Stefan Helfert, Fabian Lober,
Karin Reiter, Christian Weissensteiner

BEYOND CONVENTIONAL TESTING: DEFINING THE VALUES THAT MATTER

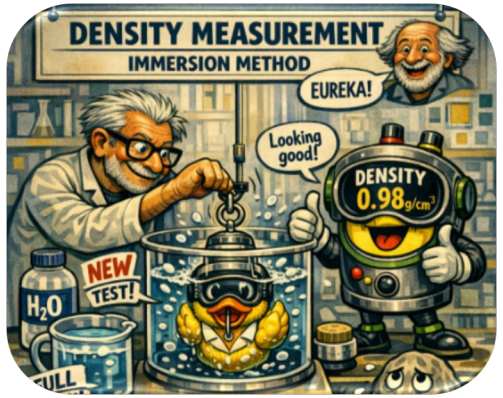
KANSAI HELIOS

Quality Control

QC

since 1995
ISO 9001

since 2019
IATF 16949



Testing of Liquid and Cured Varnish

- Traditionally based on standardized test methods – viscosity, solids content, density,
  - Specified values ensure conformity and form the backbone

Extended testing

- Application oriented
- Additional parameters influencing the end-use
  - static and dynamic friction
  - Surface free energy
  - bonding tests

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VARIOUS TESTING METHODS

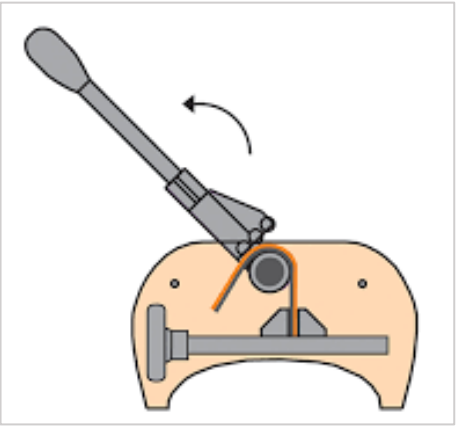
CHRISTIAN WEISSENSTEINER

Classic Test Methods for liquid Varnish

- pH-Value (DIN ISO 976)
- Viscosity with measuring cup (DIN 53211)
- Solid-Content (EN ISO 3251)

Classic Test Methods for coated Surfaces

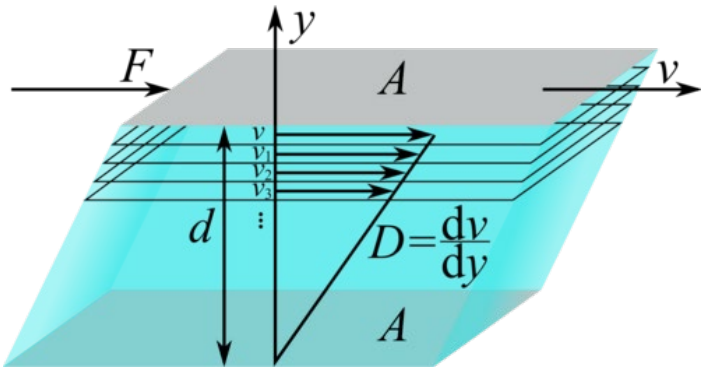
- Layer thickness
  - Magnetinductiv (EN ISO 2178)
  - Beta-Scope (EN ISO 3543)
- Water drop test
- Alcohol test (DIN EN 13523-11)
- Mandrell bending test (ISO 1519)
- Bend and impact test



Rheology

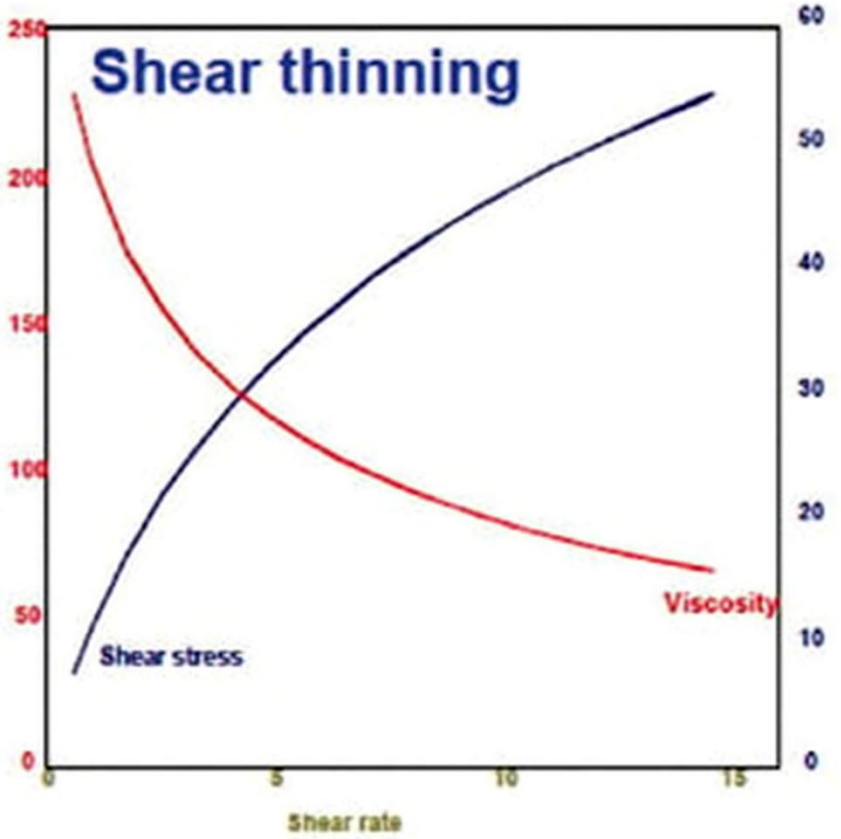
Rheometer

- Provides much more information than measuring cup
  - Viscosity at different shear rates
  - Time dependency of shear rate
- Flow curve (viscosity vs. shear rate)



