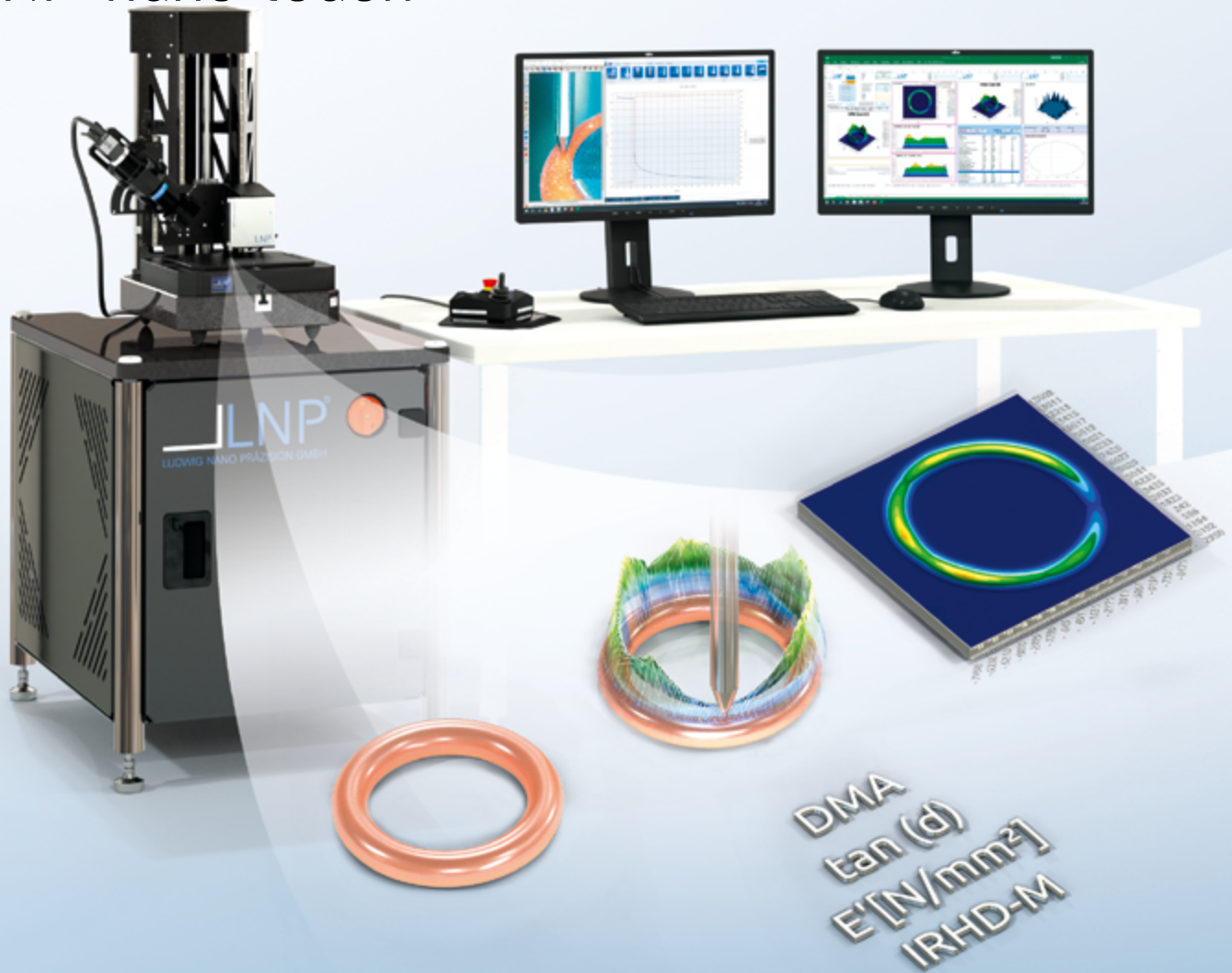


MICRO-INDENTER FOR THE ANALYSIS OF ELASTOMER PARAMETERS

LNP[®] nano touch



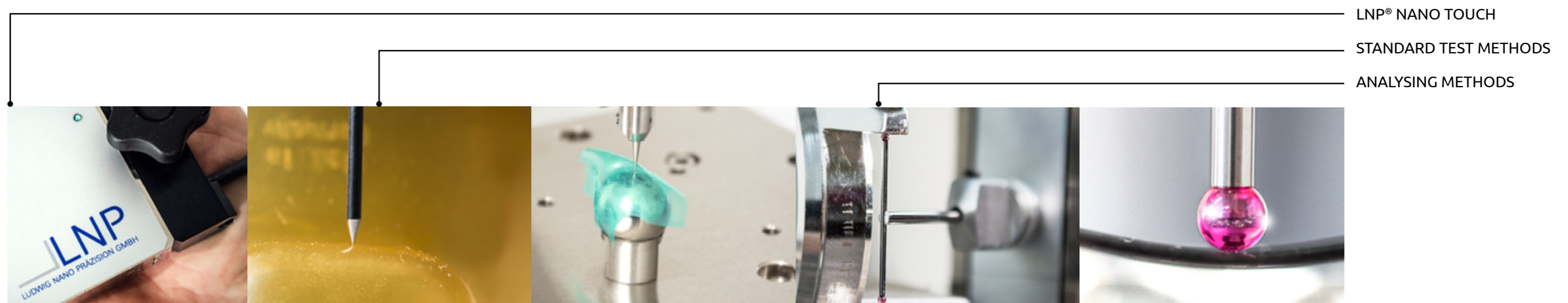
IRHD-M ISO 48
VLRH DIN ISO 27588
SHORE A/M ASTM 2240
SHORE 00 ASTM 2240

SHORE 000 ASTM 2240
SHORE A MICRO
FLEXULAR MODULUS DIN ISO 178
HARDNESS TOPOGRAPHY

ADHESION
YOUNG'S MODULUS BY LNP
MICROTRIBOLOGY
RHEOLOGY
SPATIALLY RESOLVED DMA

And further possible applications

Table of contents



LNP® nano touch

- 04** The LNP® nano touch
- 06** User interface
- 08** Measuring types and operating modes
- 09** The new LNP® linear axes
- 10** LNP®- Innovative measuring systems
- 11** Workplace configurations

Standard test methods

- 12** IRHD-M measurement
- 13** Modified IRHD-M measurement, Shore measurement
- 14** Temperature dependent, spatially resolved DMA-mikroindentation
- 15** Microtribology

