

MIL-F-9329B

2 April 1980

SUPERSEDING

MIL-F-9329A

8 March 1971

## MILITARY SPECIFICATION

## FILTERS, LIGHT PHOTOGRAPHIC, GENERAL SPECIFICATION FOR

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

## 1. SCOPE

1.1 Scope. This specification covers the requirements for four types of light filters for photographic use.

1.2 Classification. Filters, Light Photographic shall be classified as follows:

1.2.1 Type (see 3.1.1).

Type I        Polymer sheet or film  
Type II       Polymer layer sandwiches between two sheets of  
              glass  
Type III - Solid glass  
Type IV - Other materials

1.2.2 Grade (see 3.1.2).

Grade B - High optical quality  
Grade C - Lower optical quality

1.2.3 Class (see 3.1.3). Filters are classed according to use, as follows:

Class B - With black and white film  
Class C - With color film  
Class P - Printing  
Class Z - Polarizing  
Class S - Safelight  
Class ND - Neutral density

1.3 Part number. Specification part number for items described in this specification will be formulated as shown in 6.4.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to HQ AFIC CASO/LODS, Federal Center, Battle Creek, MI 49016, by using the self-addressed Standardization Document Improvement Proposal (Form DD1426) appearing at the end of this document or by letter.

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## 2. APPLICABLE DOCUMENTS

2.1 Issues of documents. 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

NN-P-71	Pallets, Material Handling Wood Stringer Construction 2-Way and 4-Way (Partial)
QQ-S-781	Strapping, Steel and Seals
PPP-B-601	Boxes, Wood, Cleated Plywood
PPP-B-621	Boxes, Wood, Nailed and Lock-Corner
PPP-B-636	Boxes, Shipping, Fiberboard
PPP-B-640	Boxes, Fiberboard, Corrugated, Triple-Wall
PPP-S-760	Strapping, Nonmetallic (and Connectors)
PPP-T-97	Tape, Pressure-Sensitive Adhesive, Filament Reinforced

## Military

MIL-P-116	Preservation-Packaging, Methods of
MIL-C-675	Coating of Glass Optical Elements (Anti-Reflection)
MIL-P-14232	Parts, Equipment and Tools for Army Materiel, Packaging of

## STANDARDS

## Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-1188	Commercial Packaging of Supplies and Equipment
MIL-STD-1278	Filters, Light, Photographic

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

## 3. REQUIREMENTS

3.1 Construction. The filters shall be constructed as follows:

3.1.1 Types.

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a. Type I filter shall be constructed of a thin plane-surfaced polymer sheet or film.

b. Type II filters shall be constructed of a thin plane-surfaced polymer sheet or film cemented between two sheets of either selected plate or optical glass.

c. Type III filters shall be constructed of a solid plate throughout in which the coloring (consisting of inorganic or organic salts, metals, or minerals) has been uniformly dispersed at the time of manufacture.

d. Type IV filters shall be constructed of materials other than those used for types I, II and III above.

3.1.2 Grade. Filters shall be graded according to optical quality as follows (see 3.6):

a. Grade B - High optical quality to be used in the path of image-forming rays.

b. Grade C - Lower optical quality not to be used in the path of image-forming rays.

3.1.3 Class. Filters are classed according to intended use.

a. Class B - Photographic use with black and white film.

b. Class C - Photographic use with color film.

c. Class P - Photographic printing (color or black and white).

d. Class Z - Light polarizing (color or black and white photography).

e. Class S - Photographic safelight.

f. Class ND - Neutral density to cut down light uniformly across the spectrum (color or black and white photography).

3.1.4 Reclaimed materials. The use of reclaimed materials shall be encouraged to the maximum extent possible.

3.2 First article. When specified in the contract or purchase order (see 6.2) the contractor shall furnish First Article units in accordance with 4.3.

3.3 Size and shape. The size and shape of Class B, C, P, Z and ND filters shall be according to MIL-STD-1278, unless otherwise specified. The size and shape of class S filters shall be 10 by 12 +0.000 -0.062 inches (25.4 by 30.48 +0.000 -0.157

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centimeters) rectangular or  $5.500 +0.000 -0.062$  inches ( $13.97 +0.000 -0.157$  centimeters) round, as specified by the procuring activity. The thickness of Class S filters shall be  $0.160 \pm 0.020$  inches ( $0.41 \pm 0.051$  Centimeters) unless otherwise specified.

