

Small Bevel Gears Made Easy

Production of small, high-precision bevel gears for robotics, power tools and other similar-size applications enters a new era

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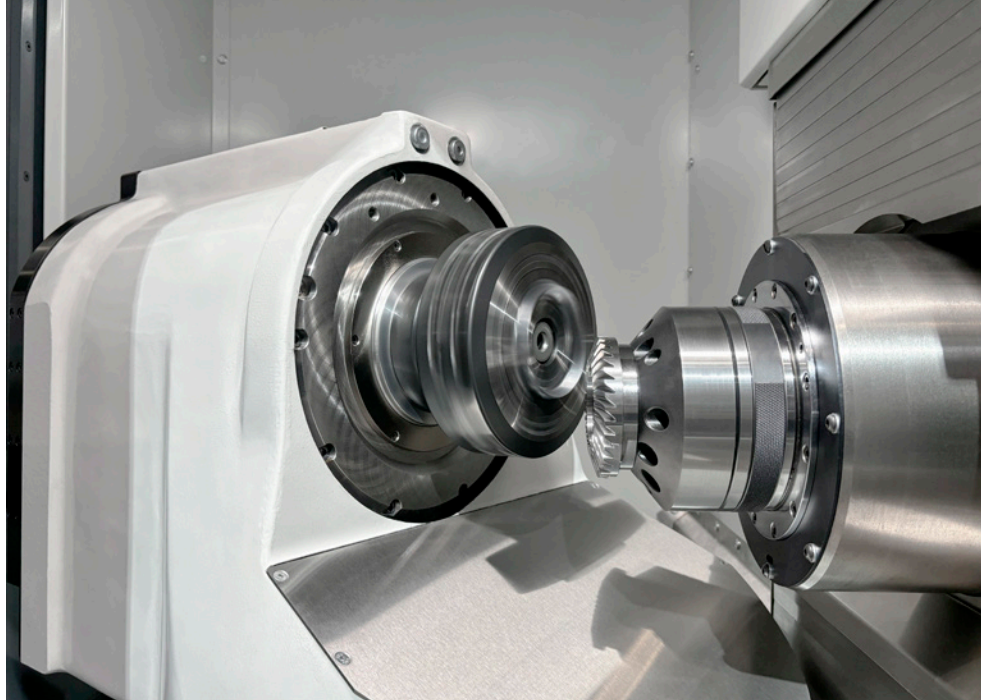


Gleason Phoenix 100C Bevel Gear Cutting Machine: fast, compact, efficient and purpose-built for smaller bevel gear cutting.

By 2030, the global robotics market size is expected to range anywhere from \$160 billion to \$260 billion. The world is expecting robots to do a lot of the “heavy lifting” going forward. But with demand pressuring supply for many of the essential components, new production technologies are needed to keep pace. Nowhere is this truer than for the smaller, high-precision spiral and hypoid bevel gears that play such a critical role in transmitting power and delivering precise, reliable movement in increasingly complex, multi-axis robotic systems. Yet, manufacturers of these gears have, up until now, had surprisingly few options available to help them ramp up production of this new generation of high-efficiency bevel gears—particularly in the increasingly common size range of 100 mm in diameter and smaller. Case in point: a technology still very much in widespread use to produce small bevel gears is a mechanical machine that dates to the 1960s: the Gleason No. 102 Generator. These tried-and-true workhorses can still be found by the many hundreds in even the most modern manufacturing environments, working dependably to cut the small spiral, hypoid and straight bevel gears that go into everything from power tools to lawn/garden and small industrial gearboxes to, yes, even advanced robotics.

Fitting Perfectly into Small Bevel Gear Production

The inherent limitations of these vintage mechanical machines make them particularly ill-suited to produce a new generation of bevel gears for robotics—and many other applications—where quality, flexibility, and, above all, speed, are paramount. The 102 Generators are, by nature, very time-consuming and difficult to set up and require operator skills that are in increasingly short supply. Changeover, whether for “high mix/low volume” or “low mix/high volume” applications and/or to accommodate fast-changing customer demand on the fly can take hours, even days on these older machines—a process that can be done with the press of a button and in a few minutes on today’s modern CNC machines. Nor can they be networked into the quality inspection process that



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many manufacturers are today using to shorten the distance from optimized new design to high quality production part. Ensuring repeatable quality on a 102 is an operator-intensive process that requires repeated cycle interruptions for part quality checking and rechecking. These limitations aren’t lost on the user, most of whom have transitioned to more modern CNC machines everywhere else in their facilities. Gleason has now developed a machine that is fast, compact, efficient and purpose-built for smaller bevel gear cutting: the Phoenix 100C CNC Bevel Gear Cutting Machine.