Analysing methods

- 16** Adhesion, Flexural modulus
- 17** Young's Modulus by LNP®
- 18** Evaluation protocols
- 19** Equipment

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 or 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 parameters

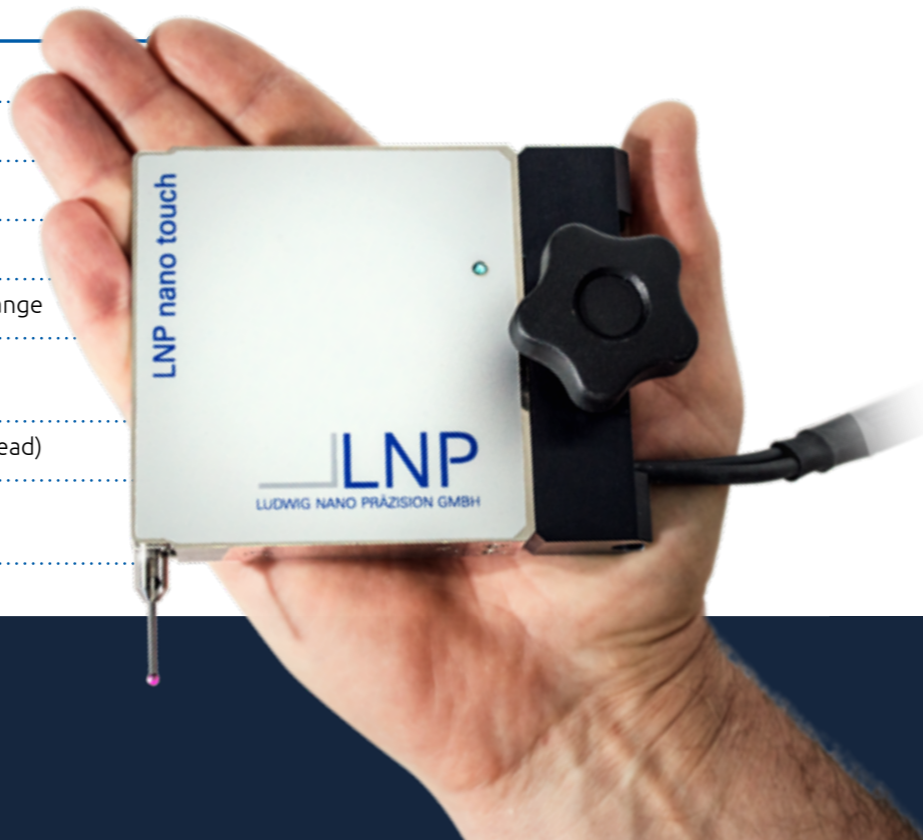
- Measurement of geometrical quantities up to 4 mm with nanometre resolution
- Measurements of material properties micro hardness, Young's modulus, damping ratio
- Measurement of very soft materials with probing force from 0.6 mN to 1.4 N
- Measurement of liquids, viscosity, surface tension
- Measurement of micro contours and tribology effects

Other advantages:

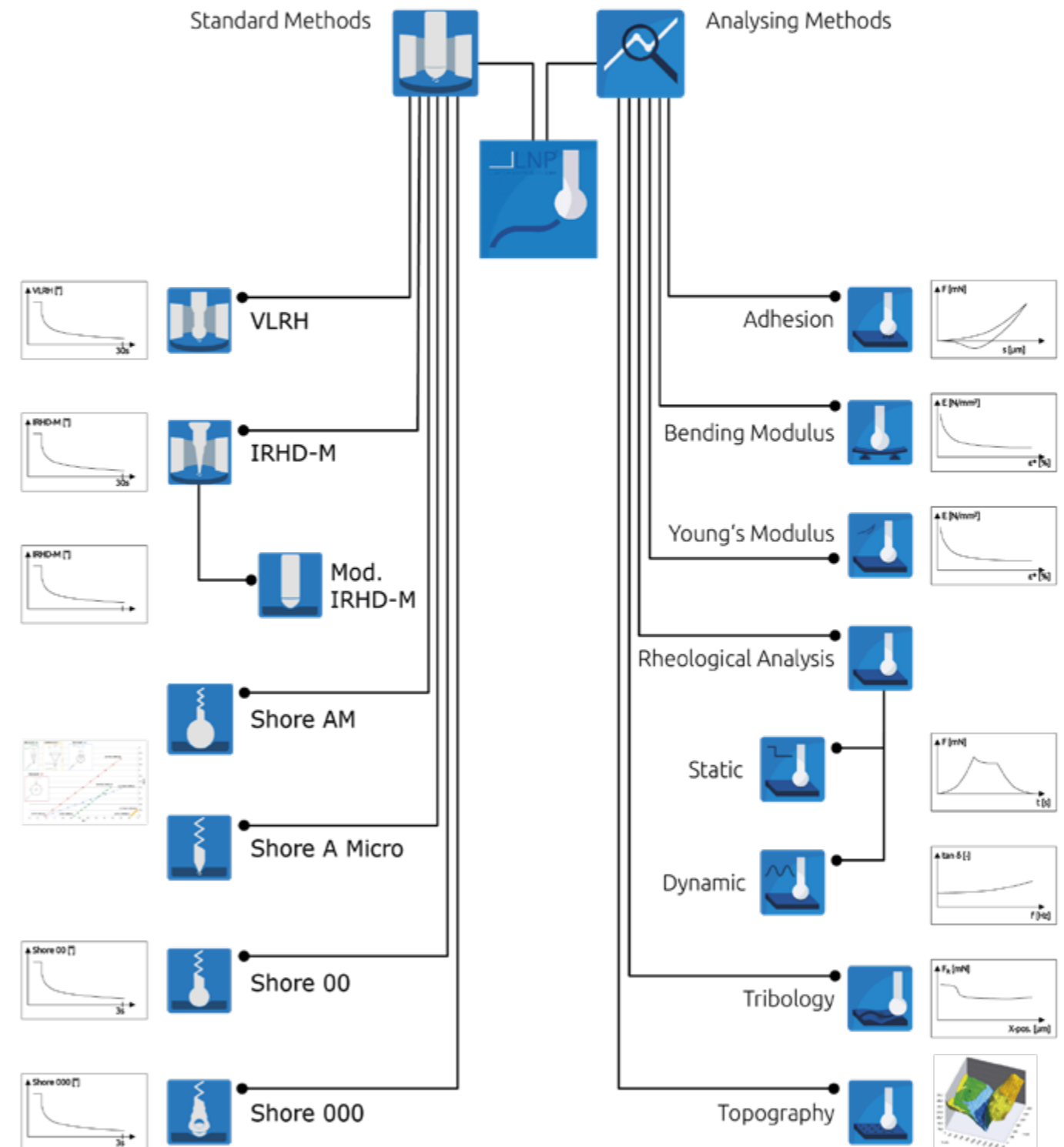
- Frictionless bearing
- Compactly built
- Optical distance measurement
- Variable measuring force, configurable measurement procedures
- Variable measuring force, configurable measurement procedures
- Constant measuring force, even when tip is moved
- Free positioning in 3D space
- Fully automated probing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

