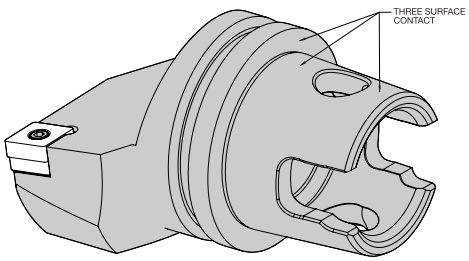
The Kennametal KM Quick-Change Clamping System is the first step in achieveing maximum machine output. Please refer to the Kennametal Machine Utilization Strategy for more information on how KM can help you to increase your machine through put.

KM Coupling

The rigidity and stiffness of the patented KM joint is achieved through a combination of unique design elements incorporated in both the shank of the tool and the clamping mechanism. The KM joint was developed as a system and takes full advantage of both the tool shank and the mechanism to obtain maximum benefit from the space utilized.

Taper Shank

All KM tooling is designed around a short 10:1 tapered shank. Extensive testing of many different lengths and angles proves this combination provides maximum stiffness and input forces required for locking/unlocking. The taper is self-centering to promote easy tool loading and unloading in both manual and automatic applications.



Face and Taper Contact

KM tooling is designed to have simultaneous taper and face contact. Two alternate methods provide metal-to-metal contact.

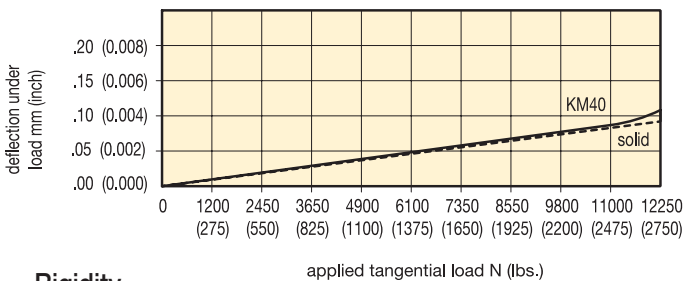
One method is to manufacture both halves of the coupling holding very close tolerances. The other is to design a small amount of elastic deformation into the assembly. With KM tooling, elastic deformation takes the form of expansion of the female taper (on the clamping unit) as the larger male taper (on the cutting unit) is pulled back during lockup. Our testing proved that an optimum combination of pull-back force and elastic deformation (rather than a close tolerance) provides greater static and dynamic stiffness, achieves a metal-to-metal fit, and is less costly to manufacture. The simultaneous face and taper contact enables a very close radial and axial repeatability of +/-.0001inch (+/-2,5um metric) for a specific cutting unit in a specific clamping unit. When more than one cutting unit is used, the accuracy of each cutting unit must be considered. Pre-gaging (when changing tools) measures the deviations of each tool from the nominal. These deviations can then be compensated for through the machine tool control offsets.

Clamping Mechanism

The KM clamping mechanism fits inside the taper shank of the KM unit and utilizes two angled holes, called ball tracks, machined through the shank. In order to produce a system with a high mechanical advantage and low frictional losses, precision hardened steel balls enable the pull-back force to the KM units. These locking balls are forced radially outward by a wedge-shaped piece called the lock rod. The combination of angles on the lock rod and in the ball tracks results in a 3.5:1 mechanical advantage. High clamping forces are produced with minimal input forces. The side activation design also permits the clamping mechanism to fit in a length and diameter equal to the respective system size.

Locking Sequence

The clamping sequence starts with the insertion of the cutting unit into the female taper of the clamping unit. The cutting unit first makes contact at a standoff from the face of approximately .010 inch (0,25 mm). A small amount of elastic deformation takes place at the front of the female taper as the locking force is applied. The cutting unit advances until the gageline face makes contact with the face of the clamping unit. The final amount of torque applied to the clamping mechanism allows the tail of the cutting unit to clamp securely between the clamping balls and the clamping unit inside diameter.

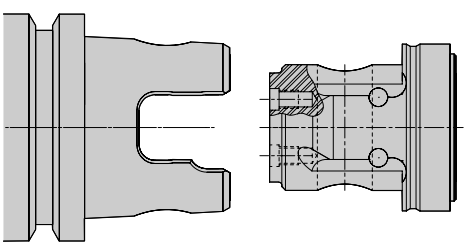


Rigidity

The unique combination of the three-zone contact and the Ball Track™ clamping mechanism produces a coupling that closely approaches the ultimate rigidity of a solid piece. The graph shown here compares the static load deflection of a solid model, machined to the same external dimensions as the KM cutting unit and clamping unit assembly, with the KM cutting unit and clamping unit assembly. As the graph indicates, using a 2700 lb (12,kN). applied load, the difference in deflection is only .0002 inch (0,05mm).

Sealed Coolant

Sealed through-the-tool coolant is offered on all standard KM tooling and clamping units. The coolant is sealed via o-rings in both the cutting units and clamping units. This feature ensures that coolant is directed as close as possible to the cutting edge while preventing contaminants from entering the clamping mechanism.



Fail-Safe Tool Orientation

A unique feature of KM clamping units is the ability to install the KM tool only one way. To allow greater flexibility, standard KM clamping units are shipped without this feature installed.

Summary

The KM coupling offers a very rigid joint with a high degree of repeatability while maintaining a very compact envelope. This permits a high degree of versatility without sacrificing cutting performance.