

Bruker alicona

Bruker Alicona is a leading global supplier of optical metrology solutions based on the principle of Focus Variation.

Focus Variation works based on moving a focal plane over a surface and collecting robust 3D data which can then be used to measure geometric form and surface finish from a single optical sensor.

Measurement processes can be fully automated and provide GD&T measurement capabilities across all industrial & medical sectors.

The systems are in use in Industry, Industrial Research, Universities and production facilities globally.

www.alicona.com

μCMM Application Note

Full Report available at: <https://bit.ly/31zWDFL>

Application: Gear Shaft
Measurement



Gear Shaft Measurement

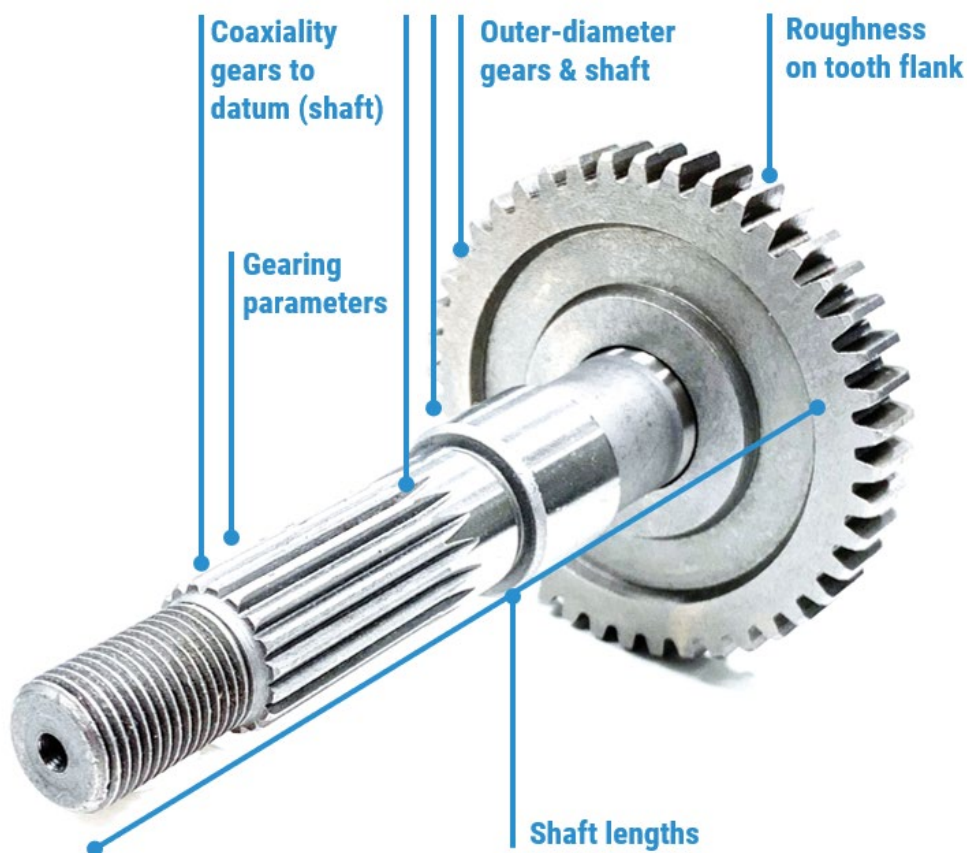
In this measurement report summary, we describe the use of the Bruker Alicona μ CMM to measure a gear shaft assembly to analyse the reason for failure in use.