Technical data

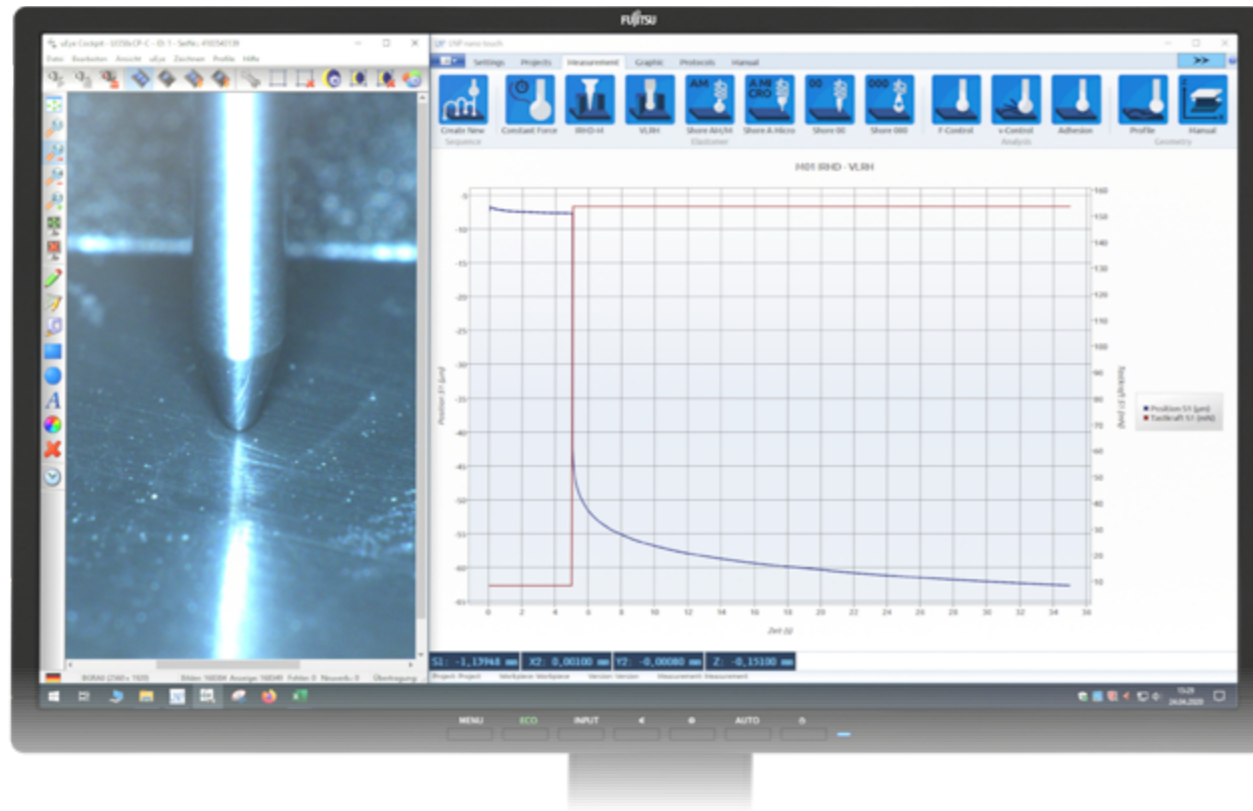
Position sensor	optical incremental
Range	4 mm
Resolution	10 nm standard
Linearity: way	< 200 nm to measuring range
Linearity: force	0...1400 mN < 0,3% to measuring range
Generating of measuring forces	electro-mechanically
Measuring force	0,6 mN...1,4 mN or 10N (with new head)
Measurement force resolution	0,6 mN (600 µN)



