Yield Strength
Tensile Strength
Ductility
from Indentation

+ optical 3D Measurement

i3D® WLI
i3D® WLI PRO

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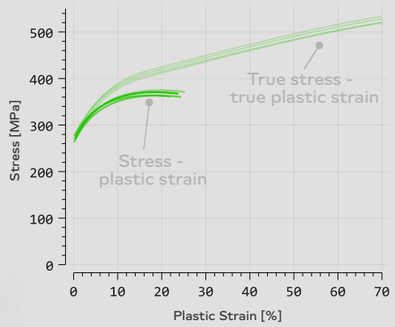
Results

- Yield strength (YS)
- Tensile strength (UTS)
- Ductility

1st Standard - DIN SPEC 4864 (ASTM and DIN ISO in Progress)



i3D® WLI – Indentation Testing Device

Precision testing device for material characterization based on DIN SPEC 4864

i3D® WLI PRO

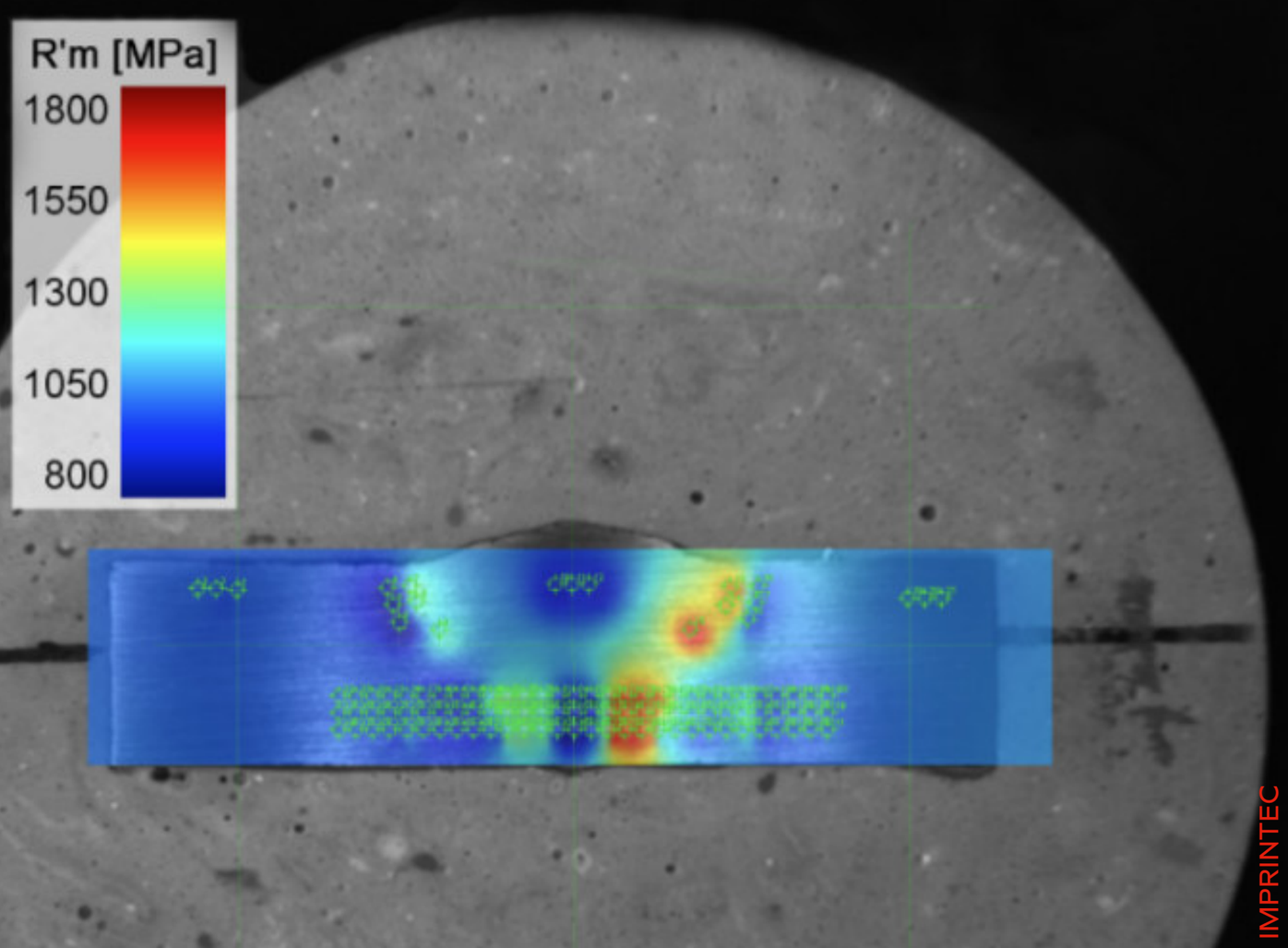
Advanced model with full automation and extended optical system for fully automatic testing of multi samples with grids, lines or single indents based on DIN SPEC 4864.