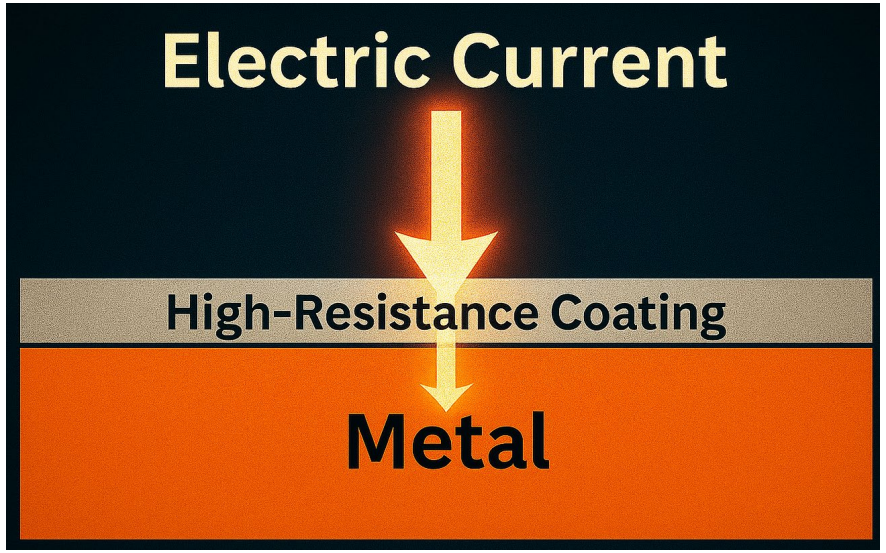
Rheology

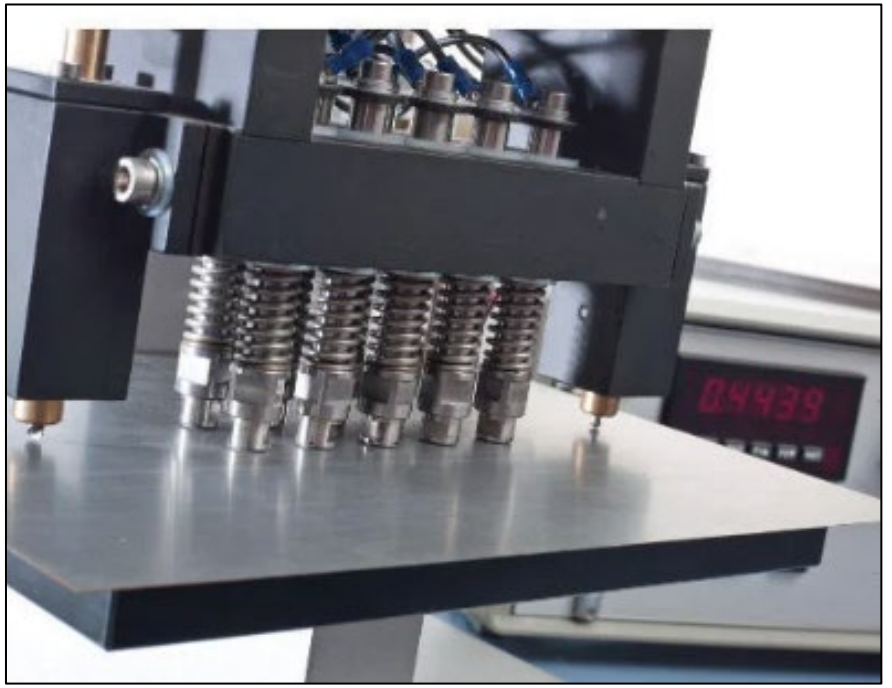
Rheometer



Franklin Test

The Franklin Test is a method to measure the electrical surface insulation resistance of coatings on metallic substrates