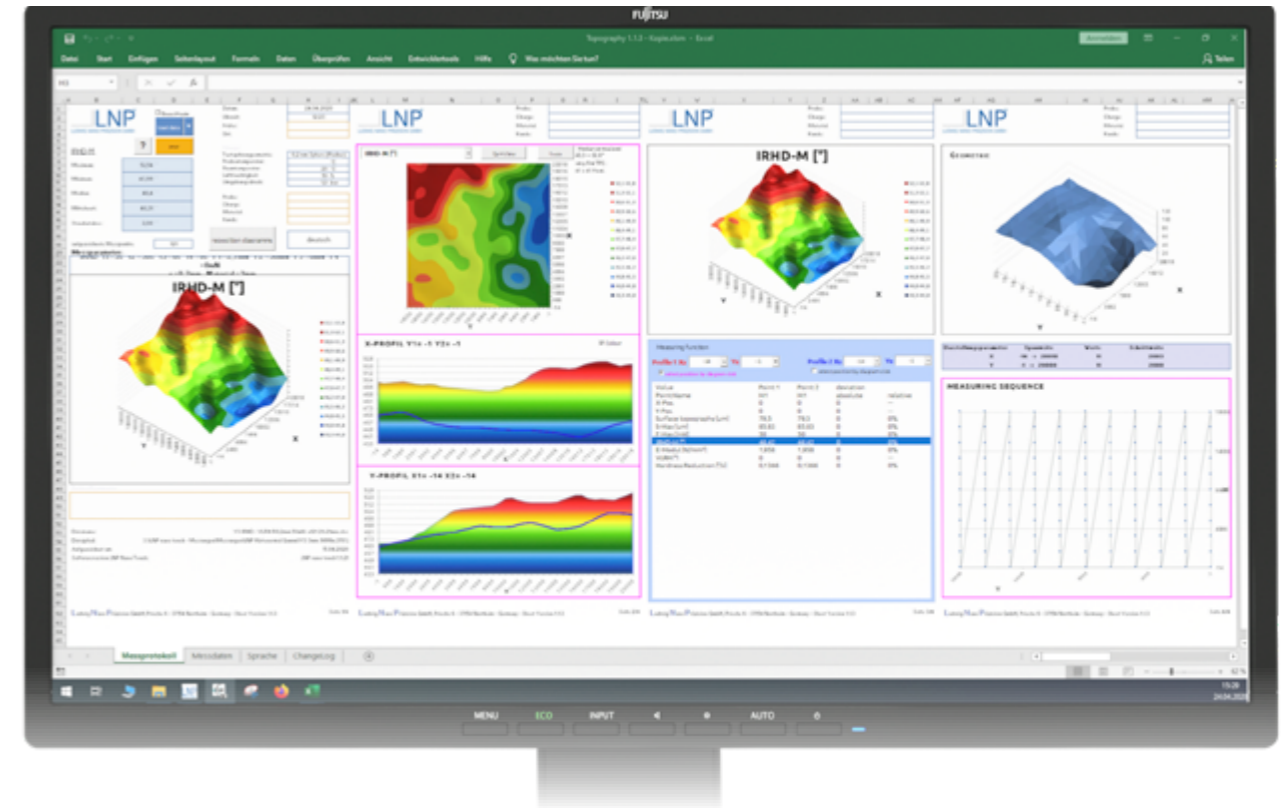
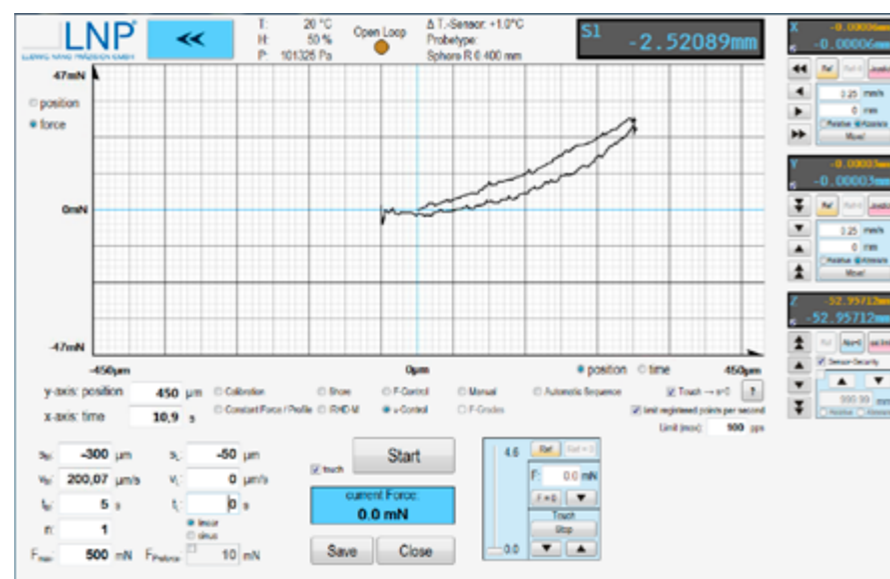
LNP® testing methods



A high-performance user interface



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

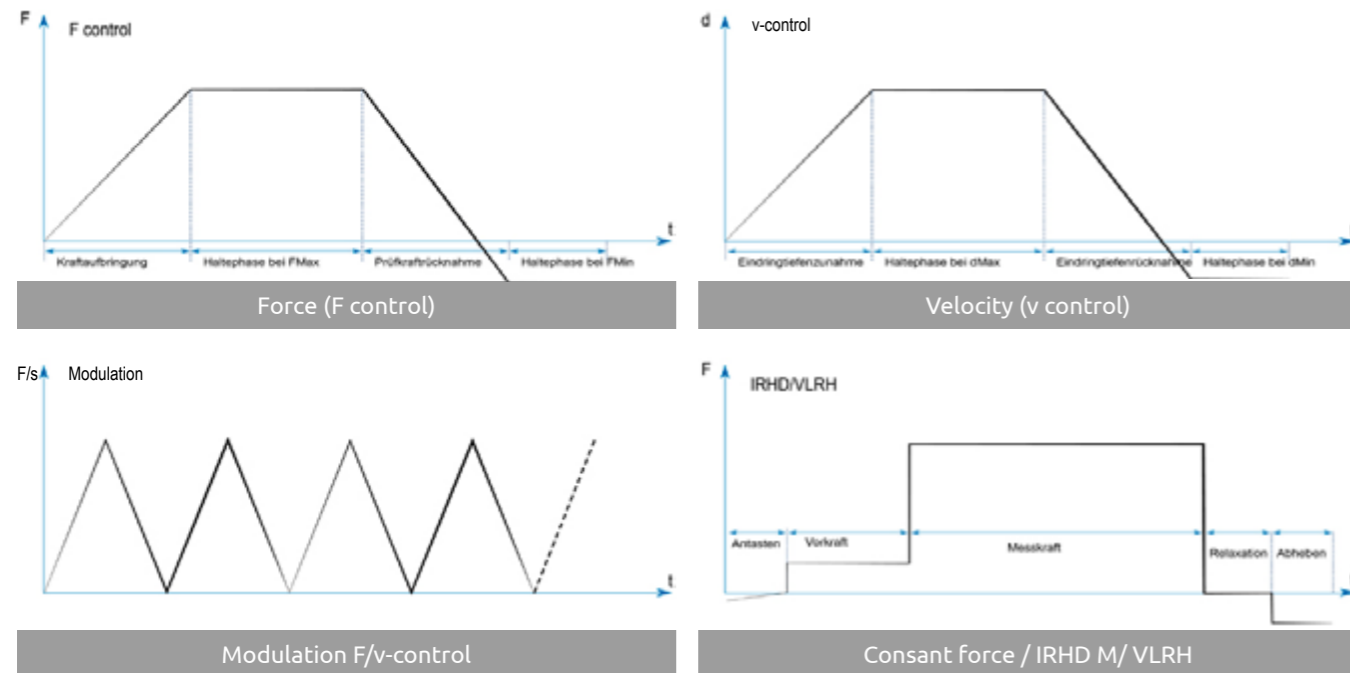


Software function	Basic	Advanced
IRHD-M and modified IRHD-M	✓	✓
VLRH	✓	✓
Shore method	✓	✓
Project-oriented templates	✓	✓
2-point measurement	✓	✓
Force and displacement controlled	✗	✓
Profile records	✗	✓
Layer measurement	✗	✓
Sinusoidal modulation	✗	✓
Tribology measurement*	✗	✓
Topography measurement**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

SOFTWARE

The software includes project-oriented 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

