

# Drive & Control profile

## Precision Down to the Finest Detail



Milling of an occlusal surface of a titanium crown in a KaVo Everest® engine.  
KaVo Dental Excellence.

Ready-to-install linear guideways and drive systems offer optimally balanced performance. Developers of application-driven system solutions, like the KaVo company, use such modules and linear motion technology know-how to reduce the design and installation effort. The variety of options offered by the PSK modules from Bosch Rexroth and their ready availability in freely selectable lengths made it possible to accelerate the development and build process for KaVo's new Everest® CAD/CAM systems for dental laboratories.

The Everest® CAD/CAM system from KaVo Dental Excellence, based in Leutkirch, Germany, is a complete machining solution for dental laboratories. It consists of autonomous system components and can be used to manufacture virtually any dental prosthesis, from a crown to a bridge, using many different advanced materials. This includes precise scanning of the models and automated milling and grinding, as well as the sintering of HPC porcelain.

5-axis milling and drilling technology in the dental lab

### Challenge

Improve machining solution used in dental laboratories to include automation, thereby simplifying routine tasks and improving quality.

### Bosch Rexroth Solution

- Bosch Rexroth PSK module
- Bosch Rexroth Ball Rail System

### Benefits

- Improved distribution of moment forces
- High load capacity
- Optimal running characteristics
- Compact, rigid design
- Space saving

The core of the system is the KaVo Everest® engine milling and grinding unit in 5-axis technology. Specially developed for dental laboratories, it allows complete machining of geometrically intricate designs, including undercuts. One striking feature is its rugged and compact design. It is based on a solid U-shaped body of dimensionally stable polymer concrete with vibration-damping and noise-absorbing properties. The five axes include the X, Y and Z axes for horizontal and vertical linear positioning. The A and B axes are designed for rotary motion and for tilting the work piece clamping platform, as well as for turning the double spindle with the tools for scrubbing and polishing.

The linear axes are in gantry form, i.e. the Y axis is supported at both ends by ball rail systems and is driven centrally by a Bosch Rexroth PSK module. The guideways integrated in the PSK modules give the system extra stiffness and improve the distribution of moment forces, which are especially high during milling. The X and Z axes, also driven and guided by PSK modules,



The KaVo Everest® engine's linear axes in gantry design.

are arranged on the Y axis and are each supported by an additional ball rail system.

**Built-in dynamics**

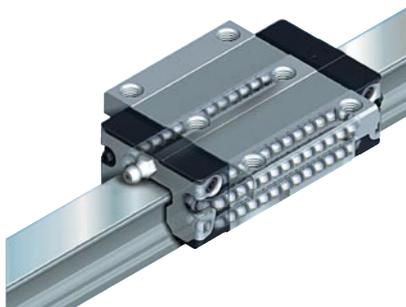
PSK Modules from Bosch Rexroth are miniature, ready-to-install linear motion systems comprising profiled rail systems and a ball screw drive. The guideway running tracks are integrated inside the frame, an extremely compact and rigid U-shaped precision steel profile. The outer reference edge is fully machined and facilitates installation. This rigid structure made it possible to build the Everest® engine small, while achieving high stiffness and precision. With their internal runner blocks and carriages, the PSK modules offer high load capacity and optimal running characteristics. The carriages are driven by a precision ball screw drive. With large screw diameters and leads, the travel speed can be as much as 96 m/min. Repeatability is

up to 0.005 mm. These product characteristics are key in achieving the necessary dynamics and accuracy in simultaneous 5-axis machining of dental prostheses. For this application, the PSK modules were produced in a special version with enhanced preload of the ball screw drive.

**Better quality and improved machining technology**

The aim in developing the KaVo Everest® CAD/CAM system was to perfect machining through automation, to simplify routine tasks and to improve quality versus conventional systems by introducing simultaneous 5-axis precision machining.

The development of the hardware for the milling/grinding unit was a major task. Using standard industrial machines would have meant compromising on quality. KaVo, therefore, built up its own mechanical engineering know-how specifically to meet the requirements of dental technology and laboratory practice. Wolfgang Gapp, one of the two developers of the Everest® engine hardware, explains exactly why the flexible application possibilities of the PSK modules were so useful during the



Ball Rail Systems from Bosch Rexroth have proven their worth in many sectors, including medical equipment.



Bosch Rexroth Precision Modules PSK are miniature, ready-to-install linear motion systems.

development phase: “We developed the machining technologies and the mechanical design of the milling/grinding unit in tandem. During this phase we built various prototypes for preliminary trials. The fact that the PSK modules are available in different versions and in optimally matched lengths helped us to quickly get the system ready for series manufacture.” His colleague, Jürgen Butscher, adds: “The technical support was always fast and unbureaucratic. Even for the motor attached to the Y axis, which we had to design as a side drive with timing belt for space reasons, we could depend on the expertise of the Rexroth linear motion specialists.”

### Summary

PSK Modules from Rexroth are ideal for manufacturing and machining equipment involving fast and precise motion sequences. Their advantage is the compact and rigid design. With their flexible make-up, unrestricted by length or the type of motor attachment, cover, etc., they allow space-saving dedicated designs.



The KaVo Everest® CAD/CAM system with its autonomous system components, the scanner, automated milling/grinding unit (engine) and sintering oven (therm).

**Rexroth**  
Bosch Group