MICRO-INDENTER FOR THE ANALYSIS OF ELASTOMER PARAMETERS

LNP® nano touch
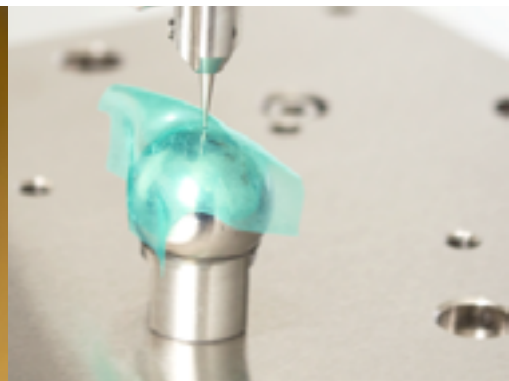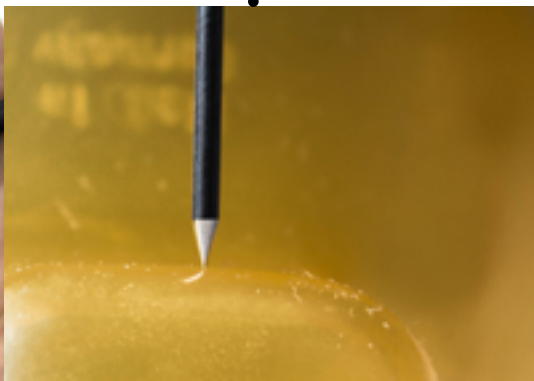

DMA
tan (d)
E'[N/mm²]
IRHD-M
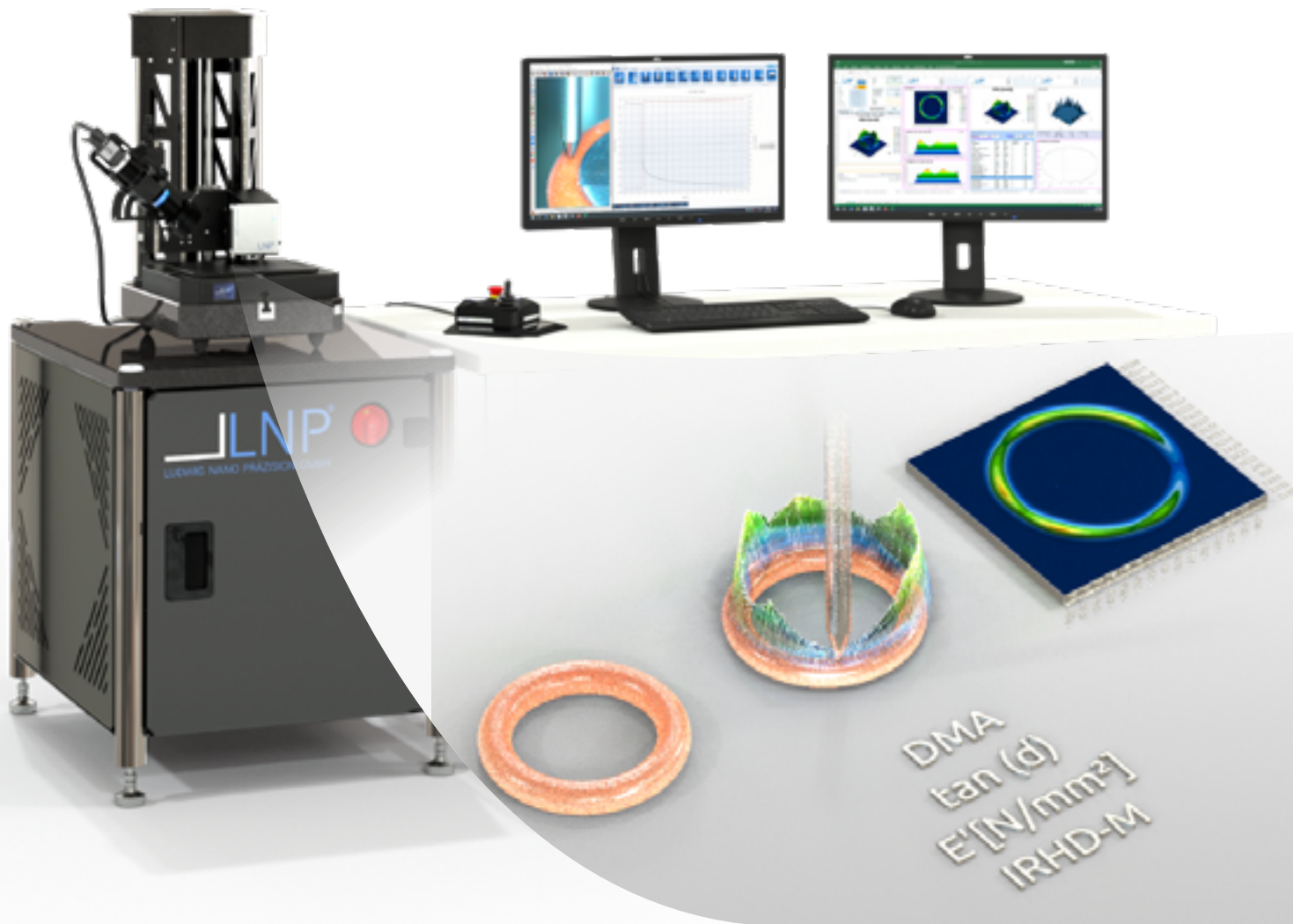
IRHD-M ISO 48	SHORE 000 ASTM 2240	ADHESION
VLRH DIN ISO 27588	SHORE A MICRO	YOUNG'S MODULUS BY LNP
SHORE A/M ASTM 2240	FLEXULAR MODULUS DIN ISO 178	MICROTRIBOLOGY
SHORE 00 ASTM 2240	HARDNESS TOPOGRAPHY	RHEOLOGY
		SPATIALLY RESOLVED DMA

And further possible applications

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LNP® NANO TOUCH

STANDARD TEST METHODS

ANALYSING METHODS

Analysing methods

The LNP®nano touch

The LNP® nano touch is a compact, infinitely variable force-position sensor with frictionless bearing and dynamic force generation up to 1.4 N . If you need more, the dynamic force generation can be increased up to 10N with our new optional head. This guarantees a precise force generation without friction nor guiding losses. Combined with an optical incremental position sensor with a high-resolution of up to 10 nm, a damage-free, high-precision geometrical and physical measurement is achieved, as is the determination of material properties.