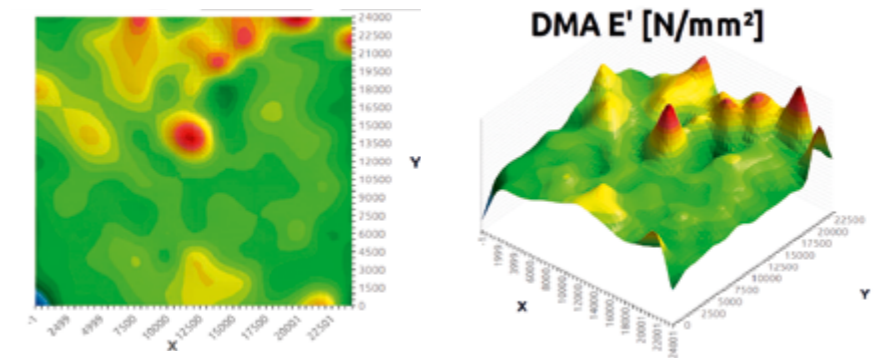


PARAMETER VARIATIONS:

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	

NEW SOLUTIONS FOR A COMPLETE MATERIAL TOPOGRAPHY

The new LNP[®] linear axes



Spatially resolved DMA diagram from an seemingly plane 4mm x 4 mm sample



The linear axis X can be used individually or in combination with a linear axis Y or rotary table

Technical Data: LNP[®] Linear axis X/Y

Linear scale / Drehgeber	0,1 µm
Repeatability of position	under 2 µm
V _{min}	1 mm/s
V _{max}	20 mm/s
Profile measurement	2D-topography possible
Travel in x and y	80 mm x 80 mm

The linear axes X or Y are characterized by their large travel of 80 mm x 80 mm. The surface stiffness of the linear axes 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 LNP[®] linear axes X and Y 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.

LNP®-Innovative measuring systems

LNP® measuring systems, based on the LNP® nano touch, are the right choice for indephth material analysis and for problems that require different measurement methods. There are many of our measuring workstations Configuration options for every conceivable application. They can also be automated at will. Your measurements and studies will run as if by themselves!

Choose a Z-stand and an LNP® nano touch Sensor
Depending on your preference, choose a motorized or manual Z-stand. With the sensor, you have the choice between maximum force or maximum force resolution.

Choose a linear axis
Individual or combined Axes, manual or motorized: Cross tables for X and Y axes, rotary tables and angle adjustments.

Special equipment
for additional accessories and more comfort, go to Page 19. There you will find high quality parts from O-ring holders to heating tables.

Our measuring systems contain a high-precision granite plate, a high-quality camera system as well as a workstation including stable and versatile testing software.



Workplace configurations

You need an LNP® 2 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® 2	LNP® 3 DC	LNP® 323
1	LNP® nano touch		
2	Motorische Z-Säule	Motorized Z-stand	Motorized x/y/z- axis. travels in; 300 mm × 300 mm × 250 mm
3	Manual cross table 12,5 mm x 12,5 mm	LNP® DC cross table 80 mm × 80 mm	Integrated motorized linear axes
4	Camera holder	Camera holder with manual 4-axis control	Camera holder with manual 4-axis control
5	5 MP USB3-camera with telecentric lens and LED-ringlight		
6	2-axis control	4-axis control	4-axis control
7	LNP® nano touch software Advanced		
8	-	LNP® Frame	LNP® engine carcass
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		

STANDARD TEST METHODS

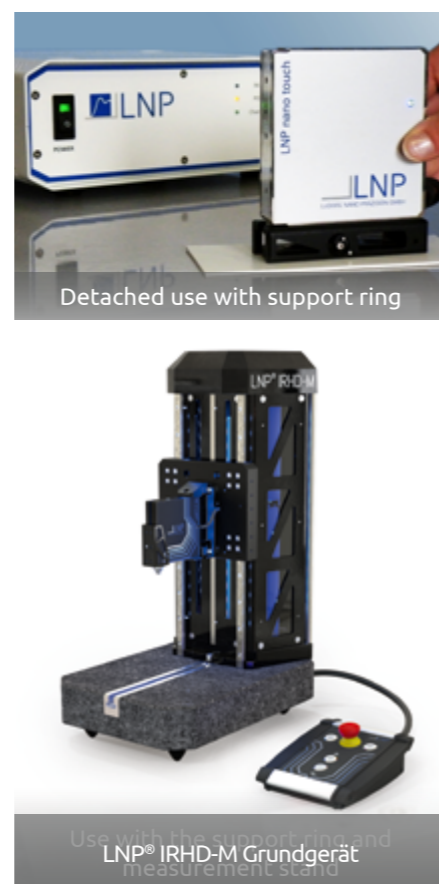
IRHD-M measurement



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-destructively micro IRHD hardness measurements on rubber-elastic materials directly during the manufacturing process or on the finished component. With a portable device!

For common standard testing in the laboratory or close to production we are offering an independent high-precision measuring device. Find out more about LNP® IRHD-M!

