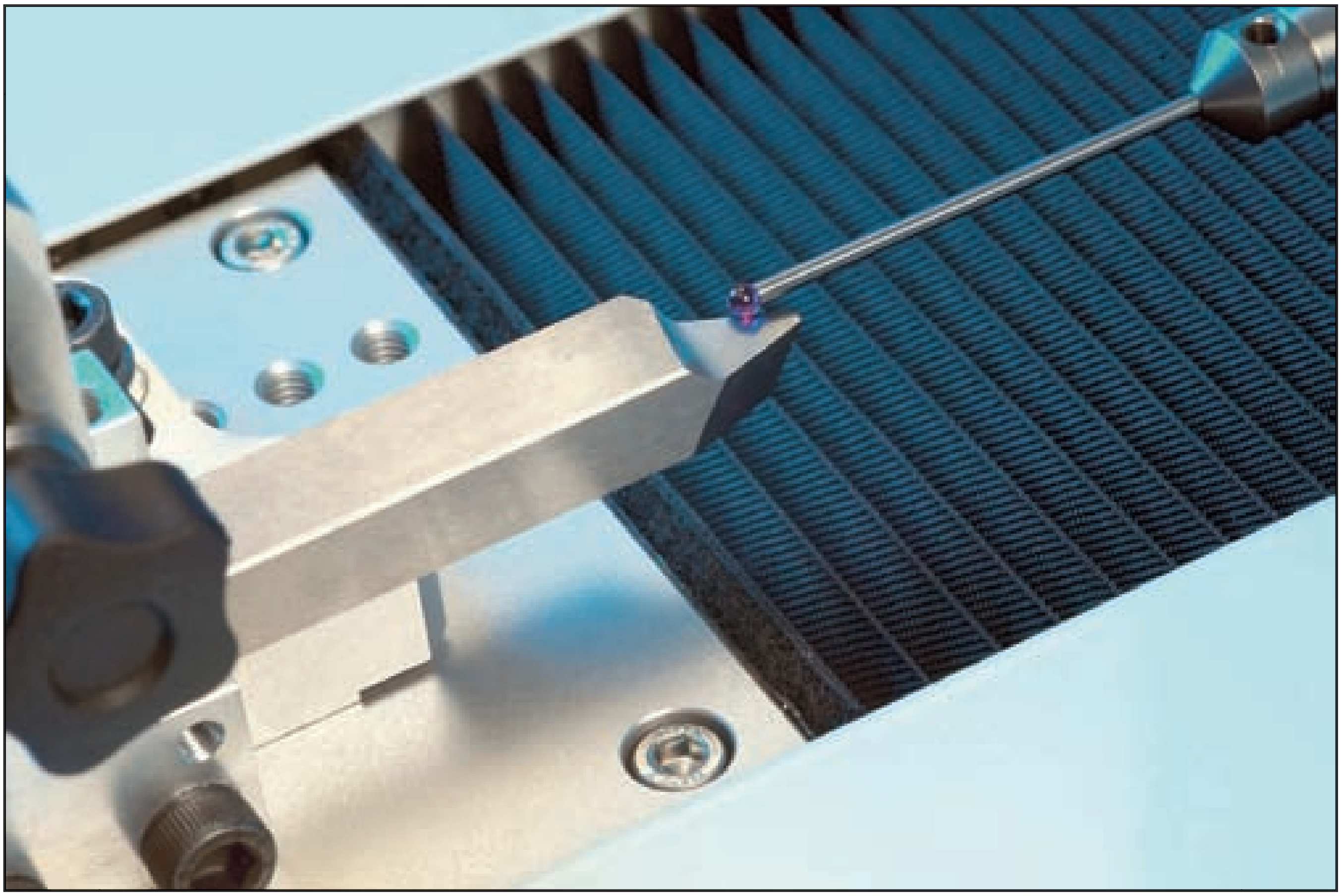
New Checker Scan-Measures Stick Blades with Ruby-Tipped Probes



Meant for use on the shop floor, the Oerlikon BC 10 scan-measures stick blades via ruby-tipped probes, collecting large amounts of information—like 200 data points on a blade's curved cutting edge—to ensure it properly cuts spiral bevel and hypoid gears.

This month, German automakers will receive the first three units of Klingelnberg's new automated blade checker designed for the shop floor. The Oerlikon BC 10 uses ruby-tipped probes to perform scanning measurement of stick blades, with direct measurement of a blade's shaft, rake face and relief face and indirect measurement of its edge for cutting spiral bevel and hypoid gears.

Introduced at EMO '05, the BC 10 measures the rake face, relief face, cutting edge, tip radius and shaft of stick blades with heights of 5–36 mm, widths of 9–36 mm and lengths of as much as 100 mm for use in cutter heads 2–16" in diameter.

