

CyberGage360 Accuracy Specification

Introduction

CyberGage30 System Accuracy is measured to ISO10360 Standards adapted to 3D Scanning System XYZ data from NIST Traceable Ball Plate artifacts measuring Ball Sphericity and Ball to Ball Center Distances. The error of each of the measurements is recorded with Total Range Error determining the System Uncertainty for Work Volume and Feature Precision. The error for length relates to System Volumetric Accuracy = MPEe and is a function of the length measured between Ball Centers and is expressed as $A + L/b$, where A is the MPE of a measurement of 0 length, L is the measured length within the Work Volume of the Scanner and b is a constant determining the slope of the MPEe function.

System Volumetric Accuracy = $0.010\text{mm} + L/10000\text{mm}$ (MPEe)

System Repeatability = 0.005mm

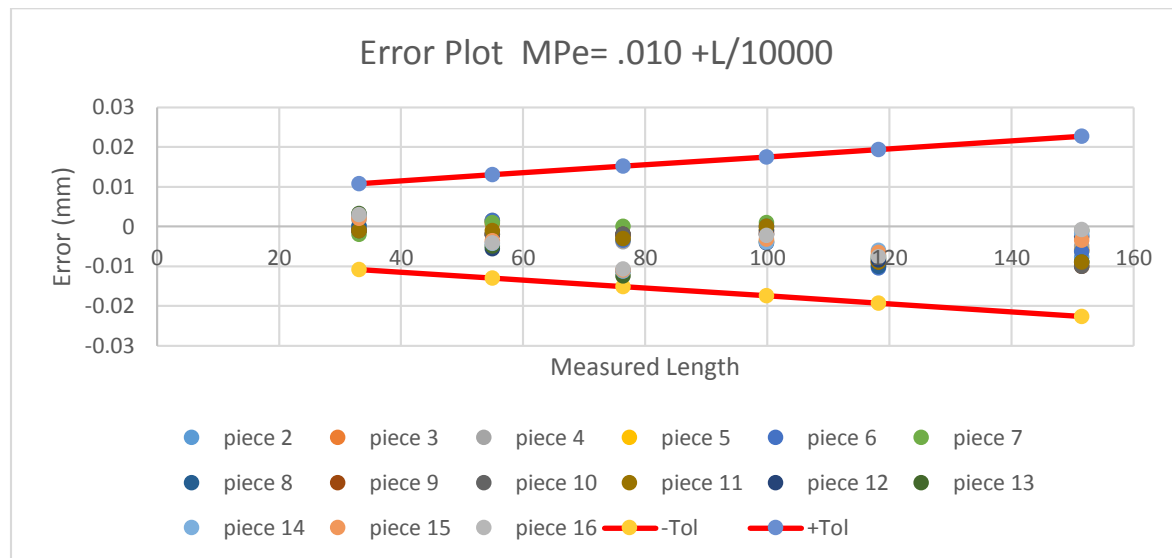
Procedure

1. Use a predefined Polyworks project that has been created for doing a Gage R&R on the ball plate to be used for the certification.
 - a. The ball plate has been certified per a NIST Traceable measurement system.
 - b. The CG360 is currently Field Calibrated using a designated ball plate.
 - c. The reference model for the Polyworks project was created from the certified data from the designated ball plate.
2. Using the CG360 UI, run the ball plate inspection 5 times.
3. When finished, open the polyworks project and run SPC on the last 5 pieces.
4. Report the Overall Statistics for the Sphere Measurements.
5. Report the Overall Statistics and Values Per Piece for the Ball to Ball Distance measurements.
6. Export the 3 tables to CSV from the report viewer.
7. Import the 3 data sets from above into the Spec Worksheet.xlsx file and copy to the proper worksheets.
8. Verify the data meets specification.
9. Place a ring gage within the field of view, prepared to reflect appropriate data from the inner cylindrical hole.
10. In Polyworks, open a CAD model of said ring gage and allow the system to best fit the scan data to the CAD model of the ring gage.
11. Extract the value and position of the inner wall of the ring gage.
12. Repeat steps 9-11 nine additional times.
13. Calculate the repeatability of the values obtained and display in graphical for as well as show the tabulated values.
14. Verify the data meets specification.

Data

MPE_E

The chart below shows the MPE_E results obtained from three CG360 machines, systems 3, 5, and 8 using ball plate 1019.