Precision measurement with variable way and force paramenters

- Measurement of geometrical quantities up to 4mm with nanometre resolution
- Measurements of material properties micro hardness, Young's modulus, damping ratio
- Measurement of very soft materials with probing force from 0.05 mN to 1.4 N
- Measurement of liquids, viscosity, surface tension
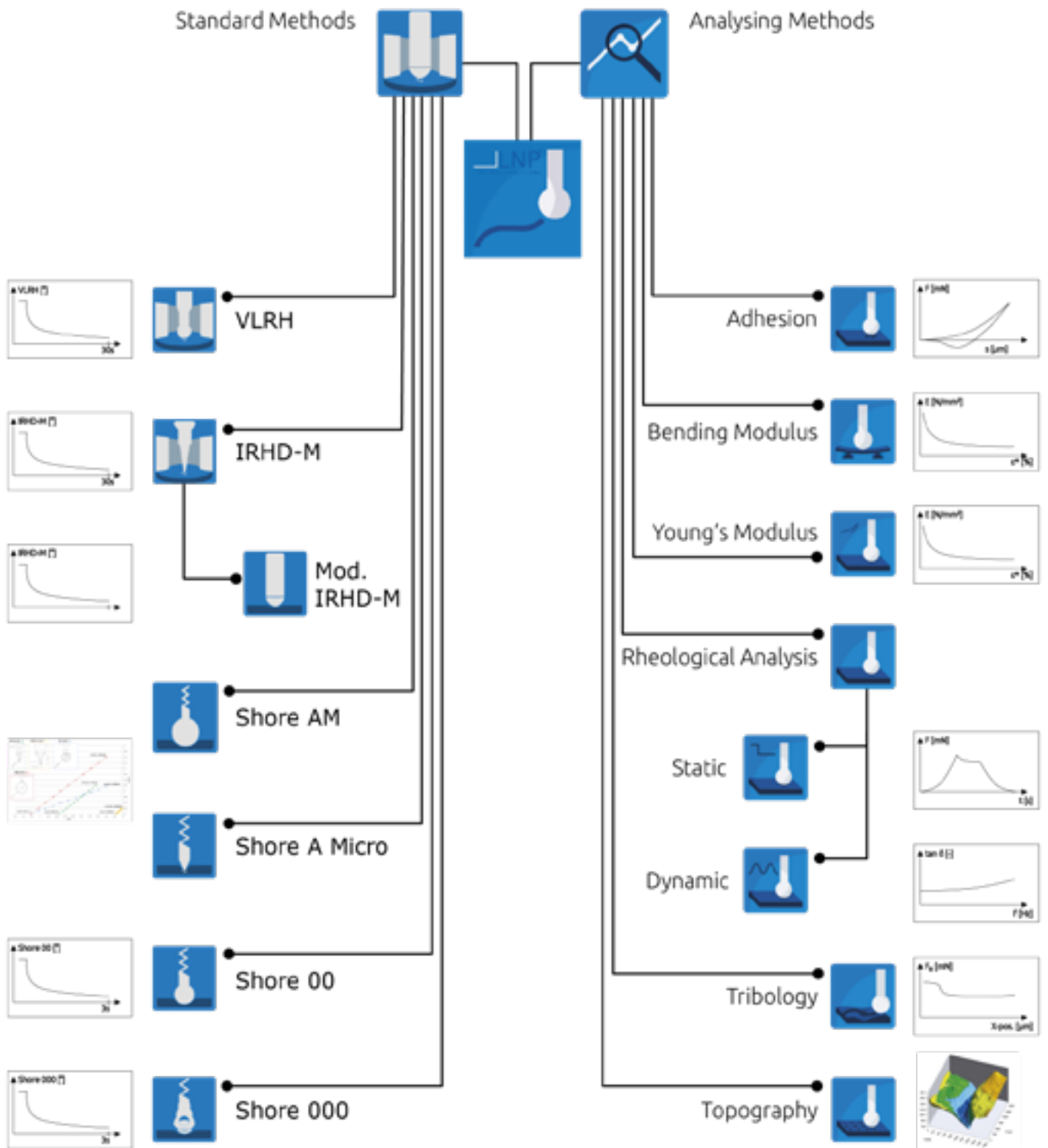- Measurement of micro contours and tribology effects

Other advantages:

- Frictionless bearing
- Compactly built
- Optical distance measurement
- Variable measuring force, configurable measurement procedures
- Variable measuring force, configurable measurement procedures
- Constant measuring force, even when tip is moved
- Free positioning in 3D space
- Fully automated probing of workpiece surfaces
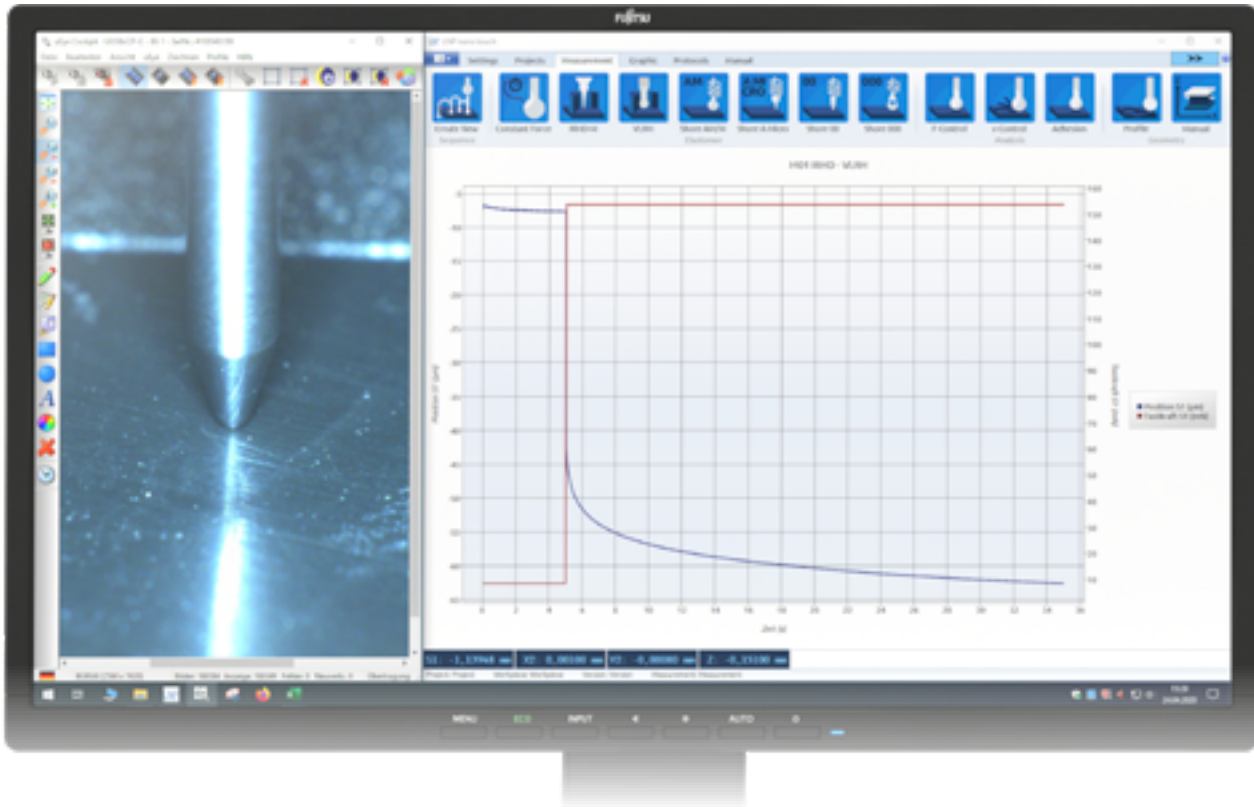
Technical data

