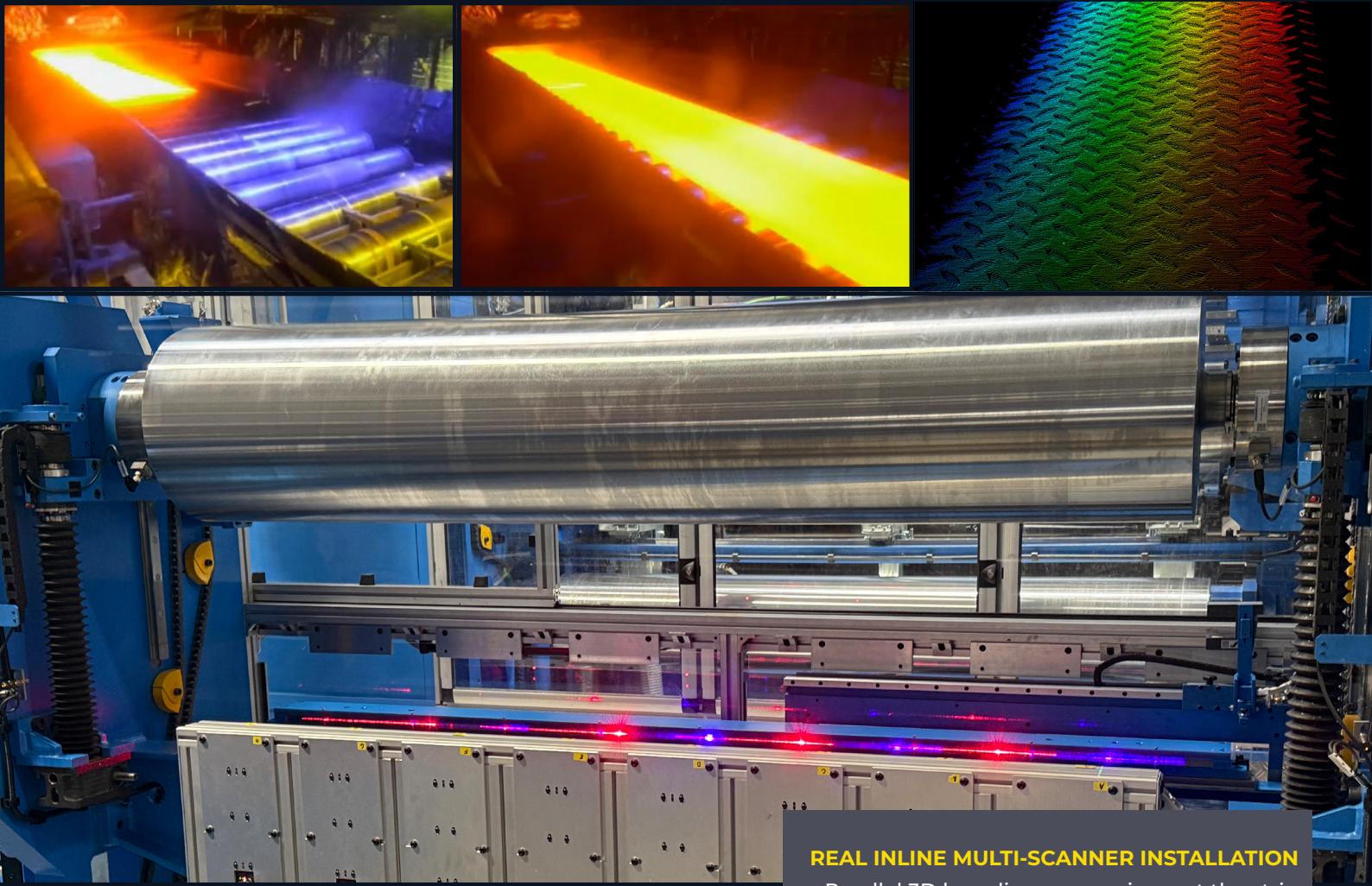




REAL INLINE MULTI-SCANNER INSTALLATION

Parallel 3D laser line sensors inspect the strip across its full width during production

QuellTech GmbH Germany

SEE THE SURFACE. MEASURE THE GEOMETRY.