The 100C has been designed to fit seamlessly into the world of small bevel gear production: easily applied to “legacy” production and the continued use of traditional solid body HSS cutter systems and a myriad of pre-existing workholding systems, while ideally suited as well for the application of today’s most advanced inserted blade carbide cutter systems for Power Dry Cutting at speeds two to three times faster than possible with older machines. Additionally, the machine can be equipped with very fast, fully integrated gantry-type load/unload automation, which easily interfaces with common palletized, basket-type and/or conveyor parts handling

systems for higher volume applications. Even with its loader automation, the 100C’s small footprint takes up only 65 sq. ft (6 m²) of precious floor space.

Scaled Down, Powered Up

In the case of the 100C, “downsized” doesn’t mean “under-equipped.” In fact, the machine offers many of the same features and benefits users have come to expect in the latest generation of larger Phoenix machines. For example, the powerful, high-speed direct-drive cutter and work spindles are designed to support almost every spiral bevel, hypoid and even straight bevel gear production application in its size range, including face milling and face hobbing, wet or dry cutting, low to high production volumes – all through application of all types of cutter systems. These, of course, include older-style solid-body HSS cutters, but also Gleason’s latest solid-body carbide cutters and most advanced Pentac carbide stick blade cutter systems to achieve the extremely high speeds and greatly improved productivity of the Power Dry Cutting process. The 100C also saves time with an integrated brush deburr unit that automatically deburrs the workpiece in seconds right on the machine.

The 100C comes equipped with the latest Gleason bevel gear quick change tooling to help eliminate much of the costly non-productive time that was once required to change over different parts—while at the same time achieving high, repeatable accuracies. Note that the system is designed for the machine's 39-taper spindle bore; existing

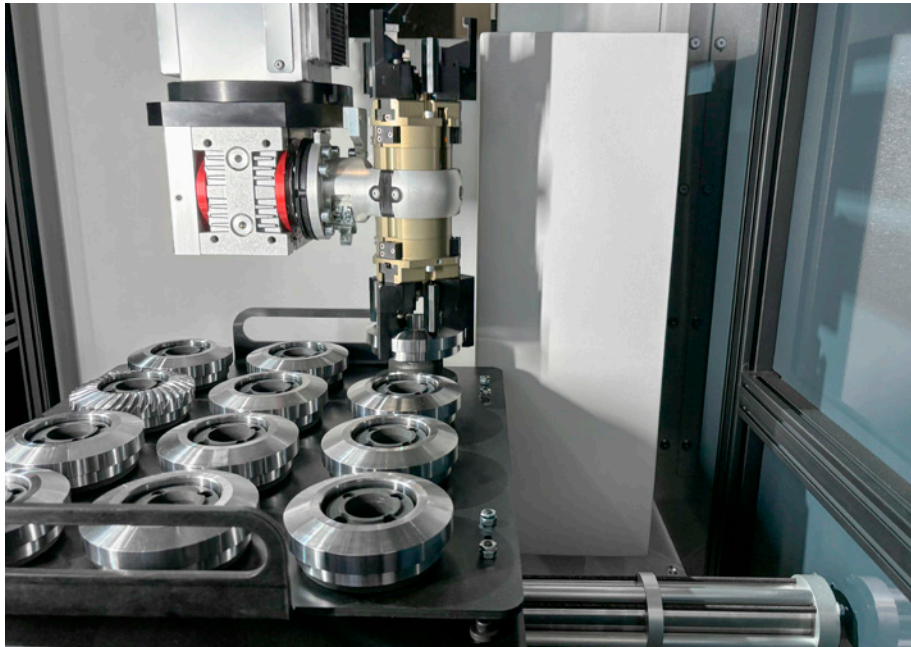
workholding for legacy parts with other taper requirements can easily be accommodated with a variety of adapters for the most common bore sizes.

Finally, when automation is used to load the gear blanks, an air-detect system ensures that the part is chucked and seated properly in advance of the machining cycle.

Working Smarter on Smaller Parts

Shorter cycle times and more efficient, error-free operation also result from Gleason's *GEMS* Machine User Interface software, which makes setup and changeover more intuitive and simpler to both learn and operate. This User Interface, coupled with the latest Fanuc CNC, provides several new process options and guides the operator intuitively through the workflows of the machine. Contrast that with the many hours, and vast experience, required for operators of older mechanical machines to change components like feed cams and change gears when setting up part-to-part. Since setup and operation are largely summary-driven, even new operators can be trained and operating the machine productively practically overnight.

These operating software and network capabilities allow easy integration of the 100C into any modern production environment. They can also interface the 100C into *GEMS* Closed Loop Manufacturing, which connects all process steps, from gear design to the final, optimized gear in a single system approach—for worry-free and intelligent gear production.



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