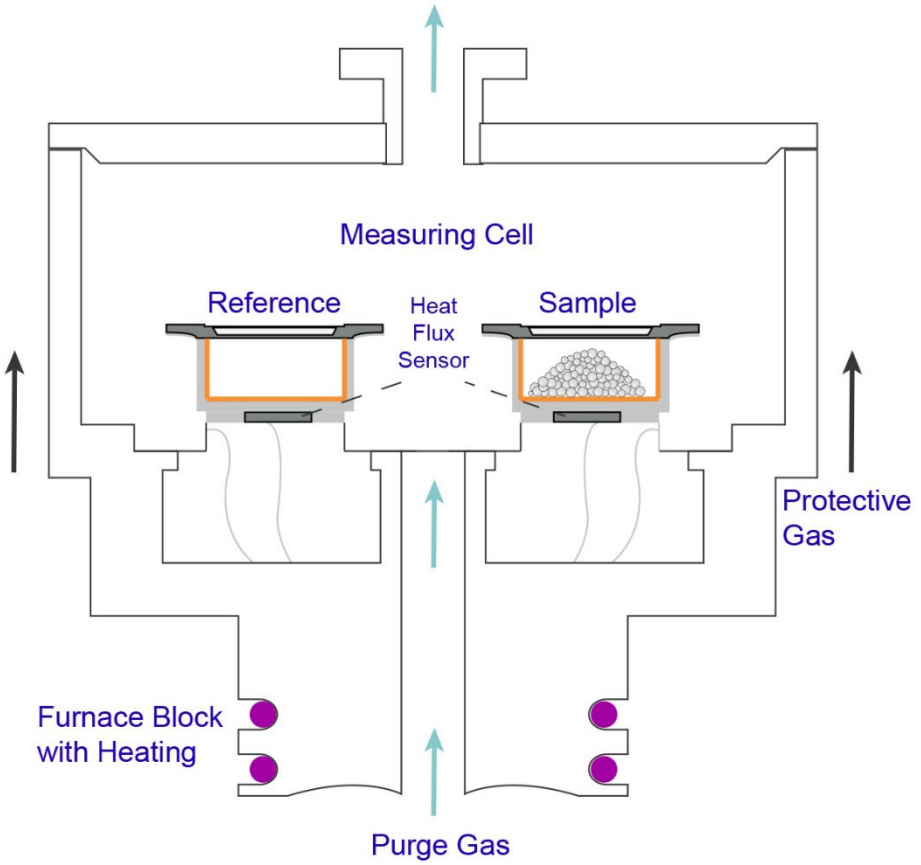


$$R = \frac{U}{I}$$

Surface Resistance of KANSAI HELIOS Core Plate Varnishes up to >10.000 Ωcm²/lam

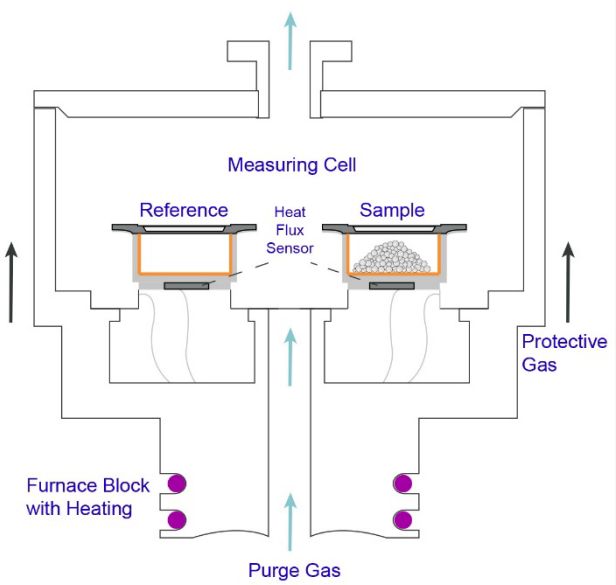
Differential Scanning Calorimetry

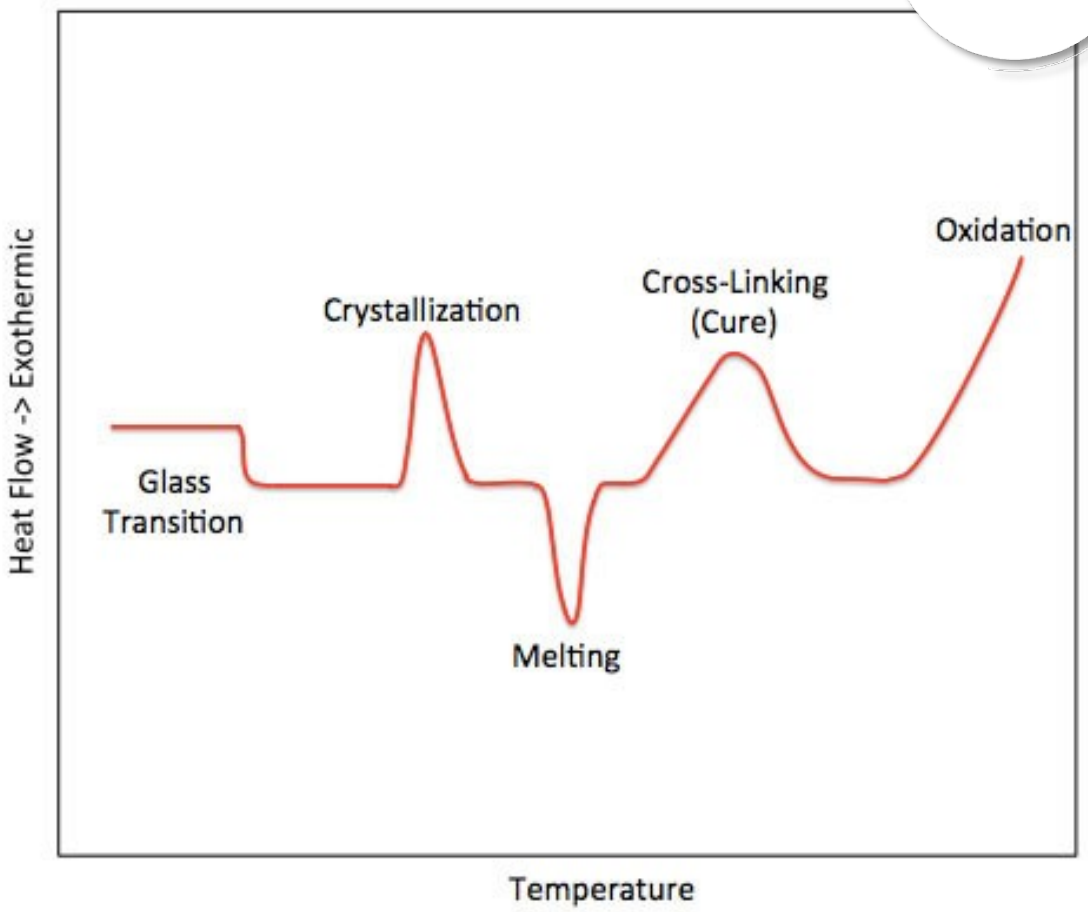
- Provides calorimetric information of physical and chemical processes at different temperatures



Differential Scanning Calorimetry

- Provides calorimetric information of physical and chemical processes at different temperatures

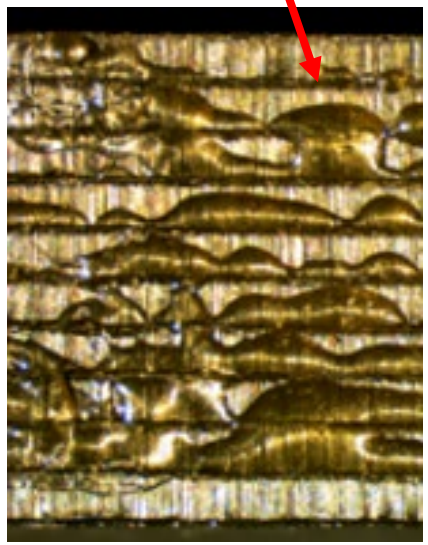




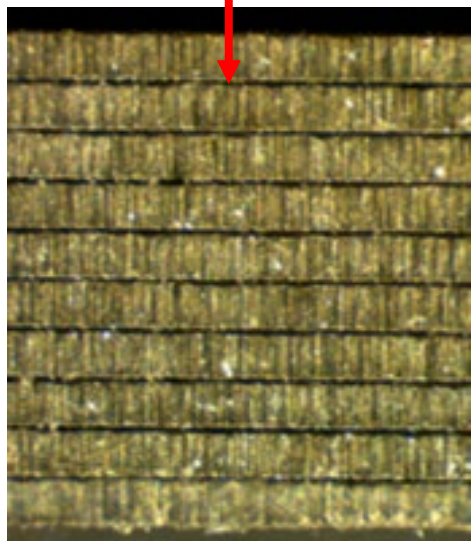
Example: Amine – Epoxy Curing

Differential Scanning Calorimetry

- Application in Backlack development

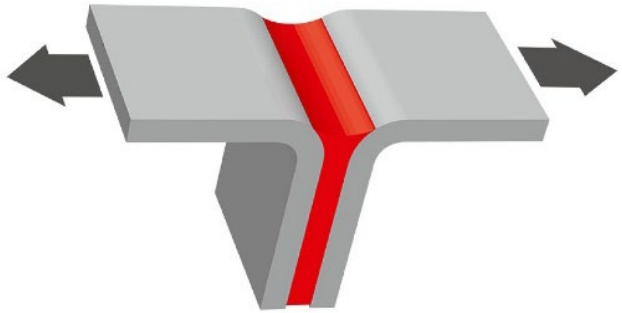


Squeeze out



No Squeeze out

Adhesion:

