

Abstract

In some critical applications, the dimensions cannot be measured with high precision, and in traditional ways, so the idea of designing and manufacturing a profilometer was generated. A developed profilometer was designed and manufactured to assess different mechanical cross sectional profiles. The design is robust and suitable to measure the selected parts. The basic concept of the profilometer work depends on direct contact between the stylus tip and the outer surface of the selected mechanical components. The motion of this developed tactile displacement sensor depends on a mechanical elastic part which was a linear spring, and obtain all the required readings by using an electrical rheostat and a digital multimeter. This rheostat represents the link between the profilometer and the digital multimeter. The probe is hard, smooth, with an aspect ratio between the stylus diameter and its length of 0.054, and has a rounded tip with a suitable diameter which can detect the measured surface profile easily. The cross- sections of three mechanical shaft (circular shaft, cam shaft, and hexagonal shaft), were obtained by using the developed profilometer. According to the measurements, best accuracy, repeatability and less error were found in measuring circular shaft, because of its smooth surface, uniform cross sectional profile, perfect finishing and free from any protrusions or defects. A comparison was made between the outputs of the developed profilometer and the same measurand parts that are measured by a traditional method by a micrometer. The developed profilometer gives an accurate determination for the surface profile for three mechanical parts. Unlike the micrometer measurements, which was not accurate enough and did not examine the desired surface profiles. The obtained profiles have a big match with the actual dimensions of the measurand parts with very small error ratio, reach 0.0034% for the circular shaft. The maximum error