

# Drive & Control profile

Multiple Axis Motion Systems:

## Flexibility Wins in Medical Assembly System



Flexibility is key: The CMS sorts the die pairs prior to the next process step.

CMS Multiple Axis Motion Systems from Rexroth offer integrators and machine manufacturers a plug-and-play solution that has been precisely pre-configured to their specifications. This opportunity was grasped by special-purpose machinery manufacturer behr GmbH who chose CMS motion systems to build an assembly line for medical equipment.

“When appropriately designed, Cartesian motion systems are more flexible than robots,” emphasizes Uwe Behr. For the Managing Director of behr

GmbH in Blaichach, Germany, this technology has still more advantages to offer: “It is substantially less expensive than other solutions. And what is most important, Rexroth offers plug-and-play solutions with its CMS, which considerably cuts our project planning and start-up costs.” For a new assembly line designed for a medical technology application, behr used pre-configured multiple axis systems CMS from Rexroth. These one, two or three-axis solutions combine linear motion systems—based on Rexroth’s proven Compact Module CCK—

### Challenge

Create a high-precision medical products assembly system for existing production facility.

### Bosch Rexroth Solution

- Pre-configured Cartesian motion system with integrated motor/controller
- Compact Rexroth EcoDrive Cs controllers and MSM motors
- Plug-and-play solution for easy set-up
- Compact CCK linear motion modules with high positioning accuracy and speeds of up to 1.0 m/s

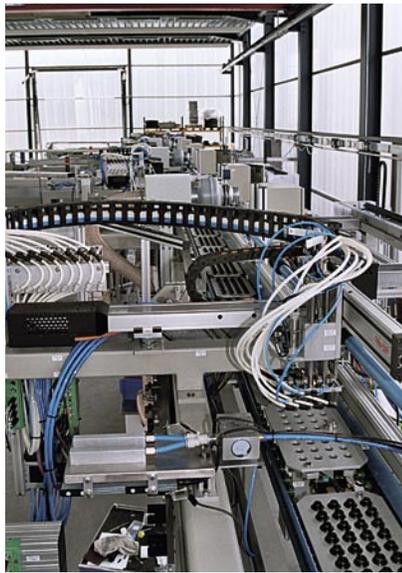
### Benefits

- Reduced project planning and start-up costs
- High travel speed and high precision
- High positioning accuracies of up to 0.01 mm
- Repeatability of up to 0.005 mm per axis
- Less maintenance with one-point lubrication integrated ball rail systems

with motors, cables and servo drives, including the interfaces to all commonly used field bus systems. “This plant has been designed to automate the handling of optical lenses produced to order by a medical equipment manufacturer,” says Markus Haberstock, Project Manager at behr, describing the task. The special challenge here was that the assembly system had to be planned and built to dovetail exactly with existing production facilities consisting of seven machines.

**Very small production runs**

The work operations reflect the complex logistics required to manufacture using very small production runs. Three injection molding machines standing side by side produce eight parts in four different designs per cycle. These are die halves which have the exact negative contours of precisely defined product variants. Pick-and-place systems position the dies, measuring 15 mm in



Clean conveying: The assembly line with four Rexroth CMS multiple axis motion systems will be installed in a class 10,000 clean room.

diameter, in workpiece trays with 32 compartments. A conveyor system moves the filled workpiece trays to a transfer system from Rexroth for the next work step. There, four Cartesian motion systems slot the die pairs into



Proven series technology: The CMS is based on Rexroth's Compact Modules CKK with specially tuned motor/controller combinations.

towers— drum magazines with eight compartments for up to one hundred dies each. In all, more than 300 storage cells are being used in the drum magazines.

“The CMS systems play a key role in sorting the dies,” emphasizes Markus Haberstock. What counts above all is high flexibility to cater for all the many product variants. Rexroth supplies the four X-Y systems as complete units with motor and controller. In this application, the controllers communicate via Profibus with the master control system. The compact Rexroth EcoDrive Cs controllers and MSM motors offer high dynamics and achieve a very high positioning accuracy with their multiturn resolvers which generate 131,072 pulses per revolution.

The behr systems have a useful stroke of 500 mm in the X-axis and 400 mm in the Y-axis. The Bavarian engineers developed a special gripper for the Z-axis. The combined linear axes, based on the Compact Module CKK, were supplied in the lengths specified by the customer. The CKK modules consist of an extremely compact precision extruded aluminum profile with an aluminum cover plate. A continuous gap seal made of PU strip protects the internals. The CKK modules have two integrated ball rail systems. Large screw diameters and leads and double floating bearings make it possible to combine high travel speed with high precision. The centrally arranged ball screw drive in tolerance grade 7 ensures

a low-profile design and, with its zero-clearance nut system, delivers high positioning accuracies of up to 0.01 mm, and a repeatability of up to 0.005 mm per axis. The ball rail systems and the ball screw drive have one-point lubrication systems accessible from either side, thus minimizing maintenance. The aluminum fixed bearing block with two-row preloaded angular-contact ball bearings and the floating bearing block with double ball bearings ensures backlash-free, dynamic motion. A locating feature and threaded mounting holes facilitate motor mounting. The perfectly matched motor/controller combinations achieve speeds of up to 1.0 m/s and acceleration rates of up to 15 m/s<sup>2</sup>, which assures a high level of efficiency and productivity.

### **Single-source system**

In the behr assembly line, the CMS systems run in concert with a further servo axis for the tower. The machine frame is constructed from tubular steel. Aluminum profiles and guard elements were also provided by Rexroth. The multi-technology specialist supplies CMS motion systems complete with matching clamping fixtures and connecting plates for mounting to the aluminum profile struts from the basic mechanical elements range. This saves even more time.

**Rexroth**  
Bosch Group