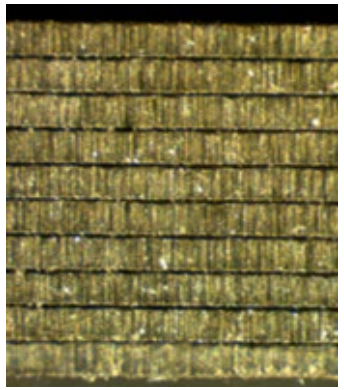


Differential Scanning Calorimetry

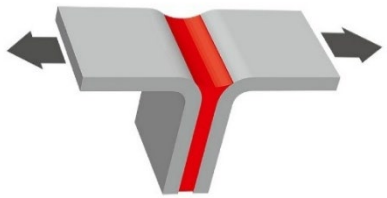
» Indication for B-state

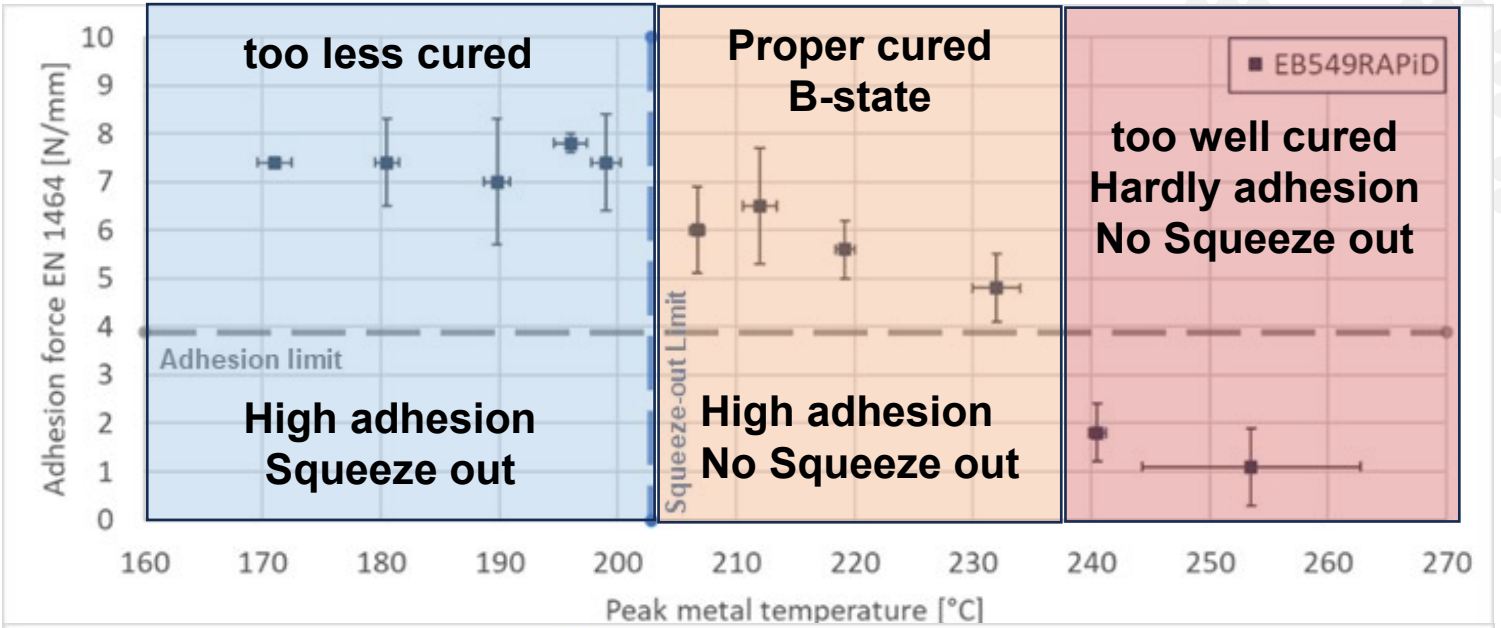
Too less cured
B-State
squeeze out

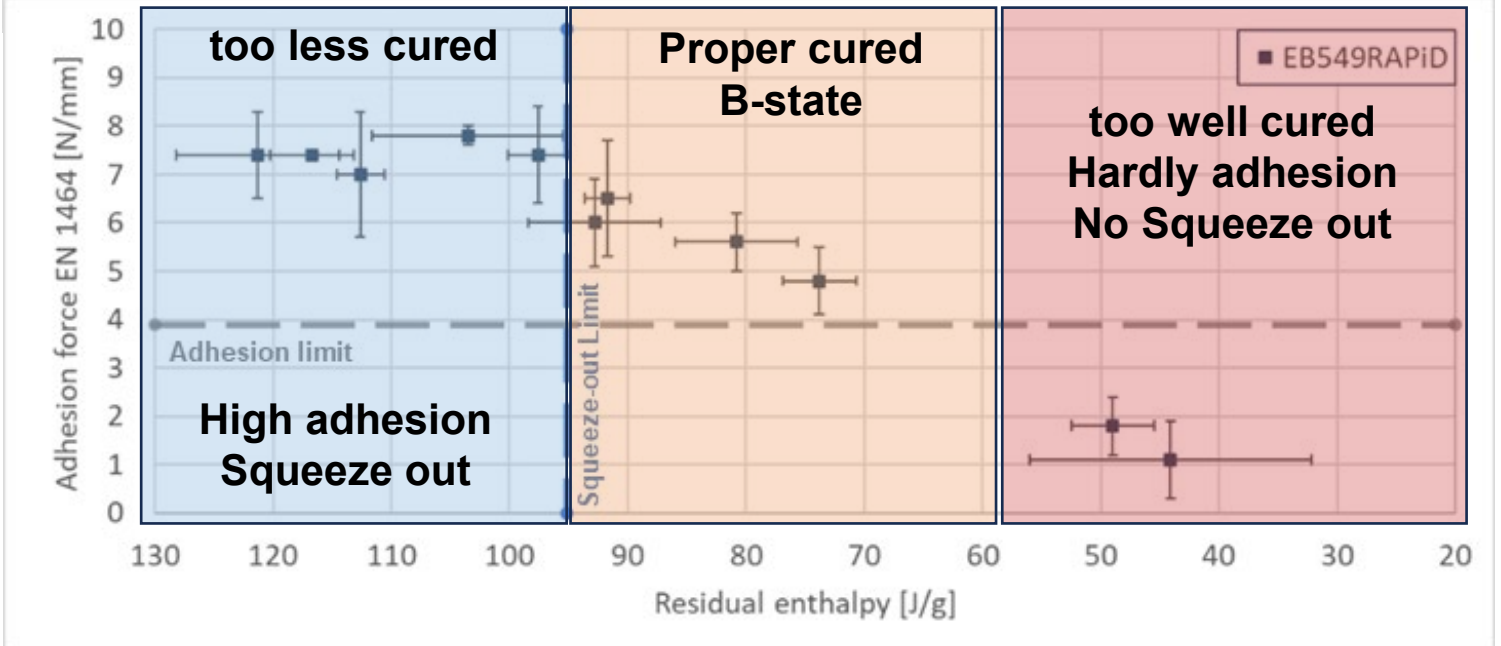
Proper B-State
No squeeze out



Adhesion:







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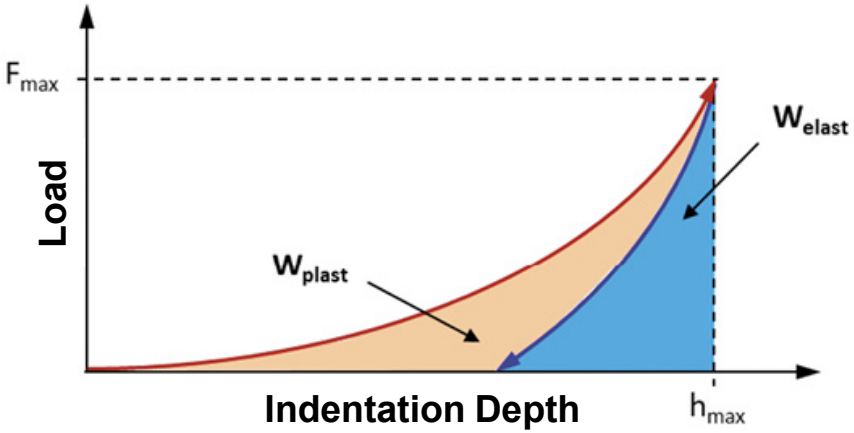
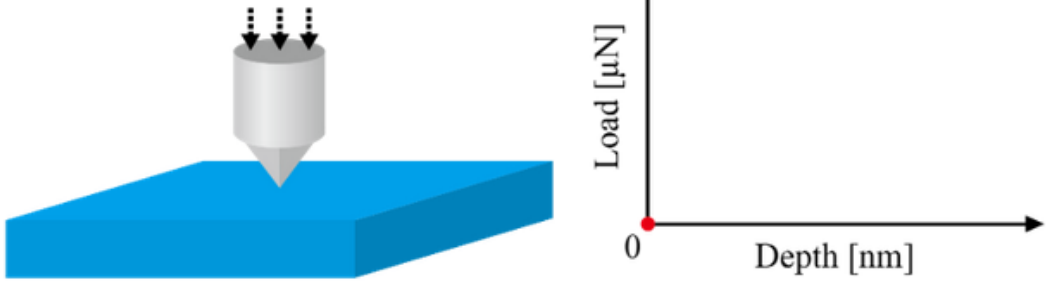
Nanoindentation

