ToolScan / ToolScan R360

System variants:

ToolScan System is a complex solution for 3D scanning in high resolution, examination, and comparison of all kinds of toolmarks including:
- Toolmarks on cylinder locks, cuts in wires, cuts in rubber, imprints of plier jaws
- Test impressions in lead, castings of toolmarks
- Various other objects of up to 10 x 10 cm size (direct scanning of jaws and blades of tools, signatures - print intersections, any other object with non-translucent approximately flat surface)

➢ ToolScan includes large flat table only and set of accessories for mounting various objects (including magnetic table, vice, tilting mounts, cylindrical lock holder). Does not have ability to scan surface of cylindrical objects.

ToolScan R360 version has all capabilities of ToolScan for 3D scanning in high resolution, examination, and comparison of all kinds of toolmarks, but, furthermore, enables to scan surface cylindrical or deformed objects. It supports:
- Toolmarks on cylinder locks, cuts in wires, cuts in rubber, imprints of plier jaws
- Test impressions in lead, castings of toolmarks
- Various other objects of up to 10 x 10 cm size (direct scanning of jaws and blades of tools, signatures - print intersections, any other object with non-translucent approximately flat surface)

- Bullets, cartridge case surface, wires
- Surface of any other cylindrical object with its diameter up to 8

➢ ToolScan R360 includes a rail with mounted rotation stage which introduces rotation about axes perpendicular to optical axes of the objective. It is also equipped with flat table mounted on the rail. ToolScan set of accessories is enhanced with set of bullet holders, chuck, cartridge case holder.

***Note: ToolScan to ToolScan R360 Upgrade** is possible in the future within system warranty period. However, on site visit of LIM technician is necessary to upgrade electronics, install the rotation stage and recalibrate the system.*

Detail of rotation stage in ToolScan R360
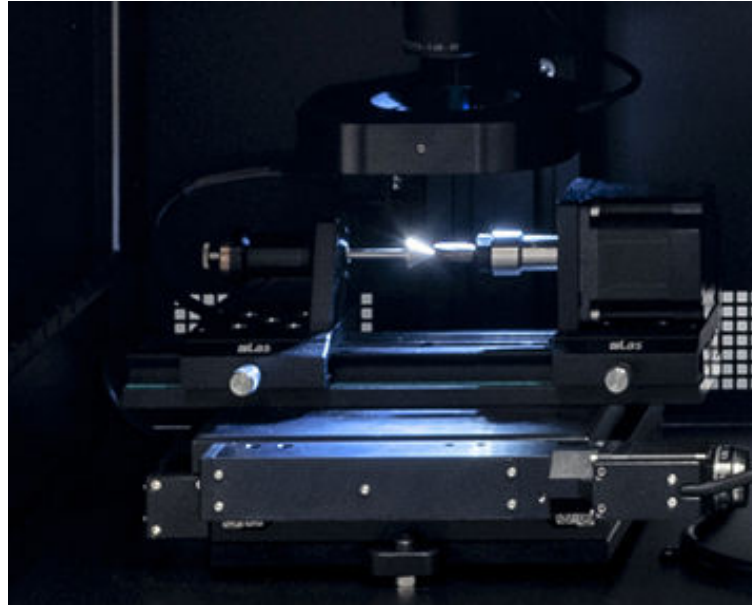
Detail of large flat table in ToolScan
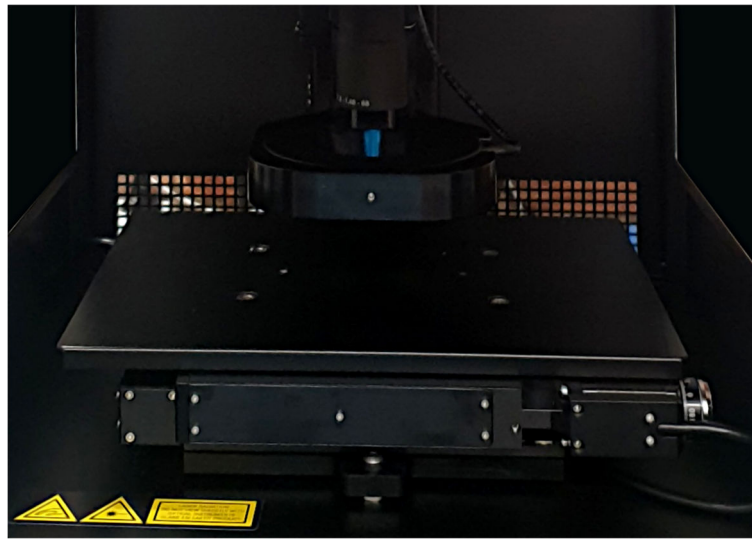
System components

