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MIL-M-13508C
19 March 1973
SUPERSEDING
MIL-M-13508B
16 November 1966

MILITARY SPECIFICATION

MIRROR, FRONT SURFACED ALUMINIZED: FOR OPTICAL ELEMENTS

This specification is mandatory for use by all Departments and Agencies of the Department of Defense

1. SCOPE

1.1 Scope.- This specification covers a mirror coating consisting of a deposited aluminum reflective film overlaid with a transparent dielectric protective film applied on the front surface of optical elements.

2 APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

* Federal

L-T-90	Tape, Pressure-Sensitive, Adhesive (Cellophane and cellulose acetate)
CCC-C-440	Cloth, Cheesecloth, Cotton, Bleached and unbleached

Military

MIL-O-13830	Optical Components for Fire Control Instruments; General Specification Governing the Manufacture, Assembly, and Inspection of

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STANDARDS

Federal

Federal Test Method, Standard No. 151	Metals; Test Methods

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-1241	Optical Terms and Definitions

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Optical terms and definitions.- Reference shall be made to MIL-STD-1241 to define optical terms used.

3.2 Optical elements.- The supplier is responsible for the quality of the optical elements used as backing for a front surface mirrored finish. Optical elements shall have been manufactured, tested and approved for use in accordance with the applicable element drawing and referenced specifications prior to the coating process.

3.3 Coating process.- The coating process producing the front surface mirror finish shall cause no impairment to the optical element. Optical elements which have met the requirements of 3.2 shall not be rejected because of fine hair lines, scratches, digs or stains which are made more visible by the coating process.

3.3.1 Aluminum film.- The deposited film shall be of high quality aluminum. There shall be no visible discontinuities or blemishes that adversely affect the field of view as seen with the eye in the specified viewing position.

* 3.3.2 Protective film.- The front surface aluminum film shall be protected by a film of high quality uniform magnesium fluoride or silicon monoxide or as otherwise specified on the applicable drawing. The film shall be free from holes, foreign matter and perceptible variations in density.

3.4 Reflectance.- The finished coated surface, for visible use, shall have more than 86 percent luminous reflectance when measured at required angle of incidence, or a reflectance as otherwise specified on the applicable drawing.

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3.5 Optical quality.- The finished coated surface shall conform to the pertinent optical requirements set forth on the applicable drawing.

3.6 Coated area.- The optical element shall be coated over its entire effective aperture or as otherwise specified by the applicable drawing.

3.7 Temperature influence.- The coated surface shall show no signs of deterioration or removal of films after being subjected to ambient temperature of -80°F and also +160°F for a period of five hours at each temperature.

3.8 Hardness.- The coated surface shall show no signs of deterioration such as streaks or hairline scratches as defined in MIL-O-13830 after being hand rubbed with a dry cloth.

3.9 Adherence.- No part of the aluminum or protective films shall be removed when cellulose tape is pressed against the coated surface and slowly removed.

3.10 Humidity and salt spray.- When specified in the contract the coated surface shall show no evidence of corrosion or pitting when exposed to a relative humidity of 95 to 100 percent at 120°F ± 4°F for a period of 24 hours and when exposed to a salt spray for the same time period. (See 6.1)

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 General provisions

4.2.1 Submission of product. - Unless otherwise specified in the contract inspection lot size, lot formation and presentation for acceptance shall be in accordance with MIL-STD-105.

4.3 Examination and tests. - Examination and tests related to Section 3 herein shall be performed on a single defect (individual characteristic) basis in accordance with MIL-STD-105 and Table I specified herein.

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TABLE I. CLASSIFICATION OF DEFECTS

Class	Requirement	Test Procedure
Critical: None defined		
Major: AQL 0.65% defective		
101. Aluminum film	3.3.1	4.4.1
102. Protective film	3.3.2	4.4.1
103. Reflectance	3.4	4.4.2
104. Optical quality	3.5	4.4.3
105. Coated area	3.6	4.4.1
106. Temperature influence	3.7	4.4.4
107. Hardness	3.8	4.4.5
108. Adherence	3.9	4.4.6
109. Humidity	3.10	4.4.7
110. Salt spray	3.10	4.4.8
Minor: None defined		

4.4 Test Methods and procedures.

4.4.1 Coating process.- Use a visual inspection and procedures set forth in MIL-O-13830 to determine compliance with requirements 3.3.1, 3.3.2, and 3.6.

4.4.2 Reflectance.- The reflectance of the finished mirror at the required angle of incidence shall be measured either with a photometer device shown in Figure 1 for luminous reflectance or an instrument (spectrophotometer) capable of measuring nonvisual reflectance as otherwise specified on the applicable drawing to determine conformance with the requirements of 3.4.

4.4.3 Optical quality.- Use testing procedures as specified in MIL-O-13830 or as otherwise specified on applicable drawing to determine compliance with requirement 3.5.

4.4.4 Temperature influence.- The element shall be exposed to ambient temperatures of -80 and +160°F for a period of 5 hours at each specified temperature. A visual inspection shall be made after the element is returned to standard ambient temperature (+60° to 90°F) to determine compliance with the requirement 3.7.

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* 4.4.5 Hardness. - This test shall be performed using a pad of clean dry laundered cheesecloth, conforming to CCC-C-440, approximately 3/8 inch diameter and approximately 1/2 inch thick. Bearing with a force of one pound ± 1/4 lb on the protected clean surface of the element, rub a minimum of 50 strokes across the surface in straight lines or circular motions. Subsequent to this procedure the protective coating must meet the requirements of 3.8.

