



**List of Acceptable Plastics for
Optical Lenses and Reflex Reflectors
Used on Motor Vehicles**

September 27, 2024



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Optical Lenses and Reflex Reflectors
Used on Motor Vehicles**

September 27, 2024 Edition

**Automotive Manufacturers Equipment Compliance Agency, Inc.
1025 Connecticut Avenue, NW Suite #1000
Washington DC 20036**

www.ameca.org

1. STATUS

The following materials have been accepted by the Automotive Manufacturers Equipment Compliance Agency as meeting the 3-year weathering test of FMVSS 108 for plastics used in optical lenses and reflectors used on motor vehicles. No evaluation has been made as to the suitability of individual materials for particular automotive uses, or to the manufacturing methods.

You must contact the resin or coating manufacturer to determine the best material for your application.

Every plastics resin manufacturer has specialized products for different applications, processing conditions, manufacturing equipment, light sources and final use.

Please contact the manufacturer directly for more information.

The device manufacturers must ensure that the lenses molded from acceptable materials meet the color and plastic stability test requirements for each individual device.

2. LISTING

The material is listed by the manufacturer's name, trade name and flow formulation, type of resin, color number and color.

3. MATERIAL COATINGS AND HAZE

When these materials are used for state/provincial regulated lighting device lenses, the applicable state/provincial regulations shall be met.

The Code "#" denotes material which must be coated to pass the 7% haze requirement. This material does **not** need to be coated to meet the 30% haze requirement.

The Code "Q" denotes a coated material that must be coated to pass the 7% haze requirement. **No information is given on uncoated performance.**

The Code "Q2" denotes a coated material that must be coated to pass the 7% haze requirement. This material **can not be used** uncoated.

The Code "\$" denotes a coated material with haze values between 7% and 30%. **No information is given on uncoated performance. These cannot be used as or in front of a reflex reflector.**

The Code "@" denotes a coated material with haze values between 7% and 30%. This material **cannot be used** when uncoated. **These cannot be used as or in front of a reflex reflector.**

The Code "!" denotes a material that does not require a coating to be used as an inner lens when protected by an outer lens designated by Code "#". The inner and outer lens materials have been tested together as a system and together they will meet FMVSS 108.

Only materials tested together, may be used this way. Not every manufacturers materials will qualify for the outer lens. **Other manufacturers lens material may NOT be used as an outer lens** even if those materials are designated #. The inner and outer lens must be tested together.

4. DISTRIBUTION

This list is updated and distributed free on a monthly basis. Any revised or pre-release editions may be obtained by contacting AMECA.

5. DEFINITIONS

Coating -- Material applied to surface of the lens to improve some aspect of performance.

Coated materials-- a material which has a coating applied to the surface of the finished sample to impart some protective properties. Coating identification means a mark of the manufacturer's name, formulation designation number, and recommendations for application.

Color bleeding -- the migration of color out of a plastic part onto the surrounding surface.

Cracking -- a separation of adjacent sections of a plastic material with penetration into the specimen.

Crazing -- a network of apparent fine cracks on or beneath the surface of materials.

Delamination -- a separation of the layers of a material including coatings.

Hard Coat -- 1) Coating which is cured by UV radiation.
2) Coating which provides additional resistance to abrasion or scratching which may be cured by thermally or by UV radiation. May contribute to long term durability of material.

Note: Both definitions are being used--please verify the intended performance when discussing hard coats.

Haze -- the cloudy or turbid appearance of an otherwise transparent specimen caused by light scattered from within the specimen or from its surface.

Inner Lens—A material covered by another material for testing. It is used interchangeably with “protected application”

Protected Application. A material covered by another material for testing. It is used interchangeably with Inner Lens.

Reflex reflectors-- devices used on vehicles to give an indication to approaching drivers using reflected light from the lamps of the approaching vehicle.

Substrate -- Base material to which all other performance enhancing materials are added.

UV-protective Coat -- Coating designed to provide additional protection from the sun's electromagnetic radiation, particularly those wavelengths in the UV bandwidth. Often used on polycarbonate substrates to improve weathering performance. Polycarbonates must be coated for use in or in front of reflex reflectors.

UV radiation -- Short wavelength, high energy radiation emitted by the sun or other object (HID lamp). Wave lengths between 10 and 380 nm.

HID Lamp -- High Intensity Discharge Lamp. Lamps produce light by the use of a stabilized arc. Lamps can produce significant UV radiation which may require special materials. See SAE J-1647

6. NOTE ON COLOR

The colors listed have been determined to be in compliance with SAE J-578 using the ASTM E 308-66 method required by FMVSS 108 or in thicknesses specified by the resin manufacturer.

NOT EVERY COLOR LISTED WILL MEET SAE J-578 COORDINATES FOR YOUR INTENDED THICKNESS

NOT EVERY MATERIAL IN EVERY COLOR WILL MEET J578 WITH LED OR ILLUMINANT C LIGHTSOURCES

CHECK WITH THE RESIN MANUFACTURER'S COLOR SPECIALIST

The ASTM E 308-66 method uses an illuminant A light source energized to 2856k. *If you use anything other than an incandescent light source at 2856k you MUST verify that the resulting color meets the specifications of SAE J-578 for your intended thickness.* Halogen light sources at 3200k, illuminant C (strobe) and LED light sources will dramatically alter the color output. In addition, some light sources do not emit color or luminous flux uniformly. Measurements should be made to verify that the emitted light using your intended lightsource meets the specifications of J-578 throughout its photometric range.

7. NOTE ON INNER LENS COLOR

Combinations of inner and outer lenses with various colors may not perform predictably. Output will vary markedly with different light sources. Check with the resin manufacturer's color specialist when making selections

8. NOTE ON "EQUIVALENT" FORMULATIONS.

Many companies have distributed manufacturing facilities, cooperative agreements or joint ventures. In order to list a facility or another company the company which has done the three year weathering testing must send documentation stating that the materials, processes and end products are equivalent between itself and the new applicant. Due to industry complaints, the List of Acceptable Plastics has revised the listing to more accurately reflect the test data from various parent companies. ***In addition, if the joint venture is terminated or the manufacturing facility is sold, the subsidiary or joint company must be able to provide weathering test data on its own. A company can no longer rely on the parent company data and processes if they have no relationship to the parent company who conducted the original testing.***

10. NOTE ON SUBMITTING FOR ADDITIONAL COLORS

If you plan to add an additional color number to your listing, please list the existing colors which have undergone the three year weathering that are a greater and lesser concentration. The colors listed MUST be in the same color space. See FMVSS 108 S14.4.2.1.3

11. Note on Inner Lens and Inner Coating Testing

Only inner and outer lens materials, tested together, may be registered for an inner lens system. Not every manufacturer's materials will qualify for the outer lens. Other manufacturers lens material may NOT be used as an outer lens even if those materials have successfully been used as an outer lens for a different material. The inner lens/coating and outer lens/coating must be tested together as a system.

Currently the DOT has issued no guidelines for inner lenses. If and when they do, they will be the requirements that everyone must follow. In the meantime, we would recommend for following guidelines for inner lens test setup.

- 1) You must bracket test every color combination (light/dark) you want to use—red, blue, amber, etc. The light/dark colors must be in the same color space.
- 2) You must bracket test molecular weight (heavy/light) for both outer lens and inner lens.

- 3) The test setup—airspace, ventilation, should duplicate as close as possible the conditions in an inner automotive lens including factors such as ventilation, spacing between inner and outer lens and coatings.
- 4) For more information, please see SAE Paper: <http://papers.sae.org/2004-01-0800>

Inner lens materials will be listed with their outer lens material jointly as a system. Both the inner lens and outer lens material/color will be listed with both materials specified. If you only test a limited range of lens colors, thicknesses or materials that is how they will be listed.

12. Special Note on the definition of “Protected Inner Lens” and/or “Protected Applications”

Protected Inner Lenses or Protected Applications for polycarbonate lenses refers to an outer lens which has a UV absorbing capabilities. NOT physical protection but UV protection.

Frequently Asked Questions

Q1) If someone else has weathered a polycarbonate/PMMA material, do I have to weather my polycarbonate/PMMA material?

A) Yes, every company's material stands independently from what another company has done. Each coating, pigment and additive must be tested with each company's own material. Each separate material stands alone for weathering performance unless bracketed by materials of higher and lower concentrations or molecular weights.

Q2) If someone else has weathered a pigment with another plastic do I have to weather the pigment with my plastic?

A) Yes, every company's material stands independently from what another company has done. Each coating, pigment and additive must be tested with each company's own material. Each separate material stands alone for weathering performance unless bracketed by materials of higher and lower concentrations or molecular weights.

Q3) If someone else has weathered a coating do I have to weather my material with that coating?

A) Yes, every company's material stands independently from what another company has done. Each coating, pigment and additive must be tested with each company's own material. Each separate material stands alone for weathering performance unless bracketed by materials of higher and lower concentrations or molecular weights.

Q4) Testing laboratories typically use a 1-10 numbering scale according to ASTM D660 to indicate the degree of crazing, cracking or delamination associated with weathering. What numerical value from ASTM D660 is acceptable for listing?

A) FMVSS 108 does not refer to any numerical values from ASTM D660. The numerical values are done by the test laboratory for manufacture convenience.

FMVSS 108 states:

S14.4.2.2.4.2 After completion of the outdoor exposure test materials used for headlamp lenses must show no deterioration.

S14.4.2.2.4.3 After completion of the outdoor exposure test all materials, when compared with the unexposed control samples, must not show physical changes affecting performance such as color bleeding, delamination, crazing, or cracking. **Additionally materials used for reflex reflectors and lenses used in front of reflex reflectors must not show surface deterioration or dimensional changes.**

Your tested samples must not show any changes affecting performance. The only value which shows no change is a numerical value of 10.

Q5) How many thicknesses do I have to test?

A) FMVSS 108: S14.4.2.1.3 Samples must be furnished in thicknesses of 1.6 ± 0.25 mm, $2.3 \pm$

0.25 mm, 3.2 ± 0.25 mm, and 6.4 ± 0.25 mm.

Q6) Even if it's for a coating? A) Yes.

Q7) Do materials have to meet the color requirements before testing?

A) Yes: S14.4.2.1.4 All samples must conform to the applicable color test requirement of this standard prior to testing.

Q8) What about the plastics used in non-FMVSS applications such as emergency vehicle lighting which also require three year weathering?

A) Yes, those can be listed with non-standard colors as long as they are NOT used on FMVSS 108 lighting devices.

Testing outline. Note, we also recommend you send DOUBLE samples to prevent any errors.

► 4 Thicknesses

- For each colour
- For each coating
- For each molecular weight (MW)

► For example for each resin type:

- 4 thickness samples of dark red, uncoated, Lowest MW Resin A
- 4 thickness samples of light red, uncoated, Lowest MW Resin A
- 4 thickness samples of dark red, uncoated, Highest MW Resin A
- 4 thickness samples of light red, uncoated, Highest MW Resin A
- 4 thickness samples of dark red, coating 1, Lowest MW Resin A
- 4 thickness samples of light red, coating 1, Lowest MW Resin A
- 4 thickness samples of dark red, coating 1, Highest MW Resin A
- 4 thickness samples of light red, coating 1, Highest MW Resin A

Each resin stands on it's own. Combinations of additives cannot be reliably predicted, especially if they are supposed to control the same issue. (such as two different UV absorbers)

- 4 thickness samples of dark red, uncoated, Lowest MW Resin B
- 4 thickness samples of light red, uncoated, Lowest MW Resin B
- 4 thickness samples of dark red, uncoated, Highest MW Resin B
- 4 thickness samples of light red, uncoated, Highest MW Resin B
- 4 thickness samples of dark red, coating 1, Lowest MW Resin B
- 4 thickness samples of light red, coating 1, Lowest MW Resin B
- 4 thickness samples of dark red, coating 1, Highest MW Resin B
- 4 thickness samples of light red, coating 1, Highest MW Resin B
- Now repeat for clear, yellow, blue, coating 2 & coating 3

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<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Asahi Kasei Corporation www.asahi-kasei.co.jp	Delmore H-350A Anhydride Acrylic	Polymethacrylic	99141	Clear
			D33144	Red
			D23084	Yellow
Asahi Kasei Corporation www.asahi-kasei.co.jp	Delpet 70H Delpet 70N Delpet 80CT Delpet 80N Delpet 80NB Delpet 80NE Delpet 80NEK Delpet 80NEN Delpet 80NET Delpet 80NF Delpet 80NP Delpet 80NR Delpet 80NS Delpet 800F Delpet 80EB Delpet 80EH Delpet 80NH Delpet 80TJ Delpet PM130N Delpet SK420N Delpet SK430N	Polymethyl Methacrylate	99141	Clear
			99142	Clear
			99143	Clear
			LM60302	Clear
			NS00165 ¹	Clear
			NS00178 ²	Clear
			31140	Red
			31141	Red
			31142	Red
			31143	Red
			31144	Red
			31145	Red
			31151	Red
			31152	Red
			31153	Red
			33140	Red
			33141	Red
			33142	Red
			33143	Red
			33144	Red
			33151	Red
			33153	Red
			33170	Red
			33232	Red
			33233	Red
			33261	Red
			33340	Red
33402	Red			
K3140 ³	Red			
K3151	Red			
K3232 ³	Red			
21102	Yellow			
21104	Yellow			
21106	Yellow			
21107	Yellow			
21108	Yellow			
21109	Yellow			
21110	Yellow			
21111	Yellow			
21207	Yellow			
21301	Yellow			
21511	Yellow			
21802	Yellow			
21803	Yellow			
21834	Yellow			

1 Note: NS00165 is listed with Delpet 80N for 1.6-3.2 mm Only

2 Note: NS00178 is listed with Delpet 80N for 1.6-2.3 mm Only

3 Note: K3140 and K3232 are listed for 6.4 mm only

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Asahi Kasei Corporation	Delpet 70H	Polymethyl Methacrylate	23080	Yellow
	Delpet 70N		23082	Yellow
www.asahi-kasei.co.jp	Delpet 80N		23083	Yellow
	Delpet 80NB		23084	Yellow
	Delpet 80NE		23090	Yellow
	Delpet 80NEK		23091	Yellow
	Delpet 80NEN		23100	Yellow
	Delpet 80NET		23102	Yellow
	Delpet 80NF		23103	Yellow
	Delpet 80NP		23501	Yellow
	Delpet 80NR		23502	Yellow
	Delpet 80NS		23503	Yellow
	Delpet 800F		23505	Yellow
	Delpet 80EB		23506	Yellow
	Delpet 80EH		23507	Yellow
	Delpet 80NH		9814	Gray
	Delpet 80TJ		9834	Gray
	Delpet PM130N		9870	Gray
	Delpet SK420N		90810	Gray
	Delpet SK430N		90811	Gray
			90812	Gray
			90813	Gray
			90814	Gray
			90816	Gray
			90817	Gray
			90818	Gray
			90821	Gray
			90823	Gray
			90825	Gray
		90827	Gray	
		90828	Gray	
		90832	Gray	
		90834	Gray	
		90836	Gray	
		90837	Gray	
		90838	Gray	
		90841	Gray	
		90844	Gray	
		90848	Gray	
		90853	Gray	
		90854	Gray	
		90861	Gray	
		90866	Gray	
		90870	Gray	
		90875	Gray	
		90876	Gray	
		90878	Gray	
		90879	Gray	
		90881	Gray	
		90882	Gray	
		90883	Gray	
		90884	Gray	
		90885	Gray	
		90886	Gray	
		90888	Gray	
		90889	Gray	
		90899	Gray	

