The Engineering Society
For Advancing Mobility
Land Sea Air and Space®

INTERNATIONAL

400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE STANDARD

AS7114/2

Issued 1997-07
Superseding AS7100/1A

Submitted for recognition as an American National Standard

NADCAP
REQUIREMENTS FOR NONDESTRUCTIVE TESTING
MAGNETIC PARTICLE SURVEY

1. **SCOPE:**

This Aerospace Standard is to be used as a supplement to SAE AS7114. In addition to the requirements contained in AS7114, the requirements contained herein shall apply to suppliers seeking NADCAP accreditation for Magnetic Particle Inspection.

When customer requirements differ from those specified herein, the customer requirements shall take precedence.

2. **REFERENCES:**

2.1 SAE Publications

Available from Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15086-0001.

AS7003	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Program Operation
AS7114	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Nondestructive Testing
AMS 2641	Vehicle, Magnetic Particle Inspection, Petroleum Base

2.2 U.S. Government Publications

Available from DODSSP Subscription Service Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-410	Nondestructive Testing Personnel Qualification and Certification
MIL-STD-1949	Inspection, Magnetic Particle
DOD-F-87935	Fluid, Magnetic Particle Inspection, Suspension Medium (Metric)

2.3 ASTM Publications

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 1444	Standard Practice for Magnetic Particle Examination

QUESTIONS REGARDING THIS DOCUMENT: (412) 772-8510 FAX (412) 776-0243
TO PLACE A DOCUMENT ORDER: (412) 776-4970 FAX (412) 776-0790

3. **MATERIALS AND EQUIPMENT:**

3.1 All magnetic particles used shall be in accordance with MIL-STD-1949/ASTM E 1444.

3.1.1 Material certification required.

3.2 Suspension vehicles shall meet requirements of MIL-STD-1949/ASTM E 1444.

3.2.1 Material certification required, except for water based.

3.3 All equipment shall include a control to vary the current from 10% to 100% of full rated output of last calibration.

4. **PROCEDURES:**

4.1 There shall be a statement in the procedure or quality manual requiring that as a minimum customer requirements shall be met.

4.2 Magnetic particle inspection shall be performed in accordance with a written procedure. The written procedure may be general in nature if it applies to all the parts being tested and meets the requirements specified herein.

4.2.1 The written procedure, general or specific, shall contain the following information as a minimum:

a. Procedure I.D. number, applicable program (if program specific), and the date the procedure was approved.
b. Identification part number, material and alloy type, shape and dimensions significant to the part to be examined.
c. Equipment to be used for magnetization, including manufacturer and model number.
d. Type of current used (e.g., single phase, half wave rectified, three phase, single phase AC, etc.).
e. Type and direction of magnetization to be used, the order in which they are applied, and any demagnetization between shots.
f. Pulse duration, type (AC, DC), and quantity (pulses/shot).
g. Magnitude of current, direction of all magnetic fields, the magnetic field strengths and the types of magnetic field strength indicators, ampere turns, etc.
h. Sketches or a chart indicating coverage and/or orientation of the part with respect to current conductors and/or contact points.
i. Details of demagnetization procedure including use of magnetic field indicator.
j. Area of parts to be examined and acceptance classes or requirements for evaluating indications.
k. Reporting of results and method of marking parts after inspection.

4.2.1 Continued:

l. Surface preparation required before and after testing.
m. Identification of test parts used for system performance.
n. Sequence of the magnetic particle inspection relative to manufacturing operations.
o. Ferromagnetic particles to be used by manufacturer, color, wet or dry, fluorescent or non-fluorescent, and suspension vehicle.
p. Contrast media or other special materials, when used.
q. A statement to the effect that all personnel are qualified and certified to MIL-STD-410 or the applicable contract requirements.
r. A statement that personnel performing inspections are prohibited from wearing glasses with photochromic lenses.
s. All process control requirements addressed in this standard.
t. Requirement to report to the customer occurrences of arcing.

4.2.2 The procedure, general or specific, shall be approved by the Level Ill in magnetic particle inspection.

4.3 The procedures/techniques shall provide a means to ensure that the appropriate work instructions/ routing/travelers (including sequence of operations, processing parameters, technique information, unique requirements) are available to inspection personnel on the shop floor.

4.4 When applicable, the procedure shall address inspection of hardware which has coating or plating applied in accordance with customer requirements.

4.4.1 When coatings are nonconductive, the procedure shall require removal where electrical contact is made.

5. PROCESS CONTROLS:

5.1 Suspension Concentration/Contamination Checks:

Determination of wet particle (petroleum based) concentration and contamination shall be made at shift change or every eight (8) hours and whenever the bath is changed or adjusted. Results shall be documented.

a. The suspension vehicle shall be agitated a minimum of 30 minutes prior to performing the suspension concentration check.
b. The sample of agitated suspension shall be demagnetized and allowed to settle undisturbed for at least 60 minutes for petroleum based suspension or at least 30 minutes for conditioned water suspension.
c. The volume of settled magnetic particles shall conform to the following ranges as applicable:

Fluorescent particles - 0.1 - 0.4 mL per 100 mL sample.
Non-fluorescent particles - 1.2 - 2.4 mL per 100 mL sample