ToolScan Device
Versatile ToolScan / ToolScan R360 device with set of holders used for scanning of all evidences.
LUCIA Forensic 8.10 Software – Active – for Acquisition (active) Workstations
Software providing full computer control of TrasoScan Device and integrating all abovementioned features, including scanning and analysis. PC is delivered with the system.
LUCIA Forensic 8.10 Software – Passive – for Analysis (passive) Workstations
Software providing all image processing and comparison tools – everything needed for analysis. Additional PCs can be delivered with the system or existing PCs can be used.

Size and recommended working space

ToolScan Device	W – D – H = 40 – 51 – 70cm, weight 35kg
Size on table	Device + PC + monitor: 140 x 65cm

ToolScan R360 Specifications

Camera and Optics

Camera type	2.8 MP, 2/3", Monochromatic*, USB 3.0 Interface, up to 20 fps *Color camera can be used upon request - Color camera provides color image at the cost of slightly lower quality of 3D details, slower speed, and larger file size.*
Objective	Telecentric, 1.48x fixed magnification
Resolution	3.07 µm/px, magnification on typical 31.5" 4K UHD monitor: 60x
Live image	Field of view 5.7 x 4.3 mm

Motorization

XY motors	Range 100 mm, perpendicular to optical axes
Focusing	Range 100 mm, parallel to optical axes
Control	Via software and joystick

ToolScan R360 additional Motorization

Rotation	Rotation stepper motor, full 360° rotation

Light

Ring	8 independent segments for real time image and photometric stereo scanning
Laser	1 mW 635 nm line laser for fast laser autofocus

Supported flat objects

Metallic	Screwdriver and plier imprints into cylinder locks or other evidence, cut wires and screws, broken drills or other objects, keys
Rubber	Cuts in tires, knife cuts in rubber
Casts	Silicone castings
Other	Any inserted object with approximately flat surface can be scanned

ToolScan R360 - Additional supported objects

Metallic	Bullets (land impressions), cartridge case surface (extractor, etc.) Cables (manufacture traces) Cylinder lock surface (toolmarks) Bottle caps (manufacture marks)
Plastic, Paper	Various non-translucent objects, boxes, bottle caps
Other	Maximum diameter: 80 mm

Achievable 3D scanning times (EDF with photometric stereo 3D scanning with 8 segments)

Flat objects:

Lock	Striated screwdriver imprint (11 x 8 mm): 50 s – 38 MB file size
Wire	Cut wire (7 mm diameter – 7 x 5 mm area): 40 s – 12 MB file size

Cylindrical objects:

CC Surface	9 mm Luger, 1 stripe (5.7 mm width, full 360°): 11:50 – 74 MB image
Bullet	9 mm Luger, 1 stripe (5.7 mm width, full 360°): 4:40 – 69 MB image
Cable	6 mm diameter, 5 stripes (24.0 mm width, full 360°): 22:50 – 191 MB image
Cylinder Lock	Surface, 2 stripes (11.0 mm width, full circumference): 15:00 – 347 MB image