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Asahi Kasei Corporation www.asahi-kasei.co.jp	Delpet SR	Polymethyl Methacrylate	99141	Clear
			33151	Red
			23100	Yellow
			90810	Gray
			90817	Gray
			90817	Gray
Asahi Kasei Corporation www.asahi-kasei.co.jp	Stylac-AS XT-751	Styrene/ Acrylonitrile Copolymer	SR 40501	Yellow
Asahi Kasei Corporation www.asahi-kasei.co.jp	Stylac-AS XT-753	Styrene/SR Acrylonitrile Copolymer	40113	Clear
			SR 40417	Red
			SR 40418	Red
			SR 40422	Red
			SR 40429	Red
			SR 40524	Yellow
			SR 40525	Yellow
			SR 40531	Yellow
			SR 40536	Yellow
SR 40539	Yellow			

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>			
Chimei Corporation Methacrylate www.chimeicorp.com.tw	ACRYREX CM-205	Polymethyl	N-000	Clear			
			R-001	Red			
			R-002	Red			
			R-003	Red			
			R-004	Red			
			R-103	Red			
			R-104	Red			
			A-001	Yellow			
			A-202	Yellow			
			A-203	Yellow			
			S-001	Smoke			
			Note: R-002 Red is only listed in 6.3 mm (1/4") thickness Note: R-003 Red is only listed in 2.3mm to 6.3 mm (0.09" to .25") thickness				
			Chimei Corporation www.chimeicorp.com.tw	ACRYREX CM-205M	Polymethyl Methacrylate	N-000	Clear
R-001	Red						
R-002	Red						
R-003	Red						
R-004	Red						
R-103	Red						
R-104	Red						
A-001	Amber						
A-202	Amber						
A-203	Amber						
P-001	Clear/Pink						
S-001	Smoke						
Note A-202 is only listed in 1.6-3.2mm thickness.							
Chimei Corporation www.chimeicorp.com.tw	WONDERLITE PC-110L	Polycarbonate	N-102	Clear \$			
			N-102H	Clear \$			
			N-102K	Clear \$			
			N-102U	Clear \$			
			N-103	Clear \$			
			N-103H	Clear \$			
			N-103K	Clear \$			
			N-103U	Clear \$			
			N-104	Clear \$			
			N-104H	Clear \$			
			N-104K	Clear \$			
			N-104U	Clear \$			

Coated Chimei Corporation plastics may only be used when treated with the following coatings applied to the molded lens:

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coating in Alphabetical Order and Corresponding Manufacturer

Acryking K-101: See Mitsubishi Chemical Corporation

FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7, FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3: See Fujikura Kasei Co., Ltd.

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, and UVHC3000KZ60: See Performance Materials Inc.

Coating Manufacturer in Alphabetical Order



FUJIKURA KASEI

Information on FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7, FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3, coating may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
6-15 Shibakoen 2-Chome
Minato-Ku, Tokyo 105-0011
Japan
www.fkkasei.co.jp



**mitsubishi
CHEMICAL
GROUP**

Information on Mitsubishi Chemical Corporation Acryking K-101 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp



Information on UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, and UVHC3000KZ60 hard coat may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Chimei Corporation	WONDERLITE PC-115L	Polycarbonate	N-15P01 N-15P801	Clear \$ Clear \$
www.chimeicorp.com.tw				

Note: N-15P01 is listed is only listed in 6.4mm thickness.

Note: N-15P01 was only tested with Acryking PH-720.

Note: N-15P801 was only tested with Acryking PH-800.

Coated Chimei Corporation plastics may only be used when treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking PH-720; PH-800: See Mitsubishi Chemical Corporation

Coating Manufacturer in Alphabetical Order



MITSUBISHI
CHEMICAL
GROUP

Information on Mitsubishi Chemical Corporation Acryking PH-720; PH-800 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Chimei Corporation Zhenjiang China www.chimeicorp.com.tw	ACRYREX CM-205	Polymethyl Methacrylate	N-000	Clear
			R-001	Red
			R-002	Red
			R-003	Red
			R-004	Red
			R-103	Red
			R-104	Red
			A-001	Yellow
			A-202	Yellow
			A-203	Yellow
			S-001	Smoke
Note: R-002 Red is only listed in 6.3 mm (1/4") thickness Note: R-003 Red is only listed in 2.3mm to 6.3 mm (0.09" to .25") thickness				
Chimei Corporation Zhenjiang China www.chimeicorp.com.tw	ACRYREX CM-205M	Polymethyl Methacrylate	N-000	Clear
			R-001	Red
			R-002	Red
			R-003	Red
			R-004	Red
			R-103	Red
			R-104	Red
			A-001	Amber
			A-202	Amber
			A-203	Amber
			P-001	Clear/Pink
S-001	Smoke			
Note A-202 is only listed in 1.6-3.2mm thickness.				
Chimei Corporation Zhenjiang China www.chimeicorp.com.tw	WONDERLITE PC-110L	Polycarbonate	N-102	Clear \$
			N-102H	Clear \$
			N-102K	Clear \$
			N-102U	Clear \$
			N-103	Clear \$
			N-103H	Clear \$
			N-103K	Clear \$
			N-103U	Clear \$
			N-104	Clear \$
			N-104H	Clear \$
			N-104K	Clear \$
			N-104U	Clear \$

Coated Chimei Corporation Zhenjiang China plastics may only be used when treated with the following coatings applied to the molded lens:

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coating in Alphabetical Order and Corresponding Manufacturer

Acryking K-101: See Mitsubishi Chemical Corporation

FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7, FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3: See Fujikura Kasei Co., Ltd.

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, and UVHC3000KZ60: See Performance Materials Inc.

Coating Manufacturer in Alphabetical Order



FUJIKURA KASEI

Information on FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7, FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3, coating may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
6-15 Shibakoen 2-Chome
Minato-Ku, Tokyo 105-0011
Japan
www.fkkasei.co.jp



**MITSUBISHI
CHEMICAL
GROUP**

Information on Mitsubishi Chemical Corporation Acryking K-101 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
1-2 Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp



Information on UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, and UVHC3000KZ60 hard coat may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Chimei Corporation Zhenjiang China	WONDERLITE PC-115L	Polycarbonate	N-15P01 N-15P801	Clear \$ Clear \$

www.chimeicorp.com.tw

Note: N-15P01 is listed is only listed in 6.4mm thickness.

Note: N-15P01 was only tested with Acryking PH-720.

Note: N-15P801 was only tested with Acryking PH-800.

Coated Chimei Corporation plastics may only be used when treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking PH-720; PH-800: See Mitsubishi Chemical Corporation

Coating Manufacturer in Alphabetical Order



Information on Mitsubishi Chemical Corporation Acryking PH-720; PH-800 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Covestro Deutschland AG (Europe)
 Covestro LLC (America)
 Covestro (Hong Kong) Limited (Asia Pacific)
www.covestro.com

Apec® 1603	High-Heat	550042	Clear Q!
Apec® 1703	Polycarbonate	551022	Clear Q!
Apec® 1803		550674	Clear Q!
Apec® 1895 (Protected Applications Only)		250337	Yellow Q!
Apec® 1897		250322	Yellow Q!
Apec® 2097		250339	Yellow Q!
(coated)		250196	Yellow Q!
		256866	Yellow Q!
		256894	Yellow Q!
		350056	Red Q!
		350335	Red Q!
		350340	Red Q!

Note: 250337 is for Apec® 1803 only

Coated Covestro Deutschland AG (Europe), Covestro LLC (America) and Covestro (Hong Kong) Limited (Asia Pacific) Apec plastics may only be treated with the following coatings listed below when applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, Acryking PH-220, Acryking PH-328. Acryking PH-730, Acryking PH-740 and Acryking PH-750: See Mitsubishi Chemical Corporation

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

MODIHARD 200S: See NOF Corporation

PHC 587C, PHC 587C2: See Momentive Performance Materials Inc.

Stanley SH-41: See Stanley Electric

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60: Momentive Performance Materials Inc.

UVHC5000, UVHC5000K, UVHC5000K1: Momentive Performance Materials Inc

UVHC8100: Momentive Performance Materials Inc

UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7 and UVT610V8: See Red Spot

(Coating information continued on the next page.)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Coating Manufacturer in Alphabetical Order



**MITSUBISHI
CHEMICAL
GROUP**

Information on Acryking F-328, Acryking K-101, Acryking PH-220, Acryking PH-328, Acryking PH-730, Acryking PH-740 and Acryking PH-750 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: Acryking K-101 is NOT suitable for use with or in front of a reflex reflector
Note: Acryking PH-328, Acryking PH-730, Acryking PH-740 and Acryking PH-750 coatings are only suitable for clear Apec® 1803, Apec® 1897 and Apec® 2097



FUJIKURA KASEI

Information on FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3 coatings may be obtained by writing:

Fujikura Kasei Co., Ltd.
6-15 Shibakoen 2-Chome
Minato-Ku, Tokyo, 105-0011
Japan
www.fkkasei.co.jp

Note: FUJIHARD HH2551U series is only suitable for use on Apec® 1803 and Apec® 1897
Note: FUJIHARD HH2551U series data was submitted by Fujikura Kasei



Information on PHC 587C, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1, UVHC3000K-Z, UVHC5000, UVHC5000K, UVHC5000K1, and UVHC8100 hard coat may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

Note: UVHC3000 was tested on Apec 1603
Note: UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60 only Apec® 1703 and Apec® 1803
Note: PHC 587C, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1, UVHC3000K-Z, UVHC5000, UVHC5000K, UVHC5000K1, and UVHC8100 test data was submitted by Momentive Performance Materials Inc.
Note: UVHC5000 was tested on clear Apec® 1603 and 1803 only.
Note: UVHC8100 was tested on clear Apec® 1603, Apec® 1697 Apec® 1803 and Apec® 1897 only.

(Coating information continued on the next page.)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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NOF

Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
Yebis Garden Place Tower
20-3, Ebisu 4-Chome,
Shibuya-Ku, Tokyo 150-6019
Japan
www.nof.co.jp

Note: All MODIHARD 200S data was submitted by NOF Corporation

Note: MODIHARD 200S is acceptable on AL2447 Clear in thicknesses 2.3-6.4 mm only



PAINT & VARNISH COMPANY, INC.

Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7 and UVT610V8 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: UVT200 tested on clear samples only.

Note: UVT610V tested on clear Apec® 1603 and 1803

Note: All UVT test data submitted by Red Spot.

Information on SH-41 hard coat may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro, Meguro-Ku
Meguro-Ku, Tokyo 153,
Japan
www.stanley.co.jp

Note: Stanley SH-41 is only acceptable for use on Apec 1803

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Covestro Deutschland AG (Europe)
Covestro LLC (America)
Covestro (Hong Kong) Limited (Asia Pacific)
www.covestro.com

	Makrolon® 2407	Polycarbonate	550012	Clear #
	(UVT610V2 Coating Only)		550115	Clear #
	Makrolon® 2407		550207	Clear #
	Makrolon® 2607		550396	Clear #
	Makrolon® 2807		550660	Clear #
	Makrolon® 3107 (only available in color 550115 Clear)		551070	Clear #
	Makrolon® AG2477		350231	Red #
	Makrolon® AG2477 RE		350232	Red #
	Makrolon® AG2477 RP(XX) CQ		350391	Red #
	Makrolon® AG2677		350392	Red #
	Makrolon® AG2677 RE		350393	Red #
	Makrolon® AG2677 RP(XX) CQ		357866	Red #
	Makrolon® AL2447		357868	Red #
	Makrolon® AL2447 MAS181		250200	Yellow #
	Makrolon® AL2447 MAS402(Coated only)		250337	Yellow #
	Makrolon® AL2447 RE		250210	Yellow #
	Makrolon® AL2477 RP(XX) CQ		250392	Yellow #
	Makrolon® AL2447 XT		250393	Yellow #
	Makrolon® AL2647		256811	Yellow #
	Makrolon® AL2647 MAS402(Coated only)		256866	Yellow #
	Makrolon® AL2647 RE		256894	Yellow #
	Makrolon® AL2677 RP(XX) CQ		256896	Yellow #
			256908	Yellow #
			558920	Blue #
			558889	Blue #
			751303	Gray #
			750142	Gray #
			752969	Gray #
			752970	Gray #
			770016	Gray #
			778002	Gray #

Note: Color 250337 is available on AL2647 only

Note: Colors 750142 and 770016 are available in AG resins only

Note: The resin designation (XX) can be part of the name and represents the specific attributed chemically recycled share for the RP(XX) CQ products

LED Product Grades
Protected Applications Only

	Makrolon® LED2045	Polycarbonate	000000	Clear
	Makrolon® LED2245		550128	Clear
	Makrolon® LED2245 RE		550207	Clear
	Makrolon® LED2245HP		551592	Clear
	Makrolon® LED2245HP RE		551467	Clear
	Makrolon® LED2247		551056	Clear

Note: All Covestro inner lens products are tested behind clear coated 2.3 mm Makrolon AL 2647

Note: Makrolon® LED2245HP and LED2245HP RE are available in color 000000 only

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Covestro Deutschland AG (Europe)
 Covestro LLC (America)
 Covestro (Hong Kong) Limited (Asia Pacific)
 www.covestro.com

Edge-Lighting Product Grades
 Protected Applications Only

Makrolon® LED2245EL	Polycarbonate	021754	White
		021760	White
		021767	White
		021769	White

Note: Makrolon® LED2245EL may not be used as a reflex reflector.
 Makrolon® LED2245EL is considered a diffused material above 3.2 mm when behind PMMA, and above 6.4 mm when behind polycarbonate.

