▶ BY MICHAEL DEREN

Face FACTS

Face drivers can cut setup times in half.

Recently, I was talking to a machinist in a job shop as he prepared to turn a shaft. I noticed he was readying the shaft for two setups on his turning center. The part drawing showed several journal-bearing diameters on each end of the shaft that needed to be concentric within a couple of tenths.

"Why don't you use a face driver and do it in one setup?" I asked. He looked at me like I had a hole in my head and replied, "What's a face driver?"

His cohorts hadn't heard of face drivers, either. When I asked their supervisor if he had, he responded, "Oh, you mean a drive dog."

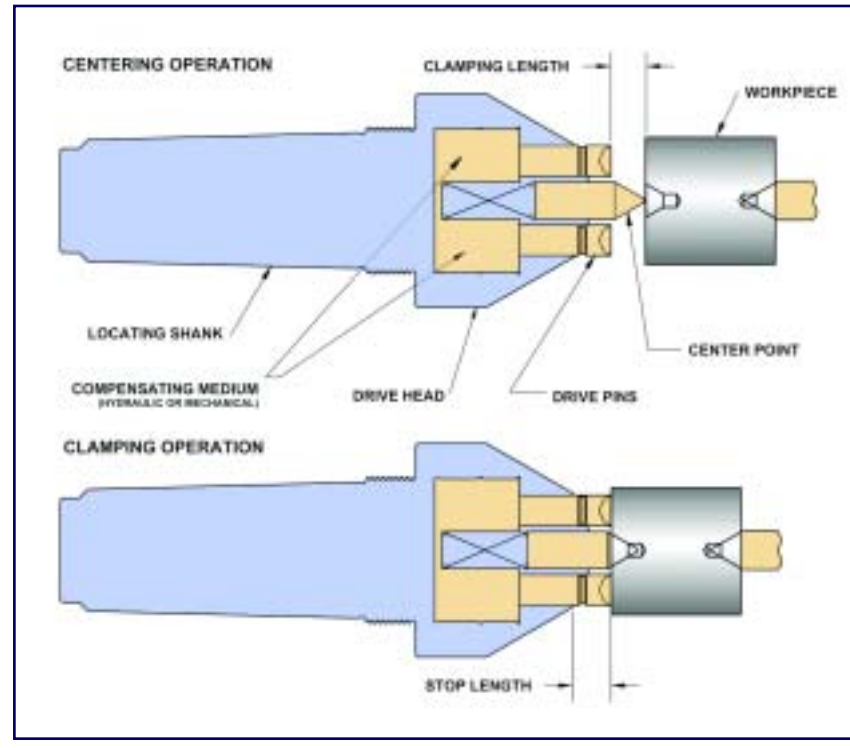
No, I said, a drive dog—though used for machining between centers—is the predecessor of the face driver. I pulled a tooling catalog out to show them what a face drive was. It was some revelation!

Face Makeup

A face driver incorporates a drive head and drive-head holder. The holder locates the drive head in the machine. It can be a Morse-taper-shank mount, a chuck mount or a flange mount. Each offers distinct advantages.

The shank type allows quick changeovers without any tooling. The chuck mount allows an existing chuck to grip the OD of the drive head; bored out soft jaws are required. The flange style mounts directly to the machine spindle face.

The latter provides the greatest rigidity. It permits parts to be machined to tighter tolerances and lessens spindle wear. Usually, a flange mount requires a spindle adapter.



Riten Industries

Face driving is a two-step operation: centering and clamping. Centering occurs when tailstock pressure is applied and the live center locates in a predilled hole. As pressure increases, the spring-loaded center retracts and the drive pins penetrate the part, completing the clamping portion of the operation.

Portions of this article were adapted from information published by Riten Industries Inc., Washington Court House, Ohio, and Madison Face Driver—A Speedgrip Company, Elkhart, Ind.

Karl Bruckner GmbH

Face drivers are available with different compensating media, including mechanical and hydraulic.

The drive head consists of a live center, a compensating medium and chisel-point drive pins that penetrate the part. When tailstock pressure is applied, the live center locates in a predilled hole. This results in the workpiece revolving around its own centerline. As tailstock pressure rises, the spring-loaded center point retracts—while still maintaining the centerline position—and the drive pins begin to engage the workpiece.