3.4 Marking. Filters shall be marked with the Military Filter Designation System (MFDS) as specified in MIL-STD-1278.

3.5 Beauty defects. The presence of minor beauty defects, as defined in MIL-STD-1278, may be permitted. Edge cracks and chips shall be ground out to prevent damage by further penetration into the filter.

### 3.6 Optical quality.

3.6.1 Grade B. Grade B filters shall be capable of meeting the requirements specified for the following:

<u>Requirement</u>	<u>Paragraph</u>
Resolution	3.7
Deviation	3.8
Homogeneity	3.9
Transmittance	3.10
Actinic radiation	3.11

3.6.2 Grade C. Grade C filters shall be capable of meeting the requirements specified for the following:

<u>Requirement</u>	<u>Paragraph</u>
Homogeneity	3.9
Transmittance	3.10
Actinic radiation	3.11

3.7 Resolving power. When tested in accordance with the following methods of MIL-STD-1278, the loss of resolution elements shall not be greater than that specified:

<u>MIL-STD-1278</u>	<u>Resolution elements</u>
Method VII	Nine
Method VIII	Four

3.8 Deviation. With aperture diameters or widths as follows, filters shall not deviate a normally incident ray of light through an angle of more than that specified:

<u>Diameter of width</u>	<u>Angle</u>
Up to 1.5 inches (3.8 cms)	$0.001454$ radians (5 minutes) of arc
Over 1.5 inches (3.8 cms)	$0.002181$ radians (7.5 minutes) of arc

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3.9 Homogeneity.

3.9.1 Method IX. When tested in accordance with Method IX of MIL-STD-1278, no cracks, delamination striations, or lack of homogeneity shall be visible in the image of the filter.

3.9.2 Method X. When tested in accordance with Method X of MIL-STD-1278, there shall be no striations in the filter and the transmission shall be homogenous.

3.10 Transmittance. When the spectral transmittance curve of a filter is analyzed as described in Methods I and II of MIL-STD-1278, the requirements of Table I shall apply.

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TABLE I. Transmittance Specifications for Filters for Black and White Films

Filter	U.V.	Blue	Green	Red
B-0-18A	>.20	<.01	<.01	<.01
B-1-38		.70 $\pm$ .10	.44 $\pm$ .10	.09 $\pm$ .04
B-1-39		>.33	<.02	<.02
B-1-47 (Note 1)	<.05	>.27	<t <sub>b</sub> .1	<.01
B-1-47B (Note 2)	<.05	>.17	<.01	<.01
B-1-98	<.01	.20 $\pm$ .03	<.01	<.01
B-2-0	>.85	>.85	>.85	>.85
B-2-2A	<.01	.69 $\pm$ .05	>.85	>.85
B-2-2C	.06 $\pm$ .015	.81 $\pm$ .04	>.85	>.85
B-2-2E	<.01	.63 $\pm$ .04	>.85	>.85
B-2-3	<.01	.33 $\pm$ .05	>.85	>.85
B-2-3-ND.5	<.01	.09 $\pm$ .05	.31 $\pm$ .05	.31 $\pm$ .05
B-2-4	<.01	.26 $\pm$ .05	>.85	>.85
B-2-6	<.01	.43 $\pm$ .13	>.85	>.85
B-2-8	<.05	.14 $\pm$ .06	>.85	>.85
B-2-8-NC.5	<.01	.06 $\pm$ .04	.29 $\pm$ .05	.29 $\pm$ .05
B-2-9	<.01	.05 $\pm$ .03	>.70	>.85
B-2-13	<.05	.25 $\pm$ <sub>g</sub> .05	>.40	.15 $\pm$ <sub>g</sub> .05
B-2-15	<.01	<.04	>.55	>.85
B-2-90		<.01	.11 $\pm$ .03	.10 $\pm$ .03
B-3-11	<.05	.25 $\pm$ <sub>g</sub> .05	>.40	.25 $\pm$ <sub>g</sub> .05
B-3-12	<.01	<.01	>.65	>.85
B-3-40	<.01	.17 $\pm$ .04	.40 $\pm$ .05	.04 $\pm$ .05
B-3-57	<.01	<.10	.45 $\pm$ .06	<.05
B-3-58	<.01	<.05	.34 $\pm$ .06	<.01
B-3-66	<.20	.40 $\pm$ .05	.67 $\pm$ .07	.18 $\pm$ .05
B-3-60	<.01	.08 $\pm$ .03	.35 $\pm$ .01	<.03
B-3-61	<.01	<.04	>.17	<.01
B-3-93 (Note 3)	<.01	<.01	.02 $\pm$ .005	<.01
B-3-99	<.01	<.01	.08 $\pm$ .02	<.01
B-4-32		<.20	<.01	>.80
B-4-34A	<.01	.32 $\pm$ .05	<.01	>.80
B-4-35	.28 $\pm$ .06	.22 $\pm$ .06	<.01	.23 $\pm$ .06
B-5-22	<.01	<.01	.35 $\pm$ .10	>.85
B-5-23A	<.01	<.01	.20 $\pm$ .06	>.85
B-5-25	<.01	<.01	.06 $\pm$ .04	>.80
B-5-29F	<.01	<.01	<.01	>.65
B-5-70 (Note 4)	<.01	<.01	<.01	.25 $\pm$ .05
B-5-92	<.01	<.01	<.01	.53 $\pm$ .05

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TABLE I. Transmittance Specifications for Black and White Printing Filters

Filter	U.V.	Blue	Green	Red
P-2-2B	<.06	.77 $\pm$ .04	>.85	>.85
P-2-1P	.57 $\pm$ .05	.52 $\pm$ .04	.89 $\pm$ .07	.92 $\pm$ .07
P-2-1.5P	.78 $\pm$ .06	.75 $\pm$ .06	.73 $\pm$ .06	.89 $\pm$ .07
P-4-2P	.86 $\pm$ .07	.82 $\pm$ .07	.55 $\pm$ .04	.87 $\pm$ .07
P-4-2.5P	.84 $\pm$ .04	.77 $\pm$ .06	.40 $\pm$ .03	.84 $\pm$ .07
P-4-3P	.76 $\pm$ .04	.68 $\pm$ .05	.20 $\pm$ .02	.78 $\pm$ .06
P-4-3.5P	.69 $\pm$ .06	.55 $\pm$ .04	.06 $\pm$ .01	.67 $\pm$ .05
P-4-4P	.38 $\pm$ .03	.26 $\pm$ .02	<.01	.45 $\pm$ .04
P-2-IV	<.01	.03 $\pm$ .01	.75 $\pm$ .06	.90 $\pm$ .07
P-2-2V	<.01	.07 $\pm$ .01	.81 $\pm$ .06	.91 $\pm$ .07
P-2-3V	.30 $\pm$ .02	.30 $\pm$ .02	.81 $\pm$ .06	.91 $\pm$ .07
P-2-4V	.41 $\pm$ .03	.31 $\pm$ .02	.75 $\pm$ .06	.91 $\pm$ .07
P-5-5V	.77 $\pm$ .06	.61 $\pm$ .05	.66 $\pm$ .05	.88 $\pm$ .07
P-4-6V	.80 $\pm$ .06	.59 $\pm$ .05	.51 $\pm$ .04	.87 $\pm$ .07
P-4-7V	.80 $\pm$ .06	.55 $\pm$ .04	.40 $\pm$ .03	.90 $\pm$ .07
P-4-8V	.70 $\pm$ .03	.51 $\pm$ .04	.31 $\pm$ .02	.15 $\pm$ .01
P-4-9V	.37 $\pm$ .03	.57 $\pm$ .05	.05 $\pm$ .01	.53 $\pm$ .04
P-4-10V	.45 $\pm$ .04	.32 $\pm$ .03	<.01	

Note 1. Blue subdivision spectral centroid between 440 and 460 nm.

Note 2. Blue subdivision spectral centroid between 425 and 445 nm.

Note 3. Spectral centroid at 600  $\pm$ 10nm.

Note 4. Red subdivision spectral centroid above 680nm.

3.10.1 Infrared filters, transmittance requirements. In addition to the transmittance requirements for infrared filters shown in Table II, all transmittance between 360 and 600 nm shall be less than 0.01.