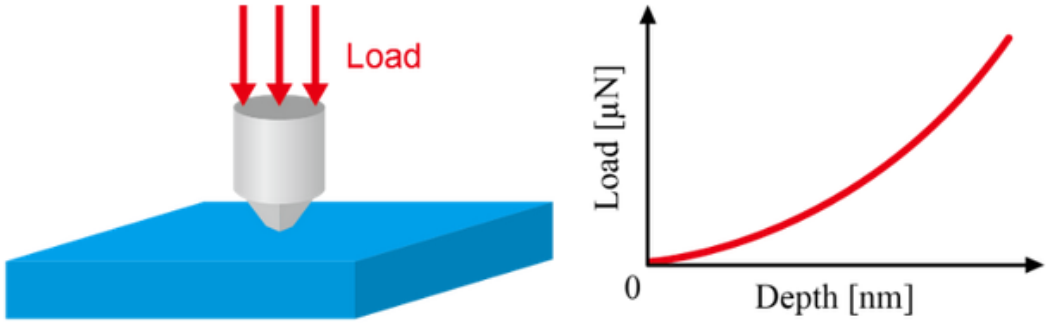
- Method for measuring youngs modulus of thin layers



(1) Surface detection



(2) Loading



(3) Unloading

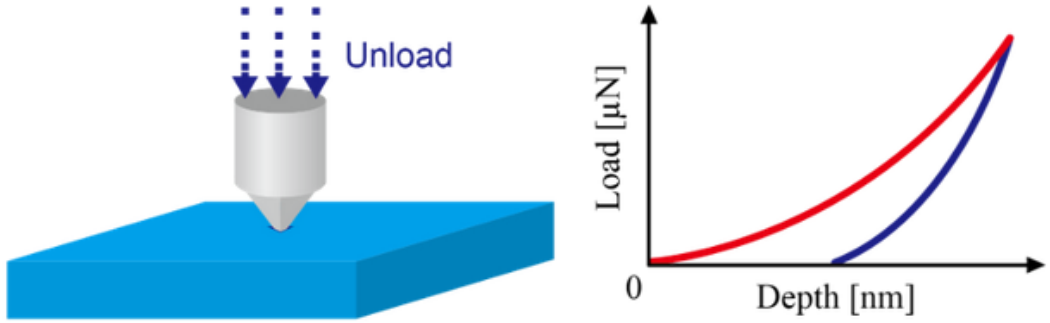
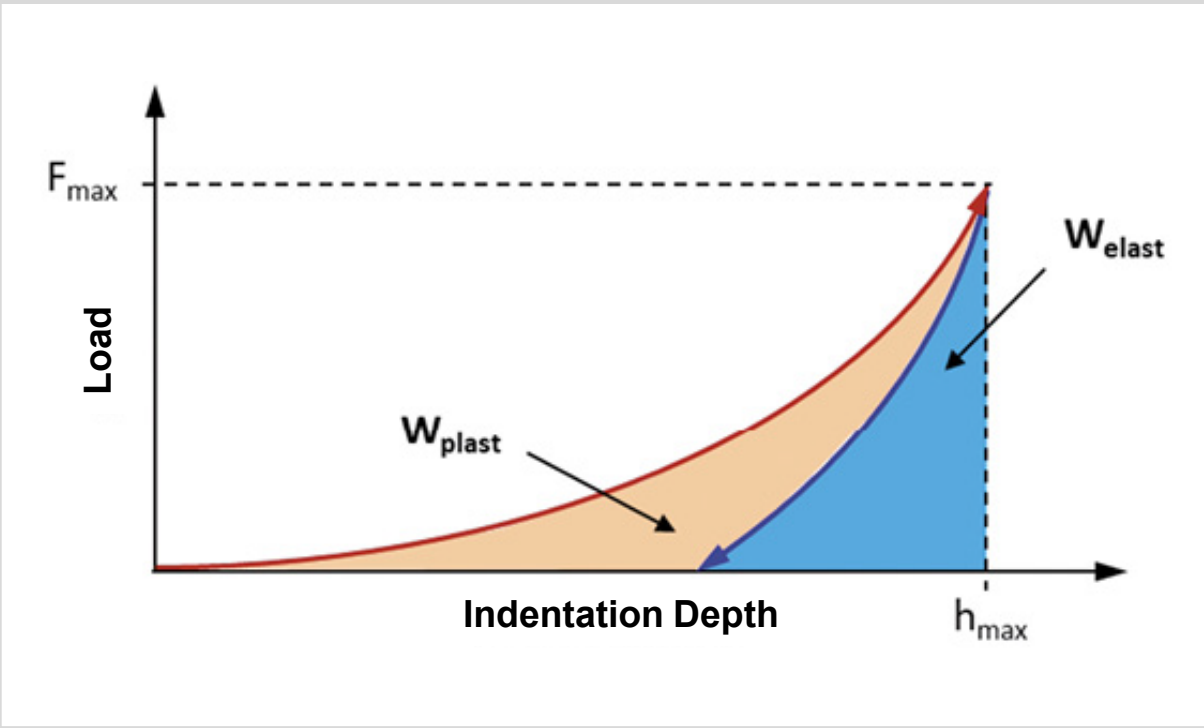
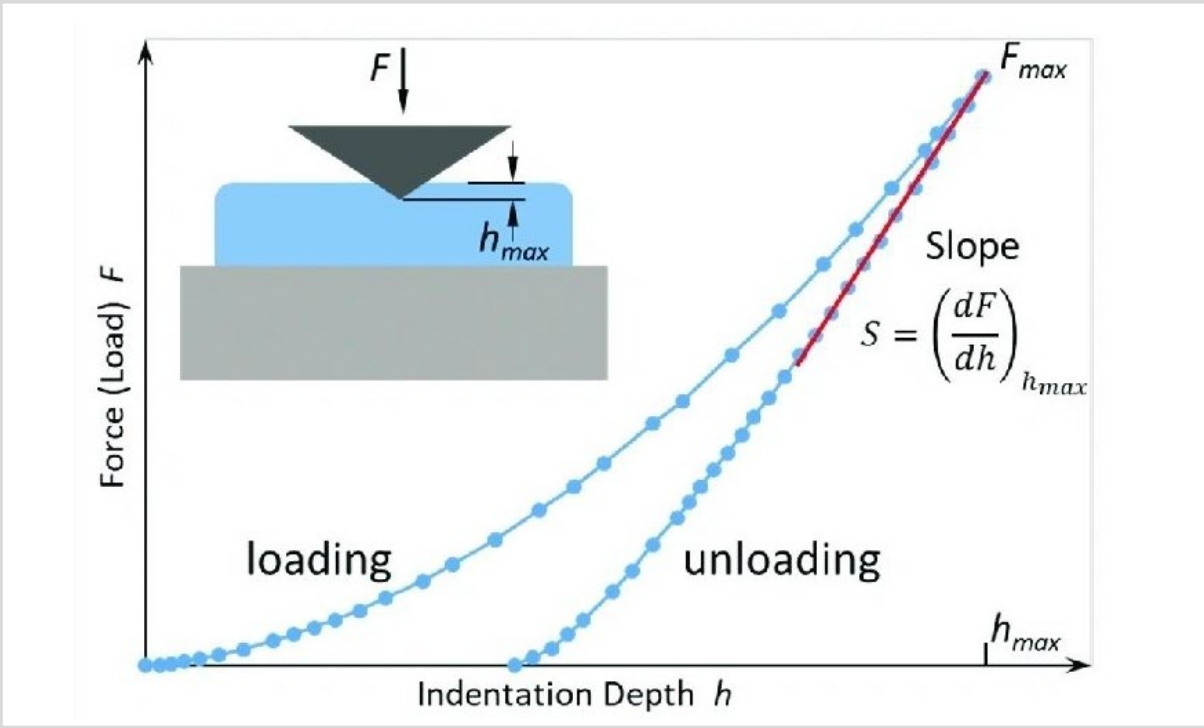


