AMCA

AMERICAN MANUFACTURING
COMPLIANCE AUTHORITY

ELECTRICAL DISCHAGRE MACHINING (E.D.M.) QUALITY STANDARD

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AMERICAN MANUFACTURING COMPLIANCE AUTHORITY (AMCA)
Quality Standards for Electrical Discharge Machining (EDM)

Version 1.0

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1. Scope and Purpose

These Quality Standards establish uniform compliance requirements for Electrical Discharge Machining (EDM) operations across all AMCA-certified manufacturing facilities. The objective is to ensure consistent product quality, operational safety, process reliability, and traceability. These standards apply to all forms of EDM, including wire EDM, sinker EDM, and fast-hole EDM.

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2. Definitions

Electrical Discharge Machining (EDM): A non-traditional machining process using controlled electrical discharges to erode conductive materials.
Workpiece: The component undergoing EDM processing.
Electrode: Tool used to generate discharges (wire, graphite electrode, copper electrode, etc.).
Dielectric Fluid: Fluid medium used to support spark generation and debris removal.

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3. General Requirements

3.1 **Compliance Obligations**
All facilities performing EDM operations must implement, document, and maintain process controls aligned with AMCA standards. Compliance audits shall be conducted annually or upon request.

3.2 **Personnel Competency**
All EDM operators must be trained and certified in:

- Machine operation and safety practices

- Material behavior under EDM conditions
- Equipment maintenance
- AMCA documentation procedures

Training records must be retained for a minimum of five years.

3.3 **Equipment Qualification**
All EDM equipment shall undergo initial capability verification and annual recalibration to confirm operating accuracy. Calibration must include:

- Axis positioning accuracy
- Power supply output stability
- Dielectric flow and filtration performance

Certificates of calibration must be verified by an AMCA-recognized laboratory.

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4. Process Control Standards

4.1 **Pre-Operation Requirements**
Before machining, operators must:

- Verify that all job documentation, drawings, and tolerances are current.
- Confirm material type and batch identification of the workpiece.
- Inspect electrodes for dimensional accuracy and physical integrity.
- Ensure dielectric fluid meets purity and conductivity specifications.

4.2 **Parameter Control**
The following parameters must be set, documented, and controlled:

- Peak current, pulse duration, and pulse interval
- Servo response settings
- Flushing pressure and dielectric flow rate
- Wire tension and feed speed (wire EDM)
- Polarity setup and electrode wear compensation

Any deviation greater than ±10% of validated process parameters must be approved by authorized process engineers.

4.3 **Dielectric Fluid Standards**
Facilities must maintain dielectric fluid within manufacturer-specified limits for:

- Conductivity
- pH value
- Contamination levels
- Filtration efficiency

Fluids must be sampled weekly and replaced when values fall outside specification.

4.4 **Electrode Standards**
Electrode materials must meet supplier certification criteria. Operators must:

- Document electrode wear rates
- Replace electrodes exceeding permitted dimensional wear
- Maintain traceability of electrode lot numbers for each job

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5. Product Quality and Inspection

5.1 **Dimensional Accuracy**
All machined components shall meet drawing tolerances unless written deviations are approved. Measurements must be taken using calibrated instruments such as CMMs, toolmakers' microscopes, or digital comparators.

5.2 **Surface Integrity and Finish**
EDM surfaces must comply with required surface roughness values (Ra). Operators shall monitor:

- Signs of thermal damage
- Recast layer thickness
- Micro-cracking

If required specifications are exceeded, parts must undergo approved secondary finishing or be rejected.

5.3 **Debris and Contamination Control**
After machining, workpieces must be:

- Cleaned using approved solvents or ultrasonic baths

- Inspected to ensure no embedded debris remains
- Labeled to prevent cross-contamination

5.4 **Nonconforming Product Management**
Nonconforming products must be:

- Tagged, segregated, and recorded
- Evaluated by quality engineering
- Dispositioned (rework, repair, scrap) with documented approval

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6. Documentation and Traceability

6.1 **Recordkeeping Requirements**
The following documentation must be maintained:

- Machine setup sheets
- Parameter logs
- Electrode usage records
- Dielectric fluid test reports
- Quality inspection reports
- Maintenance logs

All records must be retained for no fewer than seven years.

6.2 **Material Traceability**
Workpieces must remain traceable from raw material receipt through shipment. Each part shall carry or accompany:

- Material certification
- Lot number
- Work order
- Operator identification
- Machine identification

6.3 **Process Change Control**
Any adjustment to validated EDM processes must undergo:

- Engineering review
- Risk assessment
- Trial verification
- Documentation and approval

Unauthorized parameter modifications are prohibited.

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7. Safety and Environmental Standards

7.1 **Operator Safety**
Facilities must ensure the following safety practices:

- Proper grounding of all EDM equipment
- PPE usage including gloves, eye protection, and dielectric-compatible clothing
- Emergency shutoff systems accessible at all machines
- Fire suppression systems appropriate for dielectric fluids

7.2 **Environmental Management**
Dielectric waste must be disposed of through AMCA-approved hazardous waste handlers. Ventilation systems must control fumes generated during machining.

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8. Preventive Maintenance Requirements

Facilities must maintain a documented maintenance program including:

- Replacement intervals for filters, guides, and power contacts
- Verification of dielectric tank cleanliness
- Axis lubrication schedules
- Annual equipment calibration

Maintenance logs must be reviewed monthly by quality management.

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9. Continuous Improvement

Organizations must implement a continuous improvement program that includes:

- Statistical monitoring of key performance indicators
- Analysis of scrap and rework data
- Periodic review of machining efficiency
- Implementation of process enhancements

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10. Compliance and Certification

AMCA certification is granted only upon a successful audit confirming adherence to the above standards. Noncompliance results in corrective action requirements or possible suspension of certification.

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Printed in the United States of America