TABLE II. Average Transmittance for Infra-Red Films (Black and White) as Percent of Transmission

Filter	600-700nm	700-800 nm	800-900 nm	900-1000 nm
B-7-87	.01	.175 $\pm$ .075	.80	.80
B-7-87C	.01	.40	.40	.80
B-7-88A	.01	.40 $\pm$ .15	.80	.80
B-7-89B	.03	.60	.80	.80

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3.10.2 Polarizing filters. Polarizing filters shall have a nominal transmittance value of  $0.40 \pm .10$  percent in each of the blue, green, and red subdivisions of the spectrum when analyzed using method I MIL-STD-1278. Two polarizers, when in the position of maximum extinction, shall have a composite average transmittance as follows:

<u>Subdivision</u>	<u>Average Transmittance, Method I</u>
Blue	0.05 Percent
Green	0.01 Percent
Red	0.01 Percent

3.10.3 Neutral density filters. When the nominal neutral density is less than 2.0, the average transmittance in the blue, the green, and the red subdivision of the spectrum must be equivalent to a density value within  $\pm 0.1$  of the nominal when analyzed using method I, MIL-STD-1278. Filters with a nominal neutral density of 2.0 or greater shall have average transmittance in the blue, the green, and the red subdivision of the spectrum equivalent to densities of within 0.5 density units of the nominals.

3.10.4 Safelight filter. Table III contains the transmittance requirements for safelight filters.

TABLE III. Safelight Filters for Darkroom Illumination - Spectral Transmission Requirements

<u>Safelight Filter</u>	<u>Wavelength (nm)</u>	<u>Transmittance Percent</u>
S-2-00	360 to 400	No transmittance value shall be greater than 0.0001
	400 to 500	No transmittance value shall be greater than 0.0001
	500 to 600	Average transmittance values shall be $0.10 \pm 0.05$ with no value greater than 0.23
	600 to 700	Average transmittance values shall be $0.10 \pm 0.05$
S-2-0A	570 to 590	Peak transmittance values shall be less than $\pm 0.015$
	560 to 620	Average transmittance value shall be $0.007 \pm 0.002$
	360 to 530	Transmittance values shall be less than 0.0003
	650 to 700	Transmittance values shall be less than 0.001
S-2-0C	360 to 550	No transmittance value shall be greater than 0.0001
	570 to 620	Average transmittance value shall be $0.0028 \pm 0.0008$



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TABLE III. Safelight Filters for Darkroom Illumination -  
Spectral Transmission Requirements (Con't)

Safelight Filter	Wavelength (nm)	Transmittance Percent
S-2-0C	630 to 700	Average transmittance value shall be less than 0.0002
	570 to 620	Peak transmittance shall occur between 570 and 600 nm and transmittance values shall be no greater than 0.010; average transmittance shall occur between 570 and 620 nm and shall be $0.0028 \pm 0.0008$ .
S-5-1A	360 to 590	No transmittance value shall be greater than 0.0001
	600 to 700	Average transmittance values shall be $0.46 \pm 0.10$ .
S-5-1	360 to 610	Transmittance value shall be below 0.0001
	620 to 700	Average transmittance value shall be $0.0065 \pm 0.0015$
S-5-2	360 to 620	Transmittance values shall be less than 0.0001
	650 to 800	Average transmittance value shall be $0.0039 \pm 0.0015$
	680 to 700	Maximum transmittance shall occur between 680 and 700 nm and must not be greater than 0.0075
S-5-S55	360 to 540	Transmittance values shall be less than 0.00001
	560 to 700	Average transmittance values shall be $0.0016 \pm 0.004$ ; peak transmittance should occur between 575 and 600 nm and have a value $0.0025 \pm 0.0005$
S-3-7	360 to 480	Transmittance values shall be below 0.00001
	580 to 700	Transmittance values shall be below 0.00001
	490 to 570	Average transmittance must be below 0.0001; maximum transmittance shall be less than 0.00016
S-3-3	360 to 480	All transmittance values must be less than 0.000003
	630 to 700	All transmittance values must be less than 0.000003

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TABLE III. Safelight Filters for Darkroom Illumination -  
Spectral Transmission Requirements (Con't)

Safelight Filter	Wavelength (nm)	Transmittance Percent
S-3-3	500 to 520	Average transmittance value must be $0.00003 \pm 0.00002$
S-5-6B	360 to 550	Transmittance values shall be less than 0.0001
	570 to 700	Average transmittance value shall be $0.0066 \pm 0.0010$ ; maximum transmittance shall be less than 0.0028
S-5-8	360 to 550	Transmittance values shall be less than 0.00001
	650 to 700	Transmittance values shall be less than 0.00001
	570 to 630	Average transmittance shall be $0.0012 \pm 0.0003$
S-5-10	360 to 570	Transmittance values shall be less than 0.00001
	630 to 700	Transmittance values shall be less than 0.00001
	590 to 600	Peak transmittance shall occur between 590 and 600 nm and be less than 0.0005 and greater than 0.0002