Fig. 1. Nanoindentation testing

Nanoindentation

- Method for measuring youngs modulus of thin varnish layers

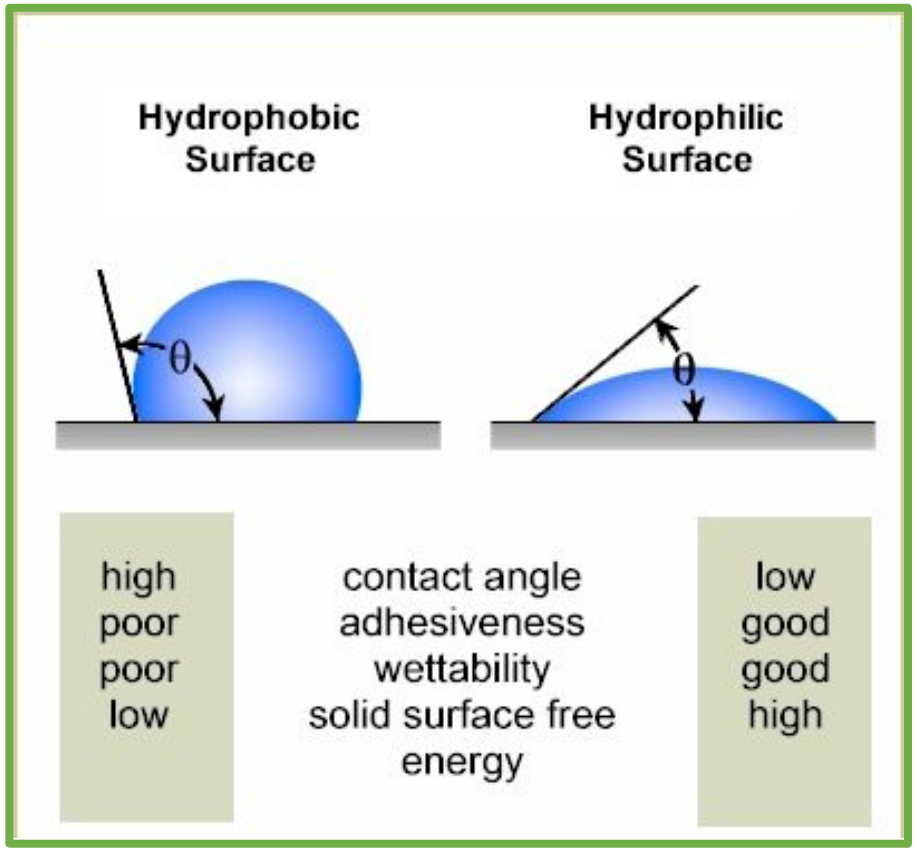




Contact Angle

- Method for surface energy of varnish layers, which is important for further overcoating.

By measuring the contact angles of differerent defined solvents on the same surface, the solids surface energy can be calculated.



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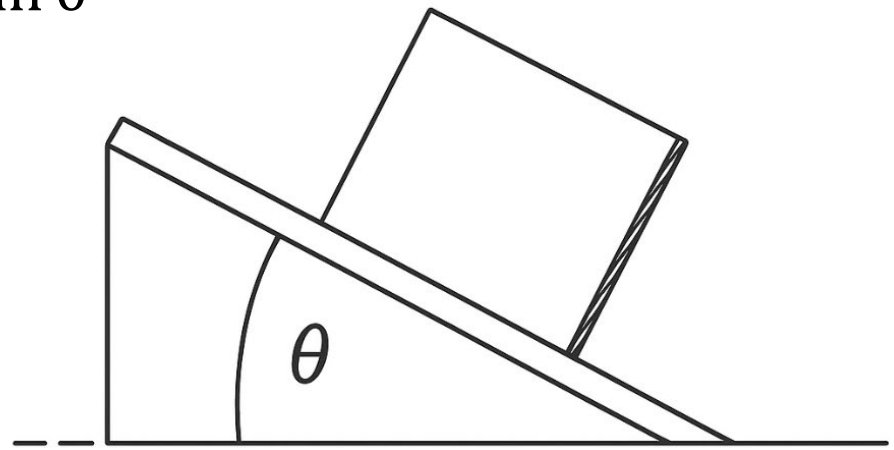
STATIC AND DYNAMIC FRICTION / BONDING STRENGTH TESTS

FABIAN LOBER

Friction: static vs. dynamic

- static friction (μ_s): prevents motion initiation
  - → Angle of static friction θ = $\tan^{-1}\mu_s$ $\mu_s = \tan\theta$
- dynamic friction (μ_k): resists motion during sliding



How is this value relevant for you?

- Higher static friction tends to decreases the risk of coil collapse

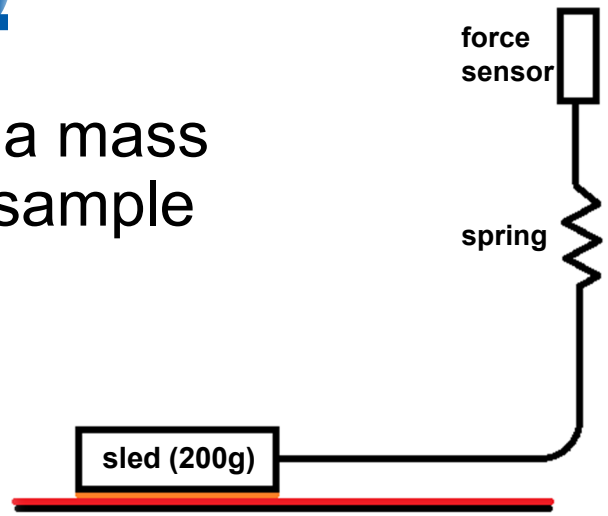
Test Setup (acc. ISO 8295)