Laser Defect 3D Inspection Systems for Cold & Hot-Rolled Steel

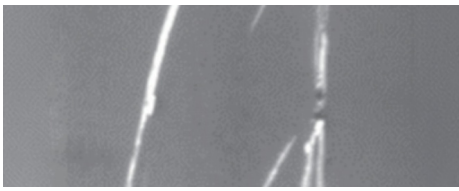
- Achieve precise strip thickness measurement for tighter process control and material savings.
- Detect and classify defects according to your own configurable defect library.
- Monitor flatness, bow, and twist in real time to ensure consistently straight and stable product.
- Capture true 3D defects in a full 360-degree point cloud for deeper root-cause analysis.
- Benefit from factory-calibrated laser cameras that require no recurring on-site calibration.
- 2D defect visibility.

FROM VISUAL ANOMALY TO MEASURABLE DEFECT

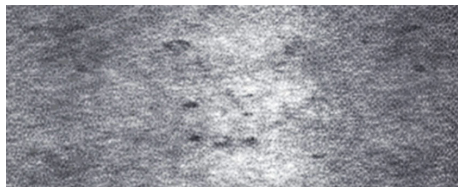
2D defect visibility — enhanced with 3D dimension

QuellTech records a high-resolution intensity image and a calibrated 3D height profile. Defect families known from camera-based inspection can be detected and classified, while their 3D dimensions are measured and not estimated.

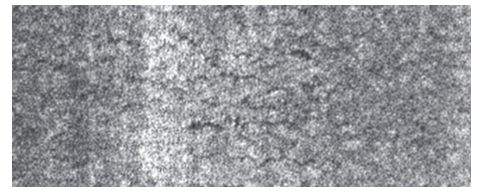
Images of Hot/Cold-Rolled-Steel surface-defects



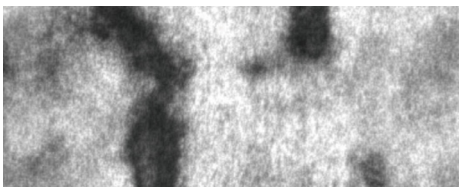
SCRATCHES



ROLLED-IN-SCALE



CRAZING



PATCHES



INCLUSION



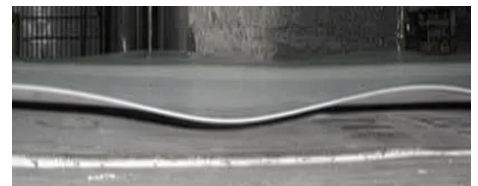
PITTED SURFACE



OXIDE SCALE



CHATER MARKS



WAVES

Why 2D needs enhancement

- ➔ Waviness can not be measured
- ➔ Surface defects may be shallow or deep
- ➔ Vibrations may alter the results
- ➔ Depth of errors cannot be measured
- ➔ Flatness cannot be measured
- ➔ Thickness cannot be measured

Z-Axis – True 2D + 3D Data

See the surface. Measure the geometry.

100% Inline Inspection

Full-width, real-time coverage.

AI-Powered Classification

From visual defect to intelligent insight.

Coil Quality Map

Instant visual intelligence for every coil.

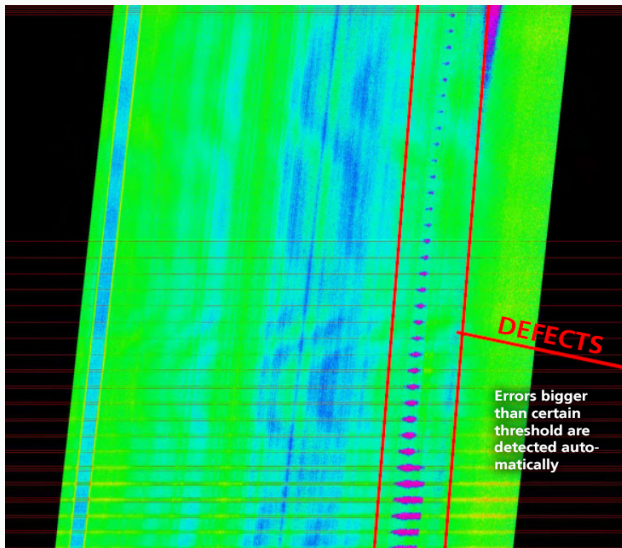
3D SURFACE DEFECT CLASSES

QuellTech measures not only the visual defect class, but also the real geometry: Position, length, width, and height/depth.