Position sensor	optical incremental
Range	4 mm
Resulotion	10 nm standard
Linearity: way	< 200 nm to measuring range
Linearity: force	0…1400 mN < 0,3% to measuring range
Generating of measuring forces	electro-mechanically
Measuring force	0,05 mN…1,4 mN or 10N (with new head)
Measurement force resolution	0,05 mN (50µN)

LNP® testing methods

Standard Methods

Analysing Methods

LNP

VLRH

IRHD-M

Mod.
IRHD-M

Shore AM

Shore A Micro

Shore 00

Shore 000

Adhesion

Bending Modulus

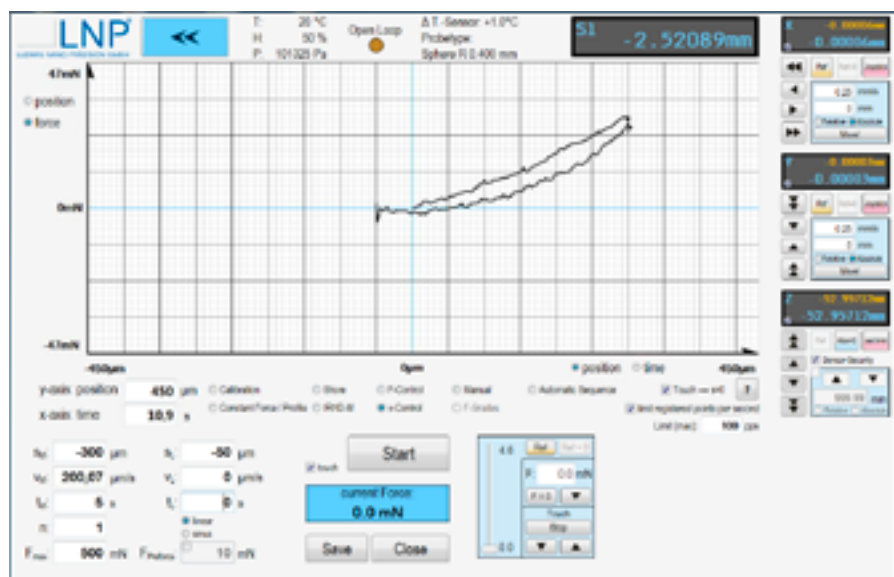Young's Modulus

Rheological Analysis

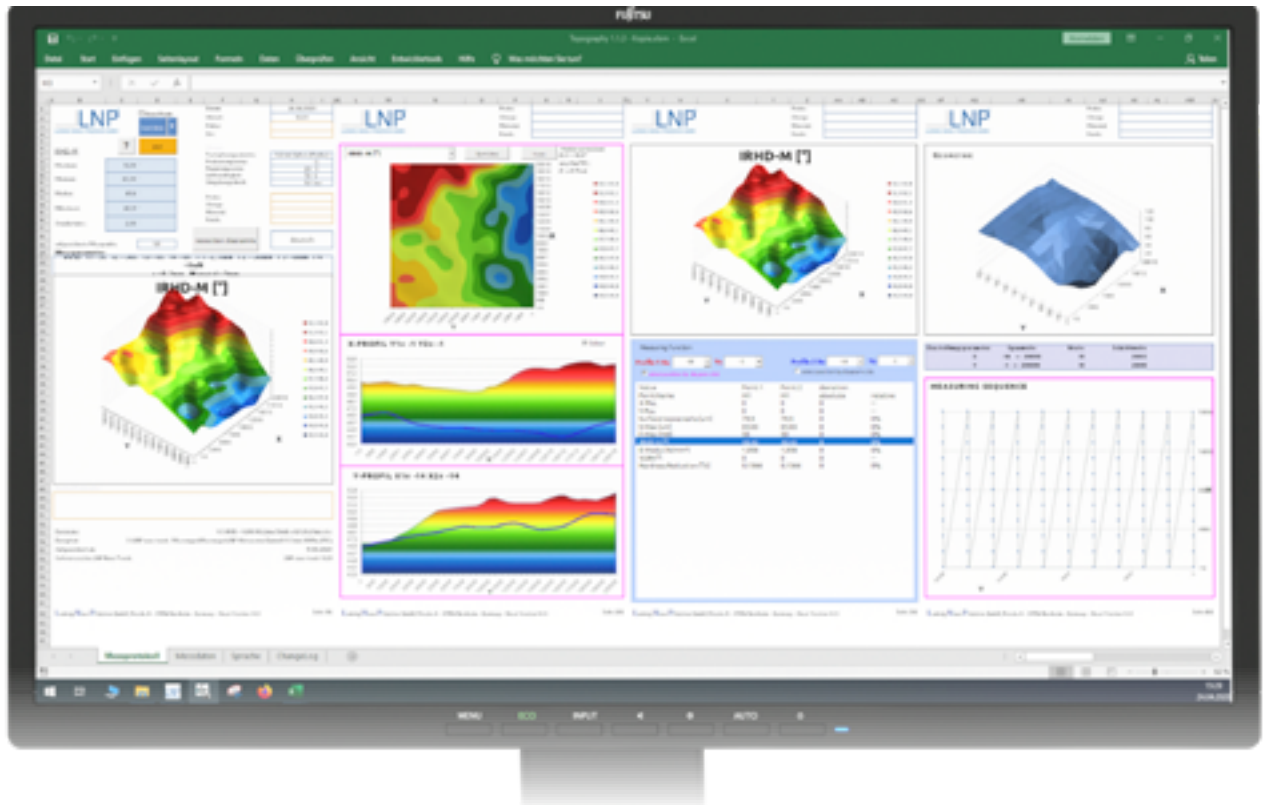Static

Dynamic

Tribology

Topography

A high-performance user interface

The program allows for an simple and uncomplicated measurement process. The measurement data are analysed with excel-based evaluation programs.

| Software function	Basic	Advanced
IRHD-M and modified IRHD-M	✓	✓
VLRH	✓	✓
Shore method	✓	✓
Project-oriented templates	✓	✓
2-point measurement	✓	✓
Force and displacement controlled	X	✓
Profile records	X	✓
Layer measurement	X	✓
Sinusoidal modulation	X	✓
Tribology measurement*	X	✓
Topography measurement**	X	✓

SOFTWARE

The software includes projectoriented input masks (production-related) and is able to perform graphic analyses like measurement tasks, regression determination and free-cutting. Free program sequences, multiple measurements in x-y- plane as well as stationary geometry- and property analyses are also possible.

Measurement and operating modes

Force (F control)

Velocity (v control)

Modulation F/v-control

Consant force / IRHD M/ VLRH