Coated Covestro Deutschland AG (Europe), Covestro LLC (America) and Covestro (Hong Kong) Limited(Asia Pacific) Makrolon AL plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328 hardcoat: see Mitsubishi Chemical Corporation

Acryking K-101, Acryking K-103 hardcoats: see Mitsubishi Chemical Corporation

Acryking PH-220, Acryking PH-328, Acryking PH-503, Acryking PH-511, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-730, Acryking PH-740, Acryking PH-750 Acryking PH-800, Acryking PH-800N5A And Acryking PH-930 hardcoats: see Mitsubishi Chemical Corporation

CD-3M12: See HIPRO Polymerials (Jiangsu) Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3372U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3401U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.

KUV-1000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100: See KCC Corporation

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
	LHP100/LHC100: See Momentive Performance Materials, Inc.			
	NIPPE UVI Coat UT-1678: See Nippon Paint Automotive Coatings Co., Ltd			
	PH503, PH-511, PH-730, PH-740 and PH-750: See Mitsubishi Chemical Corporation			
	PHC587, PHC 587C, PHC 587C2: See Momentive Performance Materials, Inc.			
	PHOLUCID No.115C, PHOLUCID No. 130C and PHOLUCID No. 180C: See Chugoku Marine Paints			
	RayGloss 400, RayGloss 401, RayGloss 402: See BASF Coatings GmbH			
	SH-41, SH-50, SH-51, and SH-61 hard coats: See Stanley Electric			
	SHP300/SHC3000, SHP401/AS4000, SHP401/SHC4002, SHP470FT/AS4700, SHP470FT2050/AS4700: See Momentive Performance Materials Inc			
	UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60: See Momentive Performance Materials Inc			
	UVHC5000, UVHC5000K, and UVHC5000K1, hard coats: See Momentive Performance Materials Inc.			
	UVHC8100: See Momentive Performance Materials Inc.			
	UVT200V1, UVT200V2, UVT200V3, UVT200V5 coatings: See Red Spot			
	UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8 coatings: See Red Spot			
	UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red Spot			
	X-48-5500-A18: See Shin-Etsu Chemical Co., Ltd.			

Coating Manufacturer in Alphabetical Order

Information on RayGloss 400, RayGloss 401, and RayGloss 402 coatings may be obtained by writing:



BASF Coatings GmbH
 ECO/DT - C422
 D-48165 Muenster
 Germany
www.basf-coatings.com

Note: BASF RayGloss 400, 401 and 402 were tested on 2447 and 2647 clear only.
 Note: All Raygloss data submitted by BASF

(Coating manufacturer information starts on next page.)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Information on PHOLUCID No. 115C and PHOLUCID No. 130C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: All PHOLUCID test data submitted by Chugoku Marine Paints.
 Note: PHOLUCID No. 115C and PHOLUCID No. 130C were tested on clear Makrolon AL2447 and AL2647.
 Note: PHOLUCID No. 180C was tested on Makrolon AL2447 and AL 2647 clear.

Information on KUV-1000, KUV-3000, KUV-4000, KUV-5000, KUV-6000 coatings may be obtained by writing:



KCC Corporation
 83 Mabook-Dong, Giheung-Gu
 Yongin-Si, Gyunggi-Do
 South Korea
www.kccworld.co.kr

Note: KUV-1000 was tested on 6.4mm lens thickness only
 Information on KUV-1000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100 was submitted by KCC Corporation
 KUV-4000, KUV-5000, KUV-6000 tested on AL2447 and AL2647 clear only.
 KUV-3000 and KUV-9100 were tested on Makrolon® AL2447 clear only.



Information on FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U coatings may be obtained by writing:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo, 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJIHARD HH2540U-series, FUJIHARD HH2551U-series, FUJIHARD HH2561U-series, FUJIHARD HH2570U-series, FUJIHARD HH3372U, FUJIHARD HH3401U, and FUJIHARD HH3482U were tested on clear Makrolon® AL2447 and Makrolon® 2647
 Note: FUJIHARD HH2541U-series, FUJIHARD HH2551U-series, FUJIHARD HH2561U-series, FUJIHARD HH2570U-series, HH3372U and FUJIHARD HH3482U data was submitted by Fujikura Kasei

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on CD-3M12 coating may be obtained by writing to the following address:

HIPRO Polymer Materials (Jiangsu) Co., Ltd.
North Industrial Park Wuxi, Jiangsu
P.R. China
Tel.: +86-510-87855326
Website: www.hiprocoating.com

Note: HIPRO CD-3M12 is NOT suitable for use with or in front of a reflex reflector
Note: HIPRO CD-3M12 only complies with FMVSS 108 in 1.6 mm through 3.2 mm thicknesses.
Note: HIPRO CD-3M12 was only tested on Makrolon 2647 Clear.



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
2-14-1 Shodai-Ohtani
Hirakata-City, Osaka 573-1153
Japan
Phone: +81-72-857-5530
Fax: +81-72-857-5640
Website: www.nipponpaint-automotive.com

Note: All data on NIPPE UVI Coat UT-1678 coating was submitted by Nippon Paint Automotive Coatings.
Note: NIPPE UVI Coat UT-1678 was tested on Makrolon AL2447 and AL2647 clear.



Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking K-101, Acryking K-103, Acryking PH-220, Acryking PH-328, Acryking PH-503, Acryking PH-511, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-730, Acryking PH-740, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 hardcoats may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: All data submitted by Mitsubishi Chemical Corporation
Note: Acryking PH-710, Acryking PH-720, Acryking Acryking PH-800 and Acryking PH-800N5A were tested on Makrolon AL2647 clear only.
Note: Acryking K-101 is NOT suitable for use with or in front of a reflex reflector
Note: Acryking PH-710 and Acryking PH-720 test data was submitted by Mitsubishi Chemical Corporation
Note: Acryking PH-710 and Acryking PH-720 were tested on clear AL-2447 only
Note: Acryking PH503, Acryking PH-511, Acryking PH-730, Acryking PH-740, Acryking PH-750, and Acryking PH-930 were tested on Makrolon AL2447 and Makrolon AL 2647 551070 clear only.
Note: Acryking PH-328, Acryking PH-800 and Acryking PH-800N5A were tested on Makrolon AL2447 551070 clear only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on LHP100/LHC100, SHP300/SHC3000, SHP401/AS4000, SHP401/SHC4002, SHP470/AS4700, SHP470FT2050/AS4700, PHC587, PHC 587C, PHC 587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC3000K-Z, UVHC5000, UVHC5000K, and UVHC5000K1:

Momentive Performance Materials Inc.
 Building V7
 51368 Leverkusen
 Germany

Momentive Performance Materials Inc.
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

- Note: SHP3000/SHC3000 is NOT suitable for use with or in front of a reflex reflector.
- Note: SHP470FT2050/AS4700 is only suitable for use on AL2447 and AL2647 in thickness 3.2 on color 751092.
- Note: All UVHC3000K test data submitted by Momentive Performance Materials, Inc.
- Note: UVHC3000K1, UVHC3000K-Z, PHC 587C, PHC 587C2, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60 and UVHC5000 was submitted by Momentive Performance Materials Inc.
- Note: UVHC5000 was tested on clear AL2447 and AL2647 only.
- Note: Makrolon® AL2447 MAS181 was tested with Momentive UVHC3000, UVHC5000, UVHC5000K, and UVHC5000K1, UVHC3000K1-40 and UVHC3000K1-50
- Note: UVHC8100 was tested on clear AL2447 and clear AL2647
- Note: Makrolon® AL2447 MAS402 was tested with UVHC3000.
- Note: Makrolon® AL2447 MAS402 with UVHC3000 data was submitted by Momentive Performance Materials.
- Note: SHP470FT/AS4700 was tested on AL2447 and AL2647 Clear
- Note: All Datea for SHP470FT/AS4700 was submitted by Momentive Performance Materials



Information on Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
 P.O. Box 418
 Evansville, IN 47703-0418
www.redspot.com

- Note: All UVT test data submitted by Red Spot.
- Note: UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on AL 2447 and AL 2647 clear only
- Note: Makrolon 2245 was tested on UVT610V2 only. Only thicknesses above 2.3 mm may be used in front of a reflex reflector.

(Coating information continued on the next page)

MFR. **TRADE NAME AND**
FLOW FORMULATION **TYPE OF RESIN** **NUMBER** **COLOR**



Information of X-48-5500-A18 hard coat may be obtained by writing to the following address:

Shin-Etsu Chemical Co., Ltd.
4-1, Marunouchi 1-Chome
Chiyoda-ku, Tokyo 100-0005,
Japan
www.shinetsu.co.jp

Note: X-48-5500-A18 was submitted by Shin-Etsu Chemical Co., Ltd.

Note: X-48-5500-A18 was tested on AL2447 clear only.

Information on SH-41, SH-50, SH-51, and SH-61 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: Stanley SH-51 and SH-61 submitted by Stanley Electric

Note: Stanley SH-51 only tested on clear Makrolon® AL2447 and AL2647.

Note: Stanley SH-61 only tested on clear Makrolon® AL2447.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Diapolyacrylate Co., Ltd. diap@anet.net.th	ACRYPET MD	Polymethyl Methacrylate	001	Clear
			101	Red
			114	Red
			203	Yellow
			206	Yellow
Diapolyacrylate Co., Ltd. diap@anet.net.th	ACRYPET V	Polymethyl Methacrylate	011	Clear
			101	Red
			114	Red
			131	Red
			146	Red
			147	Red
			148	Red
			149	Red
			160	Red
			203	Yellow
			206	Yellow
			236	Yellow
			283	Yellow
			284	Yellow
			285	Yellow
			286	Yellow
			287	Yellow
			288	Yellow
			291	Yellow
292	Yellow			
Diapolyacrylate Co., Ltd. diap@anet.net.th	ACRYPET VE ACRYPET VES ACRYPET VH ACRYPET VH4 ACRYPET VHM ACRYPET VHS ACRYPET VG ACRYPET ZVH SHINKOLITE P VE SHINKOLITE P VES SHINKOLITE P VH SHINKOLITE P VHS	Polymethyl Methacrylate	001	Clear
			361	Clear
			PYR5406	Clear
			007	White
			PR5556	White
			53260	White
			54225	White
			55475	White
			55480	White
			55485	White
			55580	White
			55670	White
			57163	White
			55780	White
			58154	White
			101	Red
			111	Red
			112	Red
			113	Red
116	Red			
117	Red			
120	Red			
121	Red			

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Diapolyacrylate Co., Ltd. diap@anet.net.th	ACRYPET VE	Polymethyl Methacrylate	128	Red
	ACRYPET VES		129	Red
	ACRYPET VH	141	Red	
	ACRYPET VH4	143	Red	
	ACRYPET VHM	151	Red	
	ACRYPET VHS	5101	Red	
	ACRYPET VG	5101B	Red	
	ACRYPET ZVH	5111	Red	
	SHINKOLITE P VE	5112	Red	
	SHINKOLITE P VES	5113	Red	
	SHINKOLITE P VH	5114	Red	
	SHINKOLITE P VHS	5115	Red	
		5116	Red	
		5117	Red	
		5118	Red	
		5121	Red	
		5131	Red	
		5141	Red	
		5142	Red	
		5143	Red	
		5151	Red	
		PR5276	Red	
		PR5296	Red	
		5386	Red	
		5456	Red	
		203	Yellow	
		209	Yellow	
		252	Yellow	
		253	Yellow	
		254	Yellow	
		255	Yellow	
		256	Yellow	
		257	Yellow	
	258	Yellow		
	259	Yellow		
	262	Yellow		
	263	Yellow		
	264	Yellow		
	265	Yellow		
	266	Yellow		
	267	Yellow		
	270	Yellow		
	290	Yellow		
	2001	Yellow		
	5203	Yellow		
	5213	Yellow		
	5223	Yellow		
	5233	Yellow		
	5253	Yellow		
	5256	Yellow		
	5283	Yellow		
	5293	Yellow		
	5303	Yellow		
	5313	Yellow		
	5333	Yellow		

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Diapolyacrylate Co., Ltd. diap@anet.net.th	ACRYPET VE	Polymethyl Methacrylate	5343	Yellow
	ACRYPET VES		5353	Yellow
	ACRYPET VH		5363	Yellow
	ACRYPET VH4		5373	Yellow
	ACRYPET VHM		5383	Yellow
	ACRYPET VHS		5393	Yellow
	ACRYPET VG		5403	Yellow
	SHINKOLITE P VE		5413	Yellow
	SHINKOLITE P VES		5423	Yellow
	SHINKOLITE P VH		531	Gray
	SHINKOLITE P VHS		533	Gray
			541	Gray
			53105	Gray
			53110	Gray
			53120	Gray
			53130	Gray
			53137	Gray
			53140	Gray
			53150	Gray
			53155	Gray
	53160	Gray		
	53165	Gray		
	53168	Gray		
	53170	Gray		
	53175	Gray		
	53178	Gray		
	53180	Gray		
	53183	Gray		
	53185	Gray		
	53187	Gray		
	53190	Gray		
	54107	Gray		
	54110	Gray		
	54112	Gray		
	54115	Gray		
	54118	Gray		
	54120	Gray		
	54130	Gray		
	54132	Gray		
	54133	Gray		
	54135	Gray		
	54140	Gray		
	54145	Gray		
	54155	Gray		
	54160	Gray		
	54165	Gray		
	54170	Gray		

(Coating Information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coated Diapolyacrylate plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

FUJIHARD HH3012U-5, FUJIHARD HH3012U-6, FUJIHARD HH3012U-7, FUJIHARD HH3012U-8, FUJIHARD HH3012U-9, and FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3,; See Fujikura Kasei Co Ltd.

Stanley SH-61: See Stanley Electric

Coating Manufacturer in Alphabetical Order



FUJIKURA KASEI

Information on FUJIHARD HH3012U-5, FUJIHARD HH3012U-6, FUJIHARD HH3012U-7, FUJIHARD HH3012U-8, FUJIHARD HH3012U-9, and FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3, coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJIHARD HH3012U-5, FUJIHARD HH3012U-6, FUJIHARD HH3012U-7, FUJIHARD HH3012U-8, FUJIHARD HH3012U-9, and FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3, for use only on Acrypet VH grades.

Information on SH-61 hard coat may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
 2-9-13, Nakameguro, Meguro-Ku
 Meguro-Ku, Tokyo 153,
 Japan
www.stanley.co.jp

Note: Stanley SH-61 was only tested on Acrypet VH 001

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
The Dow Chemical Company www.dow.com	SILASTIC™ MS-1001 SILASTIC™ MS-1002	Moldable Silicone		Clear

Helping You Put Your Products To The Test



THE GLOBAL LEADER IN
PRODUCT DURABILITY, PERFORMANCE &
WEATHERING TESTING INSTRUMENTS & SERVICES

Instruments

Accelerated Weathering ❖ Corrosion ❖ Flammability ❖ Solar Environmental ❖ Technical Lighting

Ci Series Weather-Ometers



Atlas' flagship accelerated weathering instruments offer superior performance, innovative features, and large capacity.

- ◆ Water-cooled xenon arc lamps and advanced filter technology deliver the best simulation of natural sunlight
- ◆ Best-in-class uniformity for irradiance, temperature, relative humidity and spray
- ◆ Intuitive touch screen controls
- ◆ Custom testing capabilities

SUNTEST® Family



The most widely used flatbed xenon test chambers available in tabletop or free standing models to meet lower testing capacity needs. Features include:

- ◆ Optical light filters to simulate indoor/outdoor sunlight
- ◆ A variety of accessories ideal for testing realistic end-use conditions
- ◆ Best-in-class flatbed irradiance and temperature uniformity

Xenotest® Instruments



These premium air-cooled accelerated weathering instruments offer an array of options to meet virtually all global weathering and lightfastness testing requirements.

- ◆ Designed with state-of-the-art controls
- ◆ On-rack radio-controlled sensor technology for superior monitoring of light and temperature
- ◆ High water and power efficiency

UVTest



An economical fluorescent/UV weathering test instrument for product screening at lower operating costs.

- ◆ Simple touch screen operation and control in several languages
- ◆ Patented irradiance calibration safety access ports
- ◆ Remote Ethernet data acquisition application
- ◆ Recirculating spray water option

Corrosion Cabinets



The most sophisticated and versatile corrosion and salt fog cabinets available. Capable of replicating automatic cycling between several environmental conditions to reduce the need to move or otherwise handle test specimens.

- ◆ Design maximizes testing volume
- ◆ Large solution reservoir
- ◆ Optional features allow for simulation of several environmental conditions

Flammability Chambers



Atlas flammability chambers offer unmatched accuracy, repeatability and safety when determining the burn rates and resistance of various materials.

- ◆ All chambers are easy to install and operate
- ◆ Specimen holders available to accommodate a variety of material types
- ◆ Chambers are available for appliance, aircraft and automotive applications

Solar Simulation Systems



Atlas Custom Systems designs and builds custom solar simulation systems such as walk-in chambers or full-scale test facilities. These full scale test facilities use a series of highly coordinated metal halide lights to provide uniform radiant energy to meet the demanding testing needs of many industries.

Solar Environmental Chambers



A group of integrated, easy-to-use test chambers for various solar and environmental applications. These instruments combine environmental simulation with metal halide lighting technology and are ideal for testing medium to large sized automotive, plastics, electronics and 3D components, finished products as well as PV modules.

Technical Lighting Systems



Atlas/KHS technical lighting systems are designed for high-speed photography and video. These systems are ideal for crash testing and other safety experiments, custom designed to match the complex illumination requirements of various test configurations. Available with conventional HMI light sources or the latest LED technology, these lighting systems offer an array of solutions for analytical testing of high speed events.

Our mission is to help our customers worldwide provide the most reliable and durable product solutions through our combined experience and expertise in weathering instruments and testing, custom capabilities, consulting and global support.

Services

Natural & Accelerated Weathering Testing ❖ Evaluations ❖ Consulting ❖ Technical Support ❖ Client Education

Natural Weathering Services



Atlas offers outdoor weathering sites worldwide to ensure factors from a variety of climates can be tested.

- ◆ Static Exposure Testing
- ◆ Sun Tracking Exposure Testing
- ◆ EMMAQUA® Accelerated Outdoor Testing
- ◆ Ultra-Accelerated Weathering Testing
- ◆ Automotive Exposure Testing (Samples, Components, Complete Vehicles)

Accelerated Laboratory Weathering Services



Atlas Weathering Services Group operates one of the largest networks of ISO/IEC 17025 accredited accelerated weathering testing laboratories in the world. Our indoor exposure labs offer artificial accelerated weathering tests and a variety of other environmental test programs, all designed to accurately simulate true end-use conditions and meet global weathering standards.

Evaluation Services



Atlas offers a wide range of evaluation and measurement services for your specimens during and after the weathering process.

- ◆ Instrumental Color/Gloss Measurements
- ◆ Visual Evaluations
- ◆ Photography/IR Imaging
- ◆ Emittance
- ◆ Spectral Transmittance/Reflectance
- ◆ Solar Reflectance Index
- ◆ Additional Optical Property Measurements

Consulting Solutions



Atlas Consulting Solutions offers design and implementation of environmental durability testing methods, programs, and strategies. Our international group of weathering experts help you achieve your objectives through all stages of the value chain from materials to components, systems to end-use products.

Worldwide Technical Support



Proper maintenance is critical in order for your instrument to operate at peak performance. Atlas' AMECARE Performance Services Program ensures that your instrument will operate optimally at all times. Benefits include:

- ◆ Preventative maintenance inspections
- ◆ Scheduled ISO accredited calibrations (where available)
- ◆ Detailed service reports with professional assessment of key components

Client Education & Training



Atlas offers an array of resources designed to advance your weathering education and provide you with the knowledge you need to successfully meet your testing requirements. Events include:

- ◆ Seminars
- ◆ Workshops
- ◆ Webcasts
- ◆ In-House Programs
- ◆ Technical Conferences

Solar Industry Solutions



Atlas offers a complete portfolio of testing services to evaluate the performance, durability and reliability of solar cells, modules, complete arrays, concentrated solar power products and solar thermal collectors. Atlas also offers its proprietary Atlas 25® long-term durability testing program for solar modules.

Ultra-Accelerated EMMA[®]



THE BENEFITS OF ULTRA-ACCELERATED TESTING

What is the Ultra-Accelerated EMMA®?

The Ultra-Accelerated EMMA (UA-EMMA) is Atlas' latest advancement in natural exposure testing. This new outdoor testing device delivers approximately 10-12 years of equivalent radiation exposure as would be received in a standard outdoor testing rack in South Florida in a single year.

The system achieves this accelerated exposure through a patented "cool mirror" technology that has very high reflectance in the UV and near visible wavelength ranges while attenuating reflectance in the longer wavelength visible and IR portions of the solar spectrum.

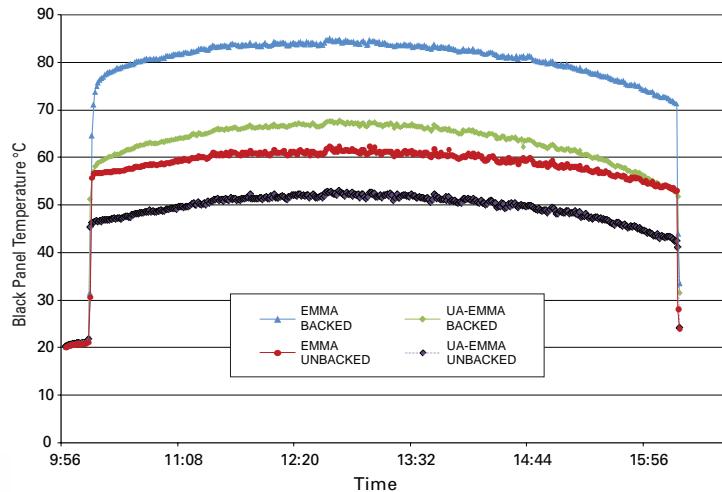


What are the Advantages?

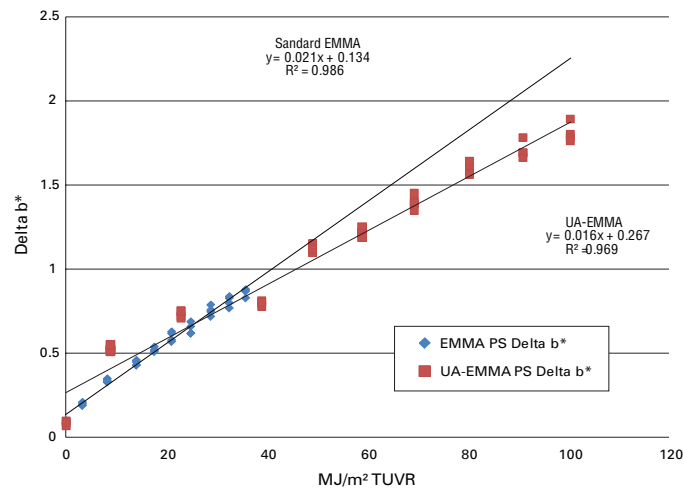
The new UA-EMMA system allows for greatly accelerated testing while fulfilling three critical testing requirements:

- Exposes many different types of materials to ultra-high UV irradiance
- Maintains high fidelity to the natural solar UV spectrum
- Keeps specimens at acceptable exposure temperatures

Black Panel Temperature Performance
UA-EMMA vs. Standard EMMA Data



Comparison of Polystyrene (PS) Reference Material in Standard
EMMA and UA-EMMA by UV Radiant Exposure



Ideal Materials for UA-EMMA® Testing

- Materials that require a long service life
- Transparent and glazed materials
- Temperature sensitive materials such as PVC
- Coatings applied to metal panels
- Materials that perform well in EMMA or EMMAQUA exposure testing

Applications

- Adhesives
- Agricultural Films
- Automotive Exteriors
- Building Materials
- Elastomers
- Glass (Architectural & Automotive)
- Packaging
- Paints & Coatings
- Plastics
- Roofing
- Sealants

EMMAQUA® Weathering Standards

The table below lists selected standards for EMMAQUA exposure. For details, refer to the individual standards. Test methods which are proprietary to individual companies and which also specify Fresnel-based exposure methods are not listed here.

EMMAQUA STANDARD	SCOPE	COUNTRY
ISO 877-3	Plastics	International
ASTM D3841	Glass-fiber reinforced polyester	USA
ASTM D4141	Coatings	USA
ASTM D4364	Plastics	USA
ASTM D5722	Coated hardboard	USA
ASTM E1596	PV modules	USA
ASTM G90	Non-metallic materials	USA
SAE J576	Optical automotive plastics	USA
SAE J1961	Automotive exterior	USA
SAE-AMS-T-22085	Preservation sealing tape	USA
JIS Z2381	General	Japan



1958

Atlas' DSET Laboratories relocates from Phoenix to New River, Arizona. The EMMAQUA device is redesigned with a steel framework and more efficient spray delivery system.



1969

The first EMMAQUA® device, constructed with a wooden frame and sheet metal skin, is patented, manufactured and placed into service.



1986

EMMAQUA+, the next generation of accelerated weathering devices, is introduced. Advancements include individual cycle programming, black panel temperature control, and altazimuth solar tracking for more efficient delivery of full-spectrum solar energy.

The MQ3K is launched, utilizing state-of-the-art technology in computer-controlled cycle programming, more accurate altazimuth solar tracking, one-touch start/stop, error sensing feedback and the most-specular mirrors available.



1999



2004

Atlas introduces the UA-EMMA, the latest advancement in outdoor accelerated testing. This device couples the EMMA platform with a new patented mirror system, optimizing real-world correlation.

Atlas introduces four patented suites of Temperature-Controlled EMMAQUA. (Static, Night, Dynamic Temperature and Variable Irradiance Control). This breakthrough allows for the testing of materials that are sensitive to thermal buildup.

2014





Global Support, Weathering Exposure Sites & Laboratories

■ Corporate Offices

Chicago, Illinois USA ■ Linsengericht, Germany ■ Shanghai, China ■ São Paulo, Brazil
Élancourt, France ■ Mörfelden-Walldorf, Germany ■ Bangalore, India ■ Leicester, United Kingdom

● Outdoor Exposure Sites & Laboratories

Miami, Florida USA • Phoenix, Arizona USA • Sanary, France • Chicago, Illinois USA • Duisburg, Germany • Leicester, United Kingdom
Hoek van Holland, The Netherlands • Chennai, India • Prescott, Arizona USA • Loveland, Colorado USA • Medina, Ohio USA
Keys, Florida USA • Jacksonville, Florida USA • Alberta, Michigan USA • Hainan, China • Guangzhou, China
Seosan, Korea • Miyakojima, Okinawa, Japan • Choshi, Japan • Kirishima, Japan
Singapore • Melbourne, Australia • Townsville, Australia • Novorossiysk, Russia
Gelendzhik, Russia • Moscow, Russia

▲ Local Sales & Service Support

To contact your local Atlas Sales representative please visit <http://atlas-mts.com/contact/local-representatives/>

For general inquiries please contact us at atlas.info@ametek.com

www.atlas-mts.com

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Formosa Idemitsu Petrochemical Corp.	TARAFLOX IV1900R TARAFLOX IV2200R	Polycarbonate		Clear Q
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www.idss.co.jp/

Coated Formosa Idemitsu Petrochemical Corp. plastics may only be used when treated with the following acceptable coating applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328 and Acryking PH-328: See Mitsubishi Chemical Corporation

PHC587, PHC 587C, and PHC 587C2: See Momentive Performance Materials, Inc.

SH-41 and SH-50 (only IV2200R and IV2200R1): See Stanley Electric

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60 and UVHC3000K: See Momentive Performance Materials, Inc.

UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot

UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.

Coating Manufacturer in Alphabetical Order



**MITSUBISHI
CHEMICAL
GROUP**

Information on Mitsubishi Chemical Corporation Acryking F-328 and Acryking PH-328, may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp



Information on UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, PHC587 and PHC587 C2 hard coat may be obtained by writing to the following:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

(Coating Information continued on the next page)

MFR. **TRADE NAME AND**
FLOW FORMULATION **TYPE OF RESIN** **NUMBER** **COLOR**



PAINT & VARNISH COMPANY, INC.

Information on Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8, coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Information on SH-41 and SH-50 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro, Meguro-Ku
Meguro-Ku, Tokyo 153,
Japan
www.stanley.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Idemitsu Kosan Co., Ltd.	TARFLON IV1900R TARFLON IV2200R (coated applications only)	Polycarbonate		Clear Q

www.idss.co.jp/

Coated Idemitsu Kosan Co., Ltd. plastics may only be used when treated with the following acceptable coating applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, and Acryking PH-328: See Mitsubishi Chemical Corporation

PHC587: See Momentive Performance Materials, Inc.

SH-41 and SH-50 (only IV2200R): See Stanley Electric

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC3000K, UVHC3000K1-40, UVHC3000K1-50, and UVHC3000KZ60: See Momentive Performance Materials, Inc.

UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot

UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.