The checker performs topographical, 3-D measurement of rake and relief faces to make certain they're in their proper places relative to the blade's shaft. The BC 10 also compares the faces' forms and positions relative to each other, uses its software to calculate the cutting edge's position and form, then compares the edge's actual form to its ideal form. Also, the checker can create a visual 3-D representation of the edge, with tolerances shown as double lines around the edge. If there are deviations, the BC 10 can use its software to calculate corrections for transfer to a stick blade grinding machine.

Roger Kirsch, head of Klingelnberg's division in Ettlingen, Germany, says measurement of both rake and relief faces results in more precise measurement of the cutting edge. "Measurement of a sharp edge is critical, especially when the stick blade is made of carbide," he adds. "The edge is very sharp."

In fact, the BC 10 doesn't directly measure the cutting edge because its sharpness could create wear on the probe. "We do not touch the edge," Kirsch says. "We calculate it. We make an interpolation."

The BC 10's use of scanning measurement allows it to collect a large amount of information in little time. For example, the checker can collect 200 data points on a curved edge of a blade 10 mm long—more if the blade is longer. “The measurement time is about 90 seconds,” Kirsch says.

The scanning is done via a series of machine measuring motions the BC 10 creates in its measuring program from neutral data in its database.

Besides the faces and cutting edge, the BC 10 can measure the shaft for width, thickness, parallelism, straightness and angularity, checking for inaccuracies, like concaveness, twist and waviness. These measurements ensure a stick blade’s shaft fits well in a cutter head’s presized slot. Such slots usually have tolerances of only a few microns. “The stick has to be manufactured very precisely,” Kirsch says.

Deviations can be displayed numerically with tolerances or on the BC 10 monitor in a 3-D format with selectable scale.

The BC 10 measures stick blades via three probes. Each probe’s size is based on its ruby diameter. The diameters are 1.5 mm, 3 mm and 5 mm. According to Kirsch, the three diameters cover the size range of stick blades. The smallest 20% of blades can be measured with the 1.5-mm ruby, the largest 20% with the 5-mm ruby and the 60% in between with the 3-mm ruby.

The BC 10 can check stick blades for all Klingelnberg cutter head systems: Arcon®, FN®, FS®, FSS®, Spiron®, and Twin Blade by Klingelnberg®. It also can check them for Gleason Corp.’s RSR® system.

The BC 10 was designed for use on the shop floor, next to the blade grinder to minimize distance—and therefore time—needed to grind and check blades. “You don’t need a special measuring area,” Kirsch says.

Klingelnberg’s Roger Kirsch says about inspection of blades: “You assure the stick blades will meet your quality requirement. If you don’t measure them, you don’t know it.”

A stand-alone workcenter, the BC 10 consists of measuring machine, controller, personal computer with the Windows XP operating system, keyboard, mouse, display screen and printer. The computer includes a CD-DVD burner for data transfer. There's also an oil-proof drawer for storing accessories and calibration tools.

As for its use, the BC 10's setup time depends on a stick blade's size, but the checker was designed to keep that time short.

Kirsch estimates the time at about 60 seconds if a different probe is required. In that case, an operator would need perhaps 30 seconds to unscrew one probe, screw in its replacement and use a ceramic ball to calibrate the new probe to an error margin of less than 1 micron. The stick blade itself is held in its fixture by two pressure springs. The operator would then need maybe 30 more seconds to access the BC 10's database, choose the right theoretical data for comparison, select the blade features to be measured and start the measurement program.

Also, during calibration, the BC 10 automatically runs a wear program to show the probe's condition. Moreover, an operator only needs to roughly clean a blade before checking it. The BC 10's measuring force negates a blade's oiliness, Kirsch says.

Measurement data can be stored in the BC 10's computer, on compact disc or via a gear manufacturer's KIMoS network. This network is created using Klingelnberg software that connects gear-manufacturing machines for computerized, closed-loop production of gears.

Electronic storage of data can speed production and reduce the possibility of error by eliminating repeated manual entry of necessary contour data. Kirsch says a stick blade might have 45 different input values for its contour data, with each value having a minimum of five characters: one to the left of the decimal point, four to the right.

Manually entering the data: "It takes some time," Kirsch says.

For more information:
Frank Irey
Klingelnberg Oerlikon Tec Center Inc.
1465 Woodland Drive
Saline, MI 48176
Phone: (734) 944-6337
Mobile: (734) 368-4465
Fax: (734) 429-8335
E-mail: *frank.irey@liebherr.com*
Internet: *www.klingelnberg.com*