





produces lines with many different diameters, lengths and profiles for various vehicle manufacturers.

The quality control systems used not only have to be able to retrieve and correctly identify a large number of similar parts, but must also be able to adapt quickly to the new workpieces following conversion to a different brake or fuel line type. Ease of operation, minimal downtimes and low costs are key factors in this context.

#### **SBOC-Q – Customised inspection**

Finding an intelligent area camera that meets all of the relevant criteria for the new system proved to be surprisingly difficult for TI. “Many of the cameras on the market fall down when it comes to ease of operation”, explains Philippe Tack, Project Manager Automation. Those responsible for choosing a solution ultimately decided in favour of the compact camera system SBOC-Q from Festo. TI is currently using four of the new systems for quality inspection as part of a pilot project in the transfer line for brake and fuel lines.

The first inspection task for the camera involved working with an Identibox to ensure that the correct screw from 17 possible screw

types reaches the assembly station. While the Identibox sorts incorrect or incorrectly oriented conical screws using the profile, the camera system checks the internal diameter of the screws. For this test, it checks the screw held by a gripper and determines whether it is a good part or a reject part by comparing it with the screw data in the camera memory. Both the sensor system that acquires the image data and the complete electronic evaluation unit and the Ethernet or CAN interfaces for communication with the master controller are already integrated in the camera system, making it an extremely practical solution.

#### **Precise**

Precision is called for when it comes to the second use of the camera – final inspection. Given the fact that there are only minor differences between some screw types, the system uses a number of dimensions to check whether the correct screw is fitted on the brake lines. It also checks the ends of the brake and fuel lines, which are first formed in a flanging press depending on the type. For the reliable detection of oval parts, the camera first records the line from one side and then from the other

Joint development with major input from Festo: Schäfer Maschinenbau, ifc and Festo are the partners in a pilot project under which the system for TI Automotive was developed. In addition to two Identiboxes and four SBOC-Q compact camera systems, CPX-MPA valve terminals, CP modules, various drive types and service units from Festo are used.



Enormous variety of part types: Brake lines are fitted with one of 17 possible conical screws, while fuel lines skip this processing step. The compact camera SBOC-Q checks both wiring systems effectively, despite the fact that the tubes have different diameters, lengths and profiles.



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following rotation of the part by 90°. If the camera system detects a defective part, this part is given an “electronic marking” and is automatically ejected when the end product is output.

In order to obtain the required level of precision in the tests – both in the final inspection as well as in the inspection of the internal diameter of the screws – all cameras in the system are fitted with telecentric lenses. These lenses map the object using parallel beams and thus help exclude the possibility of dimensional variations caused by different positioning of the inspection parts. The short exposure time of the camera (minimum of 20 µs) is also guarantees an optimum result. The system continues to provide accurate results even when the inspection part moves at high speed and the camera or part vibrate.

#### A good memory

The compact camera has no problem distinguishing the many different screw types and flanged ends in line production. Up to 256 work-

pieces can be stored in the system. This memory performance guarantees TI maximum flexibility when it comes to conversion.

The teach-in process for new parts is very straightforward. The user creates a reference image of the screw or tube using the camera and generates the test data on the PC. This data is then simply transferred to the camera system via the Ethernet interface and that’s it – job done. Another plus point for the TI Group lies in the fact that the camera system can be set up and configured using the software tools CheckKon und CheckOpti, which are also used with the Festo Checkbox. Given the fact that automotive manufacturers already use close to 20 Checkboxes for inspection tasks, personnel are already familiar with the software and can get to grips with the new camera system without the need for any training.

#### Type conversion made easy

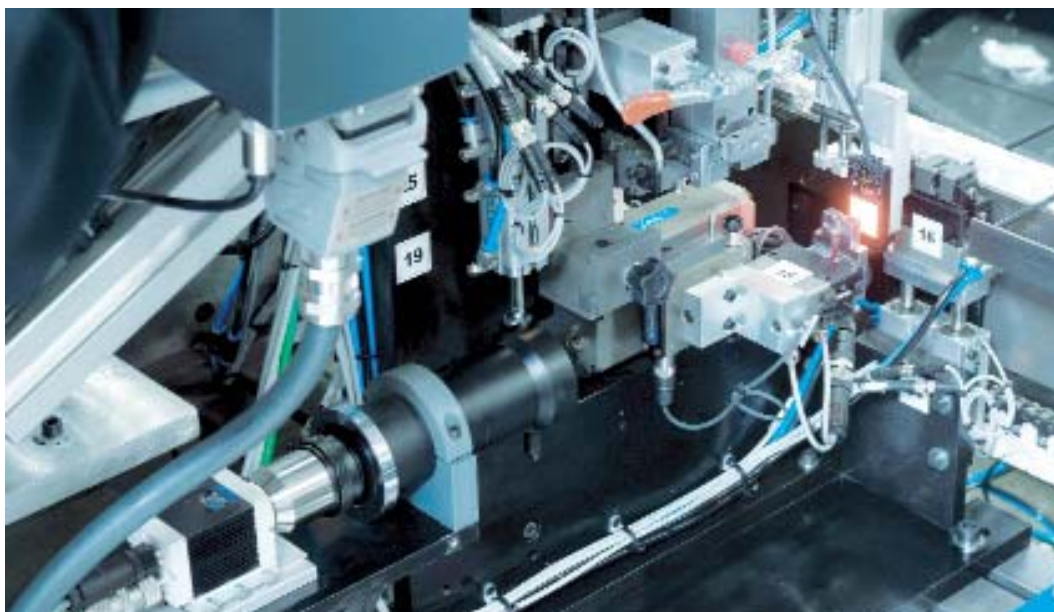
Minimal setting-up is required. If the transfer line and, consequently, quality assurance is to be con-

verted to another line type, the machine operators do not have to make any adjustments on the cameras themselves. You simply select the new line type and its parameters at the touch of a button using the system controller. The camera systems are then adapted automatically to the new inspection parts. Screw inspection and final inspection can be performed immediately, thereby ensuring that only error-free brake and fuel lines leave the system. ■

Camera system  
SBOC-Q



Checkbox Identbox  
CHB-IB



Does the supplied screw match the brake line type currently being produced? Checking the internal diameter sheds some light on the matter.