3.10.5 Light Balancing filters. The light balancing filters are those which are used to convert the spectral energy distribution of a particular source to that of daylight or to convert the spectral energy distribution of daylight to that of a given source. These light filters are designated as follows:

C-1-80B, C-1-80C, C-2-85, C-2-85B, and C-2-85C

3.10.5.1 Spectral transmittance for light balancing filters. The spectral transmittance requirements for the light balancing filters listed above are that the photicity of the normalized blue and red sensitive layers calculated in accordance with the procedure specified for reference photicity values in method IV of MIL-STD-1278 be 0.85 to 1.18 that of normalized blue and red layer photicities calculated in accordance with the procedure specified for photicity values for the Average Color Film exposed through the filter in MIL-STD-1278.

3.10.6 Filters with mired values. The spectral energy distribution of many light sources may be described by their color temperature, i.e., the temperature to which a black body

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radiator must be raised in order that the light it emits may match a given light source. Color temperature is expressed in degrees Kelvin ( $^{\circ}\text{K}$ ).

3.10.6.1 Assignment of mired values. Color temperature may be converted to  $(1/K^{\circ})10^6$ , i.e., micro-reciprocal degrees or mireds, or  $(1/K^{\circ})10^5$  decamireds. A filter which can convert the light distribution of a source at one color temperature to that of another color temperature can be given a mired value which is  $(1/K_1 - 1/K_2)10^6$ , where  $K_1$  is the color temperature of the light source and  $K_2$  is the apparent color temperature of the light source viewed through the filter. This mired value can be treated as a constant of the filter. Such a filter can be used to change the color temperature of a number of different light sources by the same mired shift value. Examples of widely used filters with mired values are listed below.

<u>Filter</u>	<u>Decamired value</u>	<u>Filter</u>	<u>Decamired value</u>
C-2-DRL (81)	1.0	C-1-DEL (82)	-1.0
C-2-DR2 (81A)	2.0	C-1-DE2 (82A)	-2.0
C-2-DR2.7 (81B)	2.7	C-1-DB3 (82B)	-3.0
C-2-DR3.5 (81C)	3.5	C-1-DB4.5 (82C)	-4.5
C-2-DR4 (81D)	4.0	C-1-DB6	-6.0
C-2-DR5 (81EF)	5.0		
C-2-DR6	6.0		

3.10.6.2 Spectral transmittance requirements for decamired filters. The color contribution of a real decamired filter, calculated by the procedure described in Method V, MIL-STD-1278, shall be within the tolerance shown in Table IV.

TABLE IV. Light Balancing Filters For Camera Use With Color Films

<u>Color contribution value of reference filter</u>	<u>Allowable tolerance</u>
.01	$\pm .01$
.02	$\pm .01$
.03	$\pm .01$
.04	$\pm .02$
.05	$\pm .02$
.06	$\pm .02$
.07	$\pm .02$
.08	$\pm .03$
.09	$\pm .03$
>.10 <.15	$\pm .03$
>.15 <.20	$\pm .04$
>.20 <.30	$\pm .05$
>.30 <.40	$\pm .06$
.40	$\pm .07$

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3.10.7 Spectral transmittance requirements for color compensating and color printing filters. The color contribution of color compensating filters shall be within the tolerance shown in Table V.

