Modular and intelligent automated complete test system for PCB technology

The complete test system for the PCB technology is based on the concept Universal Contacting Modules (UCM). The system is highly customizable, flexibly applicable, intelligent automated and energy-efficient. IMAK has already started the industrial revolution ‘Industry 4.0’.

UCM robot cell (center) UCM above a creeper (left) exchangeable test adapters for ICT (left above)

Universal Contacting Modules (UCM)

The compact modular constructed test- and programming system UCM realizes all test procedures in the PCB technology. UCM can be used overall production phases, productions designs and PCB products, and so UCM are re-useable.

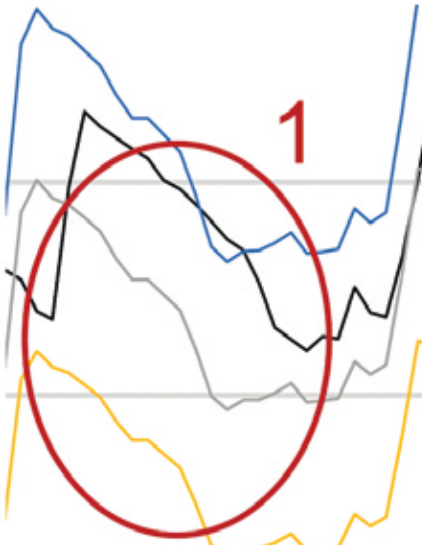
The System performs e.g. the following tests reliably: In-circuit-Test (ICT), function test, hot function test, flashing and flash test, pin check, R-test or leakage test. UCM are encased ESD conform and provide safety light grids. Depending on the production concept UCM can be used in following variations: As UCM stand alone, switch cabinet mounting module (internal/external), robot cell module (internal/external) or as an inline module with conveyor connection. Standardized creeper and standardized surfaces (plug & test) provide further flexible combinations. UCM can be equipped multilateral, i.e. manually and or automatically via conveyor and or robot handling system. The robot gripper moves in one rotation two test pieces. UCM, conveyor and gripper are adaptable and re-usable for different types of assemblies. UCM are equipped with quickly exchangeable test adapters. Conveyor and gripper are laterally adjustable. An automatic calibration of the handling system (robot) and a component based energy measurement developed, in cooperation with the University of Erlangen-Nuremberg, means more intelligent automation of the test system.

Fully automatic calibration

In order to minimize tooling time, a purpose-built camera can be integrated in the UCM robot cell. This smart camera detects a marker point on the gripper and references it with a predefined marker position, e.g. on changeable test adapters. The smart camera enables the robot to find new target positions automatically. After changing the test setting there are no more efforts for teaching/programming the handling system.

Measuring- & control system to optimize energy efficiency

UCM cells additionally can be equipped with measurement and control technologies. They trace energy consumption values and processes of electric and pneumatic components. The measuring data can be used e.g. for target/actual performance control, maintenance diagnosis, technical job order planning, validation of multiphysics studies as well as for realization of dynamical control strategies for production systems. Measured and control data is transferable via OPC UA, a standardized communication protocol, and so connectable to complex diagnosis-/control systems of modern production systems.



Energy consumption of a robot in progress (actual value curve in black) incl. fault diagnosis 1: Actual curve passes over the upper target value curve (blue)

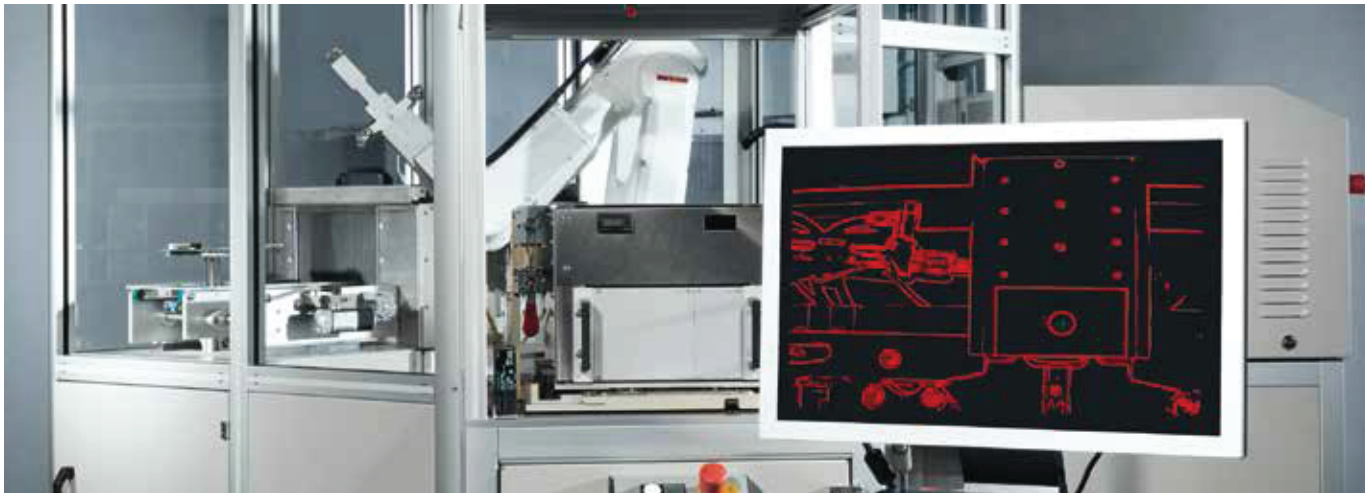


Image pattern recognition of a position marker (right) of a smart camera (center above) for automatic calibration of a robot (center) after changing test setting