Examples of 3D-Defect-Evaluation

AUTOMATIC THRESHOLD BASED DETECTION

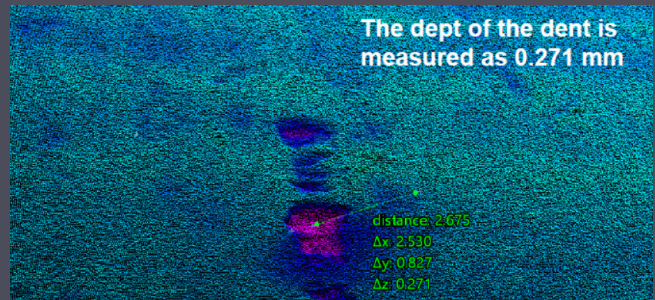
Effects above a defined Z-threshold are detected and flagged automatically.



This view illustrates a repeated 3D defect pattern. Detection can be limited to events larger than a configured threshold to avoid false alarms and focus on relevant quality issues.

DEPTH MEASUREMENT OF A SINGLE DEFECT

Example: Geometric measurement of an individual dent.

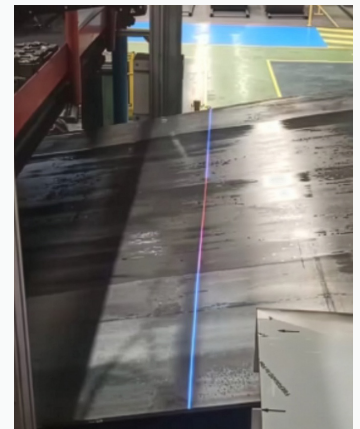


Measured defect dimensions can be stored as Δx , Δy and Δz . In this example the dent depth is shown as 0.271 mm.

INLINE MEASUREMENT ON THE STRIP

Real production image with active laser line on the material surface.

Parallel 3D laser line sensors inspect the strip across its full width during production.



3D QuellTech 3D Benefits:

3D DEFECT CLASSIFICATION

Classical 2D defect classes can be enriched by real geometric Information. This allows differentiation between visually similar but geometrically different surface events.

COIL AND POSITION REFERENCE

Detected defects are assigned to their position along the strip and across the strip width, enabling traceability by coil section and lane.

