

# Werkstatt + Betrieb

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## UNOFFICIAL ENGLISH TRANSLATION

The original article was published in German in Werkstatt + Betrieb, a trade magazine published in Germany. Prepared for CRETEC. The German original remains the reference.



## Fully automated 360° inspection of automotive components

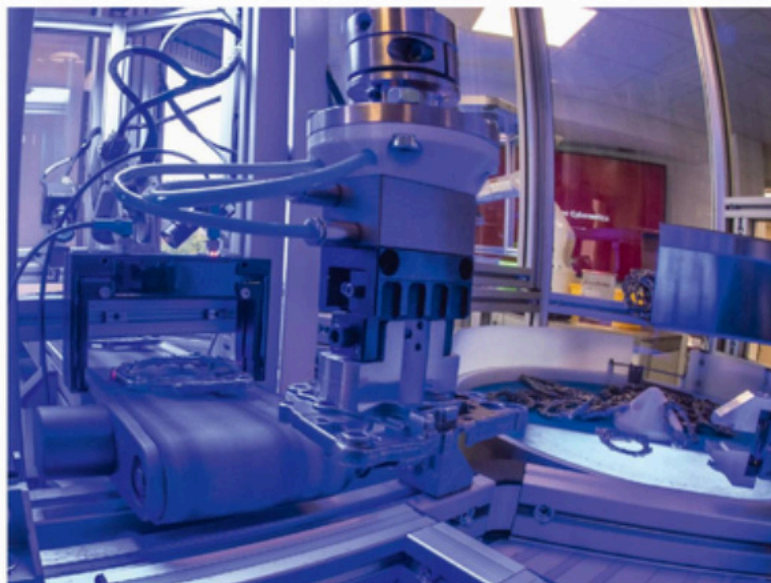
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Optical metrology

# Fully automated 360° inspection of automotive components

The modular QBIC quality-assurance stations offer a broad range of control, data-analysis and communication capabilities. As versatile units, they are connected directly into an autonomous system using Plug & Work.

By Kamillo Weiß



1 | Each part is inspected precisely from all sides (360°) for 21 features. Data is documented and the parts are sorted into pass/fail categories. © Cretec

A major automotive supplier commissioned Cretec GmbH to provide a complete system solution for 100% quality assurance of metal components measuring 10 to 60 mm. Fed as bulk goods, the parts must be inspected precisely from all sides (360°): dimensions, completeness, damage, contamination, surface defects and other deviations. The complete automated machine-vision solution must operate fully autonomously

with a high degree of flexibility and be simple to move between locations.

All quality-inspection data and images are documented and are available at any time for further analyses and statistics, including deep learning, the versatility of which can be used for many applications. A high-performance industrial PC based on Windows 10 and IoT 4.0 makes any

application possible despite complex requirements. An important aspect was achieving high cycle rates. The inspection system had to guarantee complex quality assurance of numerous features on more than ten parts per minute, and on around five million parts per year.

## Rapid feasibility study and installation

Fully controlled and documented high-mix component production with powerful machine vision adds challenges concerning flexibility across the entire process. A rapidly produced feasibility study documents the complete range of achievable flexibility and therefore ensures reliably functioning installation and production.

QBIC is the consistent strategy of a platform with synergy and scalability through logical relationships in networked quality assurance. Standard vision hardware and software components for complete station modules allow a vision-system solution to be developed quickly, already covering the required tasks in all their complexity.

The patented hexagonal design of the QBIC modules ensures very good access and flexibility in designing especially compact, mobile solutions. A module has a

footprint of 0.8 m × 0.8 m and a maximum height of 2 m. Integrated retractable wheels allow it to pass quickly through any office doorway and simplify transport by van. Individual QBIC units can be connected to one another quickly using Plug & Work, combining their extensive capabilities.

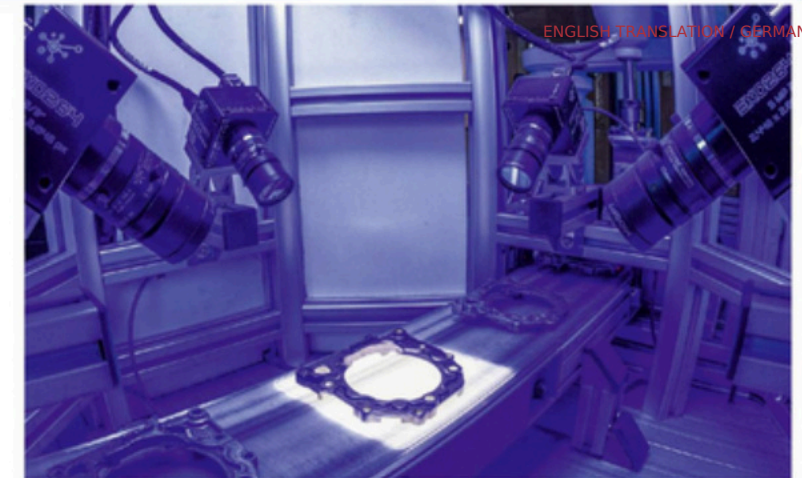
## Optimised lighting for reliable feature detection

Each application has its own optimum lighting solution with intelligent lighting control. In-house development and the resulting extensive experience in vision applications and related hardware and software play a major role. The LED-based modules can be assembled in all lighting colours, continuous or strobed illumination, and any geometric format. Homogeneous, large-area lighting is a very important aspect in minimising negative effects from reflective surfaces.

Blue light is used to inspect metal-part surfaces for scratches and impact marks from 0.2 mm × 0.2 mm, burrs at casting joints, foreign bodies and raised features (ejector marks). At the same time, ambient-light interference is excluded.



2 | The robot grips the parts precisely and presents them to the 2D and 3D vision systems for checking dimensions and surface condition. © Cretec



3 | Five high-resolution cameras inspect the parts on the conveyor with reflected and transmitted light. The shorter wavelength of blue LED lighting increases detection precision. © Cretec

## Versatile all-rounders

Three QBIC units were already connected in the feasibility study: FlexiBowl part feeding, robot-based 2D/3D part inspection, and five-sided final inspection with pass/fail sorting.

The FlexiBowl feeder's versatility ensures reliable handling even of very sensitive parts. A motorised shaker feeds them onto the rotating, vibrating disc. Even delicate parts are separated reliably and supplied to the next process. The disc handles parts with varying textures. An integrated vision system with backlighting and reflected lighting determines precise part positions, geometry, surface properties, material characteristics and weight, enabling safe robot gripping.

In the second station, a fast robot takes the parts and presents them above the 2D camera for underside inspection and to the 3D camera, before placing them on the part-turning station. They are then deposited on the conveyors and moved to the third QBIC station. Five high-resolution 5 MP cameras, using transmitted and reflected blue light, perform final all-round inspection of the parts for all remaining features and sort them into pass/fail categories.

In total, 21 features are inspected. These complete vision solutions in a minimal space can automate

many tasks particularly economically and sustainably, with very high flexibility for inspecting different part variants. Integrated equipment includes electrical systems, controls, high-performance PCs, cameras, robots, various vision modules, intelligent individual lighting, a large IP65-protected 24-inch touchscreen monitor for display and operation, and Industry 4.0 communication modules based on OPC UA.

The fully automated vision solutions based on connected QBIC modules cover a broad range of applications in many industries: pick-and-place, registration and classification, ID codes, inspections in 2D and 3D, measurement, surface inspection, sorting and assembly, and reliable decision-making.

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