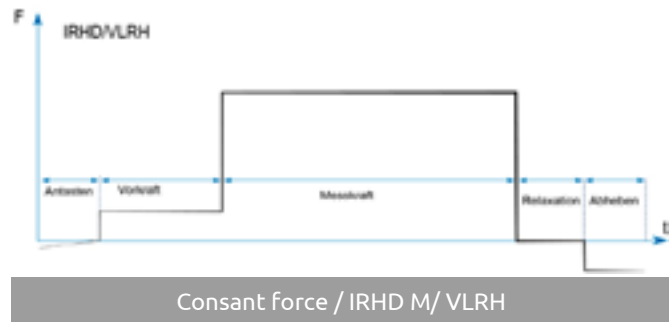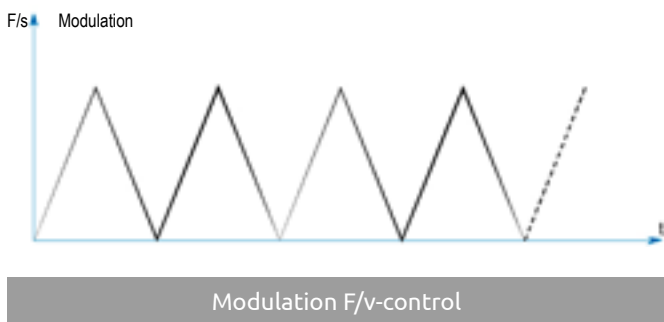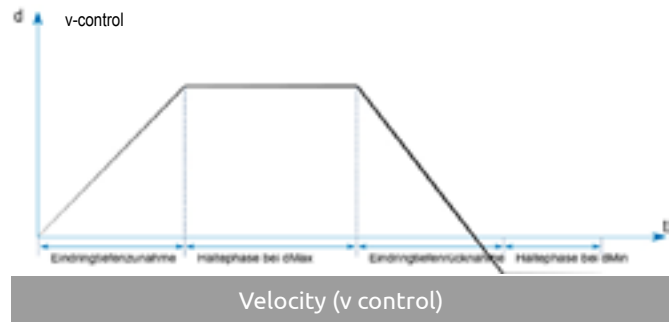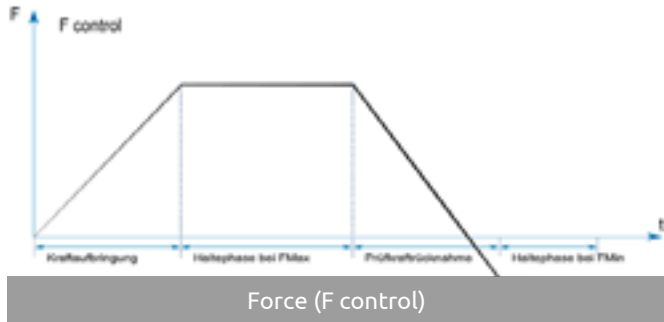
PARAMETER VARIATIONS:

F-control	v-control	Modulation F/v-control	IRHD-M/VLRH
Force-controlled procedure	Displacement controlled procedure	Min/max value freely adjustable	Up to 4 force levels possible
Measuring force and speed for loading and unloading phase freely selectable	Penetration depth and speed freely selectable	Size / duration of the loading phase freely selectable	Measuring time of individual force level variable
Position / duration of holding phase variable	Position / duration of holding phase variable	Sinusoidal modulation possible	Measurement force can be reduced (IRHD-M)
any number of repetitions	any number of repetitions	any number of repetitions	

HARDWARE UPDATE

The new LNP® DC cross table
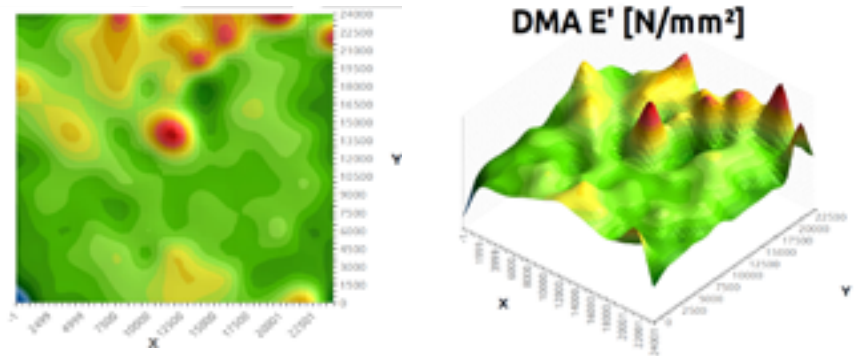
Example of a spatially resolved DMA on a plane 4x4 mm probe

Technical data: DC cross table

linear scale	0,1 µm
Repeatability of position	under 2 µm
V_{min}	1 mm/s
V_{max}	20 mm/s
Profile measurement	2D-topography possible

The DC cross table is characterized by its large travel of 80 mm x 80 mm. The surface stiffness of the cross table enables micro hardness topography with all measuring methods used in the device over the entire table surface. The flat recording and representation of the material parameters enables the Analysis of boundary layers as well as aging and mix-related inhomogeneities. The DC cross table in combination with the motorized Z-pillar enables you to use all common test methods along the complete value chain, from Standard test specimens up to the finished component.

