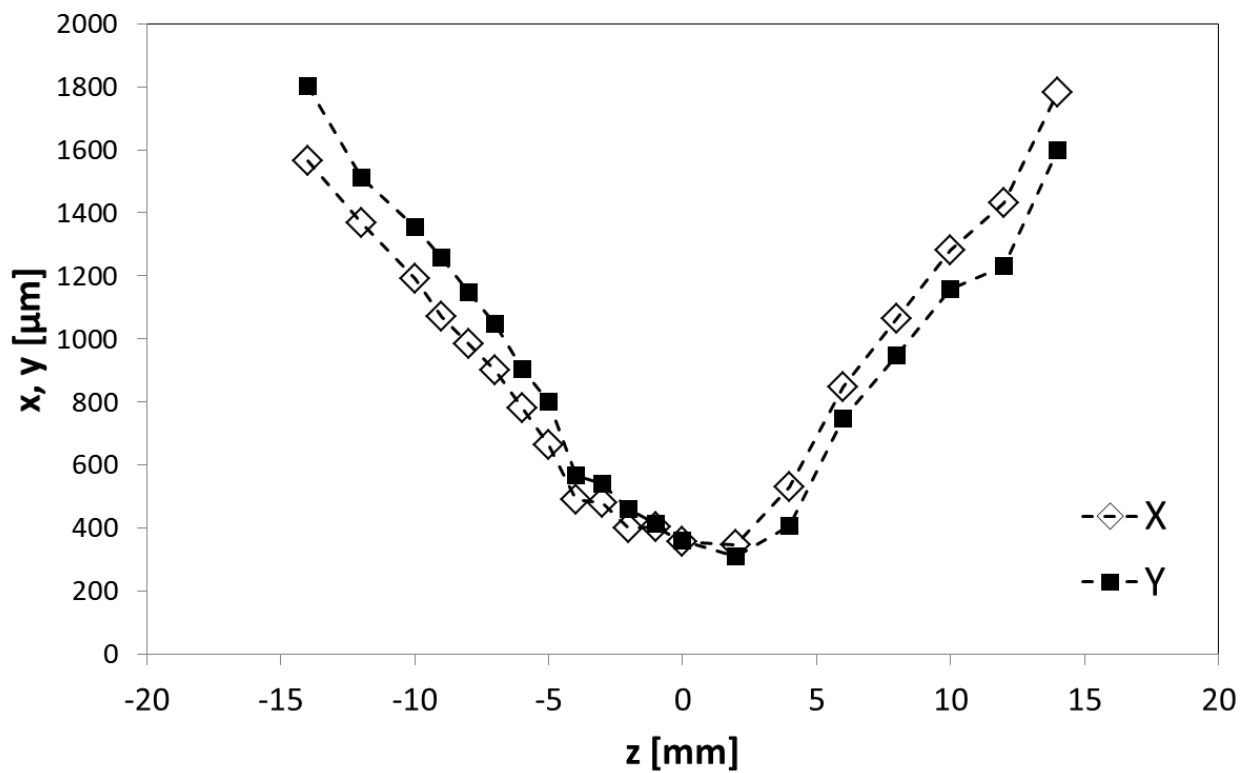
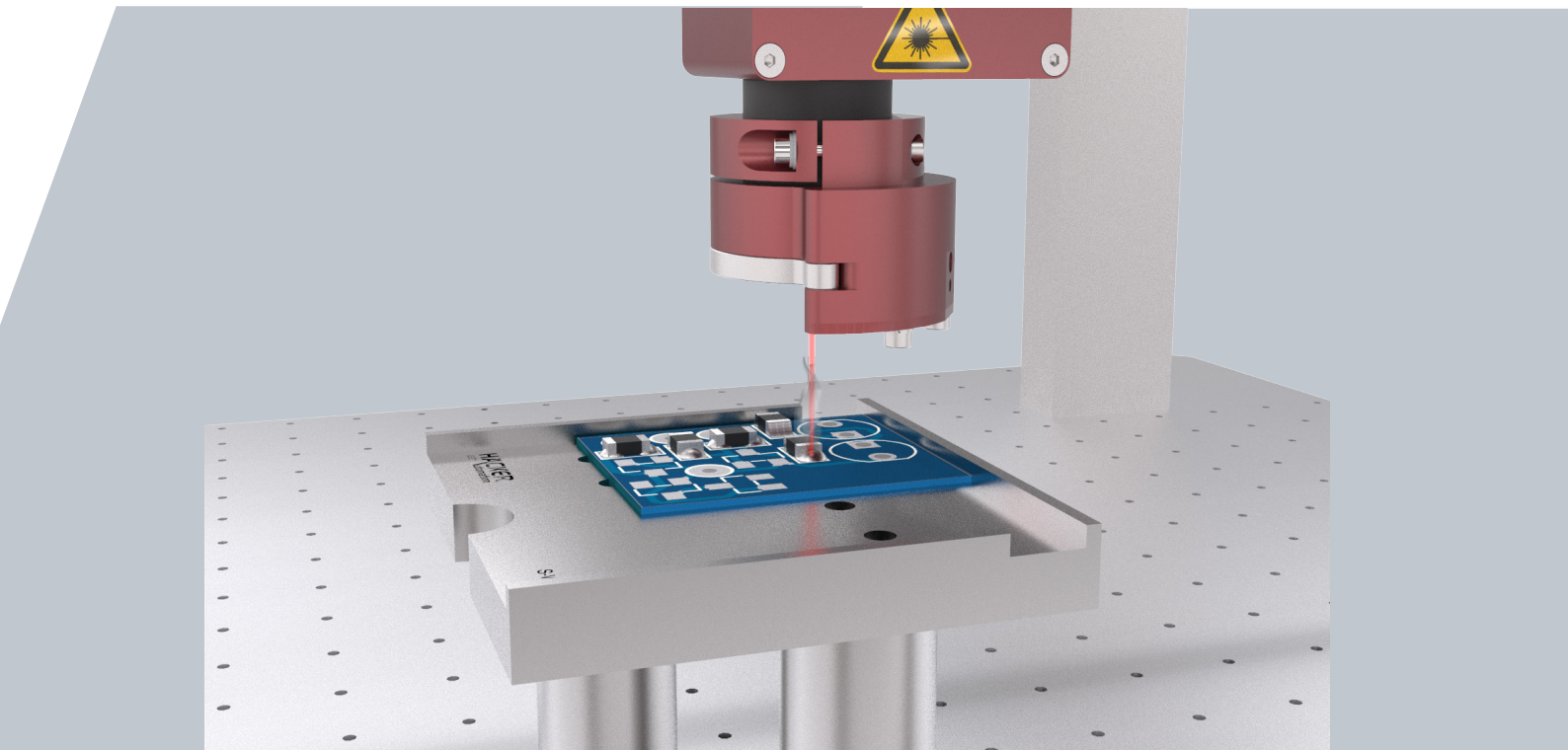