PC Workstation (typical configuration)

| Processor	12-core Intel Core i9 / 8-core Intel Xeon
RAM	32 GB DDR4
Disk space	512 GB NVMe SSD for system and HDD for local data storage
Graphic card	nVidia graphics card – high performance
Monitor	31.5" 4K UHD (3840x2160, 16:9, IPS, 60 Hz, Display port)
OS	Windows 10/11 64b

Features and highlights

- Robust mechanical construction and stages – high reproducibility, long-term stability, no need for re-alignment and recalibration during typical operation
- Real time examination of camera image of toolmarks on screen, real time 3D image preview, real time image can be compared with other images even without scanning

- Maximum versatility – and open design, removable side covers: easy insertion of any, even large evidence, set of holders enabling comfortable placement, positioning, tilting of any kind of object.
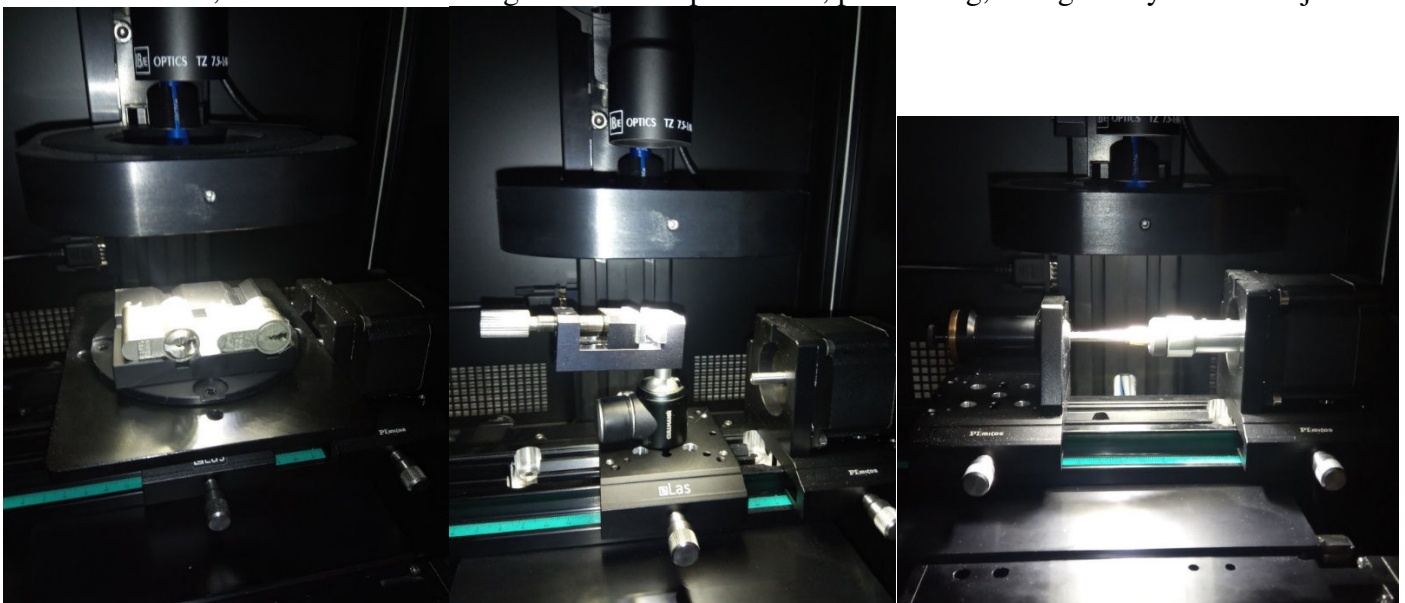
- Quick preview scan of whole object or scannable area
- Automatic 2D and 3D scanning - specialized software interface for toolmarks scanning in a few steps with minimal user input

- Various comparison modes (horizontal, vertical, freely rotatable, and freely shaped split line, transparency, tiled mode with up to 9 objects side by side) – displayed in 2D or free 3D
- Comprehensive image manager for image organizing during comparison – many images can be opened at once and displayed images quickly swapped, whole comparison can be stored including mutual image positions, light orientation, etc. for sharing with other experts
- Texture-free display, 3D model display, free 3D rotation and positioning, illumination variation, Z inversion, simulation of properties of various materials, measurement of distances, annotations
- Support of .X3P files (import and export) for data exchange with systems by other manufacturers

- Toolmarks marking and search (optional software module) – areas with striations and imprints on objects with toolmarks or tools and their castings can be marked. Correlation search can then be used to search for matching candidates and provide automatic alignment of images in comparison.
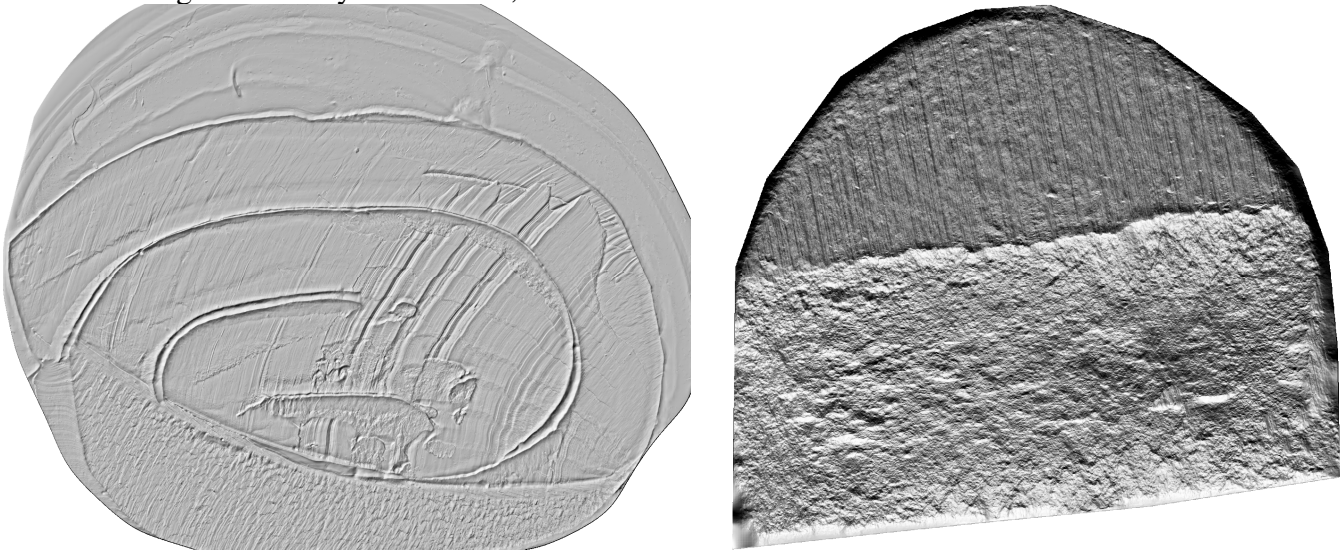
Example images