Workplace configurations

Our LNP® measuring workstations are available with many options
for every conceivable application. If you are looking
for additional accessories for special measuring tasks, go to Page
19. There you will find high quality parts from O-ring holders to hea-
ting tables. Guaranteed made in Germany!

	LNP® 1	**LNP® 2**
1	LNP® nano touch	
2	Manual stand	Motorized Z-stand
3	-	Manual cross table 12,5 mm x 12,5 mm
4	Camera holder	
5	Camera	5 MP USB3-camera with telecentric lens and LED-ringlight
6	1-axis control	2-axis control
7	LNP® nano touch software basic	LNP® nano touch software advanced
8	-	-
9	Fujitsu workstation: Celius W580 power | intel® Core™ i7-9700 processor | 16 GB DDR Ram| 512 GB SSD|2x Display B24 -9 TS PRO with windows 10 64 bit & microsoft office small business	
10	-	-

You need an LNP®1 with a frame or your desired work station configuration is not here yet?
Contact us!
We would be happy to provide you with an individual solution.

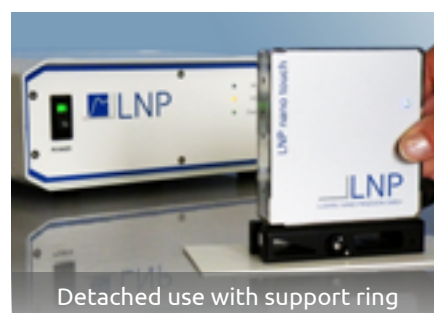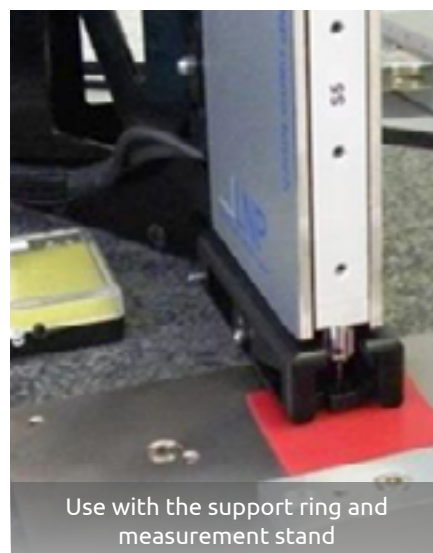| LNP® 3 DC	LNP® 3 DC + Halcyonics	LNP® 323
	LNP® nano touch	
Motorized Z-stand		Motorized x/y/z- axis. travels in; 300 mm × 300 mm × 250 mm
DC **cross table** 80 mm × 80 mm		-
	Camera holder with manual 4-axis control	
	5 MP USB3-camera with telecentric lens and LED-ringlight	
	4-axis control	
	LNP® nano touch software advanced	
	LNP® Frame	
	Fujitsu Workstation: Celius W580 Power| Intel® Core™ i7-9700 Prozessor|16 GB DDR Ram| 512 GB SSD|2x Display B24 -9 TS PRO mit Windows 10 64 Bit und Microsoft Office Small Business	
-	Accurion halcyonics_i4	-

STANDARD TEST METHODS

IRHD-M measurement

Measurement on cylindrical parts (car tyre)

Detached use with support ring

Use with the support ring and measurement stand

Measuring IRHD-M with the LNP® nano touch

The measurement of micro hardness is an important instrument for identifying the material properties of elastomers. Conventional testing devices usually need a sample cut out of bigger products or need a special test plate manufactured to measure correctly. With the LNP® nano touch it is possible for the first time to perform non-distructively micro IRHD hardness measurements on rubber-elastic materials directly during the manufacturing process, and this with a portable device!

IRHD-M hardness measurement with standard support ring

The basis of the standard support ring is a double rocker system that generates the standard contact pressure of the support ring on the sample and adjusts itself on the surface of a test plate at the same time The two skids contain the movement of the manual stand to the bottom. They enable the measurement directly on a large work piece.

STANDARD TEST METHODS

Modified IRHD-M measurement
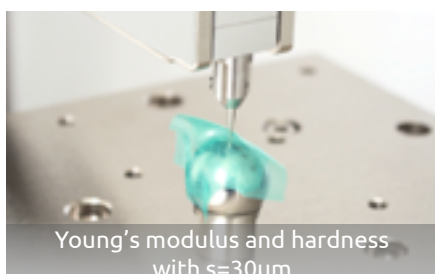
Young's modulus and hardness with s=30µm
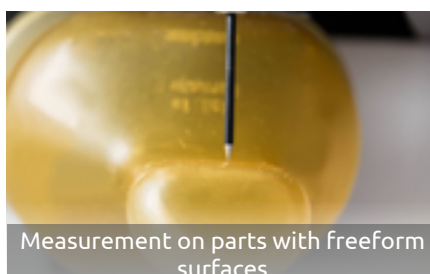
Measurement on parts with freeform surfaces
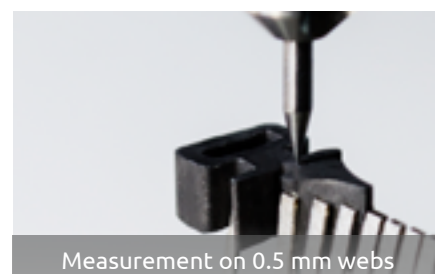
Measurement on 0.5 mm webs

Measurement on O-rings with 0.6 mm cord sizes


Measurement on polishing files

Application examples:

- Graduated geometry of the work piece
- Thin sample thicknesses
- Jagged and filigree geometry

By reducing the standard forces and / or a reduction of the radius geometry of the probe tip, it is possible to measure parts that could not be measured before. The results comply with those of the customary standard tests. The condition, however is a homogeneous material.

