SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

SAE AS7116/3A

Issued 2002-02
Cancelled 2008-07

Superseded by PRI AC7116/3

National Aerospace and Defense Contractors Accreditation Program Requirements for Electrical Discharge Machining (EDM)

RATIONALE

AS7116/3A is being cancelled and superseded by PRI AC7116/3. The requirements in the document have not changed.

CANCELLATION NOTICE

This document has been declared "CANCELLED" as of July 2008 and has been superseded by AC7116/3. By this action, this document will remain listed in the Numerical Section of the Aerospace Standards Index noting that it is superseded by AC7116/3.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

1. SCOPE:

This Aerospace Standard (AS) is to be used to supplement AS7116. In addition to the requirements contained in AS7116, the requirements contained herein shall apply to suppliers seeking NADCAP accreditation for electrical discharge machining (EDM). The EDM requirements contained herein address the wire, sinker and fast hole EDM process methods.

2. REFERENCES:

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15086-0001.

AS7101/4 National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Requirements for Materials Testing Laboratories – Metallography and Microhardness
AS7108 National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Audit Criteria for Chemical Processing
AS7116 National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Requirements for Nonconventional Machining.

2.2 PRI Documents:

Available from Performance Review Institute, 161 Thornhill Road, Warrendale, PA 15086-7527.

AC7116/3 National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Audit Criteria for Electrical Discharge Machining (EDM)

2.3 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428

ASTM E3 Methods of Preparation of Metallographic Specimens

2.4 Applicable customer specifications shall be available at the facility.

3. EQUIPMENT:

3.1 Calibration of EDM Meters and Gages:

3.1.1 An EDM power supply calibration plan shall exist and include the following items, if applicable:

a. Conductivity measuring devices for water based dielectric systems
b. Volt meters
c. Ammeters
d. Pressure gage

3.2 Verification of EDM Power Supplies Without Calibrated Meters or Gages:

3.2.1 EDM machine power supplies that do not have meters or gages shall be verified by one of the following:

a. Annually per the EDM manufacturers setup or diagnostic procedure or by a comparable plan annually
b. After any power supply maintenance that includes work performed on circuit boards, transistors, integrated circuits, or rectifiers

3.2.2 A diagnostic plan comparable to the EDM manufacturer's plan shall include schematic test point checks and a comparison of test point check results to baseline or schematic values.

3.3 Maintenance:

An EDM preventative maintenance plan shall exist and include the following, where applicable:

a. EDM dielectric system to include limits on pressure drop across filters, and a filter maintenance plan
b. EDM machine
c. EMD power supply

3.3.1 There shall be a documented schedule for preventative maintenance.

3.3.2 There shall be a preventative maintenance completion document.

3.4 EDM Power Supplies:

3.4.1 EDM power supplies shall meet customer requirements (i.e., solid state or tube).

4. WORK INSTRUCTION REQUIREMENTS:

4.1 EDM Equipment:

4.1.1 The workstation instructions shall list the power supply model.

4.2 Tooling and Support Material:

4.2.1 Fixtures/Tooling:

4.2.1.1 The tool fixture shall be listed by tool number and/or description when no tool number is available.

4.2.1.2 Any additional tools and production aids shall be listed by tool number and/or description when no tool number is available.

4.2.2 Electrodes:

4.2.2.1 Electrodes shall be listed by a drawing and revision number.

4.2.2.2 When no drawing number is available, electrodes shall be listed by size and material.

4.3 Electrode Dressing:

4.3.1 Equipment and the process used for electrode dressing shall be listed when electrode dressing is performed as part of the EDM operation.

4.4 Machining Operations per Electrode:

4.4.1 The number of EDM cuts per new or dressed surface(s) per electrode shall be specified if electrode geometry is used to control a dimension and that dimension is not measured by a gage.

4.5 Work Instruction Approval:

4.5.1 Work instructions shall be approved in accordance with customer requirements.

4.6 EDM Power Supply Parameter Requirements:

4.6.1 The EDM workstation instructions shall list values or ranges for the following EDM parameters, where applicable:

a. On-time (pulse time, arc time)
b. Off-time (interval time)
c. Peak current
d. Average voltage
e. Open gap voltage
f. Voltage type
g. Capacitance
h. Electrode polarity
i. Arc suppress
j. Vibration frequency or amplitude
k. Part program name or schedule ID or number
l. Number of power supply leads connected to tooling

4.6.2 Where EDM power supplies have switches or controls for parameters that are not listed in Paragraph 4.6.1, the workstation instructions shall list values or limits for the additional parameters.

