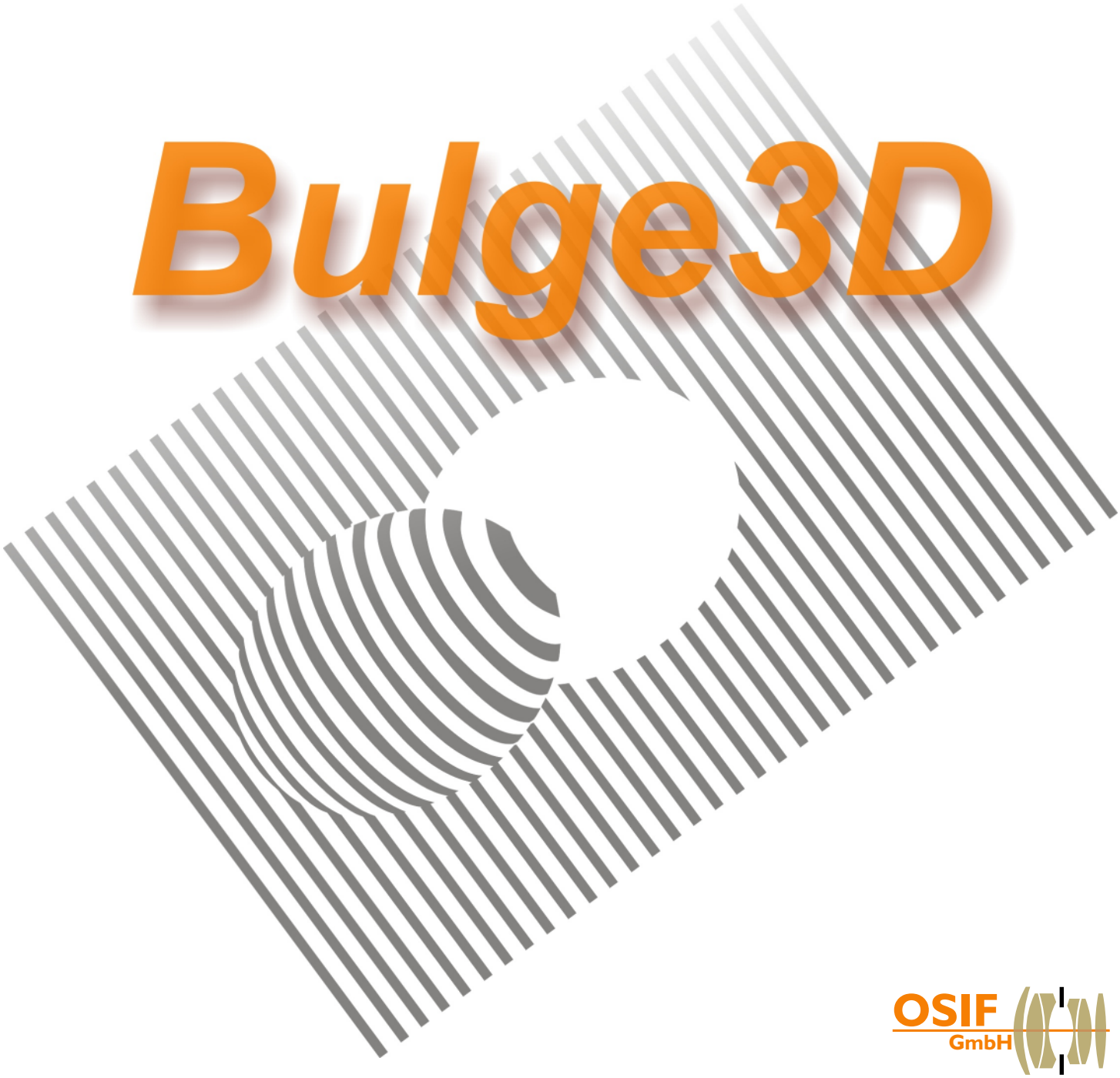
Inline 3D-Inspection of Slightly Curved Surfaces. Measurement of Flatness, Detection of Bulges, Dents and Waviness; Inline Inspection During the Production Process.

