

NOT MEASUREMENT SENSITIVENOTICE OF  
CHANGEMIL-STD-1949A  
NOTICE 2  
29 May 1990

## MILITARY STANDARD

## INSPECTION, MAGNETIC PARTICLE

TO ALL HOLDERS OF MIL-STD-1949A:

1. THE FOLLOWING PAGE OF MIL-STD-1949A HAS BEEN REVISED AND SUPERSEDES THE PAGE LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
7	15 May 1989	7	REPRINTED WITHOUT CHANGE
8	11 April 1990	8	15 May 1989

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-1949A will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or cancelled.

## Custodians:

Army - MR  
Navy - AS  
Air Force - 11

## Preparing Activity:

Army - MR

Project NDTI-0182

## Review activities:

Army - AR, AV, EA, MI  
Navy - SH  
Air Force - 99, 70, 80, 82, 24, 84

## User activities:

Army - AT, AL, ME, TE, AR  
Navy - OS  
Air Force - 71

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## MIL-STD-1949A

requirements. The written procedure may be a general one if it clearly applies to all the specified parts being tested and meets the requirements of this standard. All written procedures shall be approved by an individual qualified and certified to MIL-STD-410, Level III for magnetic particle inspection, and shall be submitted upon request to the contracting agency.

4.4.1 Elements of the written procedure. The written procedure shall include at least the following elements, either directly or by reference to the applicable documents:

- a. Identification of the parts to which the procedure applies. This shall include the material and alloy of which the parts are fabricated.
- b. Identification of test parts used for system performance verification (see 5.7.2 and 5.7.3).
- c. Areas of the part to be examined (include a sketch if necessary).
- d. Directions of magnetization to be used, the order in which they are applied, and any demagnetization procedures to be used between shots.
- e. Method of establishing the magnetization (prods, yoke, cable wrap, etc).
- f. Directions for positioning the item with respect to the magnetizing equipment
- g. The type of magnetizing current and the equipment to be used.
- h. The current level, or the number of ampere-turns, to be used and the duration of its application.
- i. Part preparation required before testing.
- j. Type of magnetic particle material (dry or wet, visible or fluorescent, etc.) to be used, the method and equipment to be used for its application, and, for the case of wet particles, the particle concentration limits.
- k. Type of records and method of marking of parts after inspection.
- l. Acceptance requirements, to be used for evaluating indications and disposition of parts after evaluation.
- m. Post-inspection demagnetization and cleaning requirements.
- n. The procedure identification number and the date it was written.
- o. Sequence of magnetic particle inspection as related to manufacturing process operations.

4.5 Record of inspection. The results of all magnetic particle inspections shall be recorded. All recorded results shall be identified, filed, and made available to the contracting agency upon request. Records shall provide for traceability to the specific part or lot inspected, and shall identify the inspection contractor or facility and the procedures used in the inspection.

4.6 Magnetizing and demagnetizing equipment. Performance of a satisfactory magnetic particle inspection requires magnetization of the part to a specified level in a specified direction. Magnetization can be accomplished either by passing an electric current directly through the material (direct method), by inducing a current to flow in the part under test (induced current method), or by placing the material within the magnetic flux of an external source such as a coil (indirect method). The types of equipment available include yokes, portable units, mobile units, stationary units, and special application units (e.g. a unit to produce a single or multidirectional field). The types of currents used for magnetization are

## MIL-STD-1949A

full-wave rectified alternating current, half-wave rectified alternating current, and alternating current. The equipment used shall adequately fulfill the magnetizing and demagnetizing requirements, as outlined herein, without damage to the part under test and shall include the necessary features required for safe operation.

4.7 Inspection sequence. Magnetic particle inspection shall be performed after the completion of operations that could cause surface or slightly subsurface defects. These operations include, but are not limited to, forging, heat treating, plating, passivation, cold forming, welding, grinding, straightening, machining, and proof loading. Unless otherwise approved by the contracting agency or as provided in 5.1.3, production parts shall be magnetic particle inspected before application of any coatings. Parts that have a tensile strength of 180 KSI or higher that are heat treated and subsequently electroplated, shall also be inspected after plating (unless otherwise specified).

4.8 Lighting intensities.

4.8.1 Visible light intensities. Visible light shall be used when testing with nonfluorescent particles. The intensity of the visible light at the surface of the parts undergoing inspection shall be maintained at a minimum of 1000 lux (100 foot-candles). Fluorescent magnetic particle inspection shall be performed in a darkened area with a maximum ambient visible light level of 20 lux (2 foot-candles).

4.8.2 Black light intensities. The black light intensity at the examination surface shall be 1000 W/cm<sup>2</sup> or greater when measured with a suitable black-light meter. Portable or hand held black lights shall produce an intensity greater than 1000 W/cm<sup>2</sup> when measured at 380 mm (15 inches) from the black light source.

4.9 Materials.

4.9.1 Magnetic particle materials. The particles used in magnetic particle inspection shall be finely divided ferromagnetic materials which have been treated to impart visibility against the background of the surfaces under inspection. They may be either colored for use with visible light or coated with a fluorescent material for use with black light. The particles may be designed for use as a free flowing dry powder (dry method), for suspension at a given concentration in a suitable liquid (wet method), for suspension in a polymerizeable material (magnetic rubber method), or for suspension in a slurry (magnetic painting). The particles shall be designed to have a high magnetic permeability and a low retentivity. Careful control of particle size, shape, and material is required to obtain consistent results. The particles shall be non-toxic, free from rust, grease, paint, dirt or other deleterious material which might interfere with their proper functioning.

4.9.1.1 Dry particle requirements. Dry particles shall meet the requirements of AMS 3040. In applying AMS 3040 the particles shall show indications as listed in table I on the test ring specimen of figure 1 using the following procedure: