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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE STANDARD

SAE AS7116/2

Issued 2002-02

NATIONAL AEROSPACE AND DEFENSE CONTRACTORS ACCREDITATION PROGRAM REQUIREMENTS FOR ELECTROCHEMICAL GRINDING (ECG)

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 electrochemical grinding (ECG).

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.

AC7116/2 National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Audit Criteria for Electrochemical Grinding (ECG)

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 ECG Meters and Gages:

An ECG calibration plan shall exist and include the following items, when they are present for the ECG process:

a. Spindle load meters
b. Volt meters
c. Ammeters
d. Grind wheel rpm meters
e. Specific gravity, temperature, or conductivity tools used to determine electrolyte concentration

3.2 Maintenance

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

a. Electrical cables and connectors
b. Power supply
c. Motors
d. Electrolyte filtration
e. Machine ways
f. Hydraulic system
g. Electrical cabinet filters
h. Arc detection/suppression circuitry

3.2.1 There shall be a documented schedule for preventative maintenance.

3.2.2 There shall be a preventative maintenance completion document.

4. WORK INSTRUCTION REQUIREMENTS:

4.1 ECG Equipment:

4.1.1 The workstation instructions shall list the machine 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 Electrical Connectors and Ground Straps:

4.2.2.1 Procedures for placing electrical connectors and ground straps shall be described.

4.2.3 Grind Wheels:

4.2.3.1 The grind wheel shall be listed by wheel part number.

4.2.3.2 The grind wheel dress frequency and procedure shall be described.

4.2.3.3 The grind wheel conditioning procedure shall be described.

4.3 Workpiece Loading:

4.3.1 The workpiece loading and loading verification procedure shall be described.

4.4 Work Instruction Approval:

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

4.5 ECG Machine Electrolyte Control:

4.5.1 The workstation instructions shall describe the following, where applicable:

a. Electrolyte inlet pressure range
b. Flow rate control
c. Method of supplying electrolyte to the grind wheel

4.6 ECG Parameter Requirements:

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

a. Feedrate or table rpm
b. DC machining voltage or amperage
c. Spindle motor load or grind wheel rpm
d. Machine control program name or schedule ID or number

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

5. QUALITY PLANS:

5.1 Procedure:

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

a. Dimensions to be checked
b. Method of control (i.e., fixture, grind wheel, machine program)
c. Method of inspection
d. Frequency of inspection
e. Visual examination to detect burrs
f. Visual comparison of surface finish
g. Metallurgical checks and frequency
h. Part cleaning procedure prior to and after processing
i. Incoming grinding wheel quality control

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 ECG operation, the quality plan shall list the gage by a drawing, gage number, or standard gage description.

5.4 ECG Surface Integrity:

5.4.1 The quality plan shall have a section that addresses ECG sparkout events or damage that occurs during ECG that includes the following:

a. Purchaser notification procedure
b. Documentation that identifies part number and/or serial number, ECG operation number, workpiece sparkout location, and sparkout cause and corrective action determination

6. ELECTROLYTE CONTROL:

6.1 There shall be an electrolyte control plan that covers the following items, where applicable:

a. Describe the electrolyte used
b. Define electrolyte concentration, conductivity, or specific gravity limits
c. Electrolyte temperature operating range
d. Electrolyte composition check interval
e. Define sludge content
f. Define viscosity limits
g. Define pH limits
h. Solutions found to be out of process limits

6.2 If the electrolyte is out of limits, there shall be a procedure for evaluating any metallurgical damage to the workpiece.

6.3 There shall be a procedure for notifying the customer that workpieces were processed with an electrolyte solution that was out of customer approved limits.

6.4 If electrolyte concentration is calculated by measuring electrolyte conductivity or specific gravity at a known temperature, the person responsible for maintaining the electrolyte shall have tables or conversion information to calculate concentration.

7. ANCILLARY PROCESSES:

7.1 Part Cleaning:

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

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

a. NADCAP accredited to SAE AS7108, proceed to Paragraph 8
b. Not accredited to SAE AS7108, only de-ionized or tap water used, proceed to Paragraph 8
c. Not accredited to SAE AS7108, cleaning solutions used, Paragraphs 7.1.2 through 7.1.10 shall be addressed

7.1.1.2 If conducted by an outside source, proceed to Paragraph 8.

7.1.2 Workstation instructions shall be available at the cleaning workstation.

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

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

7.1.5 The following controls shall be calibrated, if applicable:

a. Temperature gage
b. Timer

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

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

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

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

7.1.10 The cleaning operator shall receive required supplier training.

8. LABORATORY ANALYSIS

8.1 Inspection:

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

8.1.2 The samples used to demonstrate conformance shall meet the following:

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

8.2 Periodic Metallurgical Evaluation:

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

8.2.2 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.

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

a. NADCAP accredited to SAE AS7101/4, proceed to Paragraph 9
b. Initially approved by NADCAP subscribing customer, Paragraphs 8.2.3 through 8.2.9 shall be addressed

8.2.2.2 If conducted by an outside source, one of the following shall apply:

a. NADCAP accredited to SAE AS7101/4, proceed to Paragraph 9
b. Initially approved by NADCAP subscribing customer, proceed to Paragraph 9.