

Specifications for Makrolon Polycarbonate

A-A-59502
Superseding
MIL-P-46144C

Plastic Sheet, Polycarbonate

The General Services Administration has authorized the use of this commercial item description by all federal agencies.

SCOPE: This commercial item description (CID) covers four types of polycarbonate sheet ranging in length from 3 feet to 12 feet, width from 2 feet to 8 feet and thickness from 0.010 inch to 1.000 inch. Intended applications include architectural glazing, windows, food and medical handling, aircraft interiors, lighting fixtures, skylights, windscreens, passive solar collectors, conveyor covers, signs, and bus shelters.

Classification	Makrolon sheet*
Type I – Standard Sheet	
Class 1 – Ultraviolet (UV) Stabilized	Makrolon GP, OP, MG, WG
Class 2 – Non-UV Stabilized	Makrolon FD
Type II – Flame Resistant	
Class 1 – UV Stabilized	Makrolon LF
Class 2 – Non-UV Stabilized	Makrolon FI
Type III – Mar Resistant, UV Stabilized	
Class 1 – Mar resistant, UV stabilized	
Grade A – High abrasion	Makrolon 15 and AR
Grade B – Medium abrasion	-
Type IV – Coated Sheet with UV Resistance	
Class 1 – Monolithic	Makrolon SL and UV
Class 2 – Double-walled	-

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* Dimensional tolerances contain within this specification shall default to Covestro's internal manufacturing tolerances.



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INCH-POUND

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SUPERSEDING

MIL-P-46144C

3 June 1986

COMMERCIAL ITEM DESCRIPTION

PLASTIC SHEET, POLYCARBONATE

The General Service Administration has authorized the use of this commercial item description by all federal agencies.

1. **SCOPE.** This commercial item description (CID) covers four types of polycarbonate sheet ranging in length from 3 feet to 12 feet, width from 2 feet to 8 feet, and thickness from 0.010 inch to 1.000 inch. Intended applications include architectural glazing, windows, food and medical handling, aircraft interiors, lighting fixtures, skylights, windscreens, passive solar collectors, conveyor covers, signs, and bus shelters.

2. **CLASSIFICATION.** The polycarbonate plastic sheet shall be of the following types, classes, grades, and sizes. The type, class, and grade to be furnished shall be as specified in the acquisition order (see 7.1(b)).

Type I - Standard sheet

Class 1 - Ultraviolet (UV) stabilized

Class 2 - Non-UV stabilized

Size - See 3.3.1 and 3.3.2

Type II - Flame resistant

Class 1 - UV stabilized

Class 2 - Non-UV stabilized

Size - See 3.3.1 and 3.3.2

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent to: Defense Supply Center Richmond (DSCR), ATTN: DSCR-VBD, 8000 Jefferson Davis Highway, Richmond, VA 23297-5610.

AMSC N/A

FSC 9330

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Specifications for Makrolon Polycarbonate

A-A-59502

Type III - Mar resistant, UV stabilized

Class 1 - Mar resistant, UV stabilized

Grade A - High abrasive resistance

Grade B - Medium abrasive resistance

Size - See 3.3.1 and 3.3.2

Type IV - Coated sheet with UV resistant surface

Class 1 - Monolithic

Class 2 - Profiled/structured

Grade A - Corrugated or ribbed

Grade B - Double-walled

Size - See 3.3.1 and 3.3.2

3. SALIENT CHARACTERISTICS

3.1 Materials and composition. The material shall consist of thermoplastic polycarbonate sheet. The sheet shall be new (not a prototype) and one of the manufacturer's current products capable of use in accordance with the performance requirements herein.

3.1.1 Type I standard sheet. Type I shall be the supplier's standard polycarbonate sheet. Class 1 shall contain the necessary additives for UV stabilization material and be suitable for outdoor use. Class 2 shall be non-UV stabilized.

3.1.2 Type II flame resistant sheet. Type II sheet shall contain the necessary additives for flame resistant material and be suitable for outdoor use. Class 1 sheet shall contain the necessary additives for UV stabilization material. Class 2 sheet shall be non-UV stabilized.

3.1.3 Type III coated mar resistant sheet. Type III, class 1 sheet shall contain the necessary additives for UV stabilization material and shall be coated or co-extruded with a mar resistant material on both sides. Grade A shall be highly abrasive resistant. Grade B shall be medium abrasive resistant.

3.1.4 Type IV coated sheet with UV resistant surface. Type IV sheet shall contain the necessary additives for UV stabilization material and shall contain an added UV resistant coating co-extruded or applied to at least one surface for outdoor use. Grade A shall be corrugated or ribbed. Grade B shall be double-walled.



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Specifications for Makrolon Polycarbonate

A-A-59502

3.2 General property values. The polycarbonate sheet shall conform to the property values specified in table I as determined by the applicable commercial test method in non-Government standards.

TABLE I. Property values.

PROPERTY AND TEST METHODS	VALUES			
	TYPE I	TYPE II	TYPE III	TYPE IV
Tensile yield Strength, psi (MPa), min. [ASTM D 638]	8600 (59.3)	8600 (59.3)	8600 (59.3)	8600 (59.3)
Elongation at break percent, min. [ASTM D 638]	70	70	70	70
Deflection temperature, under 264 psi [1.82 MPa] Fiber stress, min. [ASTM D 648] Sheet 0.060 in (1.52 mm) or greater in thickness only	265 °F (129 °C)	270 °F (132 °C)	265 °F (129 °C)	265 °F (129 °C)
Tensile heat distortion temperature, at 50 psi (0.345 MPa) Tensile stress and 2 percent extension, min. [ASTM D 1637] Sheet less than 0.060 in (1.52 mm) thick only	270 °F (132 °C)	270 °F (132 °C)	270 °F (132 °C)	270 °F (132 °C)
Specific Gravity [ASTM D 792] 73.4 °F/73.4 °F (23 °C/23 °C)	1.18 - 1.22	1.20 - 1.25	1.18 - 1.22	1.18 - 1.22
Flammability oxygen index value, min. [ASTM D 2863] Sheet 0.02 in (0.508 mm) thick or less Sheet above 0.020 in (0.508 mm) to 0.04 in (1.02 mm) thick Sheet greater than 0.040 in (1.02 mm) thick	21 24	26 29	24	24
Surface abrasion (Δ%H) Delta percent change in haze 300 revolutions/CS 10F wheels [ASTM D 1044 or F 735] Grade A Grade B			≤5% ≤15%	

3.3 Dimensions and tolerances.

3.3.1 Size (length and width). The size (length and width) of the sheet shall be as specified in the acquisition order (see 7.1(c)). Standard nominal sizes are shown in table II for sheet 0.030 inch (0.762 mm) thick and above. Tolerances are 0.000 to + 0.250 inch (6.35 mm) on lengths and widths up to 48 inches (1219 mm) and 0.000 to + 0.500 inch (12.7 mm) on lengths and widths greater than 48 inches (1219 mm).

TABLE II. Size (length and width) of sheet.

Length		Width	
Code	Feet (meters)	Code	Feet (meters)
03	3 (0.914)	2	2 (0.610)
04	4 (1.219)	3	3 (0.914)
05	5 (1.524)	4	4 (1.219)
06	6 (1.829)	6	6 (1.829)
08	8 (2.438)	8	8 (2.438)
10	10 (3.048)		
12	12 (3.658)		

Note: The first 2 digits of the size designator in the PIN represent the length in feet and the third digit represents the width in feet.



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Specifications for Makrolon Polycarbonate

A-A-59502

3.3.2 **Thickness.** The thickness of the sheet shall be as specified in the acquisition order (see 7.1(d)). Standard nominal thicknesses for polycarbonate sheet are shown in table III. Tolerances are ± 10 percent on 0.010 inch (0.254 mm) to 0.080-inch (2.03 mm) sheet for 90 percent of the area and ± 15 percent on the remainder of the area. For thickness above 0.080 inch (2.03 mm), tolerances shall be ± 5 percent for 90 percent of the area and ± 10 percent on the remainder of the area.

TABLE III. Thickness of sheet.

Code	Inches (millimeters)	Code	Inches (millimeters)
A	0.010 (0.254)	M	0.150 (3.810)
B	0.015 (0.381)	N	0.177 (4.506)
C	0.020 (0.508)	O	0.187 (4.750)
D	0.030 (0.762)	P	0.220 (5.588)
E	0.040 (1.020)	Q	0.236 (5.994)
F	0.050 (1.270)	R	0.250 (6.350)
G	0.060 (1.520)	S	0.310 (7.874)
H	0.080 (2.030)	T	0.375 (9.525)
I	0.093 (2.360)	U	0.460 (11.684)
J	0.100 (2.540)	V	0.500 (12.700)
K	0.118 (3.000)	W	1.000 (25.400)
L	0.125 (3.180)	X	other

3.4 **Color.** The color shall be as specified in the acquisition order (see 7.1(e)). Sheet colors are shown in table IV. When natural color is specified, the sheet shall be colorless and transparent.