MEASUREMENT IN X, Y AND Z

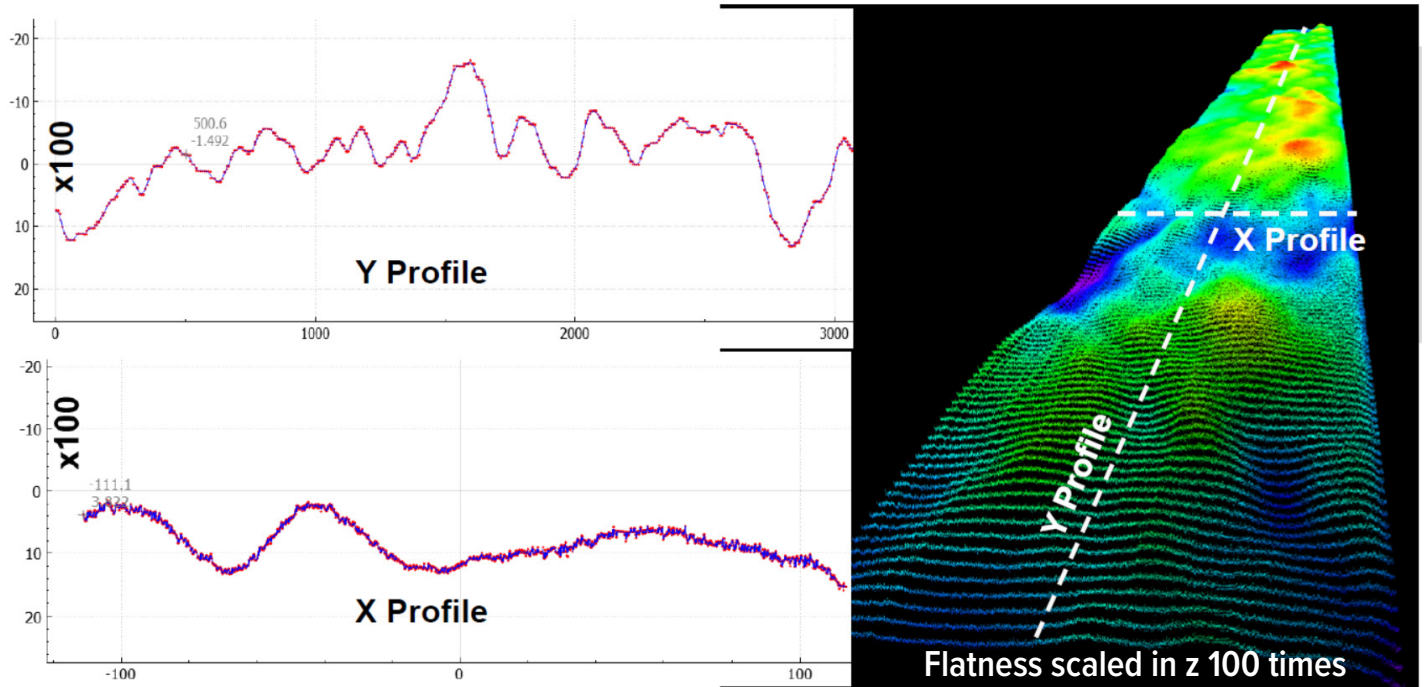
Every relevant defect can be measured by length, width and height/depth. Thresholds can be defined separately for area, depth and other geometric criteria.

AI-READY DEFECT LEARNING

New defect types can be trained with QuellTech AI modules. This supports continuous optimization when new product grades or unfamiliar defect patterns appear.

FLATNESS AND WAVINESS EVALUATION

Cross profiles and longitudinal profiles can be calculated directly from the measured 3D surface.

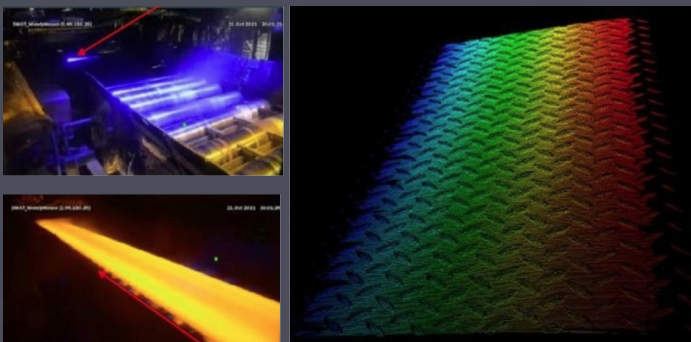


The example shows flatness visualized in 3D as well as X and Y profiles.

This supports quantitative assessment of strip shape deviations and waviness trends.

3D DEFECT ANALYSIS IN DEMANDING ENVIRONMENTS

Example image set with process view and corresponding 3D representation.