TABLE V. Printing Filters For Color Papers

Filter	Blue	Green	Red
P-1-05B	.04+.02	<1/3 DB	<1/3 DB
P-1-10B	.07+.03	<1/3 DB	<1/3 DB
P-1-20B	.15+.04	<1/5 DB	<1/5 DB
P-1-30B	.22+.04	<1/5 DB	<1/5 DB
P-1-40B	.30+.06	<1/5 DB	<1/5 DB
P-1-50B	.38+.06	<1/5 DB	<1/5 DB
P-2-05Y	.04+.03	<1/3 DB	<1/3 DB
P-2-10Y	.07+.03	<1/3 DB	<1/3 DB
P-2-20Y	.15+.04	<1/5 DB	<1/5 DB
P-2-30Y	.22+.04	<1/5 DB	<1/5 DB
P-2-40Y	.30+.06	<1/5 DB	<1/5 DB
P-2-50Y	.38+.06	<1/5 DB	<1/5 DB
P-3-05G	.04+.02	<1/3 DB	.04+.02
P-3-10G	.07+.03	<1/3 DB	.07+.03
P-3-20G	.15+.04	<1/5 DB	.15+.04
P-3-30G	.22+.04	<1/5 DB	.22+.04
P-3-40G	.30+.06	<1/5 DB	.30+.06
P-3-50G	.38+.06	<1/5 DB	.38+.06
P-4-05M	1/3 DG	.04+.02	1/3 DG
P-4-10M	1/3 DG	.07+.03	1/3 DG
P-4-20M	1/3 DG	.15+.04	1/5 DG
P-4-30M	1/5 DG	.22+.04	1/5 DG
P-4-40M	1/5 DG	.33+.06	1/5 DG
P-4-50M	1/5 DG	.38+.06	1/5 DG
P-5-05R	.04+.02	.04+.02	<1/3 DE
P-5-10R	.07+.03	.07+.03	<1/3 DE
P-5-20R	.15+.04	.15+.04	<1/5 DE
P-5-30R	.22+.04	.22+.04	<1/5 DE
P-5-40R	.30+.06	.30+.06	<1/5 DE
P-5-50R	.38+.06	.38+.06	<1/5 DE
P-6-05C	<1/3 DR	<1/3 DR	.04+.02
P-6-10C	<1/3 DR	<1/3 DR	.07+.03
P-6-20C	<1/5 DR	<1/3 DR	.15+.04
P-6-30C	<1/5 DR	<1/5 DR	.22+.04
P-6-40C	<1/5 DR	<1/5 DR	.30+.06
P-6-50C	<1/5 DR	<1/5 DR	.38+.06

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3.11 Stability to actinic radiation requirements. Filters shall be stable to actinic radiation. The transmittance of filters shall meet the appropriate requirements in 3.10 before and after exposure to actinic radiation as specified in Method XII of MIL-STD-1278.

3.12 Service conditions. Filters shall not be affected by environmental extremes to the extent specified herein.

3.12.1 Temperature. Exposure in the range of 120°F (49°C) to -65°F (-54°C) for Type I and 160°F to -65°F (71°C to -54°C) for Types II and III. Exposure at each extreme not to exceed six hours.

3.12.2 Relative humidity. Exposure to 86 percent relative humidity and 96°F (36°C) temperature for Type I and 90 percent relative humidity and 145°F (63°C) for Types II and III for a period of 48 hours.

3.13 Reflection reducing coating. When specified, Types II, III and IV filters shall be coated with reflection reducing coatings in accordance with MIL-C-675.

3.14 Workmanship. The filters shall be manufactured and assembled in accordance with the applicable portions of the following paragraphs:

- 3.1 Construction
- 3.3 Size and shape
- 3.5 Beauty defects

#### 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, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 that supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspections herein are classified as follows:

a. First article inspection (see 4.3). Does not include preparation for delivery.

b. Quality conformance inspections:

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(1) Quality conformance inspection of filters before preparation for delivery (see 4.4).

(2) Quality conformance inspection of preparation for delivery (see 4.13).

4.3 First article. Unless otherwise specified in the contract or purchase order, the first article inspection shall be performed by the contractor.

4.3.1 First article units. The contractor shall furnish six first article filters of the type, grade, and class specified in contract.

4.3.2 First article inspection. The first article inspection shall consist of the inspections specified in Table VI, Table VII and Table VIII respectively. The first article inspection shall be performed on all filters in the following order:

Temperature  
Relative humidity  
Visual inspection  
Active radiation  
Deviation  
Homogeneity  
Resolution  
Transmittance

TABLE VI. First Article Inspection

Inspection	Req Para	Insp Para
Temperature	3.12.1	4.10
Relative Humidity	3.12.2	4.8

4.4 Quality conformance inspection of equipment before preparation for delivery. The contractor shall perform the inspections specified in Table VI and Table VII. This does not relieve the contractor of his responsibility for performing any additional inspection which is necessary to control the quality of the product and to assure compliance with all specification requirements.

4.4.1 Group A inspection. Each unit on contract or purchase order shall be inspected for conformance to the inspection specified in Table VII. Discrete lots shall be formed from units that pass this inspection. Factors of lot composition not defined herein, or in the contract or purchase order, shall be in accordance with MIL-STD-105. Each lot shall be subject to sampling inspection, utilizing the procedures of MIL-STD-105, using the general inspection levels, and AQLs indicated in Table VII.