TABLE IV. Color.

Code	Color	Code	Color	Code	Color
1	Natural	4	White	0 ¹	Other
2	Bronze	5	Green		
3	Gray	6	Opal		

¹The procurer must specify color when using numeric 0 in PIN.

3.5 **UV stabilization.** The presence of an UV stabilizing additive shall be identifiable and detectable in all type I, class I; type II, class I; type III, class 1; and type IV, class 1 and class 2 sheet when tested in accordance with ASTM E 169, "Standard Practices for General Techniques of Ultraviolet-Visible Quantitative Analysis".

3.6 **Coatings.** The presence of coatings in type III and type IV sheet shall be identifiable and detectable by means of Fourier transform infrared spectrophotometry when tested in accordance with ASTM E 168, "Standard Practices for General Techniques of Infrared Quantitative Analysis" (DoD adopted) and ASTM E 204, "Standard Practice for Identification of Material By Infrared Absorption Spectroscopy, Using the ASTM Coded Band and Chemical Classification Index".



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Specifications for Makrolon Polycarbonate

A-A-59502

3.7 Special uses or applications. Special uses or applications shall be identified in the acquisition order (see 7.1(f)).

3.8 Special requirements.

3.8.1 Electrical property values. The electrical test methods and property values specified in table V shall be included as special requirements when specified in the acquisition order (see 7.1(g)).

TABLE V. Electrical property values.

PROPERTY AND TEST METHODS	VALUES			
	TYPE I	TYPE II	TYPE III	TYPE IV
Dielectric constant at 60 Hz, min. [ASTMD 150]	2.75	2.75	2.75	2.75
Dielectric strength in air or oil, min. [ASTMD 149] volts per mil (kV/mm)	350 (13.8)	350 (13.8)	350 (13.8)	350 (13.8)
Volume resistivity, min. [ASTMD 257] ohm-cm	1.0 X 10 ¹⁴	1.0 X 10 ¹⁴	1.0 X 10 ¹⁴	1.0 X 10 ¹⁴

3.8.2 Flammability. Type II sheet shall include additional flame resistance properties in accordance with ASTM D 635, "Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position" (DoD adopted), UL 94, "Tests for Flammability of Plastic Materials for Parts in Devices and Appliances" (DoD adopted), or other applicable non-Government standards as special requirements when specified with desired property values in the acquisition order (see 7.1(h)).

3.8.3 Luminous transmittance and haze. Luminous transmittance and haze properties shall be included in accordance with ASTM D 1003, "Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics" (DoD adopted) or other applicable non-Government standards as special requirements when specified with desired property values in the acquisition order (see 7.1(i)).

3.8.4 Chemical resistance. Chemical resistance properties shall be included in accordance with ASTM F 791, "Standard Test Method for Stress Cracking of Transparent Plastics" (DoD adopted) or other applicable non-Government standards as special requirements when specified with desired property values in the acquisition order (see 7.1(j)).

3.9 Uniformity. The sheet shall be uniform in appearance within each sheet and from sheet to sheet.

3.10 Workmanship. The sheet shall be free of defects in appearance, construction, and workmanship as determined by visual examination.

4. REGULATORY REQUIREMENTS

4.1 Health, safety, and environment. The polycarbonate sheet shall adhere to all Federal, state, and local health, safety, and environmental regulations. No environmentally prohibited material or components shall be used in manufacturing, finishing, or packing the sheet.



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Specifications for Makrolon Polycarbonate

A-A-59502

4.2 Recycled materials. The supplier or contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

5. PRODUCT CONFORMANCE PROVISIONS

5.1 Product conformance. The products provided shall meet the salient characteristics of this commercial item description, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial marketplace. The government reserves the right to require proof of such conformance.

5.1.1 Test data. The supplier or contractor must be able to show test data or lab results of meeting the salient characteristics as a special requirement when specified in the acquisition order (see 7.1(k)).

5.1.2 Warranty. The supplier shall provide all commercially available warranties that are customary for each type, class, and grade of sheet provided. A warranty of replacing defective sheet shall be provided as a special requirement when specified in the acquisition order (see 7.1(l)).

5.2 Storage life. The product shall meet the salient characteristics for each type, class, and grade provided as warranted or at any time up to 12 months from the date of shipment, whichever is longer.

6. PACKAGING. The product shall be packaged in a commercially acceptable manner that will protect and maintain its salient characteristics during normal transportation, handling, and storage operations for a period up to 12 months from the date of shipment.