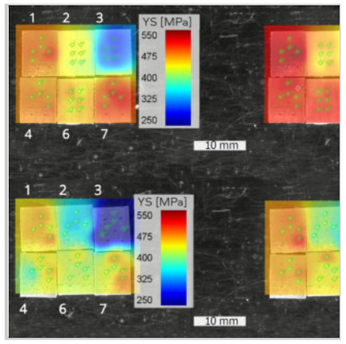
Dimensions:	555 × 381 × 531 mm	555 × 381 × 531 mm
Weight:	55 kg	**+ 65 kg**
Test Loads:	5, 10, 15, 30, 60 kgf	5, 10, 15, 30, 60 kgf
Hardware:	White Light Interferometer (3D Measurements)	White Light Interferometer (3D Measurements)
Construction:	Benchtop unit, max. specimen weight: 40 kg	**- Benchtop unit, max. specimen weight: 7 kg**
Control System:	Integrated motorized axis (manual positioning)	**+ Fully motorized XYZ-stage for automated positioning (manual positioning of Z-stage)**
Camera:	Overview camera with approx. 5 x 5 mm field of view	**+ Dedicated overview camera with approx. 7 × 5 cm field of view**
Interface:	Ethernet, USB 3.2	Ethernet, USB 3.2
Power Supply:	230 V, 16 A, 50 Hz (Schuko plug)	230 V, 16 A, 50 Hz (Schuko plug)
Standards:	DIN SPEC 4864 | Patent DE 10 2011 115 519	DIN SPEC 4864 | Patent DE 10 2011 115 519
Test Space Dimensions:	185 mm specimen height, 120 mm throat depth	185 mm specimen height, 120 mm throat depth
XY-Stage Positioning Accuracy:	Manually	**< 4 µm fully automatic**

Insight into Application - Mapping of Local Strength Properties

The i3D WLI system enables the precise determination of local mechanical properties based on individual indentation tests, even on miniature or inhomogeneous samples. By evaluating hardness impressions using optical 3D measurement and automated analysis, the device generates spatially resolved strength maps (e.g., yield strength (YS), tensile strength (UTS), plastic stress-strain curve).

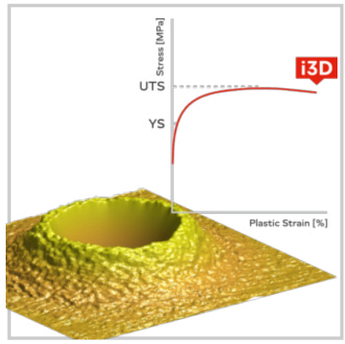
This allows clear visualization of microstructural differences, weld zones, heat-affected areas or treatment gradients—without the need for large test specimens. The example shows tensile strength mapping (UTS) across a weld zone using line and area mapping from single indentations. The result is a reliable, spatially detailed mechanical characterization with high resolution and reproducibility.





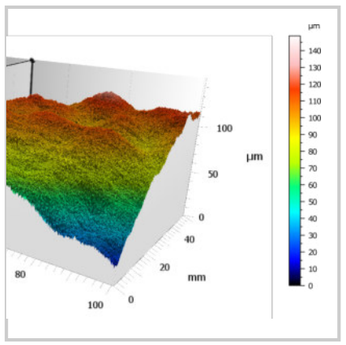
Automated Testing

Fully automated test cycles with 400+ indentations and ~72 s per point. Overnight batch testing possible.



Stress-Strain Curve Analysis

Determine tensile strength, yield strength and flow curves from individual indentations.

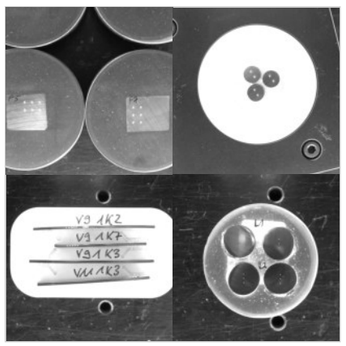


3D Topography (Optional)

White light interferometry with < 100 nm vertical resolution and ~1.5–5 µm lateral precision.

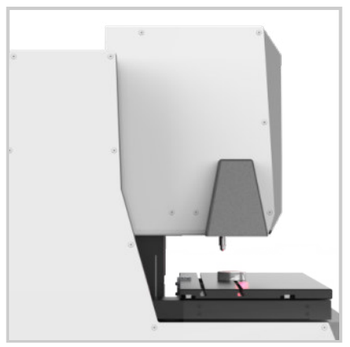
Trainable Algorithms

Import user test data to calibrate or optimize calculation models and material correlations.



Expanded Camera Field

Optional upgrade to overview image of 10 × 12 cm for larger sample positioning.



Z-Axis Automation

Motorized Z-head with automatic focus detection for precise height adjustments.

i3D®

Advanced Material Testing with Cutting-Edge Technology

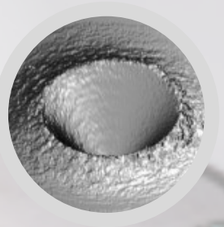
Our technology allows for the extraction of full mechanical material properties from a single indentation impression using precise 3D surface measurements. Through inverse FEM-based modeling of the plastic deformation field, we accurately reconstruct flow curves, yield strength and tensile strength values.

The method is **standardized under DIN SPEC 4864.**
Further international standardization is underway:
ASTM (expected 2026) and ISO/DIN (expected 2028).

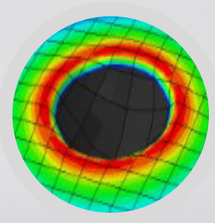
This unique approach is protected under German **Patent DE 10 2011 115 519.**

Indentation

3D-measurement of pile-up

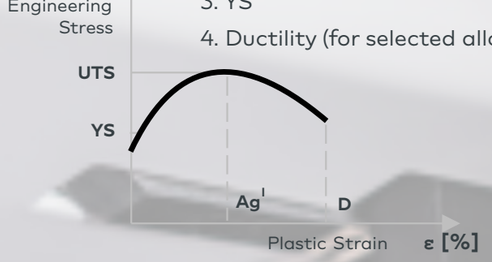


FE-simulation-databank and iterative solution



Results:

1. Plastic stress-strain curve
2. UTS
3. YS
4. Ductility (for selected alloys)



Contact

Application
Peter Zok
+49 234 970414 02
zok@imprintec.de

Imprintec GmbH
Konrad-Zuse Str.18
44801 Bochum
+49 234 970414 04
info@imprintec.de

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