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TABLE VII. Group A inspection

Inspection	Req Para	Insp Para	AQL	
			Major	Minor
Visual inspection	3.14	4.12	1.0%	4.0%

4.4.2 Group B inspection. Group B inspection shall normally be performed on inspection lots that have passed Group A inspection and on samples selected from units that have been subjected to and have met the Group A inspection. This inspection shall conform to Table VIII, the general inspection levels of Table I of MIL-STD-105, and AQLs indicated in Table VIII.

TABLE VIII. Group B Inspection

Inspection	Req Para	Insp Para	AQL	
			Major	Minor
Actinic Radiation	3.11	4.5	1.0%	*
Deviation	3.8	4.6	1.0%	*
Homogeneity	3.9	4.7	1.0%	*
Resolution	3.7	4.9	1.0%	*
Transmittance	3.10	4.11	1.0%	*

\*All optical defects are considered major.

4.5 Actinic radiation. Stability to actinic radiation shall be tested in accordance with Method XII of MIL-STD-1278.

4.6 Deviation. Filters shall be tested in accordance with Method XI of MIL-STD-1278 to determine compliance with the requirements specified in 3.8.

4.7 Homogeneity. Filters shall be tested in accordance with Methods IX and X of MIL-STD-1278 to determine compliance with 3.9.

4.8 Relative humidity.

4.8.1 Type I filters. Type I filters shall be tested in accordance with Method XV of MIL-STD-1278.

4.8.2 Types II, III and IV filters. Types II, III and IV filters shall be tested in accordance with method XVIII of MIL-STD-1278.

4.9 Resolution. Filters shall be tested in accordance with Method VII or Method VIII of MIL-STD-1278. The method utilized by the contractor shall be approved by the Government.

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4.10 Temperature.

4.10.1 Type I filters. Type I filters shall be tested in accordance with Methods XIII and XIV of MIL-STD-1278.

4.10.2 Types II, III and IV filters. Types II, III and IV filters shall be tested in accordance with Methods XVI and XVII of MIL-STD-1278.

4.11 Transmittance. Spectral transmittance of the filters shall be measured as specified in MIL-STD-1278. The method utilized shall be satisfactory to the Government.

4.12 Visual inspection. Filters shall be examined for the beauty defects specified in MIL-STD-1278 and for the defects listed in Table IX.

TABLE IX. Classification of Visual Defects

Classification	Defect
Major	1. Material not as specified. 2. Marking omitted or incorrect.
Minor	Size and shape not as specified.

4.13 Quality conformance inspection of preparation for delivery. Preparation for delivery shall be inspected in accordance with Specification MIL-P-116 to determine conformance to the requirements of Section 5.

5. PACKAGING

5.1 Preservation. Preservation shall be level A, B or Commercial as specified (see 6.2b).

5.1.1 Level A.

5.1.1.1 Cleaning. Filters other than glass (types I and IV) shall be cleaned with process C-1 of MIL-P-116. Glass filters (types II and III) shall be cleaned as specified in MIL-P-14232.

5.1.1.2 Drying. Filters other than glass (types I and IV) shall be dried in accordance with the applicable procedure of MIL-P-116. Glass filters (types II and III) shall be dried as specified in MIL-P-14232.

5.1.1.3 Preservative application. None required.

5.1.1.4 Unit packing. Unit packing shall be in accordance with



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the methods prescribed in MIL-P-116 as specified herein.

5.1.1.4.1 Type I, II, III and IV filters. Each filter shall be individually unit packed method IC-1 in accordance with the procedure as specified in MIL-P-14232.

5.1.2 Level B. Cleaning, drying, preservation application and unit packing shall be as specified in 5.1.1.

5.1.3 Commercial preservation. Preservation shall be in accordance with MIL-STD-1188.

5.2 Packing. Packing shall be level A, B or Commercial as specified (see 6.2b). Shipping containers for level A and B shall be capable of stacking and supporting superimposed loads during shipment and storage without damaging the container(s) or its contents.

5.2.1 Level A. A quantity of filters, unit packed as specified in 5.1, shall be packed within a close-fitting box conforming to PPP-B-601, overseas type; PPP-B-621, style 4, class 2. When the gross weight exceeds 91 Kilograms (200 pounds), or the container length and width is 122 x 61 Centimeters (48 x 24 inches) or more and the weight exceeds 45.4 Kilograms (100 pounds), 7.62 x 10.2 Centimeters (3 x 4 inch) skids, laid flat, shall be applied in accordance with the requirements of the container specification. Closure and strapping shall be in accordance with the applicable container specification or appendix thereto except that metal strapping shall conform to QQ-S-781, type I, finish A.