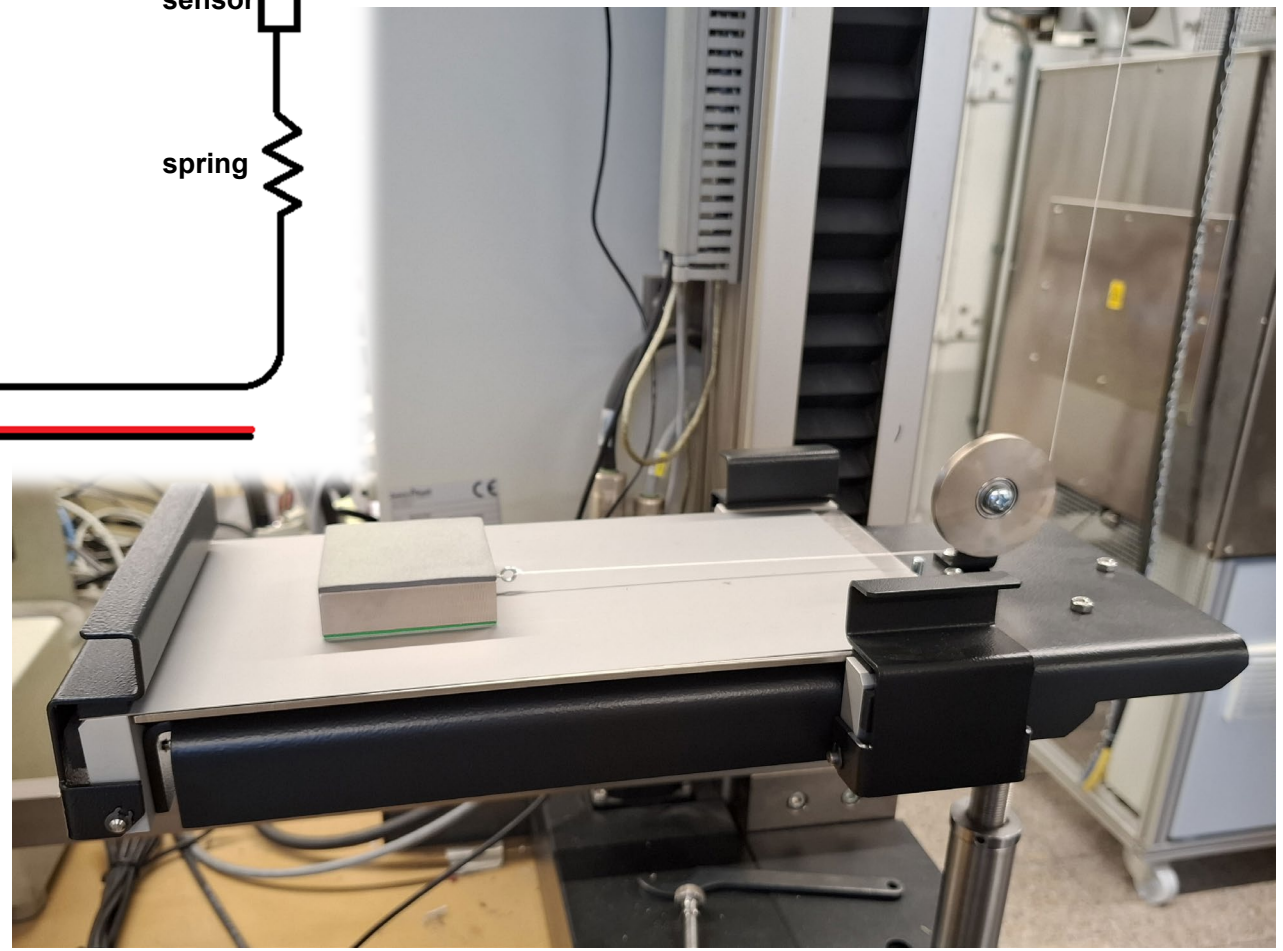
Sled with a 40 cm² sample and a mass of 200g; pulled across another sample

$$\mu_s = \frac{F_s}{F_p}$$

$$\mu_k = \frac{F_k}{F_p}$$

F_p = normal force





Reference Values of Remisol Coatings

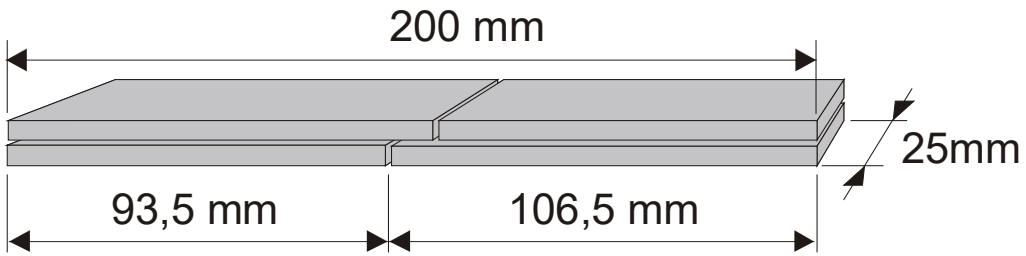
	static friction (µs)	dynamic friction (µk)
EB 5350 S	0,44	0,40
EB 5340	0,46	0,38
EB 5308	0,55	0,53
EB 5865	0,57	0,55
EB 5865 W	0,57	0,57
EB 5800	0,53	0,50
EB 549	0,32	0,22
EB 549 Precision	0,27	0,25
EB 549 RAPiD	0,29	0,25

All values were measured on **M800-50A** sheets, manually coated using a wire bar from KHA.

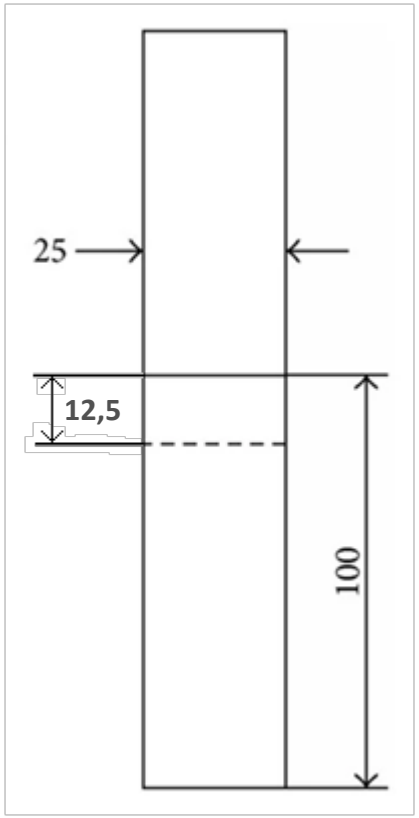
Lap Shear Tests (acc. EN 1465)

- Specifically tests the strength of the adhesive
- Well suited for testing at elevated temperatures.
- Standard test for dot glues

Supported lap shear test:



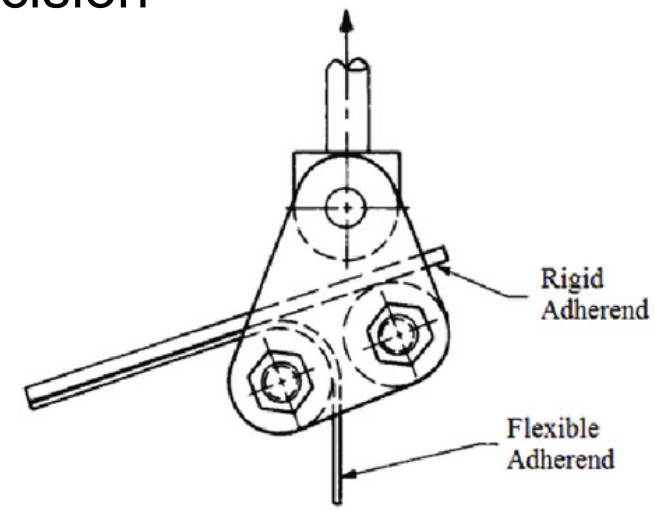
Lap shear test for dot glue:



