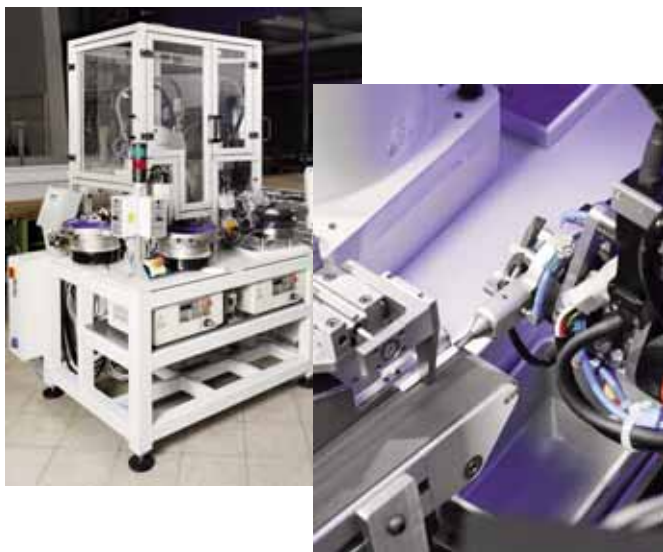


Industry: High-frequency systems / assembly and quality control

Products: Products: Industrial robots / RH-6SH SCARA robots

Precision Handling: Automated Assembly of Coaxial Connectors

Making coaxial connectors in the quality required nowadays is only economically possible with automated assembly systems and 100% quality checks using image processing systems. Rosenberger Hochfrequenztechnik GmbH & Co. KG in Fridolfing, Germany, is one of the world's leading manufacturers of high-frequency coaxial plug connectors for telecommunications, mobile phones, car electronics and industrial testing and measuring systems. At their works they have built a special assembly station for these connectors, using two industrial robots from Mitsubishi Electric.



The two SCARA robots, both of them MELFA RH-6SH units, are the key components of the system developed by Rosenberger's engineers. They perform the actual assembly of the coaxial connectors, which consist of three components: the outer and inner conductors and an insulator. Flexibility is essential, because there is a very wide variety of outer conductors and the placement of these components is thus a tricky task. In addition to this, existing connectors are continuously being discontinued and replaced by new types. This, and increasingly stringent quality requirements, make 100% quality control absolutely essential.

The outer conductors are fed in on a vibrating conveyor. Only the conductors that are oriented correctly are allowed onto the conveyor, the

others are removed automatically with a jet of compressed air. The good/bad evaluation is performed by a line-scanning camera. The correctly-oriented components on the belt are then scanned by a second camera, which reports their precise orientation and the angle of their opening to the robot controller. With the help of the controller's tracking function the first robot then reaches precisely into the opening of the moving outer conductor with a parallel gripper and picks up the component. Then the gripper attachment rotates and the robot picks up one of the insulators from a second vibrating conveyor, which feeds them into the machine with the correct orientation.

Next, the robot positions both components vertically in the actual assembly station – first the outer conductor, and then the insulator, which is inserted into the conductor. Control is then passed to the second robot, which has already picked up an inner conductor. Here too, the proper orientation of the components on the conveyor is monitored by a line-scanning camera and the conductor is positioned so that the suction gripper can pick it up easily. Using its suction gripper, the second SCARA robot then inserts the inner conductor into the insulator and holds it in position while three small notches are made in the outer conductor to secure it. An integrated load cell ensures that the robot applies exactly the right amount of force to insert the insulator into the knurled inner conductor. More force is required to join the connectors that are just pressed together without notching. Finally, robot no. 2 then picks up the completed connector and places it on a pallet.

The combination of robots and modern image processing technology delivers the high flexibility and precision needed for this assembly task. Another advantage of the robots is the multitasking capability of their controllers, which can control an additional eight axes at the same time as the robot's own four axes.



One of the major factors in favour of the Mitsubishi robots is that they have the performance we need in both the lower payload range and in the higher range up to 12kg, which makes them a good choice for our products.

Georg Lapper, Head of Process Development, Rosenberger Hochfrequenztechnik GmbH & Co. KG, Fridolfing, Germany



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