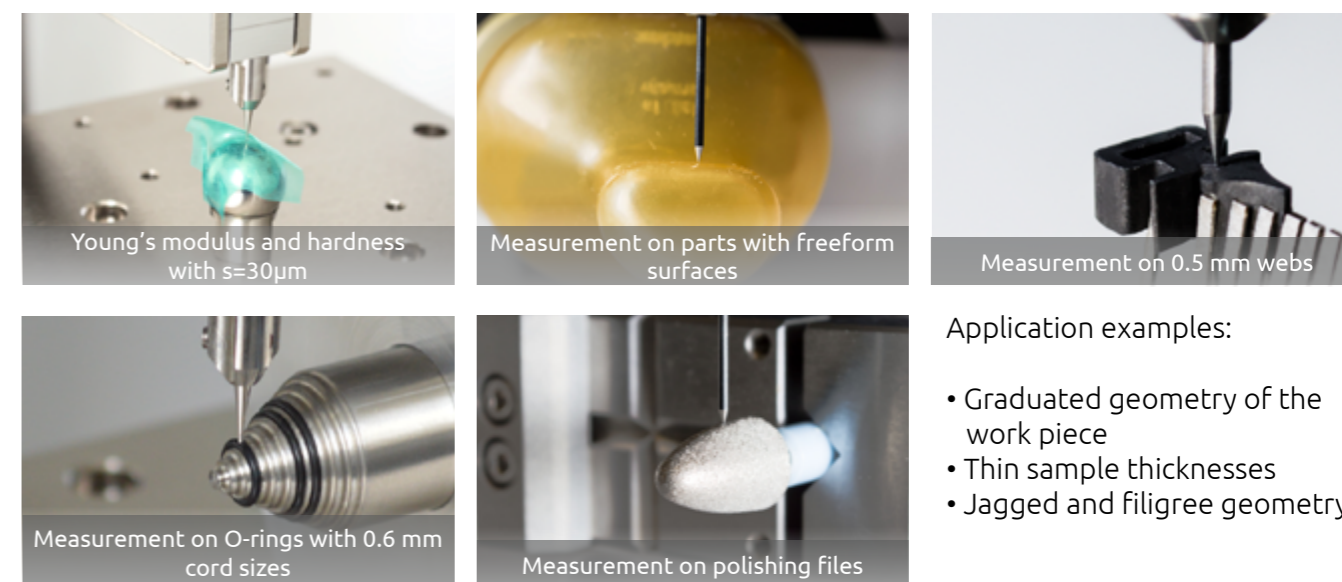


IRHD-M hardness measurement with standard support ring

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

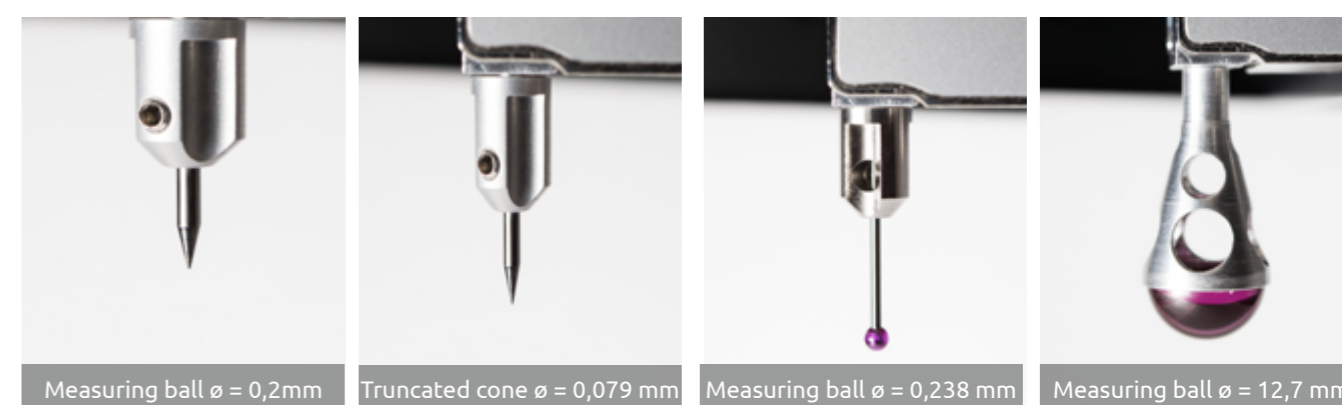
Modified IRHD-M measurement



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

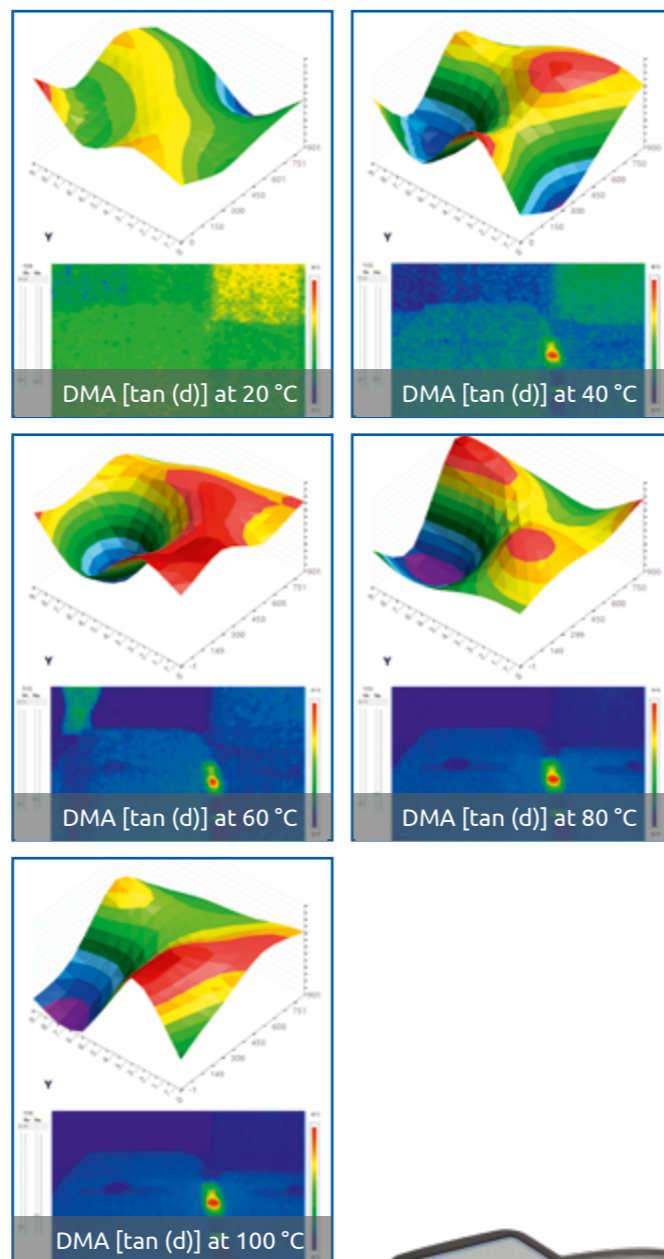
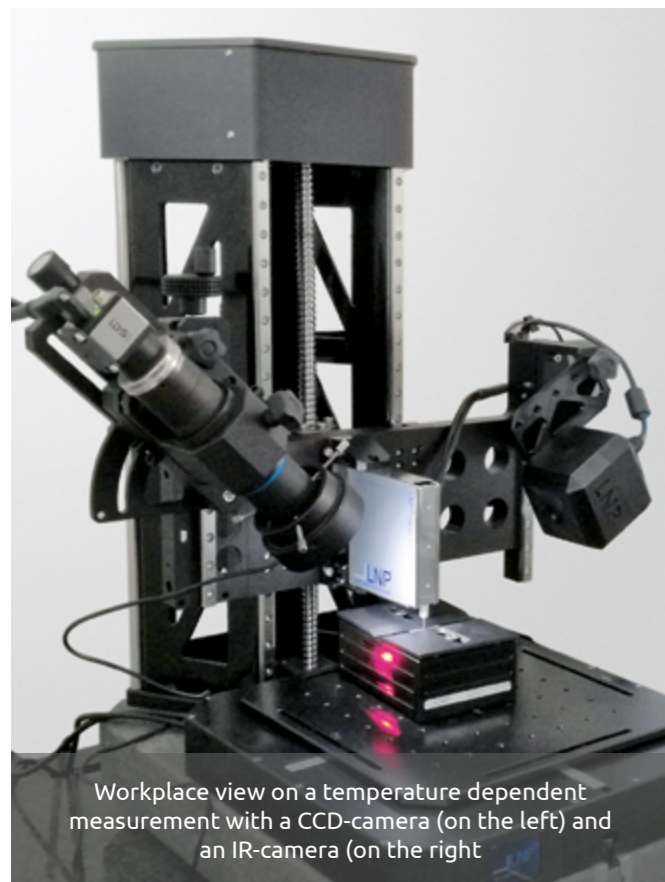


One for all and all for one!