4.7 EDM General Requirements:

4.7.1 The workstation instructions shall describe the following, as applicable:

a. Dielectric flushing method
b. Part loading and verification method
c. Electrode loading and verification method
d. Dielectric fluid conductivity limits (water based dielectric fluid only)
e. Dielectric fluid used (manufacturers name and number)
f. Number or range of parts machined simultaneously

5. QUALITY PLANS:

5.1 Procedure:

5.1.1 There shall be a quality plan for each EDM operation and part processed that includes the following, as applicable:

a. Dimensions to be checked
b. Method of control (i.e., fixture, electrode, machine program)
c. Method of inspection
d. Frequency of inspection
e. Visual examination to detect burrs
f. Visual comparison of surface finish
g. Airflow
h. Metallurgical checks and frequency

5.2 Quality Plan Approval:

5.2.1 The quality plan shall be approved in accordance with customer requirements.

5.2.2 The customer shall approve the use of any sampling plans.

5.3 Gages:

5.3.1 For those dimensions measured at the EDM operation, the quality plan shall list the gage by a drawing, gage number, or standard gage description.

6. ANCILLARY PROCESSES:

6.1 Part Cleaning:

6.1.1 Part cleaning shall be performed on processed parts either in-house or by an outside source.

6.1.1.1 If conducted in-house, one of the following shall apply:

a. NADCAP accredited to SAE AS7108, proceed to Paragraph 6.2
b. Not accredited to SAE AS7108, only de-ionized or tap water used, proceed to Paragraph 6.2
c. Not accredited to SAE AS7108, cleaning solutions used, Paragraphs 6.1.2 through 6.1.10 shall be addressed

6.1.1.2 If conducted by an outside source, proceed to Paragraph 6.2.

6.1.2 Workstation instructions shall be available at the cleaning workstation.

6.1.3 If required, workstation instructions shall be approved in accordance with customer requirements.

6.1.4 If required, cleaning solutions shall be approved by the purchaser.

6.1.5 The following controls shall be calibrated, if applicable:

a. Temperature gage
b. Timer

6.1.6 The cleaning tank agitator shall be functioning, if applicable.

6.1.7 The maximum tank time shall be posted or listed in the workstation instructions, if applicable.

6.1.8 The rinse tank cleanliness and check interval shall be defined, if applicable.

6.1.9 There shall be a solution concentration testing and makeup procedure, if applicable.

6.1.10 The cleaning operator shall receive required supplier training.

6.2 Airflow:

6.2.1 Airflow inspection shall be conducted by an approved source, either in-house or by an outside source, as required by the customer.

6.2.1.1 If conducted in-house, Paragraphs 6.2.2 through 6.2.10 shall be addressed.

6.2.1.2 If conducted by an outside source, proceed to Paragraph 7.

6.2.2 Workstation instructions shall be available at the airflow workstation.

6.2.3 Workstation instructions shall be approved in accordance with customer requirements.

6.2.4 The airflow stand shall be calibrated.

6.2.5 A working master part shall be used per customer requirements.

6.2.6 The airflow stand/system shall be corrected to the customers required barometric pressure and humidity conditions, if applicable.

6.2.7 All fixtures, manufacturing aids, gaskets, and seals identified in the workstation instructions shall be the same items used at the workstation.

6.2.8 The parts shall be clean and free of dirt and contamination prior to airflow.

6.2.9 A procedure shall be in place to check for leaks.

6.2.10 The airflow operator shall receive required supplier training.

7. LABORATORY ANALYSIS:

7.1 Inspection:

7.1.1 There shall be a laboratory analysis that shows conformance to applicable drawing notes and/or related specifications.

7.1.2 The samples used to demonstration conformance shall meet the following:

a. Machined using the same EDM process parameters used in production
b. Same material and heat treat condition as production parts, if applicable

7.2 Periodic Metallurgical Evaluation:

7.2.1 Periodic testing shall be performed to verify compliance to the customer's metallurgical requirements, if required.

7.2.2 Metallographic testing on processed parts shall be conducted by an approved source, either in-house or by an outside source, if required by the customer.