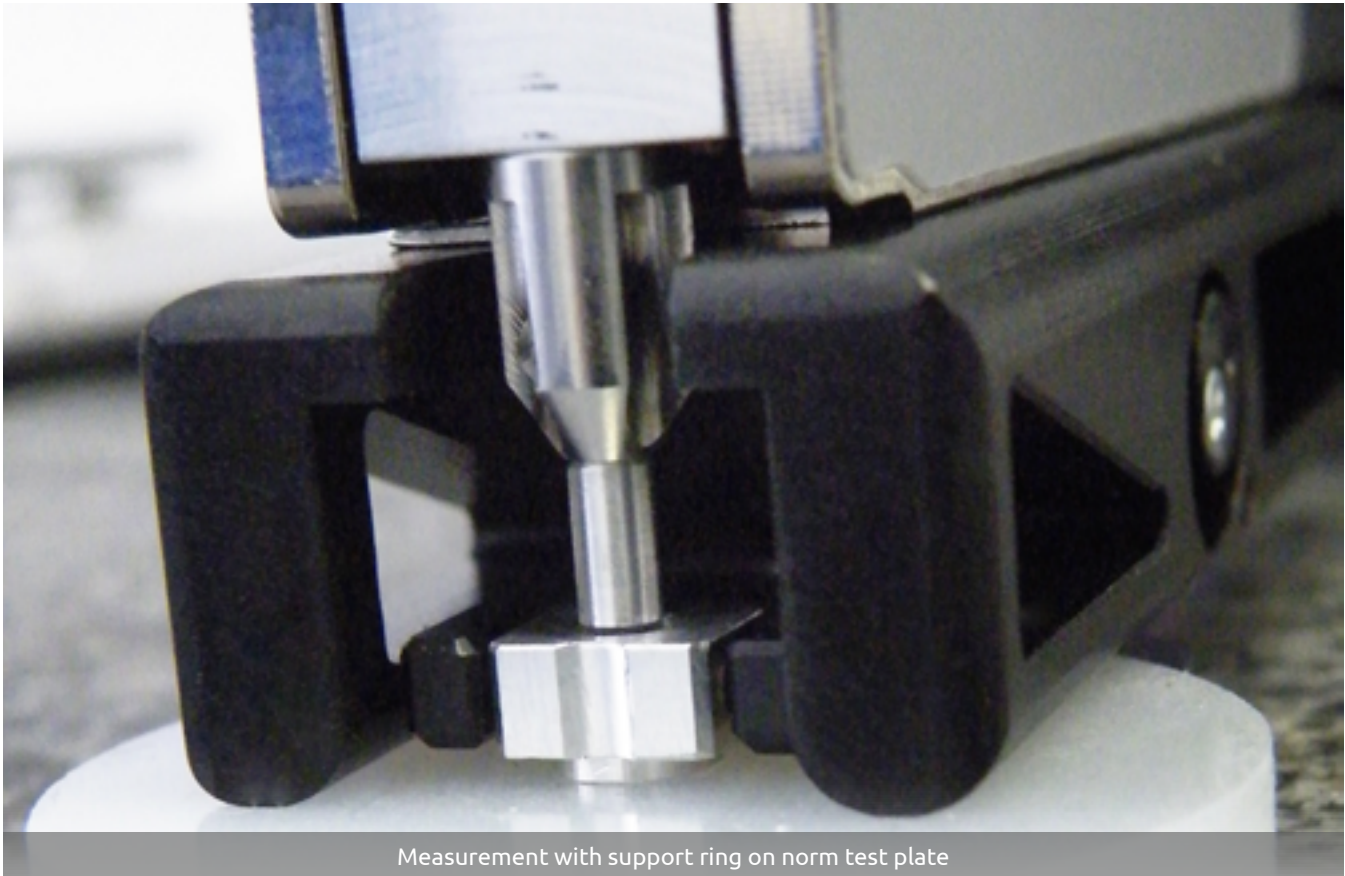STANDARD TEST METHODS

Shore measurement method
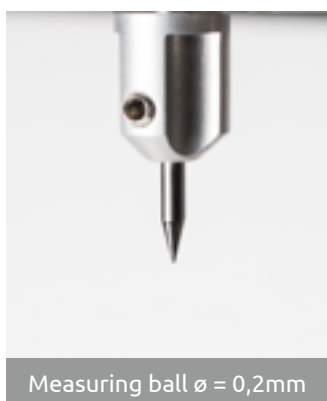
Measuring ball ø = 0,2mm
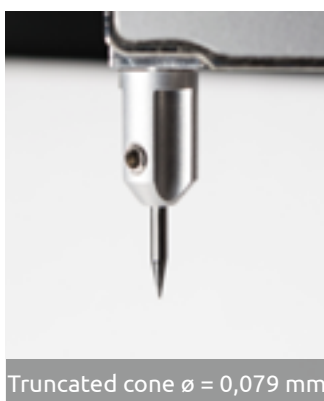
Truncated cone ø = 0,079 mm

Measuring ball ø = 0,238 mm
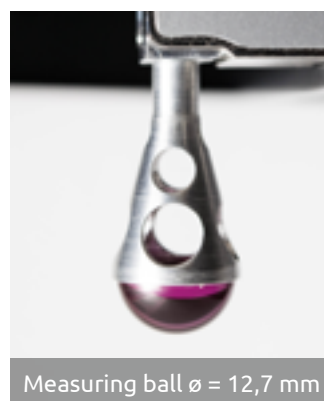
Measuring ball ø = 12,7 mm

One for all and all for one!

A simple switch of the probing tip and the choice of the measuring technique and everything from VLRH to IRHD and the different Shore methods can be used.

STANDARD TEST METHODS

VLRH measurement

Measurement with support ring on norm test plate

VLRH measurement in accordance with DIN ISO 27588

The transition from IRHD-M to the VLRH method takes place by switching the probing tip and the support ring. Furthermore the measuring force is reduced from 153.3 mN to 100 mN. With just a single measuring device, you can measure IRHD-M and VLRH in a previously unknown quality – on the measuring stand or directly on the workpiece.