Through a simple switch of the probing tip and the choice of the measuring technique, every elastomer and plastic workpiece cannot only be measured with IRHD- Methods but with all the different shore methods depicted above.

ANALYSING METHODS

Temperature dependent, spatially resolved DMA-mikroindentation



Fast working with LNP® heating table and the IR -Kamera

The heating table unit is independently usable and comes with its own software. Therefore it is easy to calibrate and to set up any heating curve control parameters possible. The measurement results can also be saved in excel files. Individual ramps and grade sequences are possible on request. In combination with the IR-Camera, temperature dependent measurements are monitored precisely. With the help of the hotspot indication and the black and white display, it is easy to keep a cool head with every measurement.

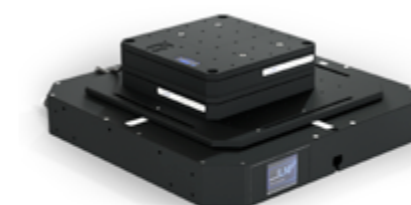


ANALYSING METHODS

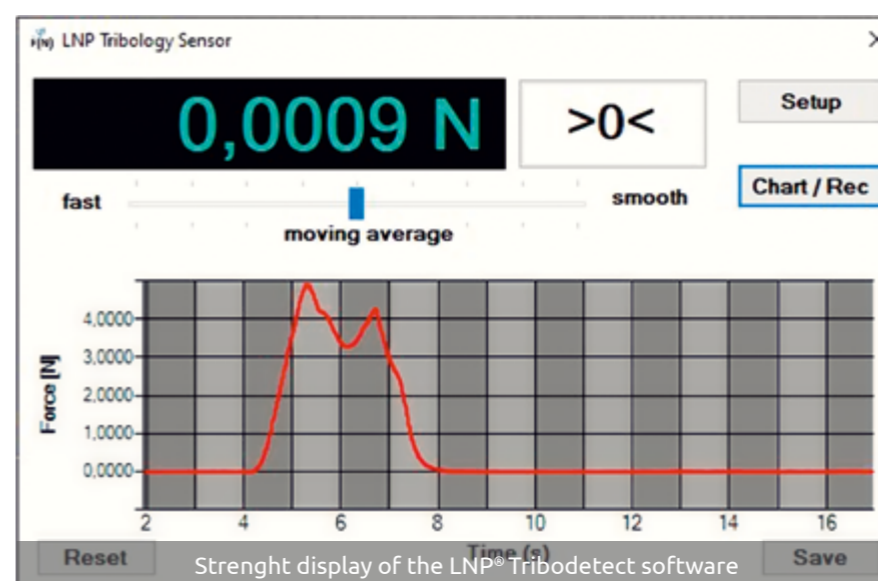
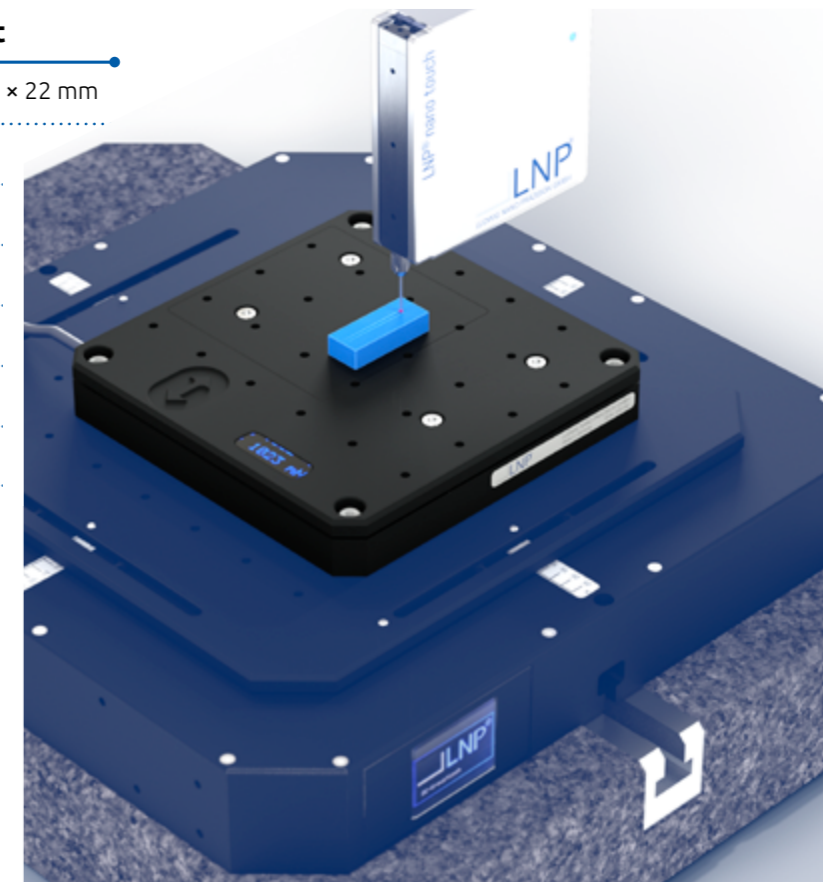
Microtribology (friction)

Technische Daten: LNP® Tribodetector

Dimensions H x B x T	145 mm x 145 mm x 22 mm
Weight	1kg
Force range	+/-100N
Force resolution	ca. 1mN
Travels	+/-2µm
Supply voltage	5V / 500 mA (USB)
Measurement frequency	>75 Hz



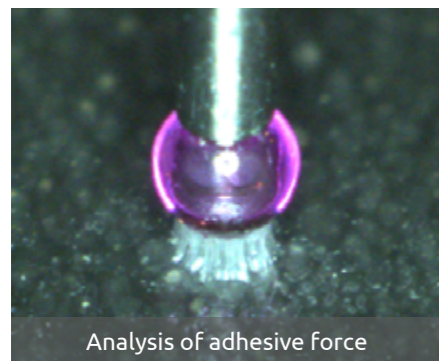
F_{Ry} / F_{Rx} : Use of a second Sensor with LNP® Crosstable DC



The LNP® Tribodetector was built with an integrated electronic measurement module, display with strength indicator included. This equipment can also be used without a PC. Within the spirit of the modular principle, it is compatible with additional force sensors or a cross table if desired.