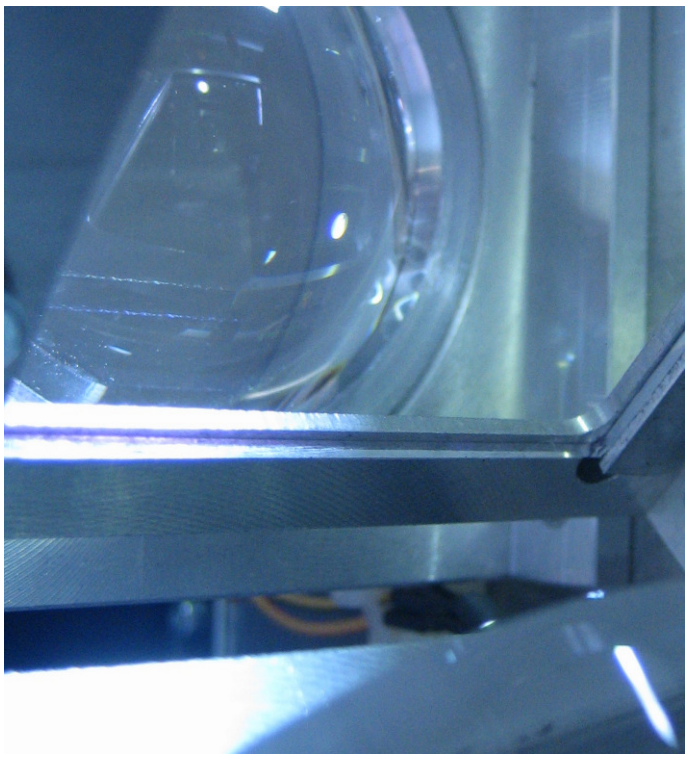
Bulge3D



OSIF GmbH

Optical **S**ensor Technologies
for **I**nspection and **F**orm Recognition

Bulge3D –
Application Areas and Key Advantages



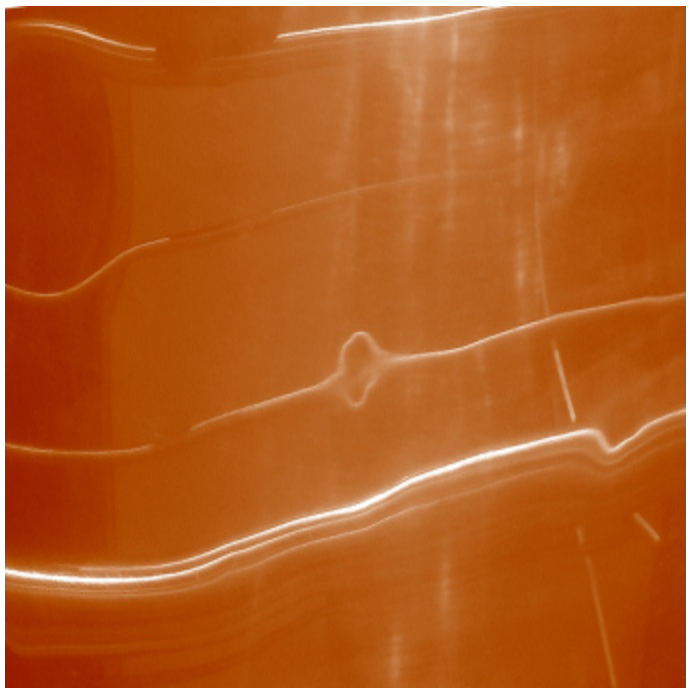
Bulge3D's key advantages are:

- Continuous, complete and objective inspection of large-area components
- Automatic documentation of detected defects
- Proof of quality for the final customer
- Avoid shipping of sub-standard products; avoidance of returns
- Avoid expensive further processing of sub-standard products
- Changes in production can be quantified immediately
- High scalability of the system to achieve very high resolutions or measurement speeds
- High inspection speed
- Minimum time requirements and low expenses for maintenance
- Small installation space; easy integration into existing production lines

The main applications of Bulge3D are inspections of slightly curved, non-reflective surfaces of all kinds. The system is primarily optimized for the inline inspection of materials on assembly lines. With few modifications, one-off inspections can also be carried out.

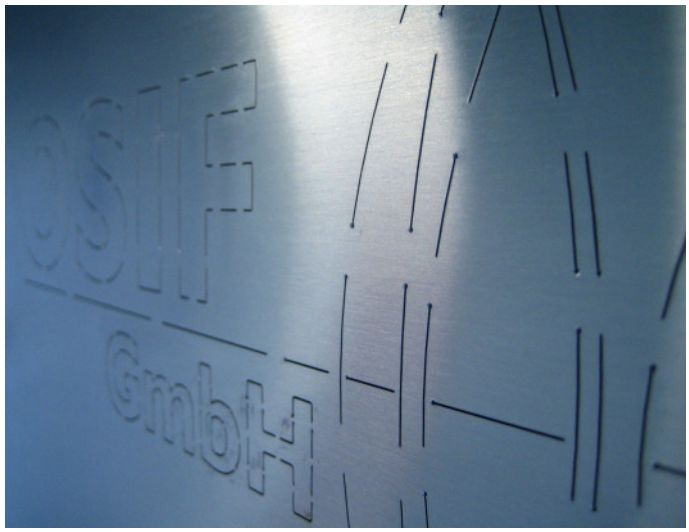
Bulge3D inspects the flatness of the material by measuring the bumps, dents and waviness.

