



Autodesk Technology Centres ensure precision with QC20 ballbar testing



Background:

Leading design and make software company, Autodesk, has collaborated with Renishaw to enhance machine calibration at two Autodesk Technology Centres in North America.



Challenge:

As machine tools can come out of alignment during transportation or operation, Autodesk wanted a reliable solution to check the accuracy of machine tool positioning performance before prototyping begins.



Solution:

Autodesk's teams in San Francisco and Toronto successfully calibrated equipment using Renishaw's QC20 ballbar, ensuring their machines are performing within specification.



Renishaw's QC20 ballbar and its intuitive software workflow check machine performance in under 10 minutes.



Ballbar testing ensures accurate parts from CNC machines, reducing machine downtime, scrap, and inspection costs.



“ Our Technology Centres are staffed by expert research and design engineers who utilise highly sophisticated equipment to validate digital workflows. Our research helps us to understand how our software is used, as well as push the boundaries of what is possible by developing and validating workflows.

Mary Elizabeth Yarbrough, Manager,
Autodesk Technology Centre, San Francisco (USA)



Autodesk operates four Technology Centres across North America and Europe for research and development and workflow validation, with knowledge and equipment shared between facilities. Each Technology Centre has specific focus areas, including architecture, engineering, construction and operations, advanced manufacturing, and robotics.

To build a more detailed understanding of calibration and metrology, Autodesk invited Renishaw to its Technology Centre in San Francisco

to run advanced ballbar testing and metrology training for its North American team. During the four-day training course, Renishaw's team shared expertise in precision measurement. They covered ballbar set-up, foundational metrology, gauge repeatability and reproducibility, geometric dimensioning and tolerancing, and integration.

The training also included calibration using the Renishaw XM-60 multi-axis calibrator and QC20 ballbar testing on three machines (Mazak, Haas, and Matsuura), where one machine was found to be out of calibration.



Machine tools can become misaligned during transport, due to environmental impacts, and as a result of normal wear and tear. Because the Autodesk Technology Centre in San Francisco specialises in prototyping — mostly one-off parts with wide tolerances — it is not always obvious if a machine is not correctly calibrated.

“Due to the earthquake risk in San Francisco, all our machines are seismically anchored,” explained Orion Beach, Senior Research and Design Engineer, Autodesk Technology Centre, San Francisco. “This process can cause misalignment in the machine tools — changes to the bottom of the machine can have a knock-on effect on overall performance.”

Jamie Nicholson, Research and Design Engineer, Autodesk Technology Centre, Toronto, went on to describe the challenge of calibrating machines in Toronto: “As the facility is on the third floor, manufacturing equipment is brought up in a size and weight restricted elevator. As a result, machine tools are often disassembled to be brought upstairs and reassembled in the workshop, where they require calibration.”





Autodesk requested Renishaw to assist in using the QC20 ballbar to check the accuracy of the machines at the Technology Centre in San Francisco. Ballbar testing is a quick way of checking a CNC machine tool's positioning performance, helping to benchmark and track its condition over time. The data collected is used to calculate overall measurements of positioning accuracy (circularity, circular deviation) in accordance with international machine performance standards (ISO 230-4 and ANSI/ASME B5.54).

“The QC20 ballbar is a telescoping linear sensor equipped with precision balls at both ends,” explained Denis Vasilescu, Industrial Metrologist at Renishaw. “In use, the balls are kinematically located between precision magnetic cups, one attached to the machine table and the other to the machine spindle or spindle housing. The QC20 ballbar follows a programmed circular path to measure minute variations in radius. The QC20 ballbar is a quick and effective way to verify machine tool performance. This helps operators to diagnose the source of errors and take preventative steps to resolve issues early.”



“The ballbar testing in San Francisco showed one machine was uncalibrated, highlighting how crucial every step of the anchoring process is,” added Mary Elizabeth Yarbrough. “The results were eye-opening and proved the tangible value of implementing metrological safeguards. We used the results to work through the issues and resolve them.”

Using the QC20 ballbar and its intuitive software workflow, the team in San Francisco can now check a machine’s calibration in under 10 minutes, without needing to call out a technician.

Following this success, Renishaw supported Autodesk to inspect a newly installed CNC machine at its Technology Centre in Toronto.

Jamie Nicholson highlighted the QC20 ballbar’s accuracy, saying, “Following the QC20 ballbar testing and recalibration, the CNC machine is cutting parts beautifully. It has increased our confidence in the accuracy of our machine tools. Autodesk can now conduct regular ballbar testing to ensure accurate parts from CNC machines, reducing machine downtime, scrap, and inspection costs.”



Now that Autodesk’s Technology Centres in San Francisco and Toronto are satisfied with the results of the project, the next stage is to use the QC20 ballbar at its Technology Centre in Boston. In the future, the Autodesk team plans to share the equipment across its North American facilities to incorporate ballbar testing into quarterly and annual maintenance activities, as well as during machine commissioning.



“ In this project, Renishaw was instrumental in calibrating our machines. We have built a strong relationship with Renishaw over the years and have a deep trust in its products, services and expertise, which are truly world class.

Adam Allard, Senior Manager,
Autodesk Technology Centres
(North Americas)



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