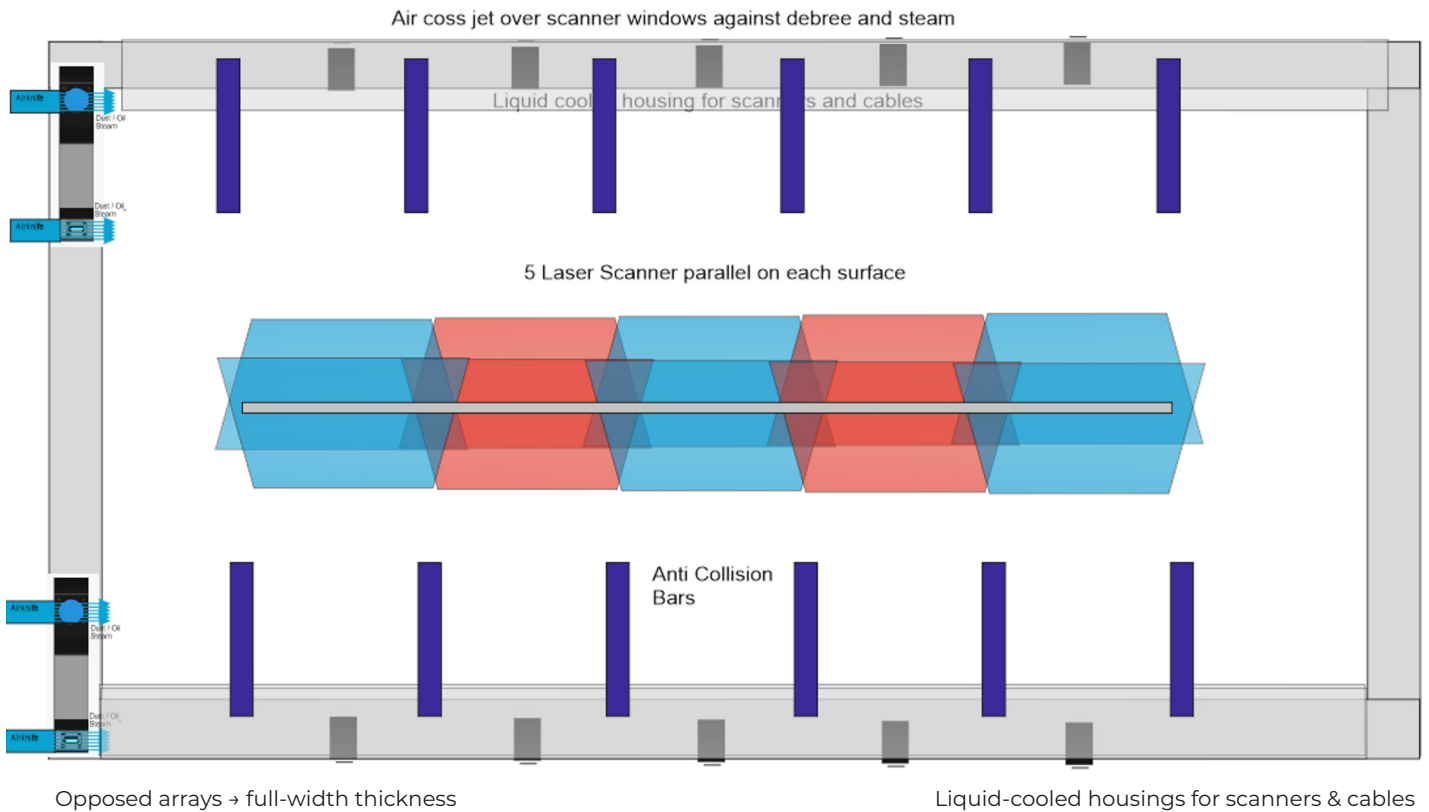
3D laser triangulation can also be applied where conventional inspection struggles, for example on hot, reflective or rough surfaces. The geometric data helps reveal surface structure, repeating patterns and localized anomalies.

WHY THIS MATTERS FOR COLD/HOT ROLLED STEEL

1. Detection of 2D defect classes plus real 3D geometry
2. Measurement of dents, pits, roll marks and other defects in X, Y and Z
3. Quantification of flatness and waviness over the strip width
4. Full-width thickness evaluation with synchronized upper and lower scanner arrays
5. AI-supported learning of new defect types
6. Coil-related statistics and reports for objective quality decisions

ONE PLATFORM FOR 100% IN-LINE MATERIAL INSPECTION

FULL-WIDTH SYSTEM ARCHITECTURE: An application concept with opposed scanner arrays, collision protection, cooling, and air purge. Designed for hot and cold strip and process lines including color coating, pickling, and annealing. Five overlapping scanners per surface deliver continuous strip coverage, and opposed arrays enable accurate full-width thickness calculation.



