



Electro-Mechanical Assembly QUALITY STANDARD



**867 BOYLSTON STREET
5TH FLOOR, SUITE 207
BOSTON, MA 02116
board@amcacert.com**

AMERICAN MANUFACTURING COMPLIANCE AUTHORITY (AMCA) QUALITY STANDARDS FOR ELECTRO-MECHANICAL ASSEMBLY

1. Purpose and Scope

These Quality Standards outline the minimum requirements established by the American Manufacturing Compliance Authority (AMCA) for the assembly, inspection, testing, and documentation of electro-mechanical products. They apply to all manufacturers, subcontractors, and repair facilities engaged in production or refurbishment of assemblies containing both electrical and mechanical elements.

2. General Requirements

2.1 Compliance

All electro-mechanical assemblies shall conform to applicable federal and state regulations, AMCA specifications, contractual requirements, and recognized industry standards (e.g., IPC, IEEE, ANSI, ISO).

2.2 Personnel Competency

Assembly technicians and inspectors must be trained, certified where applicable, and regularly evaluated for proficiency in electro-mechanical processes, safety practices, and equipment handling.

2.3 Work Environment

Assemblies shall be performed in clean, organized, and controlled environments. Electro-static discharge (ESD) precautions, temperature/humidity controls, and particulate management systems must be maintained when required by product specifications.

3. Materials and Component Control

3.1 Material Verification

All materials and components must be verified against purchase specifications upon receipt. Items shall be inspected for correct type, rating, revision level, and physical condition.

3.2 Traceability

Lot numbers, serial numbers, and supplier certifications must be recorded and

maintained for all critical and safety-related components. Traceability must be preserved through the full manufacturing cycle.

3.3 Storage and Handling

Components shall be stored in appropriate conditions to prevent degradation, contamination, ESD damage, or corrosion. Mechanical parts requiring lubrication or protective coating must be preserved according to manufacturer instructions.

4. Mechanical Assembly Standards

4.1 Fit and Alignment

Mechanical components must be aligned, seated, and torqued according to engineering drawings. Assemblies shall not exhibit interference, binding, or undue stress.

4.2 Fasteners

Threaded fasteners must use specified torque values, locking methods (e.g., threadlocker, lock washers), and material compatibility practices. Torque tools must be calibrated at least every 6 months.

4.3 Machined and Fabricated Parts

Dimensions, surface finishes, and tolerances must comply with approved technical drawings. Any deviation requires engineering authorization and documentation.

4.4 Lubrication and Seals

Lubricants, gaskets, and seals shall be applied using correct materials and quantities. Seal integrity must be verified during inspection.

5. Electrical Assembly Standards

5.1 Wiring and Termination

Conductors must be cut, stripped, and terminated without damage to insulation or conductor strands. Crimped or soldered joints shall exhibit full mechanical and electrical integrity.

5.2 Routing and Protection

Cables must be routed neatly with proper bend radii, securing methods, and protection from abrasion, heat sources, or moving mechanical components.

5.3 Printed Circuit Assemblies (PCA) Integration

PCAs must be handled with ESD protection and mounted using approved hardware. No flexing, excessive force, or contamination is permitted during installation.

5.4 Grounding and Bonding

All assemblies must include required grounding paths, bonding straps, and shielding components. Resistance values must meet engineering specifications.

6. Electro-Mechanical Integration

6.1 Interface Fit Checks

Electrical components must integrate with mechanical elements without causing mechanical strain, misalignment, pinching, or hazardous interference.

6.2 Motion Systems

Motors, actuators, gears, and linkage systems must operate freely without abnormal noise, vibration, or resistance. Electrical connections shall remain secure throughout full range of motion testing.

6.3 Thermal Management

Heat-generating components must include proper heat sinking, airflow, or thermal interfaces as specified. Assemblies shall be checked for proper placement of thermal pads, pastes, and insulators.

7. Inspection and Testing Requirements

7.1 In-Process Inspection

Critical stages of alignment, soldering, torqueing, wiring, and sealing shall be inspected and documented before operation proceeds.

7.2 Final Inspection

A complete visual and dimensional inspection must confirm workmanship quality, correct part configuration, labelling, and cleanliness.

7.3 Electrical Testing

Insulation resistance, continuity, grounding integrity, functional testing, and power-up verification must be performed using calibrated equipment. Test limits shall match approved procedures.

7.4 Mechanical Testing

Mechanical assemblies must undergo motion, torque, alignment, vibration, or functional load testing as required. Results shall be recorded and retained.

8. Documentation and Records

8.1 Build Records

Manufacturers must maintain build travelers, inspection reports, test data, torque logs, and nonconformance reports. Records must be legible, complete, and accessible for audit.

8.2 Configuration Control

Revisions to parts, drawings, firmware, or processes must be controlled through a documented change-management system.

8.3 Labeling and Identification

Assemblies must include durable labels with part number, serial number, revision, and manufacturing date. Critical safety warnings must be affixed where applicable.

9. Nonconformance and Corrective Action

9.1 Identification

Any component, process, or assembly failing to meet these standards must be clearly tagged, segregated, and recorded as nonconforming.

9.2 Disposition

Nonconformances may only be accepted, reworked, repaired, or scrapped with authorized engineering approval.

9.3 Root Cause and Corrective Action

Systemic issues shall be addressed through documented root-cause analysis and corrective action plans. Effectiveness must be verified and reviewed.

10. Safety Requirements

10.1 Personnel Safety

All operators must follow lock-out/tag-out practices, PPE requirements, and

electrical safety protocols during assembly and testing.

10.2 Product Safety

Assemblies must incorporate designed safety features such as interlocks, guards, fuses, circuit protection devices, and emergency shutoff mechanisms.

10.3 Hazardous Materials

Use, handling, and disposal of chemicals, soldering materials, and adhesives shall comply with OSHA and EPA requirements.

11. Continuous Improvement

Manufacturers shall maintain a structured continuous-improvement program that reviews defect trends, customer feedback, and audit results to enhance reliability and efficiency in electro-mechanical assembly processes.

12. Certification and Compliance

Organizations adhering to these AMCA standards may undergo periodic compliance audits. Certification may be granted based on consistent adherence to these requirements and successful resolution of any audit findings.

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AMCA, Inc.
867 Boylston Street
5th Floor, Suite 207
Boston, MA 02116

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