Coating Manufacturer in Alphabetical Order



**MITSUBISHI
CHEMICAL
GROUP**

Information on Mitsubishi Chemical Corporation Acryking F-328, and Acryking PH-328 may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp



Information on UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, PHC587C2, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, PHC587 and PHC 587C hard coat may be obtained by writing to the following:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8, coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Information on SH-41 and SH-50 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Idemitsu Kosan Co., Ltd.	LC1500	Inner Lens Polycarbonate		Clear
	LC1505			
	LC1700			
	LC2200			

www.idss.co.jp

Note: Idemitsu Kosan Inner Lens Materials were tested behind clear coated IV1900R

Idemitsu Kosan Co., Ltd. www.idss.co.jp/ (formerly Idemitsu Petrochemical Co., Ltd.)	TARFLON V1500	Polycarbonate	C901	Clear \$
	TARFLON V1700		C902	Clear \$
	TARFLON V1900		C903	Clear \$
	TARFLON V2200		R901	Red \$
	TARFLON V2500		R902	Red \$
	TARFLON V2700		R903	Red \$
	TARFLON V3000		R904	Red \$
	(coated or uncoated)		R905	Red \$
			Y901	Yellow \$
			Y902	Yellow \$
			Y903	Yellow \$
	Y904	Yellow \$		
	Y905	Yellow \$		

Coated Idemitsu Kosan Co. Ltd. plastics may only be treated with the following coatings applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking K-101: See Mitsubishi Chemical Corporation

TARFLONCOAT 101 or TARFLONCOAT 201: See Idemitsu Kosan Co., Ltd.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coating Manufacturer in Alphabetical Order

Information on Tarfloncoat 101 and Tarfloncoat 201 coatings may be obtained by writing to the following address:

Idemitsu Kosan Co., Ltd.
1-1, Marunochi 3-Chome,
Chiyoda-Ku, Tokyo 100
Japan
www.idss.co.jp/



MITSUBISHI
CHEMICAL
GROUP

Information on Mitsubishi Chemical Corporation Acryking K-101 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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INEOS Styrolution America, LLC	NAS® XC NAS® XC UV	Styrene Methyl Methacrylate		Clear
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www.ineos-styrolution.com

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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KCC Silicone Corp	ENA8520MH(LV)	Moldable Silicone		Clear
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<https://www.kccsilicone.com/main.do>

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Kuraray Co., Ltd. www.kuraraychemical.com	PARAPET HR	Polymethyl	1000	Clear
	PARAPET HR-F	Methacrylate	11095	Clear
	PARAPET HR-G		11161	Clear
	PARAPET HR-H		12064	Clear
	PARAPET HR-L		12065	Clear
	PARAPET HR-LE		14146	Clear
	PARAPET HR-N		14148	Clear
	PARAPET HR-S		16569	Clear
	PARAPET HR-X		1103	Red
	PARAPET HR-Z		1104	Red
	PARAPET GR		1106	Red
	PARAPET HR-X		1111	Red
			1116	Red
			1173	Red
			1175	Red
			11008	Red
			11009	Red
			11010	Red
			11015	Red
			11023	Red
		11025	Red	
		11028	Red	
		11029	Red	
		11030	Red	
		11031	Red	
		11035	Red	
		11036	Red	
		11037	Red	
		11038	Red	
		11039	Red	
		11040	Red	
		11041	Red	
		11042	Red	
		11046	Red	
		11048	Red	
		11050	Red	
		11051	Red	
		11052	Red	
		11053	Red	
		11054	Red	
		11055	Red	
		11056	Red	
		11057	Red	
		11072	Red	
		11083	Red	
		11107	Red	
		11120	Red	
		11121	Red	
		11152	Red	
		11153	Red	
		11165	Red	
		11175	Red	
		11178	Red	

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Kuraray Co., Ltd. www.kuraraychemical.com	PARAPET HR	Polymethyl Methacrylate	11180	Red
	PARAPET HR-F		11181	Red
	PARAPET HR-G		11182	Red
	PARAPET HR-H		11188	Red
	PARAPET HR-L		11196	Red
	PARAPET HR-LE		11194	Red
	PARAPET HR-N		11222	Red
	PARAPET HR-S		1207	Yellow
	PARAPET HR-X		1208	Yellow
	PARAPET HR-Z		1237	Yellow
	PARAPET GR		1240	Yellow
	PARAPET HR-X		1241	Yellow
			1242	Yellow
			1244	Yellow
			12008	Yellow
			12013	Yellow
			12019	Yellow
			12021	Yellow
			12062	Yellow
			12067	Yellow
			12068	Yellow
			17020	Yellow
			17021	Yellow
			17023	Yellow
			17040	Yellow
			17047	Yellow
			17048	Yellow
	17049	Yellow		
	17050	Yellow		
	17051	Yellow		
	17052	Yellow		
	17056	Yellow		
	17062	Yellow		
	17066	Yellow		
	17071	Yellow		
	17072	Yellow		
	17073	Yellow		
	17074	Yellow		
	17075	Yellow		
	17086	Yellow		
	17090	Yellow		
	17099	Yellow		
	17101	Yellow		
	17105	Yellow		
	17116	Yellow		
	17124	Yellow		
	17185	Yellow		
	17191	Yellow		
	17192	Yellow		
	17209	Yellow		
	10247	Gray		
	11161	Gray		
	11176	Gray		
	11198	Gray		

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Kuraray Co., Ltd. www.kuraraychemical.com	PARAPET HR	Polymethyl Methacrylate	12048	Gray
	PARAPET HR-F		16072	Gray
	PARAPET HR-G		16073	Gray
	PARAPET HR-H		16074	Gray
	PARAPET HR-L		16081	Gray
	PARAPET HR-LE		16333	Gray
	PARAPET HR-N		16365	Gray
	PARAPET HR-S		16384	Gray
	PARAPET HR-X		16395	Gray
	PARAPET HR-Z		16396	Gray
	PARAPET GR		16421	Gray
	PARAPET HR-X		16422	Gray
			16423	Gray
			16424	Gray
			16425	Gray
			16426	Gray
			16427	Gray
			16428	Gray
			16429	Gray
			16430	Gray
			16431	Gray
			16432	Gray
			16433	Gray
			16434	Gray
			16435	Gray
			16456	Gray
			16457	Gray
	16458	Gray		
	16459	Gray		
	16460	Gray		
	16536	Gray		
	16559	Gray		
	16563	Gray		
	16565	Gray		
	16570	Gray		
	16574	Gray		
	17172	Gray		
	16071	Brown		
	17063	Brown		
	17079	Brown		
	17212	Brown		
	17213	Brown		
<hr/>				
Kuraray Co., Ltd. www.kuraraychemical.com	PARAPET EH	Polymethyl Methacrylate	1000	Clear
	PARAPET GH			
	PARAPET HA			
	PARAPET SH			
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Kuraray Co., Ltd. www.kuraraychemical.com	PARAPET SH-N	Polymethyl Methacrylate	1000	Clear
			11099	Red
			11100	Red
			12042	Yellow
			17174	Yellow
	16437	Grey		

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
LG Chem, Ltd. www.lgchem.com	LUPOY PC 1303AH-10		W10T	White Q
	LUPOY PC 1303AH-15		W099	White \$
	LUPOY PC 1303AH-22		W099	White \$
	LUPOY PC 1303AH-30		W099	White \$
	(coated or uncoated)		W099	White \$
			R075	Red \$
		Y018	Yellow \$	

(formerly LG-Polycarbonate Ltd.)

Coated LG Chem Ltd. plastics are listed with only the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7, FUJIHARD HH3035U-3, and FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

PHC587C, PHC587C2: See Momentive Performance Materials Inc.

SH-42 and SH-51 (only on W10T): See Stanley Electric

SHP401/AS4000 hard coat: See Momentive Performance Materials Inc.

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1 UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, and UVHC3000KZ60: See Momentive Performance Materials Inc.

Coating Manufacturer in Alphabetical Order



Information on FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7, FUJIHARD HH3035U-3, and FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
6-15 Shinbakeon 2-Chome
Minato-Ku Tokyo, 105-0011
Japan
www.fkkasei.co.jp



Information on SHP401/AS4000, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60 PHC587C, and PHC587C2 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH Inc. Building V7 51368 Lverkusen Germany	Momentive Performance Materials 260 Hudson River Road Waterford, NY 12118 www.momentive.com
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(Coating Information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on SH-42 and SH-51 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

NOTE: SH-42 and SH-51 were tested on W10T only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
LX MMA Corp.	EG-930	Polymethyl Methacrylate		Clear
	EG920		4001	Red
	EH-910		4002	Red
www.lxmma.com	IH830		4003	Red
	IH830A		4006	Red
(Formerly LGMMA Corp.)	IH830C		4009	Red
	IH830CA		4070	Red
	IH830HF		40010	Red
	IH830HR		40020	Red
	IH830HT		40030	Red
	IH830L		40040	Red
	IH830SR		40050	Red
	IH830XT		40060	Red
	HI835MS		40061	Red
	HI835H		40070	Red
	HI532		41831	Red
	HI533		41943	Red
	HP202		41979	Red
	HR315		42001	Red
	HR323		42015	Red
	R830C3		42025	Red
	R830C5		42030	Red
	R830HFC3		42032	Red
	R830HFC5		42033	Red
			42037	Red
			42055	Red
			42066	Red
			42068	Red
			42070	Red
			42071	Red
			42087	Red
			42089	Red
			42101	Red
			42146	Red
			2001	Yellow
			2002	Yellow
			2559	Yellow
			2561	Yellow
			20010	Yellow
			20020	Yellow
			20030	Yellow
			20040	Yellow
			30010	Yellow
			30040	Yellow
			2568	Amber
			2569	Amber
			83295	Gray
			83480	Gray
			83481	Gray
			83482	Gray
			83520	Gray
			83523	Gray
			83529	Gray
			83530	Gray
			83566	Gray
			83569	Gray
			8001	Grey

- Note: IG-840 is now called as IH-830A
- Note: IH830CA, EG920, IH830HR, HI835MS, HI835H, HP202 only comply with FMVSS 108 in 2.0 mm through 3.2 mm thicknesses.
- Note: HR323 complies with FMVSS 108 at 1.6 mm and from 3.2-6.4 mm
- Note: IH830L is not to be used as a reflex reflect or in front of a reflector in thickness 6.4 mm
- Note: Colors ID191 White, 2568 Amber, 2569 Amber, 61547 Blue, 83480 Gray, 83481Gray, 83530 Gray and 42068 Red were all tested on IH830C
- Note: Color ID191 White is not to be used as a reflex reflector or in front of a reflex reflector.
- Note: Color 2569 Amber in 6.4 mm thickness is not to be used as a reflex reflector or in front of a reflex reflector.
- Note: Color 61547 Blue is not to be used as a reflex reflector or in front of a reflex reflector in anv thickness

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
LX MMA Corp.	EG-930	Polymethyl Methacrylate	ID191	White
	EG920		61547	Blue
www.lxmma.com	EH-910			
(Formerly LGMMA Corp.)	IH830			
	IH830A			
	IH830C			
	IH830CA			
	IH830HF			
	IH830HR			
	IH830HT			
	IH830L			
	IH830SR			
	IH830XT			
	HI835MS			
	HI835H			
	HI532			
	HI533			
	HP202			
	HR315			
	HR323			
R830C3				
R830C5				
R830HFC3				
R830HFC5				

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Lotte Chemical Corp.

LT-1100
LT-1220
(coated)

Polycarbonate

Clear Q

www.lottechem.com

Coated Lotte Chemical Corp. plastics are only acceptable with the coatings listed below when properly applied to the molded lens. Lotte Chemical Corp. plastics cannot be used uncoated.

Coating in Alphabetical Order and Corresponding Manufacturer

KUV-5000: See KCC Corporation

SH-42 and SH-51: See Stanley Electric

UVHC3000, UVHC5000: See Momentive Performance Materials Inc.

UVT610V2, UVT610V3: See Red Spot

UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red Spot

Coating Manufacturer in Alphabetical Order



Information on KUV-5000 coatings may be obtained by writing:

KCC Corporation
83 Mabook-Dong,
Giheung-Gu, Yongin-Si, Gyunggi-Do
South Korea
www.kccworld.co.kr



Information on UVHC3000 and UVHC5000 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

Note: Lotte Chemical Corp. *Plastics are only to be used in a production process approved and monitored by Momentive Performance Materials*

Note: Lotte Chemical Corp. LT-1100 & LT-1220 with UVHC3000 must be coated to pass 7% haze.

Note: Lotte Chemical Corp. LT-1220 with UVHC3000 over 3.2mm cannot be used as a reflex reflector or in front of a reflex reflector.

(Coating Information continued on the next page)

MFR. **TRADE NAME AND**
FLOW FORMULATION **TYPE OF RESIN** **NUMBER** **COLOR**



PAINT & VARNISH COMPANY, INC.

Information on UVT610V2, UVT610V3, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Lotte Chemical Corp. LT-1220 with UVT610V2 and UVT610V3 is not listed over 3.2 mm.

Note: UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on Lotte LT-1110 and Lotte LT-1220.

Information on Stanley Electric SH-42, and SH-51 may be obtained by writing to the following company:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: Thickness 6.4 mm of Lotte Chemical Corp. LT-1100 & SH-42, LT-1220 & SH-42, and LT-1220 & SH-51 cannot be used as a reflex reflector or in front of a reflex reflector.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Lotte Chemical Corp.

PC-1000L

Polycarbonate

100

Clear Q

www.lottechem.com

Coated Lotte Chemical Corp. plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

KUV-2000, KUV-3000 and KUV-5000: See KCC Corporation

UVHC3000, UVHC5000: See Momentive Performance Materials Inc.

UVT610V2 and UVT820: See Red Spot

Coating Manufacturer in Alphabetical Order



Information on KUV-2000, KUV-3000 and KUV-5000 coatings may be obtained by writing:

KCC Corporation
83 Mabook-Dong,
Giheung-Gu, Yongin-Si, Gyunggi-Do
South Korea
www.kccworld.co.kr



Information on UVHC3000 and UVHC5000 hard coat may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com



PAINT & VARNISH COMPANY, INC.