* 4.4.6 Adherence. - Place the sticky surface of cellulose tape, conforming to TYPE I, Class A of L-T-90, over a portion of the coated surface. Press the tape firmly against the coated surface. Pull the tape down over the edges of the element and then slowly remove the tape. A visual inspection shall be made of the tested area to assure that the films have not been removed from the substrate material to determine compliance with 3.9. Edges not forming a part of the reflecting surface shall not be considered when inspection is being performed.

* 4.4.7 Humidity. - The coated elements shall be exposed for a period of 24 hours in a thermostatically controlled humidity chamber having a relative humidity of between 95 and 100 percent of 120° ± 4°F. The elements shall be removed from the chamber and dried with lens tissue or soft cloth, then visually inspected to determine compliance with the requirements of 3.10. (See 6.1).

* 4.4.8 Salt spray. - A visual inspection of the element shall be made of the coating after exposure to the salt spray test described in Federal Test Method Std No. 151 to determine compliance with the requirements of 3.10 (See 6.1).

5. PREPARATION FOR DELIVERY - This section not applicable to this specification.

6. NOTES

* 6.1 Humidity and salt spray. - Humidity and salt spray requirements and tests are applicable only when specifically required by contract. The contract shall also prescribe the specific protective coating that will meet the environmental requirements of 3.10. Federal Test Method Std No. 151 Metals, Test Methods, should be furnished as part of applicable documents required under 2.1.

Custodians:
Army - MU
Air Force - 82

User activity:
Army - EL, ME, MI
Navy - OS, SH
Air Force - None

Review activity:
Army - MU
Air Force - 82

Preparing activity:
Army - MU (FA)

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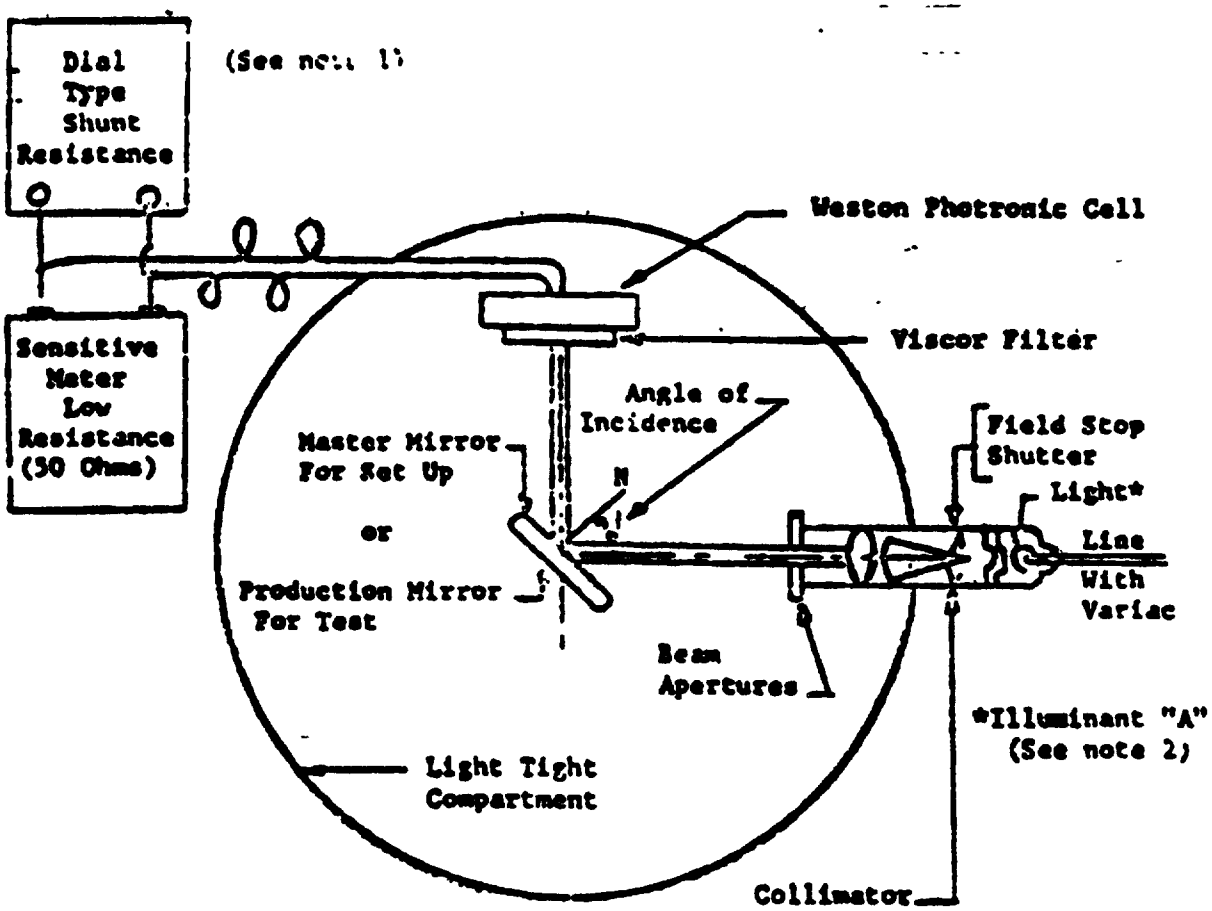

Notes: 1. The load resistance of the photocell is reduced by meter adjustment shunt.

2. Illuminant "A" is an incandescent tungsten lamp having a spectral distribution corresponding to a black body at a temperature at 2848°K.

Figure 1. Weston Photronic Cell, Viscor Filter and Tungsten Light

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(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)* ☐ VENDOR ☐ USER
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ MANUFACTURER ☐ OTHER *(Specify)*:

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation.

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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