## VARIATION OF LASER SPOT SIZE FOR CORRECT SOLDERING OF SMD COMPONENTS.





Using a laser for the selective soldering of SMD components can provide high quality electrical connection on PCBs additionally comprising temperature sensitive systems, e.g. CCDs. In order to achieve a high quality connection, the soldering pads of the SMD and the PCB and the solder paste itself has to be heated simultaneously and homogenous in time and temperature. Thus the spot of the laser, which is usually in the range of  $10^{-4}\text{m} \leq d \leq 10^{-3}\text{m}$  in diameter, has to be adjusted in size to match both, the component and pad size.

The adjustment of the spot size of the soldering laser can be realized by defocussing. Therefore, a laser with a fixed focal length has to be moved in vertical direction respectively to the reference plane of the PCB. This direction is mainly defined as the z-direction. Figure 1 shows an example of the size of the laser spot on the PCB. The diagram shows very clearly, that the spot size is not continuous distribution and there are differences in x and y. Although the data also is sensitive to the used measurement system the values have to be determined in order to achieve high quality results of the soldered junction. Moreover, due to the usage of laser diodes the shape of the laser spot have an additional variation due to the optical properties of the diode.

For achieving high accuracy in the laser soldering process, it is necessary to measure the optical properties of the laser spot along the z-direction. This measurement has to be repeated for different laser powers as well due to the thermal and optical behavior of the laser diodes. The most simple measurements can be conducted using a plastic sheet and apply laser pulses in order to drill holes into it. These holes can be measured afterwards. The most precise but expensive procedure might be the usage of a special laser camera measurement equipment. These measurement systems are able to perform direct high resolution measurements of the laser spot. Mainly, laser soldering heads in the micro assembling industry has been characterized using such a system before being delivered to the customer. The customer can determine the spot size from a calibration sheet provided from the manufacturer. This calibration sheet has to be refreshed after a certain working time due to the degeneration of the laser diode.