Information on UVT610V2 and UVT820 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V2 was only tested on a 3.2mm lens

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Lotte MCC Corporation	ACRYPET VH	Polymethyl	001	Clear
	ACRYPET VHM	Methacrylate	111	Red
	ACRYPET VG		112	Red
	ACRYPET ZVH		121	Red
www.lottemcc.com			PR5296	Red
(Formerly Lotte MRC Corp.)			101	Red
			113	Red
			116	Red
			117	Red
			120	Red
			128	Red
			129	Red
			141	Red
			151	Red
			5101	Red
			5111	Red
			5112	Red
			5113	Red
			5114	Red
			5115	Red
			5117	Red
			5118	Red
			5121	Red
			5143	Red
			5151	Red
		209	Yellow	
		258	Yellow	
		259	Yellow	
		533	Grey	
		53137	Grey	
		53140	Grey	
		53150	Grey	
		53155	Grey	
		53160	Grey	
		53165	Grey	
		53170	Grey	
		53175	Grey	
		53183	Grey	

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Lucite	DIAKON CLG902	Polymethyl	001	Clear
International	DIAKON CLG902L	Methacrylate	006	Clear
(U.K.)	DIAKON CLG904		007	Clear
	DIAKON CMG302		011	Clear
www.luciteinternational.com	DIAKON CMG302S		0P11	Clear
	DIAKON CMG314		9047	Neutral
	DIAKON CMG314N		9051	Neutral
	DIAKON CMG314R		9184	Neutral
	DIAKON CMG314V		9195	Neutral
	DIAKON CMG334V		9197	Neutral
	DIAKON CMH450		9198	Neutral
	DIAKON CMH454L		405	Red
	DIAKON CMH454V		413	Red
	DIAKON HS3120		415	Red
	DIAKON MG114		416	Red
	DIAKON MH254		417	Red
	DIAKON ST10H8L		418	Red
	DIAKON ST15G8		419	Red
	DIAKON ST15H8L		421	Red
	DIAKON ST20G8		422	Red
	DIAKON ST20H8L		425	Red
	DIAKON ST25G7		428	Red
	DIAKON ST25G8		433	Red
	DIAKON ST25H8L		435	Red
	DIAKON ST35G7		436	Red
	DIAKON ST35G8		437	Red
	DIAKON ST35H8L		438	Red
	DIAKON TD5H05L		439	Red
	DIAKON TD5H10L		440	Red
	DIAKON TD5H15L		442	Red
	DIAKON TD5H25L		4088	Red
	DIAKON TD5H42L		4114	Red
	DIAKON TD510		4132	Red
	DIAKON TD515		4162	Red
	DIAKON TD525		4163	Red
	DIAKON TD542		4169	Red
	DIAKON TD825		4194	Red
	DIAKON TD842		4209	Red
			4222	Red
			4223	Red
			4232	Red
			4234	Red
			4235	Red
			4236	Red
			4237	Red
			4238	Red
			4239	Red
			4248	Red
			4249	Red
			4255	Red
			4256	Red
			4259	Red
			4260	Red
			4261	Red

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Lucite International (U.K.)	DIAKON CLG902	Polymethyl Methacrylate	4262	Red
	DIAKON CLG902L		4263	Red
	DIAKON CLG904		4264	Red
	DIAKON CMG302		4265	Red
www.lucitesolutions.com	DIAKON CMG302S		4266	Red
	DIAKON CMG314		4267	Red
	DIAKON CMG314N		4268	Red
	DIAKON CMG314R		4269	Red
	DIAKON CMG314V		4270	Red
	DIAKON CMG334V		4271	Red
	DIAKON CMH450		4272	Red
	DIAKON CMH454L		4273	Red
	DIAKON CMH454V		4281	Red
	DIAKON HS3120		4286	Red
	DIAKON MG114		4287	Red
	DIAKON MH254		4P01	Red
	DIAKON ST10H8L		310	Yellow
	DIAKON ST15G8		311	Yellow
	DIAKON ST15H8L		312	Yellow
	DIAKON ST20G8		314	Yellow
	DIAKON ST20H8L		316	Yellow
	DIAKON ST25G7		317	Yellow
	DIAKON ST25G8		318	Yellow
	DIAKON ST25H8L		319	Yellow
	DIAKON ST35G7		3064	Yellow
	DIAKON ST35G8		3069	Yellow
	DIAKON ST35H8L		3071	Yellow
	DIAKON TD5H05L		3080	Yellow
	DIAKON TD5H10L		3081	Yellow
	DIAKON TD5H15L		3103	Yellow
	DIAKON TD5H25L		3104	Yellow
	DIAKON TD5H42L		3150	Yellow
	DIAKON TD510		3151	Yellow
	DIAKON TD515		3152	Yellow
	DIAKON TD525		3153	Yellow
	DIAKON TD542		3154	Yellow
	DIAKON TD825		3161	Yellow
	DIAKON TD842		3162	Yellow
			3163	Yellow
			3164	Yellow
			3165	Yellow
			6150	Green
			9388	Grey

Note: Red 4281 listed in 1.6mm only.

For Lucite International (U.S.A.) please see Plaskolite.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Luminit	PRO10676	Inner Lens	10676	Red
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www.luminitco.com

Note: Luminit PRO10676 materials were tested on LEXAN™ HP92W behind Arkema Plexiglas V-52i Med Red outer lenses or on Covestro 503 behind Arkema V-52i 2.3 and 3.2mm outer lenses.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi Chemical Corporation	ACRYPET TN 100	Polymethyl Methacrylate	001	Clear
Mitsubishi Chemical Corporation	ACRYPET UT 100 ACRYPET UT 200 SHINKOLITE UT 100 SHINKOLITE UT 200	Polymethyl Methacrylate	001 011 101 111 121 203 254 264 601	Clear Clear Red Red Red Yellow Yellow Yellow Grey
www.m-chemical.co.jp				
Mitsubishi Chemical Corporation	ACRYPET IR ACRYPET NAV SHINKOLITE P IR SHINKOLITE P NAV	Polymethyl Methacrylate	001 011 101 112 113 116 117 121 5101 203 254 255 256 257 258 259 264 265 5203 531 541 53160 53170 53180 53190 54115 54135 54160 54165 54170	Clear Clear Red Red Red Red Red Red Red Yellow Yellow Yellow Yellow Yellow Yellow Yellow Yellow Yellow Yellow Yellow Gray Gray Gray Gray Gray Gray Gray Gray Gray Gray
www.m-chemical.co.jp				
Mitsubishi Chemical Corporation	ACRYPET MD SHINKOLITE P MD	Polymethyl Methacrylate	001 101 114 203	Clear Red Red Yellow
www.m-chemical.co.jp				

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi Chemical Corporation www.m-chemical.co.jp	ACRYPET V	Polymethyl	001	Clear
	SHINKOLITE P V	Methacrylate	011	Clear
			101	Red
			114	Red

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>	
Mitsubishi Chemical Corporation www.m-chemical.co.jp	ACRYPET V SHINKOLITE P V	Polymethyl Methacrylate	131	Red	
			146	Red	
				147	Red
				148	Red
				149	Red
				160	Red
				203	Yellow
				236	Yellow
				283	Yellow
				284	Yellow
				285	Yellow
				286	Yellow
				287	Yellow
				288	Yellow
				291	Yellow
				292	Yellow
	<hr/>				
Mitsubishi Chemical Corporation www.m-chemical.co.jp	ACRYPET VE	Polymethyl Methacrylate	PDA0010	Clear	
	ACRYPET VES		PDA0020	Clear	
	ACRYPET VH		PDA0030	Clear	
	ACRYPET VH3F		PDA0040	Clear	
	ACRYPET VH4		PDA0050	Clear	
	ACRYPET VH4F		PDA0013	Clear	
	ACRYPET VHM		PDA0023	Clear	
	ACRYPET VHS		PDA0033	Clear	
	ACRYPET VG		PDA0043	Clear	
	ACRYPET ZVH		PDA0053	Clear	
	SHINKOLITE P VE		001	Clear	
	SHINKOLITE P VES		361	Clear	
	SHINKOLITE P VH		PYR5406	Clear	
	SHINKOLITE P VHS		007	White	
			PR5556	White	
			53260	White	
			54225	White	
			55475	White	
			55480	White	
			55485	White	
			55580	White	
	55670	White			
	57163	White			
	55780	White			
	58154	White			
	101	Red			
	111	Red			
	112	Red			
	113	Red			
	116	Red			
	117	Red			
	120	Red			
	121	Red			
	128	Red			
	129	Red			
	141	Red			
	143	Red			
	151	Red			

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi Chemical Corporation	ACRYPET VE	Polymethyl	5101	Red
	ACRYPET VES	Methacrylate	5101B	Red
www.m-chemical.co.jp	ACRYPETVH		5111	Red
	ACRYPET VH3F		5112	Red
	ACRYPET VH4		5113	Red
	ACRYPET VH4F		5114	Red
	ACRYPET VHM		5115	Red
	ACRYPET VHS		5116	Red
	ACRYPET VG		5117	Red
	ACRYPET ZVH		5118	Red
	SHINKOLITE P VE		5121	Red
	SHINKOLITE P VES		5131	Red
	SHINKOLITE P VH		5141	Red
	SHINKOLITE P VHS		5142	Red
			5143	Red
			5151	Red
			PR5276	Red
			PR5296	Red
			5386	Red
			5456	Red
			203	Yellow
			209	Yellow
		252	Yellow	
		253	Yellow	
		254	Yellow	
		255	Yellow	
		256	Yellow	
		257	Yellow	
		258	Yellow	
		259	Yellow	
		262	Yellow	
		263	Yellow	
		264	Yellow	
		265	Yellow	
		266	Yellow	
		267	Yellow	
		270	Yellow	
		290	Yellow	
		2001	Yellow	
		5203	Yellow	
		5213	Yellow	
		5223	Yellow	
		5233	Yellow	
		5253	Yellow	
		5256	Yellow	
		5283	Yellow	
		5293	Yellow	
		5303	Yellow	
		5313	Yellow	
		5333	Yellow	
		5343	Yellow	
		5353	Yellow	
		5363	Yellow	

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi Chemical Corporation www.m-chemical.co.jp	ACRYPET VE	Polymethyl	5373	Yellow
	ACRYPET VES	Methacrylate	5383	Yellow
	ACRYPET VH		5393	Yellow
	ACRYPET VH3F		5403	Yellow
	ACRYPET VH4		5413	Yellow
	ACRYPET VH4F		5423	Yellow
	ACRYPET VHM		531	Gray
	ACRYPET VHS		533	Gray
	ACRYPET VG		541	Gray
	ACRYPET ZVH		53105	Gray
	SHINKOLITE P VE		53110	Gray
	SHINKOLITE P VES		53120	Gray
	SHINKOLITE P VH		53130	Gray
	SHINKOLITE P VHS		53137	Gray
	SHINKOLITE P VHS		53140	Gray
			53150	Gray
			53155	Gray
			53160	Gray
			53165	Gray
			53168	Gray
		53170	Gray	
		53175	Gray	
		53178	Gray	
		53180	Gray	
		53183	Gray	
		53185	Gray	
		53187	Gray	
		53190	Gray	
		54107	Gray	
		54110	Gray	
		54112	Gray	
		54115	Gray	
		54118	Gray	
		54120	Gray	
		54130	Gray	
		54132	Gray	
		54133	Gray	
		54135	Gray	
		54140	Gray	
		54145	Gray	
		54155	Gray	
		54160	Gray	
		54165	Gray	
		54170	Gray	

Coated Mitsubishi Chemical Corporation plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

FUJIHARD HH3012U-5, FUJIHARD HH3012U-6, FUJIHARD HH3012U-7, FUJIHARD HH3012U-8, FUJIHARD HH3012U-9, and FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3,; See Fujikura Kasei Co Ltd.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Coating Manufacturer in Alphabetical Order



Information on FUJIHARD HH3012U-5, FUJIHARD HH3012U-6, FUJIHARD HH3012U-7, FUJIHARD HH3012U-8, FUJIHARD HH3012U-9, FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, and FUJIHARD HH3035U-3, coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJIHARD HH3012U-5, FUJIHARD HH3012U-6, FUJIHARD HH3012U-7, FUJIHARD HH3012U-8, FUJIHARD HH3012U-9, and FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3, for use only on Acrypet VH grades.

Mitsubishi	CLEARLAC M100	METHYL	001	Clear
Chemical	CLEARLAC M101	Methacrylate/	101	Red
Corporation	CLEARLAC M102	STYRENE	5101	Red
		COPOLYMER	203	Yellow
			5203	Yellow
			531	Gray
			541	Gray

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi	ACRYPET VE	Polymethyl	001	Clear
Chemical	ACRYPET VES	Methacrylate	361	Clear
Polymer	ACRYPET VH		PYR5406	Clear
Nantong Co., Ltd.	ACRYPET VH4		007	White
	ACRYPET VHM		PR5556	White
www.mrpn.com.cn	ACRYPET VHS		53260	White
	ACRYPET VG		54225	White
	ACRYPET ZVH		55475	White
	SHINKOLITE P VE		55480	White
	SHINKOLITE P VES		55485	White
	SHINKOLITE P VH		55580	White
	SHINKOLITE P VHS		55670	White
			57163	White
			55780	White
			58154	White
			PTS0074	White
			101	Red
			111	Red
			112	Red
			113	Red
			116	Red
			117	Red
			120	Red
			121	Red
			128	Red
			129	Red
			141	Red
			143	Red
			151	Red
			5101	Red
			5101B	Red
			5111	Red
			5112	Red
			5113	Red
			5114	Red
			5115	Red
			5116	Red
			5117	Red
			5118	Red
			5121	Red
			5131	Red
			5141	Red
			5142	Red
			5143	Red
			5151	Red
			PR5276	Red
			PR5296	Red
			5386	Red
			5456	Red
			203	Yellow
			209	Yellow
			252	Yellow
			253	Yellow
			254	Yellow

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi	ACRYPET VE	Polymethyl	255	Yellow
Chemical	ACRYPET VES	Methacrylate	256	Yellow
Polymer	ACRYPET VH		257	Yellow
Nantong Co., Ltd.	ACRYPET VH4		258	Yellow
	ACRYPET VHM		259	Yellow
www.mrpn.com.cn	ACRYPET VHS		262	Yellow
	ACRYPET VG		263	Yellow
	ACRYPET ZVH		264	Yellow
	SHINKOLITE P VE		265	Yellow
	SHINKOLITE P VES		266	Yellow
	SHINKOLITE P VH		267	Yellow
	SHINKOLITE P VHS		270	Yellow
			290	Yellow
			2001	Yellow
			5203	Yellow
			5213	Yellow
			5223	Yellow
			5233	Yellow
			5253	Yellow
			5256	Yellow
			5283	Yellow
			5293	Yellow
			5303	Yellow
			5313	Yellow
			5333	Yellow
			5343	Yellow
			5353	Yellow
			5363	Yellow
			5373	Yellow
			5383	Yellow
			5393	Yellow
			5403	Yellow
			5413	Yellow
			5423	Yellow
			531	Gray
			533	Gray
			541	Gray
			53105	Gray
			53110	Gray
			53120	Gray
			53130	Gray
			53137	Gray
			53140	Gray
			53150	Gray
			53155	Gray
			53160	Gray
			53165	Gray
			53168	Gray
			53170	Gray
			53175	Gray
			53178	Gray
			53180	Gray
			53183	Gray
			53185	Gray
			53187	Gray

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi	ACRYPET VE	Polymethyl	53190	Gray
Chemical	ACRYPET VES	Methacrylate	54107	Gray
Polymer	ACRYPET VH		54110	Gray
Nantong Co., Ltd.	ACRYPET VH4		54112	Gray
	ACRYPET VHM		54115	Gray
www.mrpn.com.cn	ACRYPET VHS		54118	Gray
	ACRYPET VG		54120	Gray
	ACRYPET ZVH		54130	Gray
	SHINKOLITE P VE		54132	Gray
	SHINKOLITE P VES		54133	Gray
	SHINKOLITE P VH		54135	Gray
	SHINKOLITE P VHS		54140	Gray
			54145	Gray
			54155	Gray
			54160	Gray
			54165	Gray
			54170	Gray

Coated Mitsubishi Chemical Polymer Nantong Co., Ltd. plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

FUJIHARD HH3012U-5, FUJIHARD HH3012U-6, FUJIHARD HH3012U-7, FUJIHARD HH3012U-8, FUJIHARD HH3012U-9, and FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3,; See Fujikura Kasei Co Ltd.

