

Abstract

The size of the projected beam on the workpiece and the energy distribution profile defines the response of the material to the applied laser heat. The use of galvo-scanners to manipulate laser beam across the working envelop is the most popular choice in powder bed technology due to fast scanning requirement. However, one of the downsides of galvo-scanners is distortion of the projected laser spot, which varies continuously during the processing. Consequently, the quality of deposited beads and the process efficiency may not be uniform. This work examines the influence of change in shape of the projected beam and its energy distribution on the weld bead profile of conduction welds. It has been found that for the same optical set-up and system parameters, different bead profiles can be obtained with different degree of distortion of the beam profile. In addition, it has been shown that Gaussian beams result in deeper welds than top-flat beams for the same nominal beam diameter, therefore defocusing the beam to achieve an appropriate spot size may have consequences on the weld profile due to difference in the peak intensity.