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Cutting force measurement leads to superior tooling concept

BIG Daishowa relies on Kistler dynamometers

BIG
BIG DAISHOWA

BIG Daishowa, headquartered in Osaka, Japan, is one of the leading producers of tool holders for the machining industry. Each year the company produces over half a million collet chucks. Their products are developed using, among other resources, Kistler's cutting force measuring device.

More than 500 machine tools as well as some 300 robots and automated systems — these are the figures for BIG Daishowa's production capacity. The family-owned company was founded in 1967 and employs close to 900 employees worldwide. In Europe and North America the company is known through its subsidiary, BIG KAISER. The core competence of BIG Daishowa: high-quality tool holders for cutting with a machining run-out of max. 0.001 mm. Aside from various types of tool holders like collet chucks, hydraulic chucks, milling chucks and tapping holders, their selection encompasses angle heads, measuring devices and cutting tools.

Goal: Minimize forces on thread flanks

In order to further develop their product portfolio, BIG Daishowa is continuously developing new tool concepts in-house at the MEGA Technical Center. One of the products that emerged from these efforts is the MEGA Synchro tapping holder. It is a "compensation chuck," which uses elastic components to compensate for the synchronization errors between tooling machines and tools. The basic challenge threads pose is to minimize the differences in length arising from the spindle speed as well as the applied feed rate in relation to thread pitch and thread depth, in order to minimize the axial forces that arise on the thread flanks. High axial forces can have a negative impact on the thread flanks and result in decreased lifetime of the tap holder: "Although modern CNC machines are equipped with synchronous spindles, minor synchronization errors still occur," says Masayuki Doi, development manager at BIG Daishowa. Even minor deviations immediately create high axial forces on the flanks of the tap holder.

Optimized construction thanks to cutting force measuring

In order to optimize the design of the MEGA Synchro, BIG Daishowa relied on a 3-component dynamometer from Kistler. The piezoelectric cutting force measuring device measures a



The tapping holder MEGA Synchro was developed with a dynamometer 9257B from Kistler

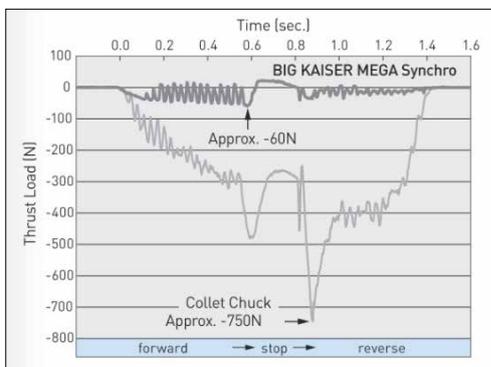
compact 170×140 mm and can be mounted onto the machine tool table. It is exceptionally rigid and accordingly has a high natural frequency, which allows highly precise measurement of forces per cut even at high rotation speeds. "Due to the precise measurements obtained using Kistler's dynamometer and the conclusions drawn from those, we have been able to tailor the design to such an extent that the forces on the thread flanks have been drastically reduced," Doi states. In concrete terms: For tapping with a collet chuck, axial forces exert up to 750 N on the tap. Whereas when it comes to MEGA Synchro this is at max. 60 N. This increases the lifetime of an M12 tap by a factor of 2.4.

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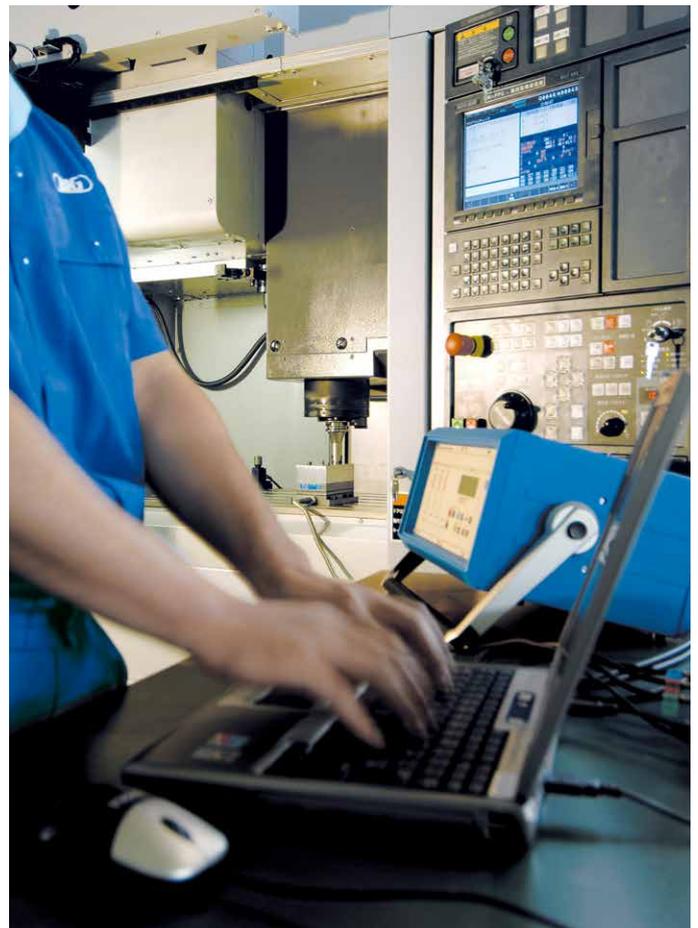


In its MEGA Technical Center BIG has 10 machine tools for testing purpose only



Cutting data: Vc: 20 m/min.; RPM 1,050; Thread: M6x12m, Material: C55

Doi is self-assured: "Without Kistler's cutting force measuring device, we would not have been able to develop the MEGA Synchro." BIG Daishowa has developed unique collets and nuts for their new tapping holder. In contrast to many other tooling manufacturers, BIG isn't using conventional ER collets but their proper slim collets to clamp the tap. This has a positive effect on the runout accuracy. Moreover, their slim diameter nut is avoiding interference with the work piece.



BIG is not only using Kistler's dynamometer but also a charge amplifier as well as software solutions

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