

Project Summary:

Design Review of a Pneumatic Actuator Range

A major actuator manufacturer asked DfR Solutions to perform a design analysis of a new pneumatic actuator. Clearly defining the desired lifetime and use environment gave more focus to the overall reliability goals for the actuator. After a thorough review of the design, improvements were recommended on circuit board components. Some fragile components were recommended to be reselected and components too close to board edges were recommended to be relocated on the board. After reviewing the test plan for the new actuator, DfR Solutions recommended further qualification testing to include HALT, thermal cycling, and vibration. Also, site audit of the contract assembler noted areas of manufacturing concern that could greatly contribute to contamination issues. Overall, the actuator manufacturer had an innovative design that could be improved with a few minor modifications in design and process.

Keywords: pneumatic actuator, use environment, lifetime, switchbox, failure mode effects analysis, FMEA, CTQ, critical to quality parameters, step stress test, virtual qualification, highly accelerated life testing, temperature-humidity bias, THB, mechanical shock, failure analysis, field failures, returns, supply chain ownership, Monte Carlo circuit analysis, equivalence series resistance, ESR, electrolytic capacitors, design for reliability, insufficient clearance, attachment point, trace to board edge, glass and ceramic components, thermal and mechanical damage, solder joint failure, crack, MELF, silicone potting, flex, rigid-flex, wave, reflow, gasketing, handling, product screening, defect rate, electrostatic discharge, re-used, cleaning