For example, you can use Bulge3D to examine finished products such as coils produced in steel rolling mills (quality classification), for 3D quality control during production and also for incoming material checks prior to manufacture. Because it is insensitive to vibration and can inspect large-area materials with only small surface defects, it is also suitable for inspecting formed components (with small curves on the surface) right next to the press. Typical applications are e.g inspection of car roofs and car hoods and the inspection of fuselage components in the aerospace industry.



Bulge3D –
Optical Surface Inspection

Bulge3D is a contactless inspection system for large surfaces. It is used for the 3D inspection of slightly curved areas during manufacture to check for local distortions such as bulges, dents and waviness.

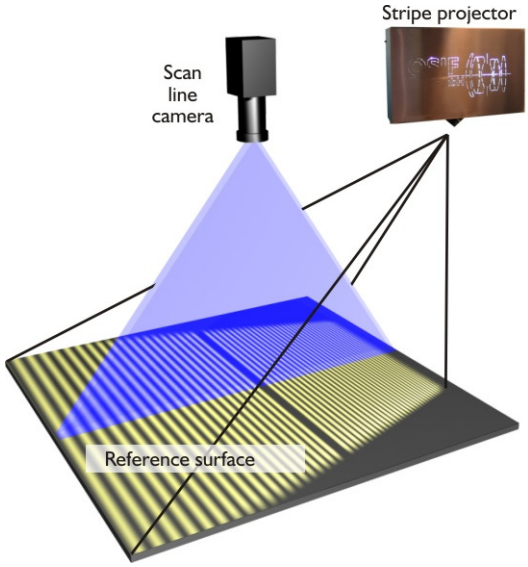


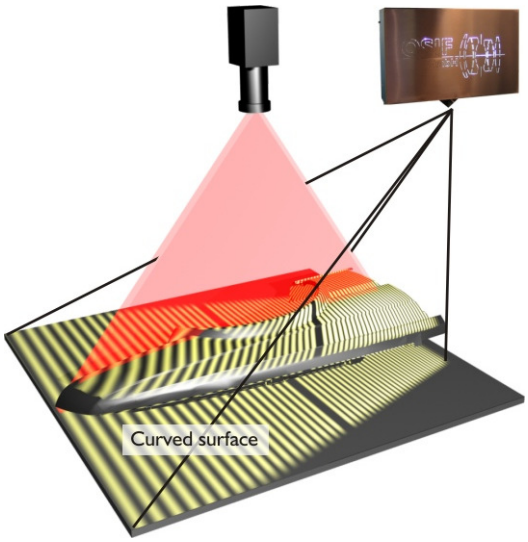
Bulge3D uses the principle of optical triangulation. It incorporates a new evaluation method called static stripe projection. The objects to be measured are passed under a gate, and the projected stripe pattern is digitized line by line. Based on the stripe pattern, a digital topographic map of the component is calculated and analyzed. The detected faults are then shown in a view of the scanned surface. A unique feature is the use of a single, unchangeable stripe pattern. This leads to a very high measuring speed.

On a material width of 1 m, the standard version of Bulge3D can detect surface defects with a width or length of approx. 1 cm and a height resolution of approx. 30μm. Due to its scalability, Bulge3D is capable of higher resolutions of approx. 10μm at lower measurement widths, or larger material widths at lower resolutions . Among other things, the inspection speed depends on the size of the smallest surface defect to be detected. The image capture speed of the standard system is currently about 1300 scan lines / sec. For a required defect resolution of 1 cm (bulge diameter or length of waviness), a meaningful line gap would be 2 mm. This leads to an inspection speed of 160 m / min.

Bulge3D – Technical Background

Bulge3D is calibrated during initial setup by scanning a high-precision reference surface with the line scan camera. The calculated topological map of the object to be measured is relative to the reference surface.

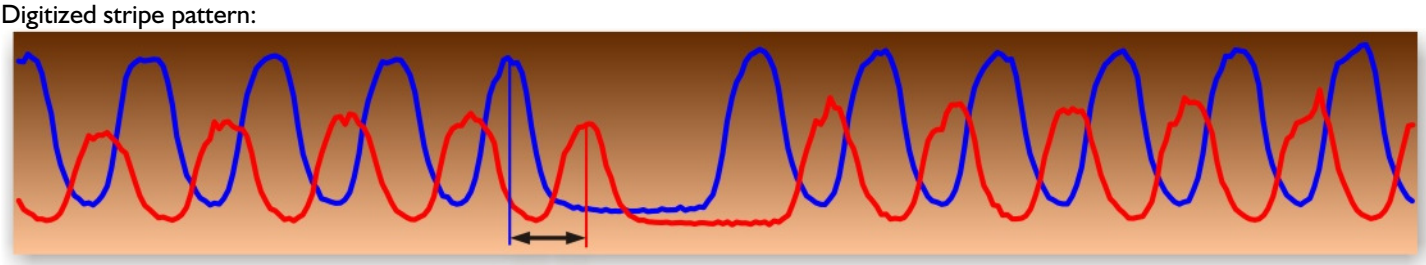




Due to the angle between camera and projector (from the camera´s perspective), the stripe pattern on the object to be measured is displaced from the stripe pattern on the reference surface. The displacement correlates with the height of the object. After preprocessing of the measured data, the object´s height can be determined through triangulation.