The parameters to be measured are

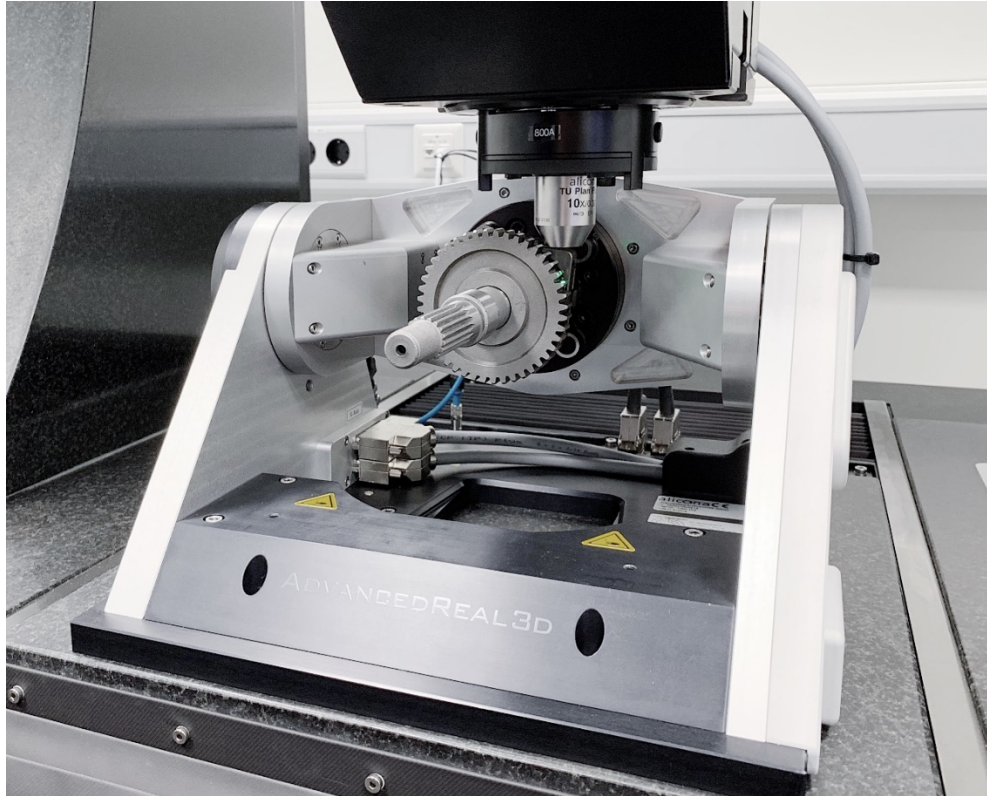
- Coaxiality of gearing in respect to shaft
- Outer diameter of gearing and shaft areas
- Shaft lengths
- Profile & areal roughness on the tooth flank
- Parameters to qualify the gearing itself

The full measurement report is available at <https://bit.ly/31zWDFL>

The illustration below shows the sample to be measured.



The measurement system used in this report is the Bruker Alicona **optical μ CMM** fitted with Real3D allowing 360 degree measurement as illustrated below.

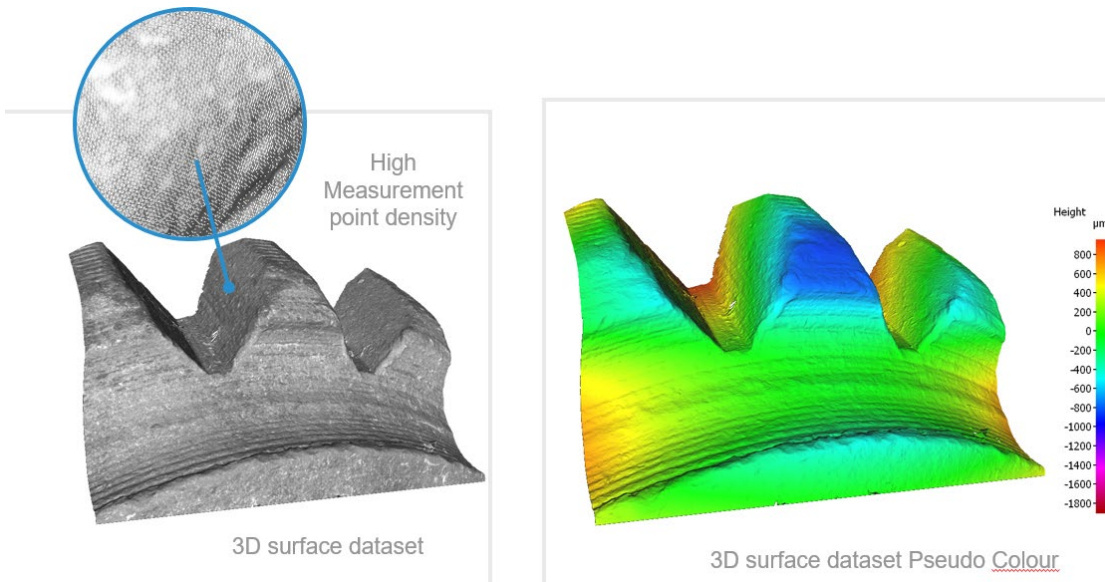


A 3D data set of a region of interest is captured using the Focus Variation principle.

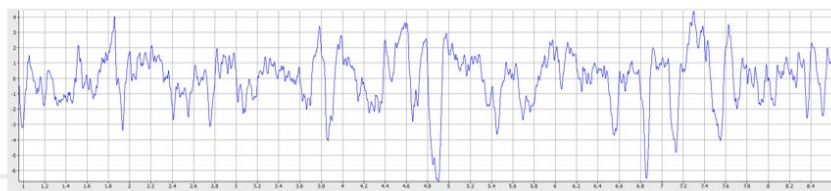


Region of interest illustration

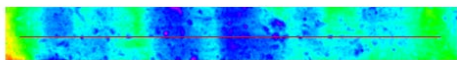
A 3D model of the feature to be measured is presented to the user as a true colour model and pseudo colour related to height. The data provided has a very high measurement point density allowing the measurement of surface finish and surface texture as illustrated below.



