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0. Abstract

The validation of a brazed work piece requires lot of operating experiences in order to assure a sufficient joint quality for a reliable manufacturing process. In most cases, a quality assurance is only performed by destructive methods to measure the strength of the joint. Conventional non-destructive testing methods such as computer tomography, ultrasonic inspection, and magnetic particle inspection as well as other available optical and thermal methods are commonly not suitable for brazing applications in mass production. This is partly due to the fact that these methods are very expensive or even highly limited when it comes to the detection of critical imperfections. Hence, there is a high demand to investigate alternative non-destructive testing methods.

The main focus of this feasibility study is the examination of the electrical resistance behavior of the brazed joint. In this regard, different positions of defects within the filler metal as well as different contact positions for the current supply and voltage measurement of the 4-wire technique are investigated by means of FEM-analyses. A key aspect is the evaluation of the particular voltage distribution within the brazed work pieces as a function of these variations and to generate significant potential differences for the measurement of brazed joints. The results will contribute the design of the resistance measurements on various component geometries to enable a precise quality inspection.

Keywords: *Brazing, non-destructive testing, 4-wire technique, electrical resistance, FEM*

1. Introduction

In order to make a significant statement about the quality of a brazed joint, in general, very intensive or expensive analytic methods are required. Joining cemented carbides to ductile steel to manufacture fail safe and durable carbide tipped circular saw blades or hammer drill bits, exemplifies the high and complex demands of a reliable, simple, and cost-effective method to ensure a certain quality of the joint [1, 2, 3]. Brazing processes are usually subjected to many influencing variables such as the surface contamination, an insufficient surface preparation or even an unbalanced temperature distribution [4].

With regard to soldering processes in the electronics industry, the main concern is a sufficient contact resistance between the various components, while brazing processes are usually focused on mechanical strength. Moreover, brazing processes are typically