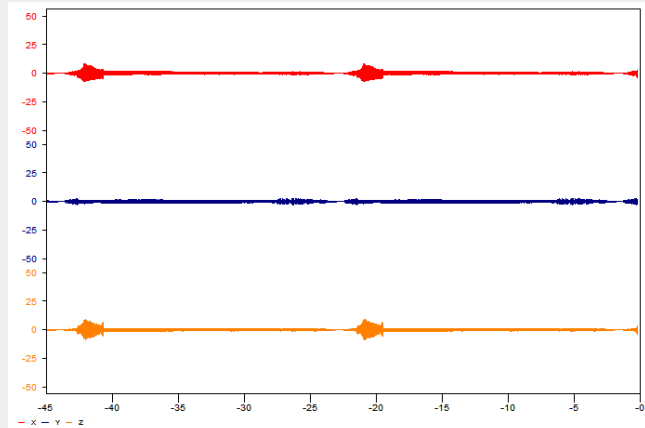
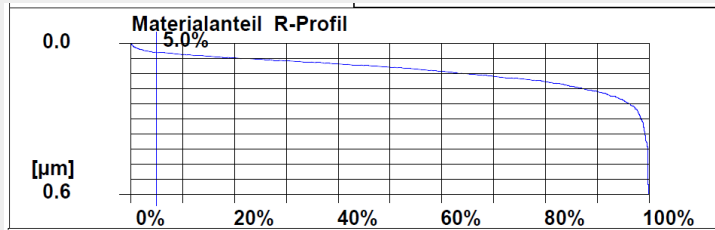
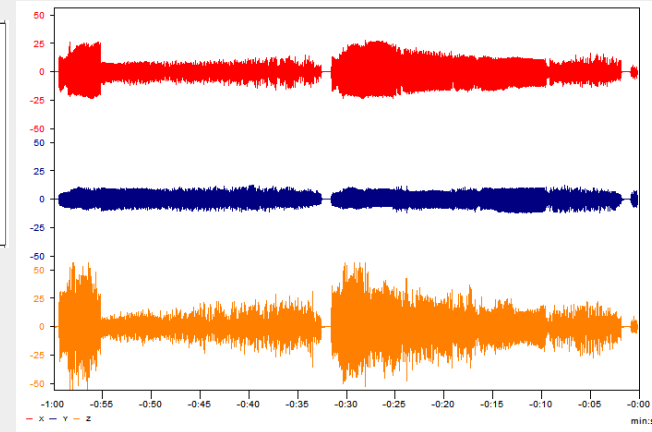
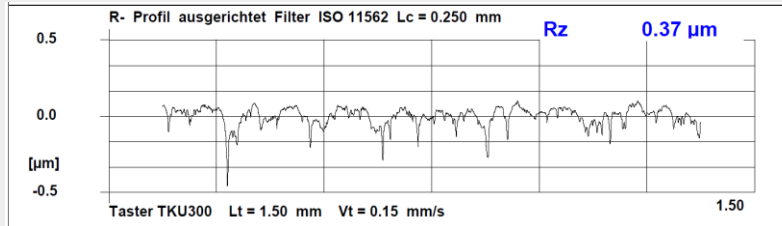