Profile Roughness Measurement - Tooth flank roughness

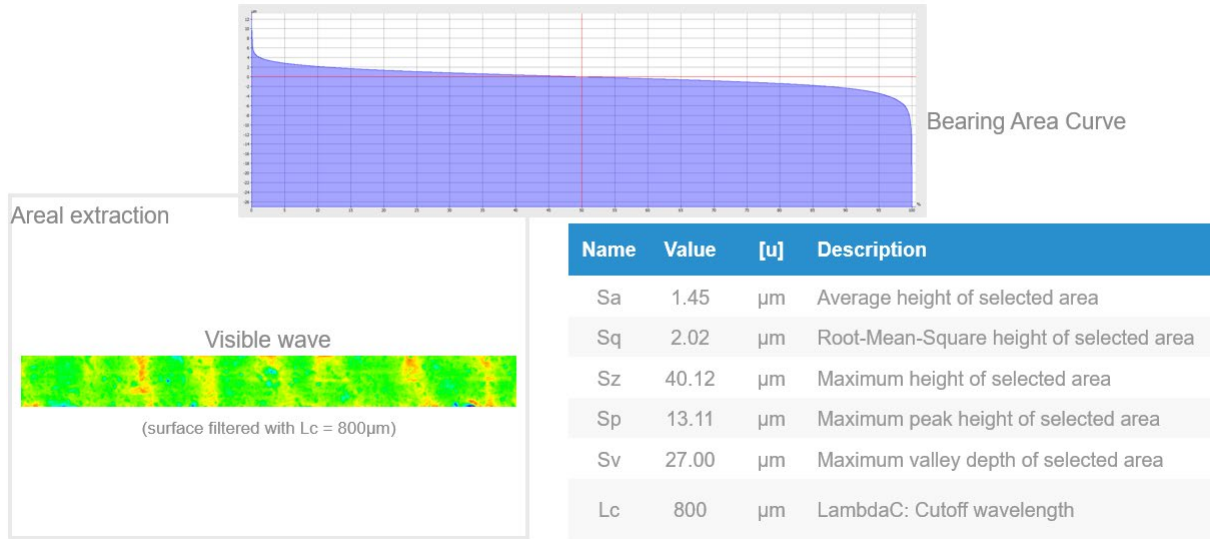


Profile extraction



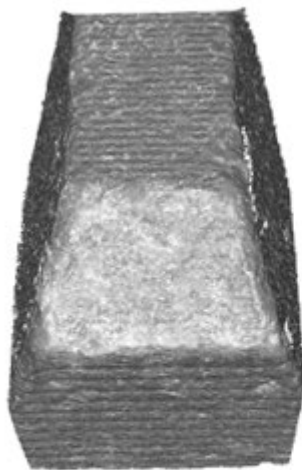
Name	Value	[u]	Description
Ra	1.30	µm	Average roughness of profile
Rq	1.70	µm	Root-Mean-Square roughness of profile
Rz	8.71	µm	Mean peak to valley height of profile
Rp	4.41	µm	Maximum peak of height of profile
Rv	6.72	µm	Maximum valley depth of profile
Lc	800	µm	LambdaC: Cutoff wavelength

Surface Texture Measurement - Tooth flank

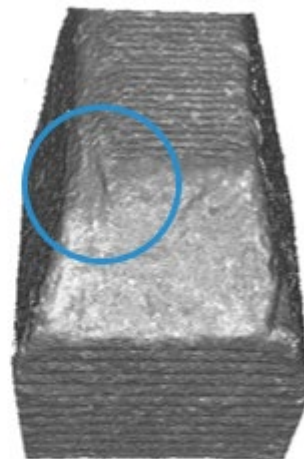


Additionally it is now possible to measure on the same set of data.

- Shaft Lengths
- Outer, Inner, and PCD
- Coaxiality
- Defects with OK and NOK information as illustrated below.



Tooth OK



Tooth
NOK

Summary

Using the **Bruker Alicona μ CMM with Real3D** the gear shaft is easily measured. The systems accuracy, which is specified at **$E_{\text{Uni:Tr:ODS,MPE}} = (0.8 + L/600) \mu\text{m}$** allows for high density 3D measurements at areas of interest with high accuracy over the complete travel range of the axes.

The measurement positions and the subsequent analysis of data only need to be taught-in once with the AutomationManager Software and can be repeated at any given time. The shop-floor-ready software suite enables the combination of any shape, distance, position or roughness analysis.

The results of the critical parameters of the gear shaft show that the gearing machined on the shaft has good results within tolerance. Whereas the bigger assembled gear is out of tolerance regarding coaxiality and position. In the same measurement routine the roughness analysis showed too high values. By looking at the areal analysis a significant waviness can be observed that should not be on the flanks. In addition a detailed 3D comparison of one tooth showed large defects with depth of more than $150\mu\text{m}$.