Detail of a toolmark on cylindrical lock
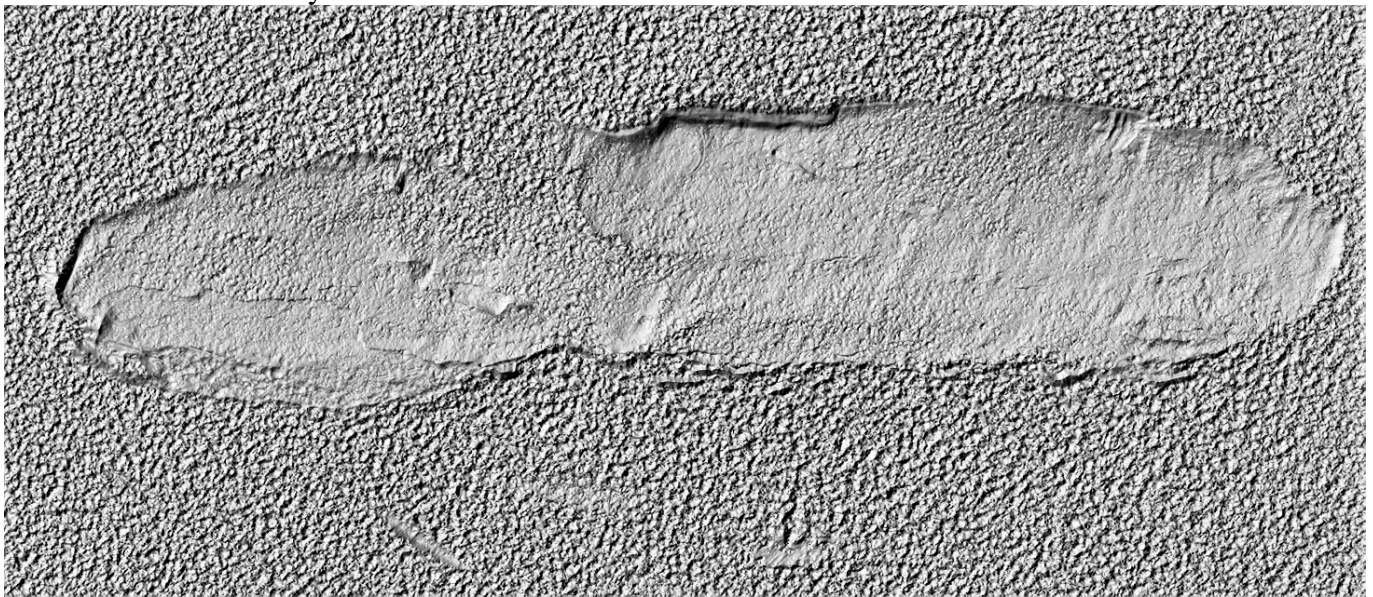
Toolmark on cylindrical lock with designated striation marks for search
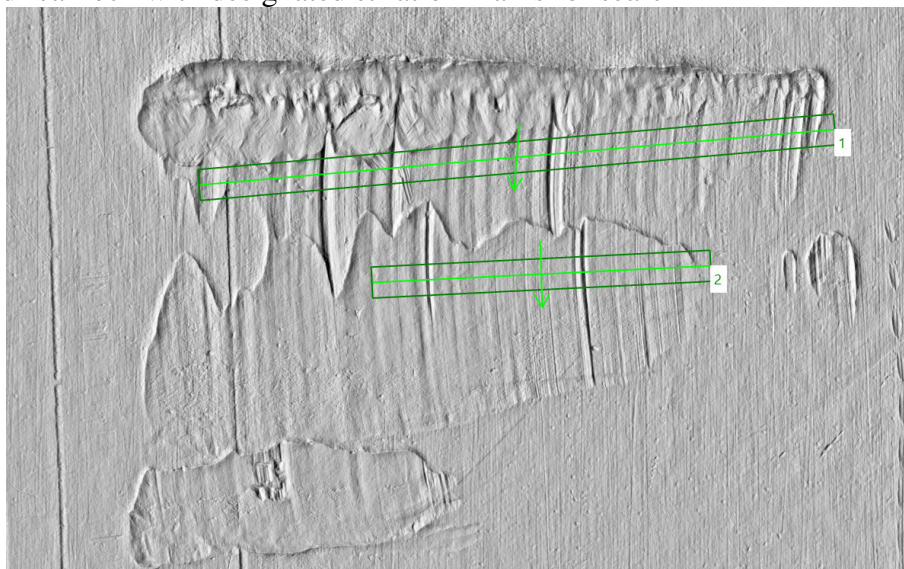
Silicon casting of marks by cable cutter; Wire cut with bolt cutters

Directly scanned breech face and firing pin of Luger P08 pistol