The drive pins initially penetrate the workpiece approximately 0.010" to 0.015", depending on material hardness. The completion of the clamping occurs when the cutting tool engages the workpiece during the first cut. *The first cut must be toward the spindle.* Cutting in this direction increases pin penetration to approximately 0.030". Once the first cut is completed, cutting from the opposite direction is permissible.

The compensating medium can be hydraulic, mechanical or an elastomer ring. The medium ensures that the drive pins penetrate the face of the workpiece equally, even if the face isn't square or has deviations.

A mechanical medium accommodates a part face that is up to 5° out of square. A hydraulic medium can secure a part face up to 7° of out of square. Elastomer rings are limited to slightly out-of-square conditions and typically are used with lower-priced drive heads.

Parts with spherical ends or irregular shapes can be held by face drivers, too. These types of parts, however, require specially designed pins and centers.

Benefits, Use Considerations

The biggest advantage of a face driver is that it allows the entire OD to be machined in one setup. This enhances part-diameter concentricity.

Face drivers also can save time. That's certainly the case when machining journal bearings that are turned then finish-ground. A face driver allows more stock to be removed during turning, which minimizes the time spent removing grind-stock.

In addition, because a face driver centers the workpiece, load and unload times are shorter than with a conventional chuck. Another benefit is that a machinist can face and chamfer both ends of a workpiece mounted in a face driver. That is not possible with a chucked part.

And, contrary to what some people think, a face driver can be used at aggressive machining parameters. Up to 0.250" per side is possible during turning.

Besides turning applications, face drivers also can be used for hobbing, grinding and milling. Typically when applying a face driver, the ratio of workpiece diameter to driver size is 2:1. However, it can be as high as 3:1. Parts with diameters from 0.28" to over 13" can be machined using face drivers.

Workpiece hardness must be considered when using face drivers. Part hardness up to 36 HRC shouldn't cause any problems, in terms of drive-pin penetration. When hardness exceeds that level, though, tailstock forces must be increased and cutting depths reduced. Carbide pins are recommended for harder materials.

When using a manual tailstock, the initial tailstock force is reduced as the tool begins cutting. The operator must retighten the tailstock to maintain the required force. With powered tailstocks, the needed force is automatically maintained.

It's best to use a heavy-duty live center in the tailstock. It will allow smooth, free rotation of the workpiece. A power-operated unit should allow the machinist to adjust the actuator mechanism to prevent the tailstock from "slamming" the workpiece into the drive pins. This could permanently damage the pins.

Tailstock pressure is critical. Most manufacturers of face drivers publish charts and recommendations for tailstock pressures. Adhere to them. More tailstock force is required when taking a heavier cut. If there is insufficient tailstock force, the part may slip as it rotates.

Several manufacturers of face drivers offer tailstock pressure gages and live centers with color bands on them that indicate the level of pressure being applied. These are must-have tools.

Unlike tailstock pressure, the diameter of the center-hole diameter isn't critical. Still, it must be taken into account or problems can arise during turning.

If the center hole is undersize, the center point of the face driver will not retract far enough to allow the pins to penetrate to the needed depth. If that

occurs, the part will not rotate properly. Or, during a roughing operation, the part may slip, damaging the pins, the cutter or itself. If the center hole is too large, the center point will not locate the part properly, possibly resulting in the production of eccentric parts.

Face drivers generally require little maintenance, but they should be inspected periodically. Check for deteriorating springs and washers in mechanical units, and look for leaks in hydraulic units.

Also, periodically remove and inspect the drive pins and center point. Clean and lightly coat them with oil or a rust inhibitor.

The live centers and drive pins are commodity items, so replace them when worn. Drive pins can be resharpened to extend their life.

Limited Use Here

I have used face drivers for more than 20 years to machine shafts on lathes and turning centers. They let me turn the entire OD in one setup, and I get concentric parts every time.

Europeans understand the benefits of face drivers. They have been popular on the Continent for decades, but their use in the U.S. has been limited.

That could change, though. As the global marketplace continues to pressure American manufacturers to increase productivity by eliminating operations and lowering cycle times, the inherent advantages face driver technology offers will likely come to the forefront.

About the Author

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