ANALYSING METHODS

Adhesion



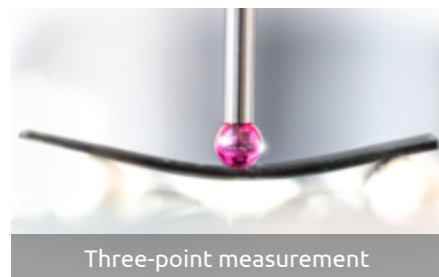
Analysis of adhesive force

Information about the adhesion measurement

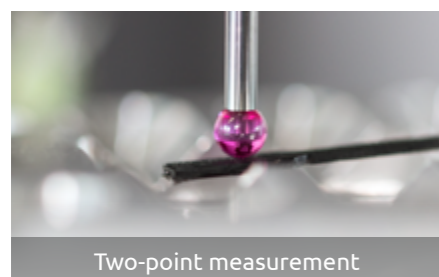
Naturally the LNP® nano touch can not only measure the measurement force while penetrating the workpiece, but also while leaving it. If the probing geometry clings to the surface, the disengaging is registered and analysed with the force and displacement. The shape and material of the specimen can be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

ANALYSING METHODS

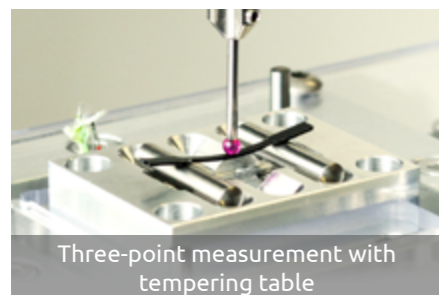
Flexural modulus



Three-point measurement



Two-point measurement



Three-point measurement with tempering table

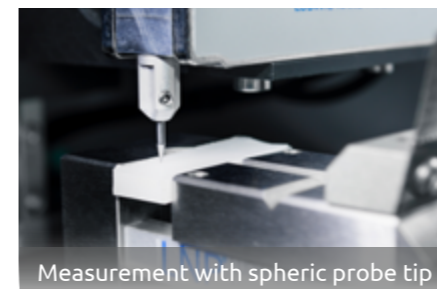
A great advantage of the LNP® nano touch is that you only need one device for the three- and two-point measurements. You receive highly precise measurement values due to the electromagnetic force generation and the optical distance measurement system. You can not only measure the Young's modulus but 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:

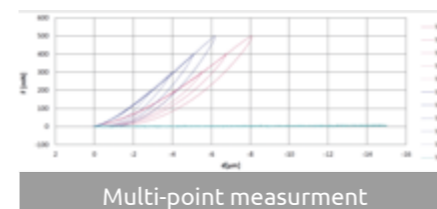
- Two-point measurement
- Three-point measurement in accordance with ISO 178
- Temperature-dependent three-point measurement from 5°C to 80°C
- Young's modulus, penetration characteristics, plastic deformation of the material
- Round or rectangular cross sections

ANALYSING METHODS

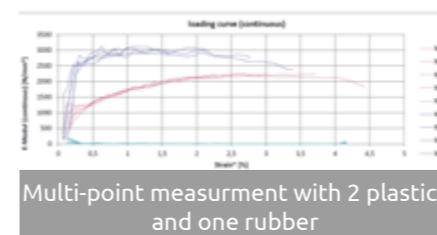
Young's modulus by LNP®



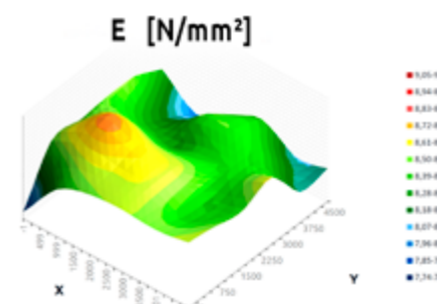
Measurement with spheric probe tip



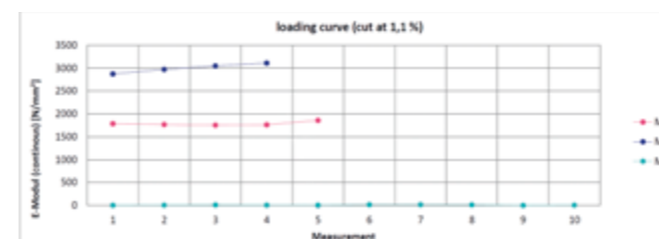
Multi-point measurement



Multi-point measurement with 2 plastics and one rubber



Spatially resolved DMA



Multi-point measurement diagrams



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.

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 Berkovich and Vickers, ruby probing tips, diamond probing tips, carbide probing tips

LNP[®] hardness reference block
035170



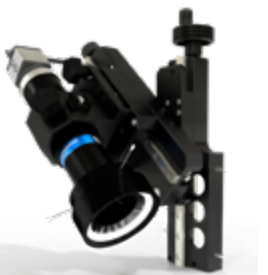
LNP® O-ring holder
033502



LNP® Parallel vice
031077



LNP® sample holder even
034103



5MP USB3-camera with telecentric lens and LED light



LNP® Rotary table with LNP® angle adjustment K
034842

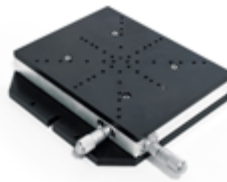


LNP® Heating table with controller
035007

More equipment



*LNP® DC Cross table
034947*



*LNP® Cross table 12,5 mm x 12,5 mm
033394-01*



*LNP® Linearaxis type X
035541*



*LNP® Linearaxis type X & Y
035542*



*Active vibration decoupling
(HALCYONICS NANO_i4)*



*LNP® Frame
034605*



*LNP® Joystick
035006*

Other services for you:

- Individual training offers
- Service and maintenance

Contact us!

May 2022- Subject to technical modifications

