

Application Report – New 3D scanner with flexible measuring fields from 20 to 200 mm

# Detecting the smallest deviations with maximum flexibility

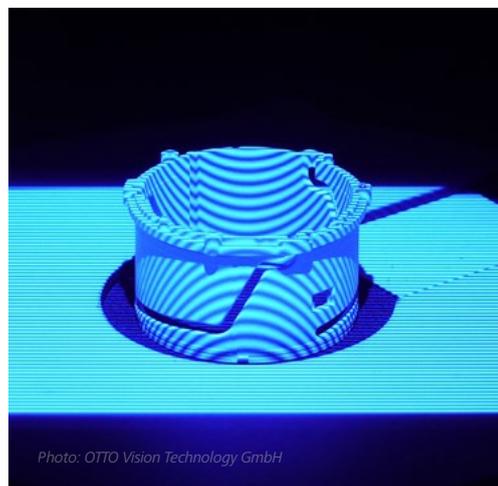
FLEX-3A by OTTO Vision Technology GmbH is a high-end 3D scanner for non-contact measurements on shape and coordinates in automated quality control. Thanks to the further enhanced image processing system integrating two Baumer 12 megapixel cameras used as stereo cameras, one device will suffice for high-precision 3D image acquisition to check object dimensions, shape and position within measuring fields from 20 mm to 200 mm.

Non-contact 3D measurements and geometry inspection on complex objects can be applied in every manufacturing stage – from initial commissioning to first sample inspections on to automated sampling in series production – in order to quickly identify any non-compliance or error source to take corrective actions. FLEX-3A acquires the object's 3D surface data with very narrow point spacing for all-surface target/actual comparisons. Particularly in the stamping industry, many manufacturers rely on the system of the image processing experts from Jena. "But other sectors are also growing. Particularly in the plastics industry we see a big potential", explains Gunter Otto, Managing Director of OTTO Vision. With this advanced product, OTTO Vision has streamlined the portfolio which now covers measuring fields from 20 mm to 200 mm by a single device. The optical approach was a particular challenge. As with previous products, just changing the lens should suffice to define the individual measuring fields, even from a fixed measuring distance.

## Say bye-bye to physical targets

FLEX-3A operates as all-automatic multi-view system based on phase-related structured light scanning with triangulation and photogrammetry. The 3D sensor holds two 12 megapixel USB 3.0 cameras and an LED light source with a resolution of 1440 × 1080 pixels. A third reference camera ensures multi-image registration. According to the complexity, the object can be illuminated and measured from several angles. A complete 3D scan

is obtained by help of the optionally available motorized object frame. This method of image acquisition is patented: "In addition to the two cameras on the 3D sensor we use a fix reference camera to determine the position of the object to be inspected. In this way, the partial views from different angles are put together to build up a complete 3D model using highly accurate and automated photogrammic transformation – completely without the need for physical targets, which saves time and money," Otto explains. The optionally available motorized object frame allows for all-automated measurements from top and below. This way, the universal system can be flexibly deployed for prototype sampling, automated sample checks in series production as well as for inspections on incoming machined parts.



FLEX-3A utilizes structured light projection, triangulation and photogrammetry to form 3D images.

### Target/actual comparison with flexibility

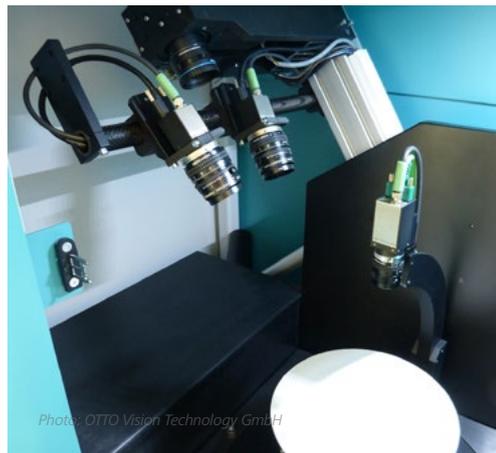
Automated image data acquisition to form the 3D model including data calculation and evaluation is performed by high-performance software. The digitized data are either point clouds or meshed STL surfaces that can be directly aligned to the coordinate system of the reference model. This allows for a quick and easy-to-understand graphical target/actual comparison of manufactured parts against the corresponding CAD model. The comparison reveals any non-compliance to shape caused by distortion, shrinkage, object misalignment or even tool wear. The intuitive user interface allows direct and fast creation of any number of measurement plans, the simple setting of part-specific measurement parameters, the definition of automation sequences and the easy adaptation and optimization of the structured-light pattern. Furthermore, system recalibration within another measuring field is very simple.

### Precise detection in measuring fields of different sizes

Thanks to FLEX-3A, automated non-contact 3D inspection of dimensions, shape and position in the various measuring fields is made easy and quick. The very narrow point spacing allows for an extremely precise comparison – even in measurements on small objects where tactile detection is difficult. To change the measuring field, simply exchange the lenses and recalibrate the system using sphere-spacing gauges. These are included in the delivery and may also serve for monitoring and documenting the measuring accuracy.