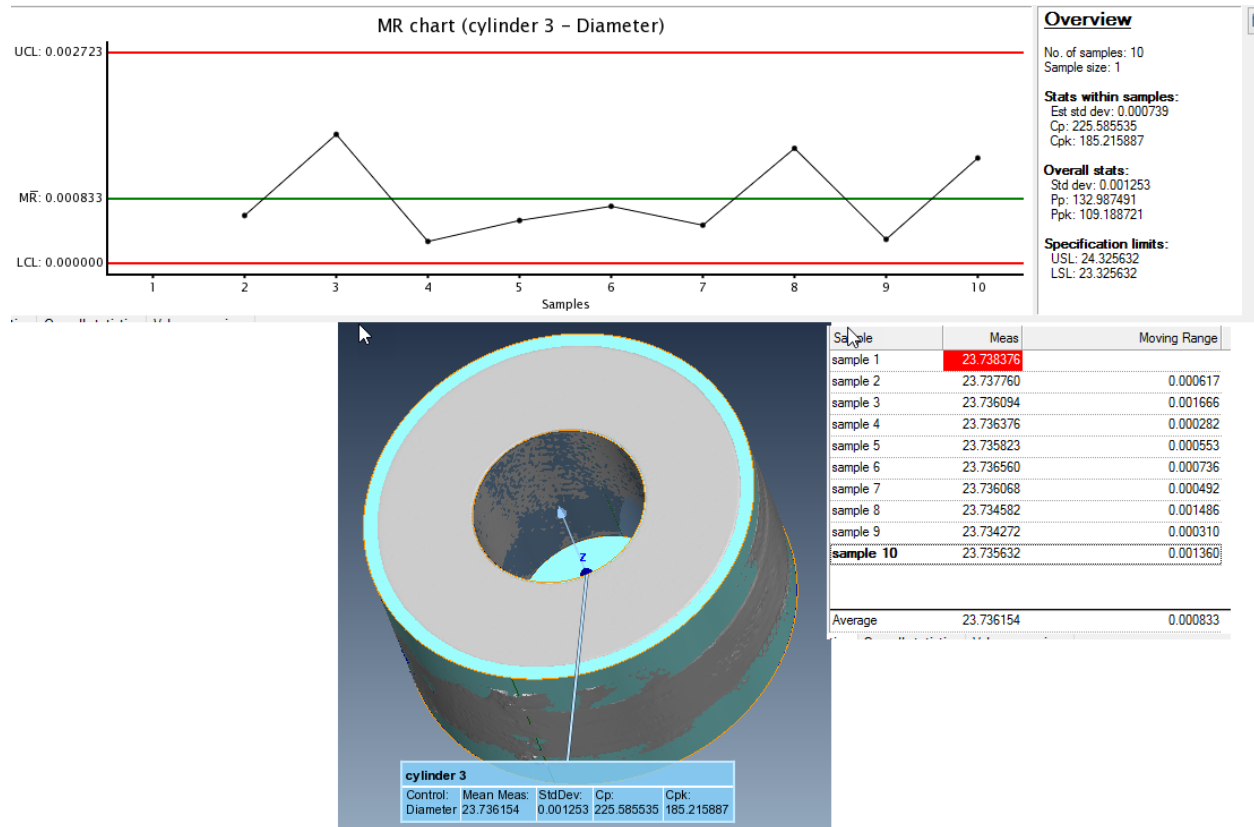


The 2 red lines represent the MPE_E Tolerance. Each point is a single measurement, and the vertically stacked points represent measurements of the same ball to ball distance. For this chart we have set the tolerance, $MPE_E = 0.10 + L/10000$. So at 0 length, we should see a maximum error of 10 microns. there are 35 ball to ball distances times 5 repetitions per machine times 3 machines represented on the chart.

Note: System Accuracy is the Maximum Permissible error of the measured length between 6 sets of sphere features, repeated 10 times. These distances vary in length from approximately 30mm to 150mm. Measurements are made utilizing CyberGage360's standard operating procedure, and thus include all potential hardware and software error sources.

Repeatability

Working from the data sets as noted in the procedures above, the repeatability of each measurement can be calculated.



Note: Repeatability is the allowable 3 Sigma error of the measured diameter of a ring gage, repeated 10 times. Measurements are made utilizing CyberGage360's standard operating procedure, and thus include all potential hardware and software error sources.