7. NOTES

7.1 Ordering data. Acquisition documents must specify the following:

- a. CID document number, revision, and CID PIN
- b. Type, class and grade (see 2)
- c. Size (length and width), as specified (see 3.3.1)
- d. Thickness, as specified (see 3.3.2)
- e. Color, as specified (see 3.4)
- f. Special uses or application, as specified (see 3.7)
- g. Electrical property values, when specified (see 3.8.1)
- h. Flammability, when specified (see 3.8.2)
- i. Luminous transmittance and haze, when specified (see 3.8.3)
- j. Chemical resistance, when specified (see 3.8.4)
- k. Tests data, if required (see 5.1.1)
- l. Warranty, as specified (see 5.1.2)
- m. Packaging (see 6)

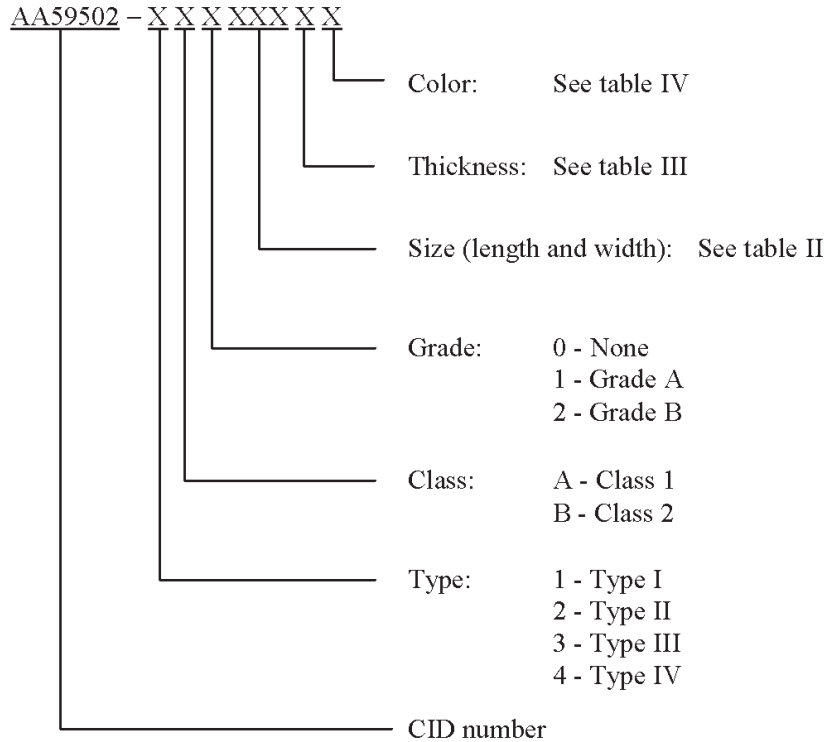


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Specifications for Makrolon Polycarbonate

A-A-59502

7.2 Part or identification number (PIN). The following part or identification numbering procedure is for government purposes and does not constitute a requirement for the contractor.



EXAMPLE: AA59502-3A1084J1 would be Type III, Class 1, Grade A, sheet which is 8 feet long by 4 feet wide, 0.1 inch thick, and with natural color.

7.3 Other specifications. This CID is not intended to provide products for vital applications and other documents may be more applicable for some applications. Other specifications concerning polycarbonate sheet are as follows:

- SAE AMS 3611, "Plastic Sheet, Polycarbonate - General Purpose" (DoD adopted)
- SAE AMS 3614, "Polycarbonate Sheet and Parts, Optical Grade, Coated"
- SAE AMS-P-83310, "Plastic Sheet, Polycarbonate, Transparent"
- MIL-P-83310, "Plastic Sheet, Polycarbonate, Transparent"



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Specifications for Makrolon Polycarbonate

A-A-59502

7.4 Source of documents.

7.4.1 FAR. The FAR may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-0001.

7.4.2 ASTM standards. Copies of ASTM standards may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

7.4.3 SAE standards. Copies of SAE standards may be obtained from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

7.4.4 UL standards. Copies of UL standards may be obtained from Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

MILITARY INTERESTS:

Custodians:

Army - MR
Navy - SH
Air Force - 99

Reviewers:

Army - AR, AT, CR
Navy - AS, MC, OS
Air Force - 19, 84

CIVIL AGENCY COORDINATING ACTIVITY:

GSA - 7FXE

Preparing activity:

DLA - GS

(Project 9330-0119)



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