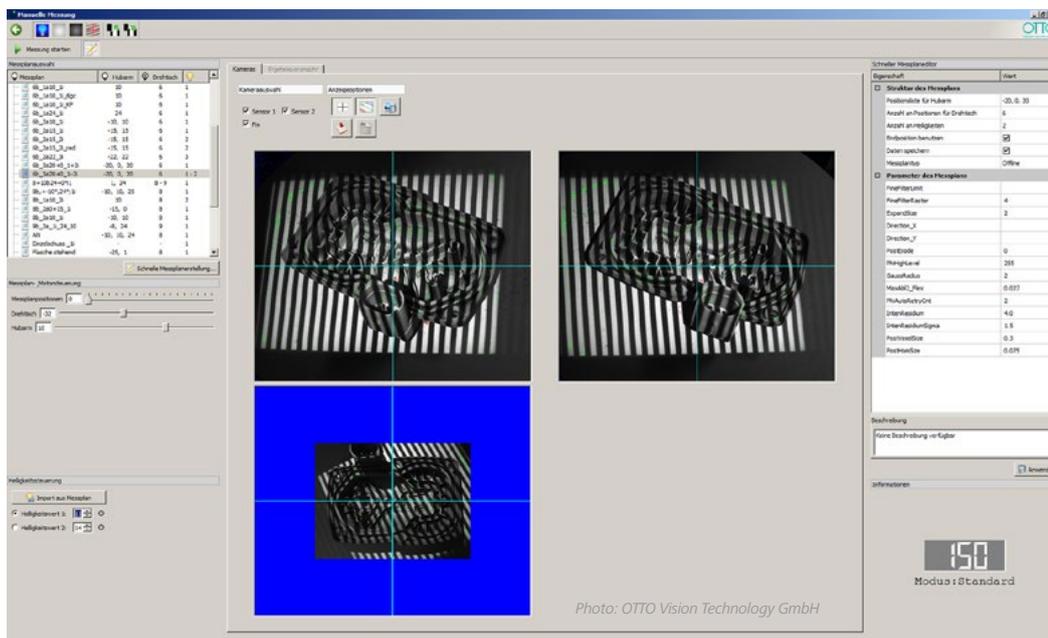
Two 12 megapixel Baumer CX series cameras used as stereo cameras acquire the images to create the 3D image. The optional motorized object frame allows for a full 3D scan from top and below. Optionally with vibration-isolated laboratory table.



The patented image acquisition method using three cameras fully eliminates the need for physical targets.

### Switching to USB 3.0

With the new 3D scanner, USB cameras are premiering at OTTO Vision. "We have been successfully using Baumer cameras for many years. Due to the good cooperation and product reliability, it was clear that we would also use these cameras for the FLEX-3A," Otto explains. Combining



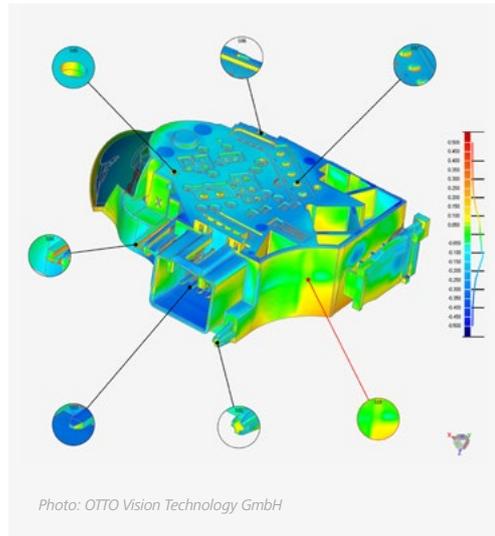
Intuitive user interface for quick and easy selection and editing of measuring plans and parameters.

high 12 MP resolution at 30 fps with a compact 29 × 29 mm form factor, the VCXU-124 cameras of the CX series perfectly match the system design requirements. The Sony® Pregius™ CMOS sensor IMX304 delivers the excellent image quality required for 3D data acquisition. Thanks to USB 3.0 connectivity, OTTO Vision additionally benefits from a reliable single-cable solution with plug & play functionality saving time and money during installation. All-around M3 mount ensures convenient and flexible mechanical camera integration. Thanks to optimally synchronized cameras and digital projection, the image processing experts have succeeded in utilizing the full camera speed.

**The growing market of 3D inline inspections**

All-automated 3D object measurement allows fast and uninterrupted use under production conditions and delivers a higher information density than tactile methods. According to OTTO Vision, this offers an enormous growth potential. “We are not only going to focus on offline devices, but more and more on 3D inline inspection,” so Otto views the future.

More Information:  
[www.baumer.com/cameras](http://www.baumer.com/cameras)



The 3D color view quickly reveals any non-compliance of the machined part compared to the digital model part for immediate corrective actions.



With more than 80 models, the Baumer CX cameras include GigE and USB 3.0 models with cutting-edge global and rolling shutter CMOS sensors for cross-industry applications.



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