ANALYSING METHODS

Microtribology (friction)

Tribology analysis

Roughness measurement on clock axle

Measurement on strongly curved surface
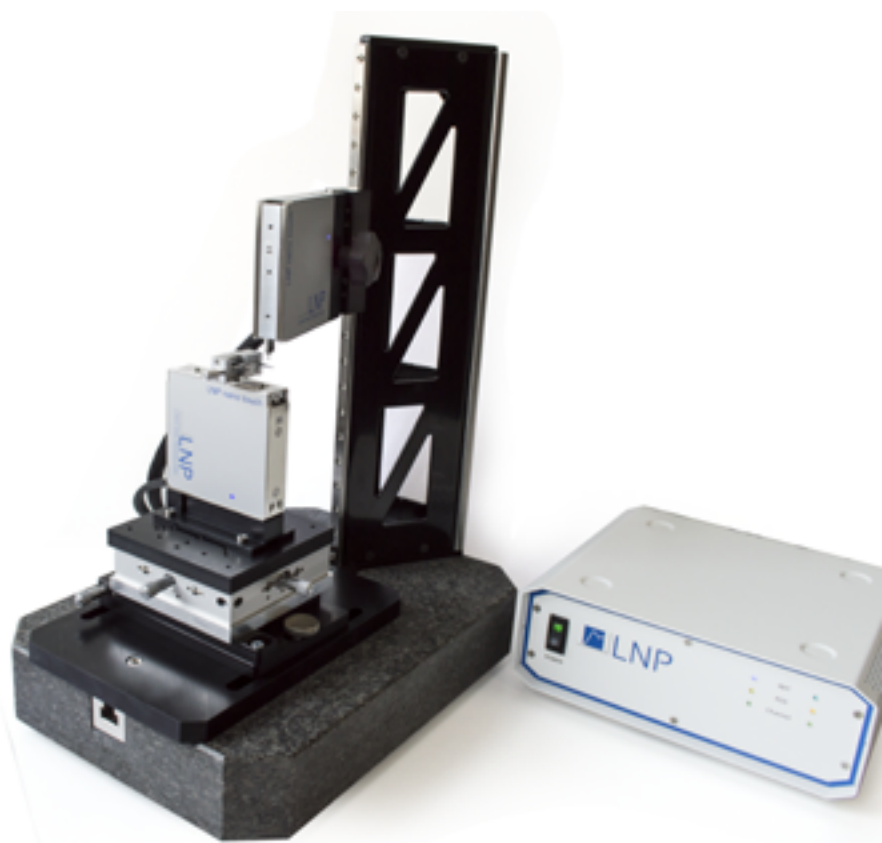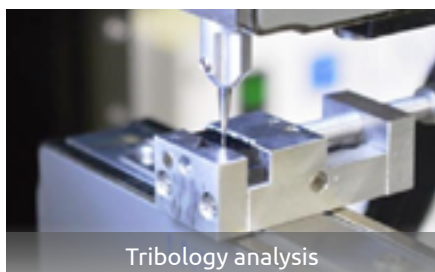
Possibilities of microtribology with the LNP® nano touch

Normal and friction force in one measurement

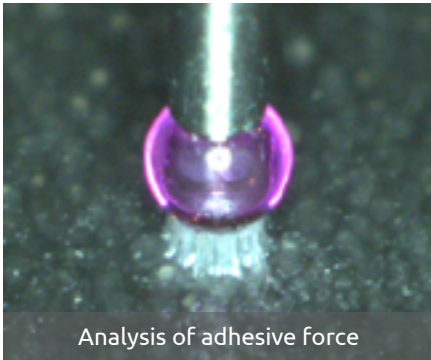Resolution of Z- and X-axis: 10nm

Lowest velocity: 0.2µm/s

Greatest velocity: 2000µm/s

Continuous registration possibility

Visualization of the sliding and static friction coefficient

ANALYSING METHODS

Adhesion

Analysis of adhesive force

Information about the adhesion measurement

Naturally the LNP® nano touch can not only measure the measurement force while penetrating the workpiece, but also while leaving it. If the probing geometry clings to the surface, the disengaging is registered and analysed with the force and displacement. The shape and material of the specimen can be varied freely. The only limitation is with its force (+1.4N to -0.7N).
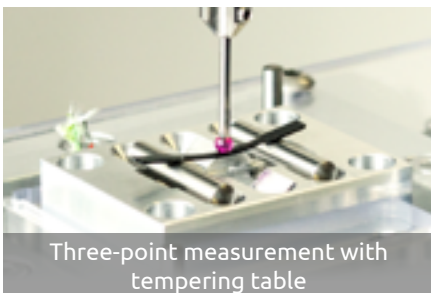
ANALYSING METHODS

Flexural modulus
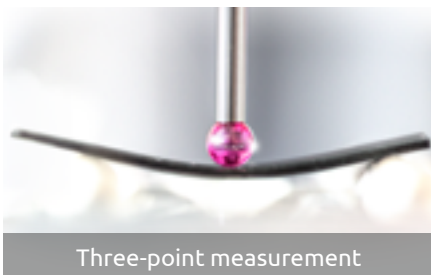
Three-point measurement

Two-point measurement

Three-point measurement with tempering table

A great advantage of the LNP® nano touch is that you only need one device for the three- and two-point measurements. You receive highly precise measurement values due to the electromagnetic force generation and the optical distance measurement system. You can not only measure the Young's modulus but also receive information about the penetration characteristics and the plastic deformation of the material. The Young's modulus can be determined on significantly smaller specimens than the norm allows. This is made possible by varying the measuring force. This saves material. Applicable for plastic materials and metal specimen which can also be measured temperature-dependent. The measured data can finally be saved in a meta-evaluation and analysed statistically. An export to Access- and Q-DAS- databases is possible as well.