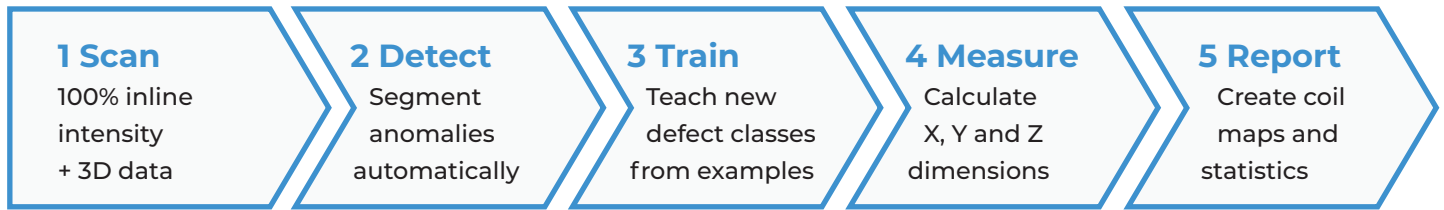
QUALITY DIMENSIONS

1	SURFACE TOPOGRAPHY High-resolution 3D profiles quantify scratches, pits, scale, dents and other anomalies in X, Y and Z.	2	FLATNESS & WAVINESS Cross-strip and longitudinal shape are calculated from the measured surface geometry.
3	FULL-WIDTH THICKNESS Synchronized upper and lower arrays determine point-by-point thickness across the entire strip.	4	INDUSTRIAL PROTECTION Collision bars, liquid-cooled housings and air purge protect the sensors in demanding mill environments.

CONFIGURATION-DEPENDENT CAPABILITIES:

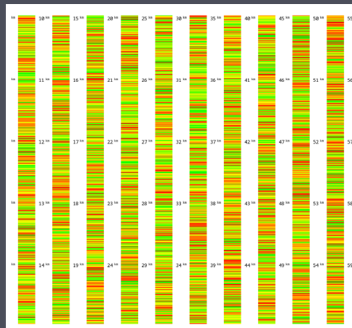
Up to 4096 points/profile • Scan rates up to 200 kHz • Ranges up to 5000 mm • Multi-scanner arrays HDR / multi-exposure • Red, green or blue laser • Rugged housings, cooling & air purge.
Performance depends on material, temperature, line speed, optical setup and selected sensor model.

AI enhanced insights for steel coil production



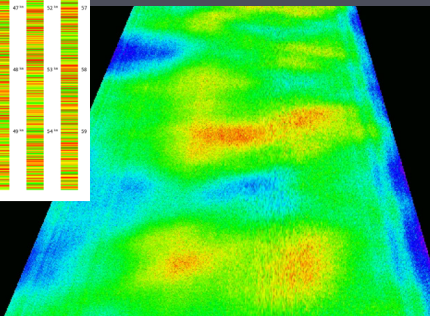
3D SURFACE TOPOGRAPHY

Measured height/depth instead of visual contrast alone. The Z profile reveals waviness and the true height or depth of a surface anomaly.



COIL QUALITY MAP

Defect distribution by strip, lane and coil section.



Colour-coded results provide an immediate overview of where quality events occur.

STATISTICAL QUALITY REPORTS

Counts, pass rates and defect statistics for production analysis:

- Number of defects by class and coil section
- Defect dimensions and severity in X, Y and Z
- Position, clustering and repeat patterns
- Comparison by coil, grade, shift and campaign
- Export to reports, databases and higher-level systems

QuellTech 3D laser advantages compared to a camera system:

- ➔ No influence from dark or bright field illumination - measurement is independent of ambient light
- ➔ No recurring on-site calibration required - the system is factory-calibrated
- ➔ Conventional cameras provide only 2D data, whereas the laser system delivers full 3D geometry
- ➔ Measurement is unaffected by oils, water emulsions and steam at high temperatures in hot strip mills
- ➔ The 3D laser scanner records defects + profile, thickness and strip bow over the entire strip width

Resolution comparison	3D Laser Scanner*	2D Line Camera
x-resolution	10 µm	200 µm
y-resolution	30 µm	200 µm
z-resolution	4 µm	- - -

*Best case, depends on selected scanner model