Bonding Strength Tests

Floating Roller Peel Test (acc. EN 1464)

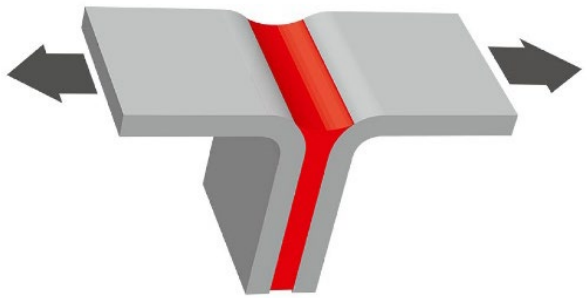
- Specifically tests the flexibility of the adhesive as well as its adhesion.
- Well suited for the tests of bondable coatings.
  - EB 549; EB 549 RAPiD; EB 549 puls; EB 549 precision

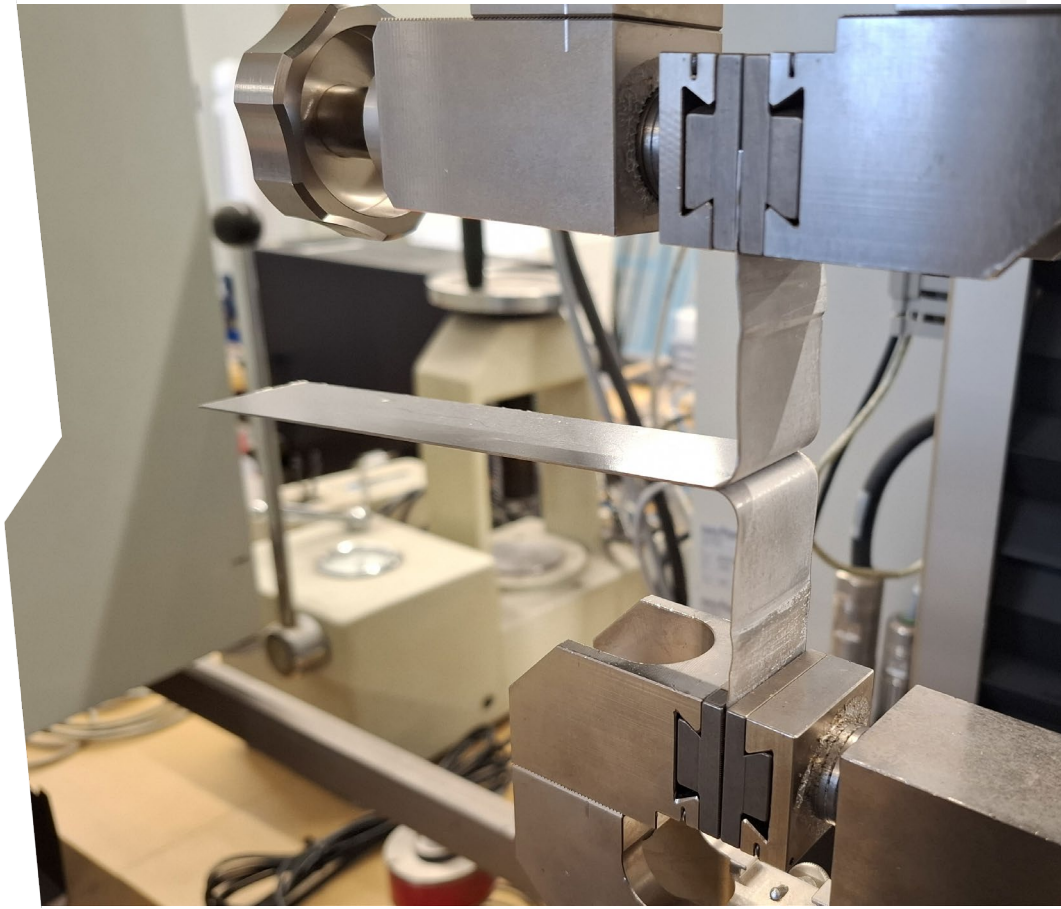


Bonding Strength Tests

T-peel Test (acc. ISO 11339)

- Specifically tests the flexibility of the adhesive as well as its adhesion
- Fast but old standard, rarely used
- Well suited for soft/flexible adhesions
  → EB 548





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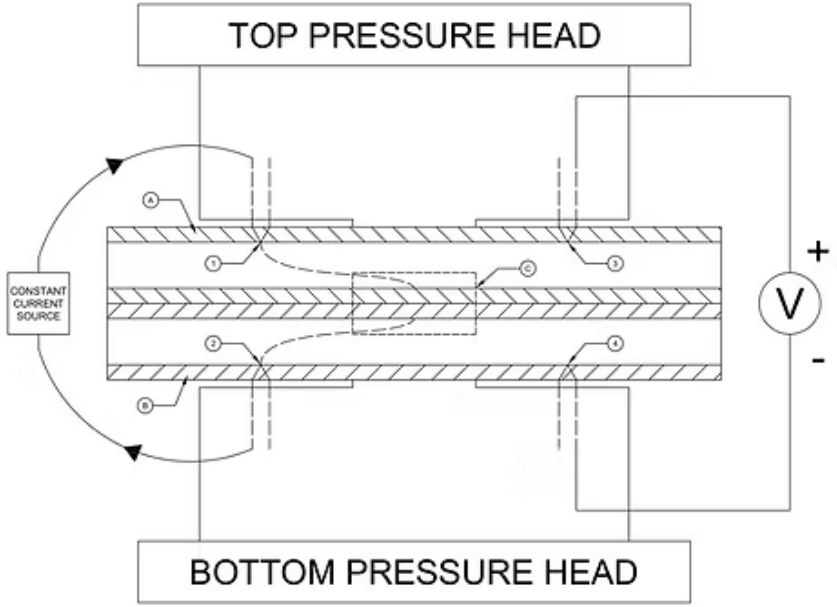
UPCOMING TESTING METHODS

STEFAN HELFERT

Interlamellar Resistance Tester IRT

- The Interlaminar Resistivity Tester is an advanced instrument for measuring the interlaminar resistance of electrically insulating coatings of adjacent electrical steels.
- This tester follows and conforms to all requirements in ASTM standard A937



Quality Control

- **We focus on extending quality assesment beyond classical test routines.**
- **We are evaluating, which material parameters provide high informative value with respect to functional performance and process stability.**
- **Rather than generating additional data points, the objective is to identify those parameters that are technically meaningful, reproducible and decision-relevant.**

but….

Live Survey

What will be necessary in the Future to ensure Quality and Customer Specifications?

Always looking forward to working with you!

Our Team is at your Service

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