ProCam® Align Smart

Optimized production of digital camera systems for commercial vehicles and mobile machinery

Machine owners and operators increasingly expect their assisting systems to work and look like the ones on their personal cars. Even though commercial vehicles and work machinery are much larger and more complex, they should be just as easy and safe to operate as passenger cars. As a result, the demands on robust camera systems as the basis for many driver assistance systems have risen significantly in recent years.

1. Market demands

The demand for more advanced driver assistance systems for transport vehicles, construction machinery, agricultural machinery, forklifts and industrial trucks, rail vehicles, and even military vehicles can only be satisfied with greater digitization. Greater digitization can include turn-off assistants for large vehicles that warn of pedestrians or cyclists in blind spots. Active assisting rear-view systems or intelligent monitoring of the agricultural harvesting process are other typical use cases for smart assistance systems that use cameras. In addition, mobile machinery manufacturers are increasingly demanding driver assistance systems that meet the high-quality standard of the automotive industry. Automotive camera systems require perfect image quality as the data basis for further image processing.

2. Motec GmbH test case

Motec GmbH from Hadamar - a subsidiary of AMETEK Inc. - is a leading manufacturer in the field of intelligent driver and process assistance systems. They specialize in the development, design, and production of high-quality camera monitor solutions for mobile work machinery. To meet the increased demand for assisting systems, Motec wanted to implement its own

digitalization strategy. The company also wanted to automate and optimize the manufacturing process of its camera systems. In came TRIOPTICS to meet the demand. The automated active alignment equipment ProCam® Align Smart from TRIOPTICS meets the high requirements of the industry and was successfully integrated as a test and manufacturing device for camera production at Motec.

3. Production volume increased by a factor of ten with best possible image quality

Motec was able to satisfy the increased demands on the image quality of digital cameras with their own production process with the help of the active alignment solution from TRIOPTICS. The ProCam® Align Smart ensures reproducible quality and quality control during the production process of the camera systems. In addition, much higher quantities can be realized with this automated production machine in comparison to the conventional, manual assembly. The new machine in operation at Motec is designed for a production volume of 400 cameras per day, which represents a 10-fold increase in the number of units that were previously manufactured manually.

4. The active alignment solution

The state-of-the-art ProCam® Align Smart production machine includes automated assembly and alignment of the lens to the camera sensor in the camera housing.

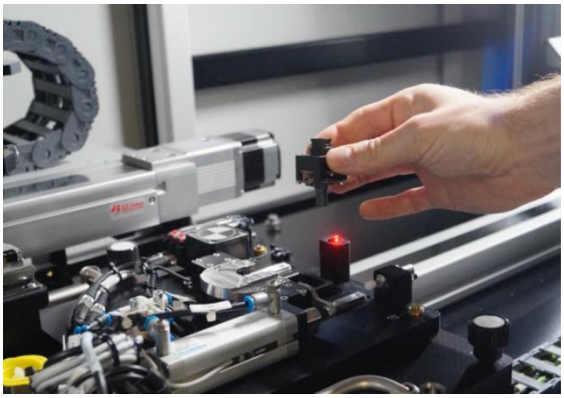
The machine is designed to eliminate faulty pairings. To maximize effectiveness, the lens and camera housing are inserted into the device. ProCam® Align Smart software then checks the compatibility of the assemblies based on the stored characteristics, parameters, and geometrics.

An adhesive is then dispensed onto the camera housing with microliter precision. The module then moves to the focusing and joining process. The lens is picked up by the ProCam® Align Smart and inserted into the camera housing. Using focusing collimators and 6-axis alignment kinematics, the lens is perfectly aligned until the best possible focus is achieved. The machine also adjusts and checks the image tilt, optical axis, optical center, and other quality-relevant parameters of the camera. This complex task is performed by ProCam® software in just a few seconds and the optical alignment is optimized regarding adjustable target values. In the following process step, the adhesive is pre-cured by UV light and the lens is fixed in its optimal position.

Compared to the classic adjustment of the focus position by screwing the lens, up to 6 degrees of freedom can be aligned in just one automated operation. This reduces the

overall time and can significantly improve image quality by positioning the camera to the lens in all spatial and rotational axes.

Finally, the adhesive between the lens and the camera housing is thermally cured in a separate process outside the ProCam® Align Smart. Another special feature of the active alignment equipment is an integrated adhesive shrinkage compensation. Applied adhesive usually shrinks during the thermal curing process. But the control unit of the ProCam® Align Smart takes that shrinkage rate into account by using a process- and adhesive-specific offset. The lens is inserted in such a way that the image parameters are optimally balanced after the adhesive process has cured.



The automated manufacturing concept of camera modules ensures the reproducible quality and characteristics required for digital assistance systems of increasingly autonomous mobile working machinery. At the same time, the active alignment process enables a significant speed-up of the focusing process. Overall, with the help of ProCam® Align Smart, Motec now manufactures approximately ten times faster than before and can offer digital camera systems for high-volume vehicles.

Contact:

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