Application:

Two-point measurement

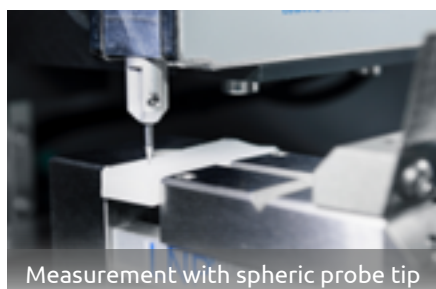Three-point measurement in accordance with ISO 178

Temperature-dependent three-point measurement from 5°C to 80°C

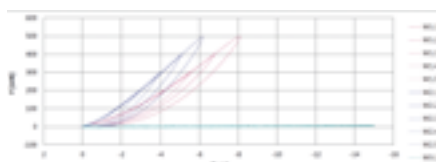Young's modulus, penetration characterisitcs, plastic deformation of the material

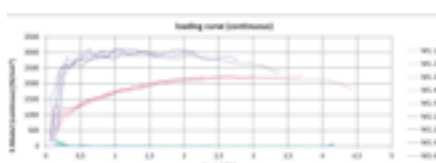Round or rectangular cross sections
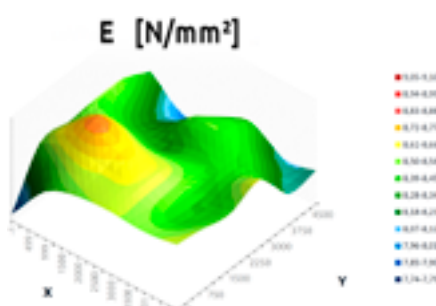
ANALYSING METHODS

Young's modulus by LNP®

Measurement with spheric probe tip
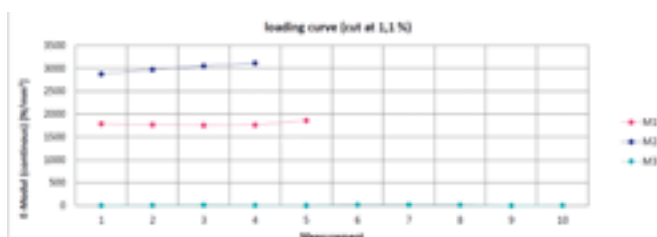

Multi-point measurment

Multi-point measurment with 2 plastics and one rubber

Spatially resolved DMA

Measurement with spherical surface probe tip

The determination method by LNP calculates the young's modulus at any point of load and unloading curve. Implementation of more accurate and faster measurements on delicate prefabricated parts.

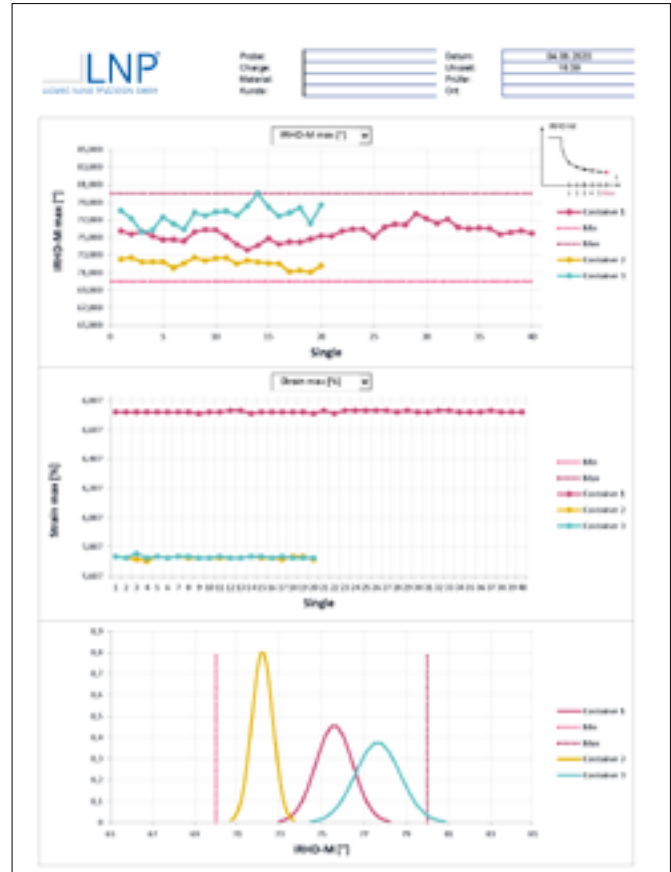Multi-point measurment diagrams

Processing characteristics:

Materials: Polymers, Elastomers

Multi-point measurements possible

Probe tip geometry: Spherical surface, Berkovich and Vickers

Evaluation protocols

For every application, numerous Excel-based evaluation protocols are available. This makes the evaluation software self-explanatory and 100% Microsoft-compatible. The evaluation and analysis of the data takes place via specially programmed macros. Thus, adjustments and individual configurations are easily possible.

Equipment

You can find even more useful equipment in our
current equipment catalog! Or on our homepage
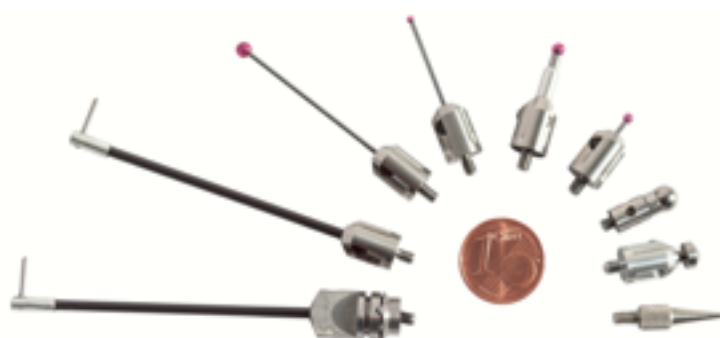
*LNP® nano touch measuring tips: hardness test specimen according to Berko-
vich and Vickers, ruby probing tips, diamond probing tips, carbide probing tips*
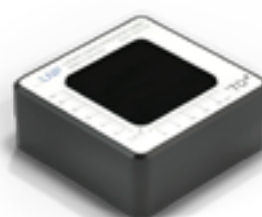
*LNP® hardness reference block
035170*

*O-ring holder
033502*

*Parallel vice
031077*

*sample holder even
034103*

*Rotary table with angle adjustment K
034842*

*Heating table with controller
035007*

More equipment

DC Cross table
034947

Motorized Piezo-cross table
033372

Cross table 12,5 mm x 12,5 mm
033394-01

Active vibration decoupling
(HALCYONICS NANO_i4)

LNP® Frame
034605

LNP® Joystick
035006

Other services for you:

- Individuelle training offers
- Service and maintenance services

Contact us!

June 2020- Subject to technical modifications

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