5.2.2 Level B. A quantity of filters, unit packed, as specified in 5.1, shall be packed within a close-fitting box conforming to PPP-B-601, domestic type; PPP-B-621, style 4, class 1; PPP-B-640, class 2, style E; or PPP-B-636, type CF, class weather-resistant. The gross weight of boxes conforming to PPP-B-640 shall not exceed 113.4 Kilograms (250 pounds). Closure and strapping or reinforcing shall be in accordance with the applicable container specification or appendix thereto except that fiberboard shipping containers shall be reinforced by pressure-sensitive filament tape banding or nonmetallic strapping conforming to PPP-T-97 and PPP-S-760, respectively. Selection of the material and application shall be in accordance with the appendix of the applicable box specification. When the gross weight of wood boxes exceeds 91 Kilograms (200 pounds), or the container length and width is 122 x 61 Centimeters (48 x 24 inches) or more and the weight exceeds 45.4 Kilograms (100 pounds), 7.62 x 10.2 Centimeters (3 x 4 inch) skids, laid flat, shall be applied in accordance with the requirements of the container specification. When the gross weight of fiberboard boxes exceeds 91 Kilograms (200 pounds), or the container length

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and width is 122 x 61 Centimeters (48 x 24 inches) or more and the weight exceeds 45.4 Kilograms (100 pounds), containers will be pallet-mounted on pallets conforming to NN-P-71, group I or II woods. The load shall be "bonded" to the pallet by strapping conforming to QQ-S-781, type I, finish A, or shrink film.

5.2.3 Commercial packing. Packing shall be in accordance with MIL-STD-1188.

### 5.3 Marking.

5.3.1 Military marking. In addition to any special marking required by the contract or order, interior packs and exterior shipping containers shall be marked in accordance with MIL-STD-129.

5.3.2 Commercial marking. In addition to any special marking required by the contract or order, interior packs and exterior shipping containers shall be marked in accordance with MIL-STD-1188.

## 6. NOTES

6.1 Intended use. Light filters covered by this specification are intended for photographic application for removing unwanted radiation from specified areas of the electro-magnetic spectrum.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification and any amendment thereto.
- b. Level of preservation required; (Level A, Level B or Commercial).
- c. Level of packaging and level of packing required for shipment (Level A, Level B or Commercial).
- d. First Article inspection: Six sample units of the type, grade and class cited in Section 1 are required.
- e. Type, grade and class required.
- f. Size and shape.
- g. Marking, if other than specified (see 5.3).
- h. Place of final inspection.

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i. Whether reflection reducing coating is required (see 3.13).

j. When rough handling test is required.

6.3 Environmental. Environmental pollution prevention measures are contained in the packaging material specifications referenced herein. Refer to material specifications or preparing activity for recommended disposability methods.

6.4 Definitive specification part number. The specification part number is a definitive part number which will be formulated to identify each item covered by this specification. The part number will be formulated by selecting from the requirements options available in this specification as follows:

Photographic Light Filters:

Definitive Military Specification

Part Number	M9329	X	X	X
Military Specification Number	_____	_____	_____	_____
Type (See 6.4.1)	_____	_____	_____	_____
Grade (see 6.4.2)	_____	_____	_____	_____
Class (See 6.4.3)	_____	_____	_____	_____

e.g., M9329ABC is for Type I, Grade B, Class C (Polymer sheet or film, high optical quality for use with color film).

6.4.1 Type. Type shall be designated as per Table X.

TABLE X

TYPE CODE LETTER	REMARKS
A	Type I, Polymer Sheet or Film
B	Type II, Polymer Layer Sandwiches between two sheets of glass
C	Type III, Solid glass
D	Type IV, Other materials

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6.4.2 Grade. Grade shall be designated as per Table XI.

TABLE XI

GRADE CODE LETTER	REMARKS
B	Grade B, High Optical Quality
C	Grade C, Lower Optical Quality

6.4.3 Class. Class shall be designated as per Table XII.

TABLE XII

CLASS CODE LETTER	REMARKS
B	Class B, Use with black and white film
C	Class C, Use with color film
P	Class P, Use for printing
Z	Class Z, Polarizing use
S	Class S, Safelight use
N	Class ND, Neutral Density

Custodians:  
 Navy - AS  
 Air Force - 99

Preparing activity:  
 Air Force - 99

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Other - NSA

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