Bulge3D is insensitive to vibration of the object to be measured, because every scan line contains a complete height profile of the object. Vibrations are recognized and filtered out during post-processing of the measured data, .

Digitized stripe pattern:

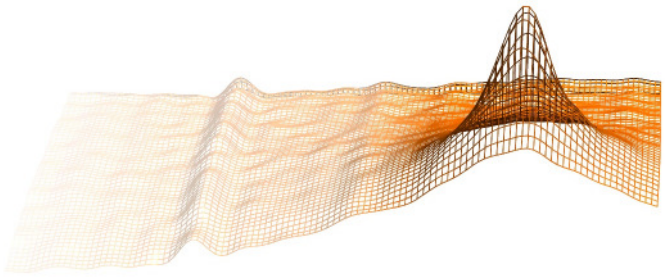


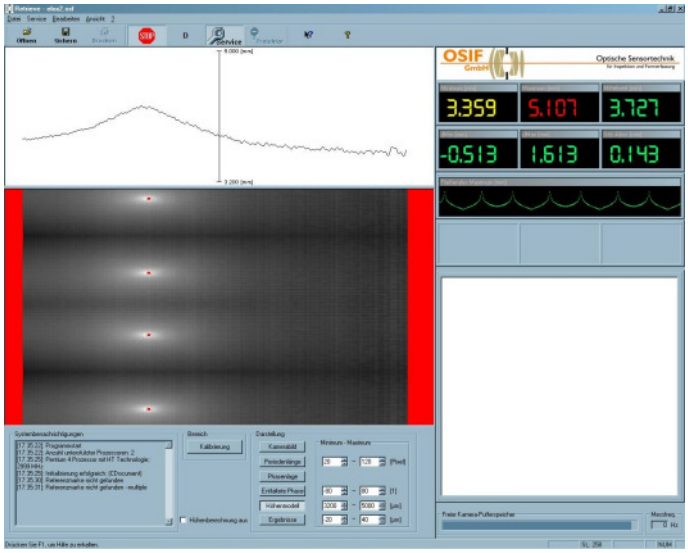
Phase shift between reference stripe pattern and measured stripe pattern

Bulge3D –Retrieve, the Evaluation Software

The Bulge3D system includes the Retrieve software, which is responsible for hardware control, system calibration, display of current measurements and statistical data, as well as for recording the results in a database.

The graphical user interface can be customized to reduce the displayed information to the data, which is of interest to the user. This ensures a good overview of the important data, but also gives the user the ability to retrieve further information when necessary.





Visualization of the captured surface
- Display of the current profile
- Display of the topology profile

Statistical values
- Global minimum / maximum
- Average, standard deviation
- Minimum / maximum deviation from average for scan line
- Curve of extreme values versus time
- Log file with detected surface defects including type, position and expanse

System messages
- System status (e.g. "Initialization successful")
- System warnings (e.g. "End of life has been reached for the lamp(s)"
- Error messages (i.e. "Interfering object or obstruction in camera´s view")

Expandability
- We can customize our software to your special needs, for example through integration of the measurement results into your database (e.g. through an import function) or by calculating additional statistical parameters.

	Bulge3D-1000		Bulge3D-500	
Measurement width	1000 mm		500 mm	
Defect detection threshold	30 µm depth or height		15 µm depth or height	
Lateral resolution in production line direction	2 mm (Same as scan line spacing)		1 mm (Same as scan line spacing)	
Lateral resolution in cross direction	**Resolution**	**m/min**	**Resolution**	**m/min**
Measurement frequency 1000 Hz	977µm	120	488 µm	120

OSIF GmbH – Location

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Train

From main train station by metro or by foot (3 min. walk, following the "Bahnhofstrasse" direction city centre) to "Kröpcke". Then take line 4 direction "Garbsen" to station "Marienwerder/Wissenschaftspark". For about 500 m walk on the "Hollerithallee".

Car

Exit the A2 at "Hannover-Herrenhausen". Drive on the B6 towards "Hannover". After crossing the „Mittellandkanal", leave B6, turning left at the following traffic light.

Hanover Airport

We will pick you up from the airport (approx. 20 min).

We are looking forward to your visit!