SH-61: See Stanley Electric Co., Ltd.

Coating Manufacturer in Alphabetical Order



FUJIKURA KASEI

Information on FUJIHARD HH3012U-5, FUJIHARD HH3012U-6, FUJIHARD HH3012U-7, FUJIHARD HH3012U-8, FUJIHARD HH3012U-9, and FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3, coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
6-15 Shibakoen 2-Chome
Minato-Ku, Tokyo 105-0011
Japan
www.fkkasei.co.jp

Note: FUJIHARD HH3012U-5, FUJIHARD HH3012U-6, FUJIHARD HH3012U-7, FUJIHARD HH3012U-8, FUJIHARD HH3012U-9, and FUJIHARD HH3035U, FUJIHARD HH3035U-1, FUJIHARD HH3035U-2, FUJIHARD HH3035U-3, for use only on Acrypet VH grades.

(Coating information continued on the next page.)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on SH-61 hard coat may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro, Meguro-Ku
Meguro-Ku, Tokyo 153,
Japan
www.stanley.co.jp

Note: Stanley SH-61 was only tested on Acrypet VH 001

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi Engineering Plastics Corporation www.m-ep.co.jp	IUPILON ML-100	Polycarbonate	001	Clear #
	IUPILON ML-200		0001	Clear #
	IUPILON ML-300		R591A	Clear #
	IUPILON ML-300AH		R530B	Clear #!
	IUPILON ML-350		R591B	Clear #
	IUPILON ML-400		R591C	Clear #
	IUPILON ML-100R		R591S	Clear #
	IUPILON ML-200R		101	Red #
	IUPILON ML-300R		H101T	Red #
	IUPILON ML-350R		102	Red #
	IUPILON ML-400R		103	Red #
	IUPILON HL-3003		104	Red #
	IUPILON HL-3503		R138J	Red #
			1001	Red #
			1002	Red #
	301	Yellow #		
	3001	Yellow #		

Note:	ML-300/R1GYH, ML-300/R1BWH, ML-400/R148A, ML-300/R265E, ML-400R/R206F, HL-3003/N414, HL-3003/N418, HL-3003/N424, HL-3003/N428 HL-3503/N414, HL-3503/N418 HL-3503/N424, HL-3503/N428 and HL-3503/N428R are for protected applications only	ML-300/R1GYH	Red!
		ML-300/R1BWH	Red!
		ML-400/R148A	Red!
		ML-300/R265E	Yellow!
		ML-400R/R206F	Yellow!
		HL-3003/N414	Clear!
		HL-3003/N418	Clear!
Note:	All Mitsubishi Engineering protected application materials were tested behind clear coated ML-300 or ML-350	HL-3003/N424	Clear!
		HL-3003/N428	Clear!
		HL-3503/N414	Clear!
		HL-3503/N418	Clear!
		HL-3503/N424	Clear!
		HL-3503/N428	Clear!
	HL-3503/N428R	Clear!	

Coated Mitsubishi Engineering Plastics Corp. Iupilon plastics may only be treated with the following coatings listed below.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-503, Acryking PH-511, Acryking PH-700, Acryking PH-710 Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A, and Acryking PH-930: See Mitsubishi Chemical Corporation

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2561U-3: See Fujikura Kasei

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
	FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2:			See Fujikura Kasei
	FUJIHARD HH3372U:			See Fujikura Kasei
	FUJIHARD HH3401U:			See Fujikura Kasei
	FUJIHARD HH3482U:			See Fujikura Kasei
	IUPILON Coat UV:			See Mitsubishi Engineering Plastics Corp.
	NIPPE UVI Coat UT-1678:			See Nippon Paint Automotive Coatings Co., Ltd.
	MODIHARD 200S:			See NOF Corporation
	PHC587C, PHC587C2:			See Momentive Performance Materials Inc.
	PHOLUCID No.180C and 185C:			See Chugoku Marine Paints Ltd..
	SH-41, SH-50, SH-51 and SH-61:			See Stanley Electric
	UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60:			See Momentive Performance Materials Inc.
	UVHC5000, UVHC5000K, and UVHC5000K1:			See Momentive Performance Materials Inc.
	UVHC8100:			See Momentive Performance Materials Inc.
	UVT200V1, UVT200V2, UVT200V3 and UVT200V5, :			See Red Spot.
	UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8:			See Red Spot.
	UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8:			See Red Spot

Coating Manufacturer in Alphabetical Order



Information on PHOLUCID No.180C and 185C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
Tokyo Club Building,
2-6, Kasumigaseki 3-Chome
Chiyoda-Ku, Tokyo, 100-0013
Japan
Telephone: 81-3-3506-3971
Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No.180C was tested on Iupilon ML-300AH R591C Clear and ML-300 R591B Clear only.

Note: PHOLUCID No.185C was tested on Iupilon ML-300AH R591C Clear only.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Information on FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJIHARD HH2540U series, HH2551U series, HH2561U series and HH2570U series were tested on ML-300 clear only

Note: FUJIHARD HH3372U and FUJIHARD HH3401U were tested on ML-300 and ML-350 clear only.



Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000 and KUV-6000 coatings may be obtained by writing:

KCC Corporation
 83 Mabook-Dong, Giheung-Gu,
 Yongin-Si, Gyunggi-Do
 South Korea
www.kccworld.co.kr

Information on IUPILON COAT UV may be obtained by writing to the following address:

Mitsubishi Engineering Plastics Corp.
 Plastics Sales Department
 5-2, Marunouchi 2-Chome
 Chiyoda-Ku, Tokyo
 Japan
www.m-ep.co.jp



Information on Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-503, Acryking PH-511, Acryking PH-700, Acryking PH-710 Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following company:

Mitsubishi Chemical Corporation
 1-1 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking PH-503, PH-511, PH-700, PH-710, Acryking PH-720, PH-750, Acryking PH-800 and Acryking PH-800N5A were tested on ML-300 clear only

Note: Acryking PH-930 was tested on clear ML-300 and ML-350 only.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Information on PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, UVHC5000K1 and UVHC8100 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH Building V7 51368 Leverkusen Germany	Momentive Performance Materials Inc. 260 Hudson River Road Waterford, NY 12118 www.momentive.com
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Note: UVHC3000K, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60 only tested on lupilon ML-300 / ML-350
 Note: UVHC3000 only tested on lupilon ML-350
 Note: UVHC8100 was tested on Clear ML-300 and ML-350



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
 2-14-1 Shodai-Ohtani
 Hirakata-City, Osaka 573-1153
 Japan
 Phone: +81-72-857-5530
 Fax: +81-72-857-5640
 Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on lupilon ML-300 and ML-350 clear.



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
 Yebisu Garden Place Tower 20-3, Ebisu 4-Chome,
 Shibuya-Ku, Tokyo 150-6019
 Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on ML-300 Clear in thicknesses 2.3-6.4 mm only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on Stanley Electric SH-41, SH-50, SH-51 and SH-61 may be obtained by writing to the following company:

Stanley Electric Co., Ltd.
 2-9-13, Nakameguro,
 Meguro-Ku, Tokyo 153
 Japan
www.stanley.co.jp

Note: SH-41 may be used in front of a reflex reflector. Material would have code Q
 Note: Stanley SH-51 and SH-61 only tested on clear IUPILON ML-300



Information on UVT200V1, UVT200V2, UVT200V3 and UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
 P.O. Box 418
 Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 is only acceptable on clear ML-300 and ML-350

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi Engineering-Plastics Corporation	IUPILON ML-100	Polycarbonate	001	Clear \$
	IUPILON ML-200		H5102	Clear \$
	IUPILON ML-300		R5RSE	Clear \$
	IUPILON ML-400		R5QTE	Clear \$
	IUPILON ML-500		R5RZE	Clear \$
www.m-ep.co.jp	IUPILON ML-100R		R5GSF	Clear \$
	IUPILON ML-200R		R5KYH	Clear \$
	IUPILON ML-300R		R329K	Clear \$
	IUPILON ML-400R		R166J	Clear \$
	IUPILON ML-500R (coated or uncoated)		H2059	Clear \$
			A6067	Clear \$
			R525A	Clear \$
			R456J	Clear \$
			R526A	Clear \$!
			T689R	Clear \$
			A6067	Clear \$
		105	Red \$!	
		302	Yellow \$!	
		501	Gray Smoke \$!	
		R5YNH	Gray Smoke \$!	

Coated Mitsubishi Engineering-Plastics Corp. plastics may only be treated with the following acceptable coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930: See Mitsubishi Chemical Corporation

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2561U-3: See Fujikura Kasei

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei

FUJIHARD HH3372U: See Fujikura Kasei

FUJIHARD HH3401U: See Fujikura Kasei

FUJIHARD HH3482U: See Fujikura Kasei

IUPILON COAT UV: See Mitsubishi Engineering Plastics Corp.

MODIHARD 200S: See NOF Corporation

NIPPE UVI Coat UT-1678: See Nippon Paint Automotive Coatings Co., Ltd.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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(Coating information continued on the next page)

SH-41, SH-50, SH-51 and SH-61: See Stanley Electric

PHOLUCID No.180C: See Chugoku Marine Paints Ltd.

UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials

UVHC8100: See Momentive Performance Materials

UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot.

UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.

UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red Spot

Coating Manufacturer in Alphabetical Order



Information on PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
Tokyo Club Building,
2-6, Kasumigaseki 3-Chome
Chiyoda-Ku, Tokyo, 100-0013
Japan
Telephone: 81-3-3506-3971
Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No.180C was tested on Lupilon ML-300 R591B clear only.



Information on: FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
6-15 Shibakoen 2-Chome
Minato-Ku, Tokyo 105-0011
Japan
www.fkkasei.co.jp

Note: FUJIHARD HH2540U series, HH2551U series, HH2561U series and HH2570U series were tested on ML-300 clear only

Note: FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U were tested on ML-300 and ML-350 clear only.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Materials Inc. Building V7
 51368 Leverkusen
 Germany

Momentive Performance
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on ML-300 clear only.

Information on IUPILON COAT UV may be obtained by writing to the following address:

Mitsubishi Engineering Plastics Corp.
 Plastics Sales Department
 5-2, Marunouchi 2-Chome
 Chiyoda-Ku, Tokyo,
 Japan
www.m-ep.co.jp



Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-700, Acryking PH-710 Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-1 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking PH-700, PH-710, Acryking PH-720, PH-750 Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 were tested on clear ML-300 only



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
 2-14-1 Shodai-Ohtani
 Hirakata-City, Osaka 573-1153
 Japan
 Phone: +81-72-857-5530
 Fax: +81-72-857-5640
 Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Iupilon ML-300 and ML-350 clear.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
Yebis Garden Place Tower 20-3, Ebisu 4-Chome,
Shibuya-Ku, Tokyo 150-6019
Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on ML-300 Clear in thicknesses 2.3-6.4 mm only



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 is only acceptable on clear ML-300 and ML-350

Information on Stanley Electric SH-41, SH-50, SH-51 and SH-61 may be obtained by writing to the following company:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: SH-41 may be used in front of a reflex reflector. Material would have code Q

Note: Stanley SH-51 and SH-61 only tested on clear IUPILON ML-300

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi Engineering-Plastics Corporation	NOVAREX 7022L1 NOVAREX 7022L2 NOVAREX 7022L3 (coated or uncoated)	Polycarbonate		Clear \$
			R111	Red \$
			R112	Red \$
			R212	Red \$
			R213	Red \$
			R311	Red \$
			R312	Red \$
			R313	Red \$
			A114	Yellow \$
			A115	Yellow \$
			A212	Yellow \$
			A213	Yellow \$
			A306	Yellow \$
			A307	Yellow \$
			A308	Yellow \$
			A411	Yellow \$
			A412	Yellow \$

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Mitsubishi Gas Chemical Engineering-Plastics (Shanghai) Co. Ltd.	IUPILON ML-100	Polycarbonate	001	Clear #
	IUPILON ML-200		0001	Clear #
	IUPILON ML-300		R591A	Clear #
	IUPILON ML-300AH		R530B	Clear #!
	IUPILON ML-350		R591B	Clear #
	IUPILON ML-400		R591C	Clear #
	IUPILON ML-100R		R591S	Clear #
www.m-ep.co.jp	IUPILON ML-200R		101	Red #
	IUPILON ML-300R		102	Red #
	IUPILON ML-350R		103	Red #
	IUPILON ML-400R		104	Red #
	IUPILON HL-3003		R138J	Red #
	IUPILON HL-3503		1001	Red #
			1002	Red #
			301	Yellow #
			3001	Yellow #

Note:	ML-300/R1GYH, ML-300/R1BWH, ML-400/R148A, ML-300/R265E, ML-400R/R206F, HL-3003/N414, HL-3003/N418, HL-3003/N424, HL-3003/N428	ML-300/R1GYH	Red!
	HL-3503/N414, HL-3503/N418 HL-3503/N424, and HL-3503/N428 are for protected applications only	ML-300/R1BWH	Red!
		ML-400/R148A	Red!
		ML-300/R265E	Yellow!
		ML-400R/R206F	Yellow!
		HL-3003/N414	Clear!
		HL-3003/N418	Clear!
Note:	All Mitsubishi Engineering protected application materials were tested behind clear coated ML-300 or ML-350	HL-3003/N424	Clear!
		HL-3003/N428	Clear!
		HL-3503/N414	Clear!
		HL-3503/N418	Clear!
		HL-3503/N424	Clear!
		HL-3503/N428	Clear!