Stangendichtung mit Dämpferelement

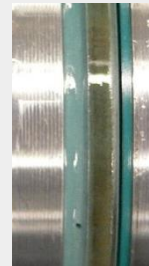


Kolbendichtungen

ohne Dämpfung



mit Dämpfung



Rpk 0.02 µm

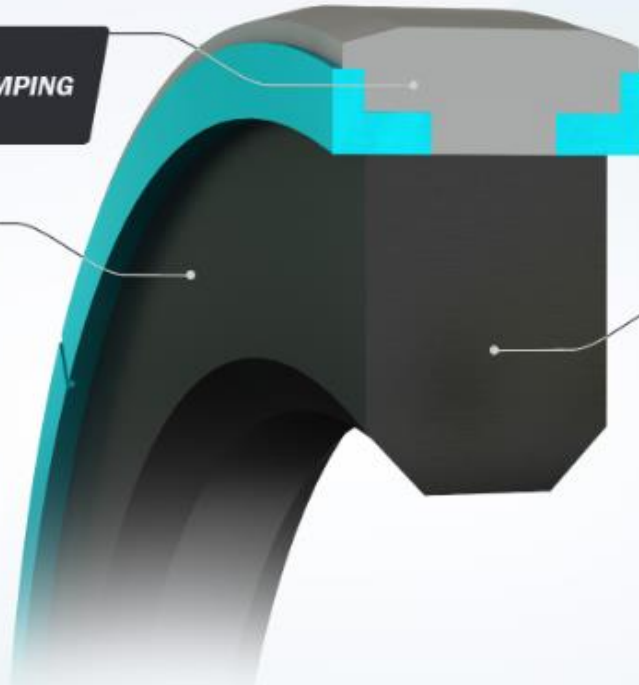


Glyd Ring[®] PD

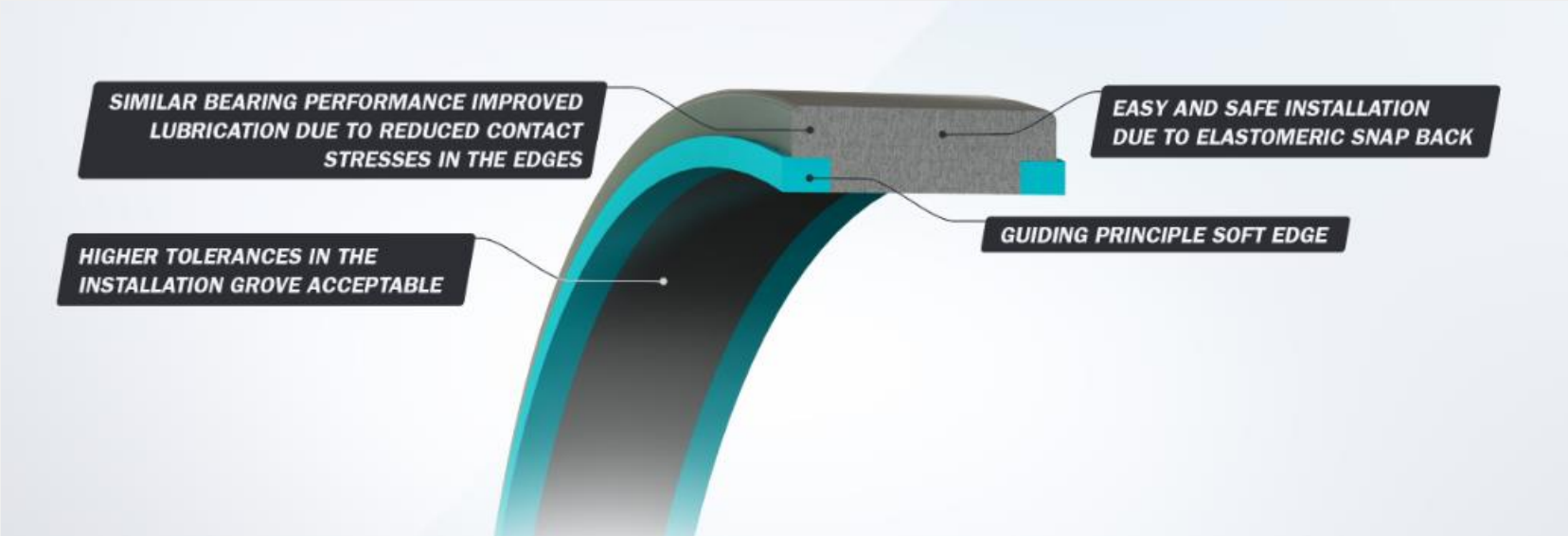
**NO STICK-SLIP ON START-UP DUE TO
TRELLEBORG SEALING SOLUTIONS DAMPING
TECHNOLOGY**

**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.



TRELLEBORG