Coated Mitsubishi Gas Chemical Engineering Plastics (Shanghai) Co. Ltd. Iupilon plastics may only be treated with the following coatings listed below.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-503, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A, and Acryking PH-930: See Mitsubishi Chemical Corporation

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2561U-3: See Fujikura Kasei

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
FUJIHARD HH3372U:	See Fujikura Kasei			
FUJIHARD HH3401U:	See Fujikura Kasei			
FUJIHARD HH3482U:	See Fujikura Kasei			
IUPIILON Coat UV:	See Mitsubishi Engineering Plastics Corp.			
NIPPE UVI Coat UT-1678:	See Nippon Paint Automotive Coatings Co., Ltd.			
PHC587C, PHC587C2:	See Momentive Performance Materials Inc.			
PHOLUCID No.180C, 185C:	See Chugoku Marine Paints Ltd..			
SH-41, SH-50, and SH-51:	See Stanley Electric			
UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60:	See Momentive Performance Materials Inc.			
UVHC5000, UVHC5000K, and UVHC5000K1:	See Momentive Performance Materials Inc.			
UVHC8100:	See Momentive Performance Materials Inc.			
UVT200V1, UVT200V2, UVT200V3 and UVT200V5, :	See Red Spot.			
UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8:	See Red Spot.			
UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8:	See Red Spot			

Coating Manufacturer in Alphabetical Order



Information on PHOLUCID No.180C and 185C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
Tokyo Club Building,
2-6, Kasumigaseki 3-Chome
Chiyoda-Ku, Tokyo, 100-0013
Japan
Telephone: 81-3-3506-3971
Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No.180C was tested on lupilon ML-300AH R591C and lupilon ML-300 R591B clear only.

Note: PHOLUCID No.185C was tested on lupilon ML-300AH R591C Clear only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJIHARD HH2540U series, HH2551U series, HH2561U series and HH2570U series were tested on ML-300 clear only.

Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on ML-300 and ML-350 clear only.



Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000 and KUV-6000 coatings may be obtained by writing:

KCC Corporation
 83 Mabook-Dong,
 Giheung-Gu, Yongin-Si Gyunggi-Do,
 South Korea
www.kccworld.co.kr

Information on IUPILON COAT UV may be obtained by writing to the following address:

Mitsubishi Engineering Plastics Corp.
 Plastics Sales Department
 5-2, Marunouchi 2-Chome
 Chiyoda-Ku, Tokyo
 Japan
www.m-ep.co.jp



Information on Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-503, Acryking PH-700, Acryking PH-710 Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A, and Acryking PH-930 coatings may be obtained by writing to the following company:

Mitsubishi Chemical Corporation
 1-1 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking PH-503, PH-700, PH-710, Acryking PH-720, PH-750, Acryking PH-800 and Acryking PH-800N5A were tested on ML-300 clear only

Note: Acryking PH-930 was tested on clear ML-300 and MI-350

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, UVHC5000K1 and UVHC8100 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Materials Inc. Building V7
 51368 Leverkusen
 Germany

Momentive Performance
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC3000K, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60 only tested on lupilon ML-300 / ML-350

Note: UVHC3000 only tested on lupilon ML-350

Note: UVHC8100 was tested on clear lupilon ML-300 and lupilon ML-350



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
 2-14-1 Shodai-Ohtani
 Hirakata-City, Osaka 573-1153
 Japan
 Phone: +81-72-857-5530
 Fax: +81-72-857-5640
 Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on lupilon ML-300 and ML-350 clear.



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
 Yebis Garden Place Tower 20-3, Ebisu 4-Chome,
 Shibuya-Ku, Tokyo 150-6019
 Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on ML-300 Clear in thicknesses 2.3-6.4 mm only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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PAINT & VARNISH COMPANY, INC.

Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 is only acceptable on clear ML-300 and ML-350

Information on Stanley Electric SH-41, SH-50 and SH-51 may be obtained by writing to the following company:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: SH-41 may be used in front of a reflex reflector. Material would have code Q
Note: Stanley SH-51 only tested on clear IUPIILON ML-300

Mitsubishi	IUPIILON ML-100	Polycarbonate	001	Clear \$
Gas Chemical	IUPIILON ML-200		H5102	Clear \$
Engineering-	IUPIILON ML-300		R5RSE	Clear \$
Plastics	IUPIILON ML-400		R5QTE	Clear \$
(Shanghai)	IUPIILON ML-500		R5RZE	Clear \$
Co. Ltd.	IUPIILON ML-100R		R5GSF	Clear \$
	IUPIILON ML-200R		R5KYH	Clear \$
www.m-ep.co.jp	IUPIILON ML-300R		R329K	Clear \$
	IUPIILON ML-400R		R166J	Clear \$
	IUPIILON ML-500R		H2059	Clear \$
	(coated or uncoated)		A6067	Clear \$
			R525A	Clear \$
			R456J	Clear \$
			R526A	Clear \$
			T689R	Clear \$
			A6067	Clear \$
			105	Red \$
			302	Yellow \$
			501	Gray Smoke \$
			R5YNH	Gray Smoke \$

Coated Mitsubishi Gas Chemical Engineering Plastics (Shanghai) Co. Ltd. plastics may only be treated with the following coatings applied to the molded lens:

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-700, Acryking PH-710
 Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930: See Mitsubishi
 Chemical Corporation

FUJIHARD HH2540U, HH2540U-1, HH2540U-2: See Fujikura Kasei.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2561U-3: See Fujikura
 Kasei

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See
 Fujikura Kasei

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei

(Coating information continued on the next page)

FUJIHARD HH3372U: See Fujikura Kasei

FUJIHARD HH3401U: See Fujikura Kasei

FUJIHARD HH3482U: See Fujikura Kasei

IUPILON COAT UV: See Mitsubishi Engineering Plastics Corp.

MODIHARD 200S: See NOF Corporation.

NIPPE UVI Coat UT-1678: See Nippon Paint Automotive Coatings Co., Ltd.

PHOLUCID No.180C: See Chugoku Marine Paints Ltd..

UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials

UVHC8100: See Momentive Performance Materials

UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot.

UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See
 Red Spot.

UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red
 Spot

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coating Manufacturer in Alphabetical Order



Information on PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No.180C was tested on lupilon ML-300 R591B clear only.



FUJIKURA KASEI

Information on: FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkcasei.co.jp

Note: FUJIHARD HH2540U series, HH2551U series, HH2561U series and HH2570U series were tested on ML-300 clear only

Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on ML-300 and ML-350 clear only.



Information on UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Building V7
 51368 Leverkusen
 Germany

Momentive Performance Materials Inc.
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on ML-300 clear only

Note: UVHC8100 was tested on clear lupilon ML-300 and lupilon ML-350

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on IUPILON COAT UV may be obtained by writing to the following address:

Mitsubishi Engineering Plastics Corp.
 Plastics Sales Department
 5-2, Marunouchi 2-Chome
 Chiyoda-Ku, Tokyo
 Japan
www.m-ep.co.jp



**MITSUBISHI
 CHEMICAL
 GROUP**

Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-700, Acryking PH-710 Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A, and Acryking PH-930 may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-1 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking PH-700, PH-710, Acryking PH-720, PH-750 Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 were tested on clear ML-300 only



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
 2-14-1 Shodai-Ohtani
 Hirakata-City, Osaka 573-1153
 Japan
 Phone: +81-72-857-5530
 Fax: +81-72-857-5640
 Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Iupilon ML-300 and ML-350 clear.



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
 Yebis Garden Place Tower 20-3, Ebisu 4-Chome
 Shibuya-Ku, Tokyo 150-6019
 Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on ML-300 Clear in thicknesses 2.3-6.4 mm only

(Coating information continued on the next page)

MFR. **TRADE NAME AND**
FLOW FORMULATION **TYPE OF RESIN** **NUMBER** **COLOR**



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 is only acceptable on clear ML-300 and ML-350

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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ACRYVIEWA

Polymethyl
Methacrylate

RM-104-U1

Clear

Nippon Shokubai Co., Ltd.

www.shokubai.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Novacel Co., Ltd. https://novacel.co.jp/	Cevian N 080W	Styrene/ Acrylonitrile	01042 1Z026 1Z027 2Z010 2Z011 2Z012 2Z013 20385 20388	Red Red Red Yellow Yellow Yellow Yellow Yellow Yellow



Real Weathering Test Solutions

DEPLOYING PRECISION AND SPEED FOR REAL-WORLD RESULTS



AZTEST
arizona desert testing llc

SAE J 576 TESTING

AZTEST provides SAE J576 compliant testing services to meet automotive plastic lens material requirements as required by the Federal Motor Vehicle Safety Standard No. 571.108.

SAE J576 also allows accelerated testing in accordance with ASTM D 4364. This standard is based on ASTM Standard G 90, "Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight."

Accelerated and Natural Arizona and Florida Weathering tests are available, including all the required instrumental measurement and visual evaluations.

Federal Motor Vehicle Safety Standard No. 571.108, Lamps, Reflective Devices, and Associated Equipment requires the following tests:

TEST	REQUIREMENT
Material Thickness	Required thickness 1.6 mm, 2.3 mm, 3.2 mm, 6.4 mm
Heat Test	2 hours in circulating oven at 79 ± 3° C
Outdoor Weathering	3 years Arizona and Florida — SAE J576
Haze	After weathering, haze cannot exceed 30% as measured by ASTM D1003 for plastic materials used for outer lenses; 7% for plastic materials used as reflex reflectors or for lenses used in front of reflex reflectors.
Luminous Transmittance	After weathering, the luminous transmittance measured in accordance with ASTM E308 shall not have changed more than 25% compared to unexposed measurements.
Color	Must meet SAE J578 color specification before and after weathering
Visual Evaluations	After weathering, must not have color bleeding, delamination, crazing, or cracking. Materials used for reflex reflectors and for materials used in front of reflex materials must not have surface deterioration or dimensional changes.
Minimum number of specimens per material, coating and color type	20 specimens (Five of each thickness).



As an A2LA and AMECA accredited lab, AZTEST can perform all weathering tests required by AMECA and SAE specifications related to automotive lighting lens materials.

convenient : quick : secure

ORDER

How To Order

Contact AZTEST Customer Service at wsales@aztest.com for more information on how AZTEST can meet your specific test requirements. The sales team will provide guidance on how to create a test, ship your samples and set parameters to evaluate products.

TO CREATE AN ORDER:

- Go to www.aztest.com
- Click on "Download" at the top of the home page
- Select "Order Forms" from the drop down menu
- Select order form format
- Complete and submit to wsales@aztest.com

GUIDELINES FOR ORDERING, PACKING AND SHIPPING*:

From US locations—

- Carefully package test samples for shipment
- Non-fabric specimens should be wrapped in a soft paper product (we recommend Kimtech Kimwipes Delicate Task Wipers)
- Do not use newspaper
- Wrap entire package in bubble wrap and secure with tape
- Place package in sturdy box or container and fill gaps with packing material

From international locations—

- Follow US location packaging instructions above
- Complete a Commercial Invoice to accompany samples
- Assign a \$1.00 value on shipping documents (we recommend sample description as follows: "Test Samples. No Commercial Value")

*INSTRUCTIONS ALSO AVAILABLE AT www.AZTEST.COM

SEND PACKAGED SPECIMENS, ORDER FORM (OPTIONAL) AND PURCHASE ORDER TO:

Arizona Desert Testing LLC
21212 West Patton Road
Wittmann, Arizona 85361
USA


To contact AZTEST:

call: +1-623-388-9500
fax: +1-623-388-9007
e-mail: wsales@aztest.com
visit: www.aztest.com

write: 21212 West Patton Road
Wittmann, Arizona 85361
USA

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Plaskolite, Inc. www.plaskolite.com	CA-61	Polymethyl Methacrylate		Clear
	CA-71		RD 01	Red
	CA-75		RD 03	Red
	CA-82		RD 05	Red
	CA-924		RD 10	Red
	CA-927		RD 80	Red
	CA-1000E		RD 110	Red
	CA-1000I		RD 114	Red
	CP-61		RD 117	Red
	CP-71		RD 125	Red
	CP-75		RD 126	Red
	CP-82		RD 128	Red
	CP-86		RD 145	Red
	CP-86 UVA		RD 169	Red
	CP-924		RD 171	Red
	CP-927		RD 176	Red
	CP-1000E		RD 180	Red
	CP-1000I		RD 181	Red
			RD 187	Red
			RD 188	Red
			RD 189	Red
			RD 190	Red
			RD 191	Red
			RD 192	Red
			RD 195	Red
			YL 07	Yellow
			YL 12	Yellow
			YL 48	Yellow
			YL 64	Yellow
			YL 87	Yellow
			YL 90	Yellow
			YL 91	Yellow
			YL 99	Yellow
			YL 102	Yellow
			YL 130	Yellow
			YL 131	Yellow
			YL 133	Yellow
			YL 198	Yellow
	BL 35	Blue		
	BL 92	Blue		
	BL 142	Blue		
	GY 58102	Gray		
	GY 58200	Gray		
	GY 58240	Gray		

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Plaskolite, Inc. www.plaskolite.com	PL-30 MS983	Polymethyl Methacrylate	NC 10	Clear
			RD 01	Red
			RD 03	Red
			RD 05	Red
			RD 10	Red
			RD 80	Red
			RD 110	Red
			RD 114	Red
			RD 117	Red
			RD 125	Red
			RD 126	Red
			RD 128	Red
			RD 145	Red
			RD 169	Red
			RD 171	Red
			RD 176	Red
			RD 180	Red
			RD 181	Red
			RD 187	Red
			RD 188	Red
			RD 189	Red
			RD 190	Red
			RD 191	Red
			RD 192	Red
			RD 195	Red
			YL 07	Yellow
			YL 12	Yellow
			YL 48	Yellow
			YL 64	Yellow
			YL 87	Yellow
			YL 90	Yellow
			YL 91	Yellow
			YL 99	Yellow
YL 102	Yellow			
YL 130	Yellow			
YL 131	Yellow			
YL 133	Yellow			
YL 198	Yellow			
BL 35	Blue			
BL 95	Blue			
BL 142	Blue			
GY 58102	Gray			
GY 58200	Gray			
GY 58240	Gray			

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
 COMPOSITES 3A Composites www.3acomposites.com (Formerly Polycasa GmbH)	POLYCASA ACRYL G 77	Polymethyl Methacrylate	KK 000	Clear
	POLYCASA ACRYL G 77E		RT 011	Red
	POLYCASA ACRYL G 87E	RT 014	Red	
	POLYCASA ACRYL G 88	RT 018	Red	
	POLYCASA ACRYL G 88E	RT 045	Red	
	POLYCASA ACRYL G 88 Q11	RT 049	Red	
	POLYCASA ACRYL G 88 Q18	RT 050	Red	
	POLYCASA ACRYL KR 2006/1	RT 051	Red	
	POLYCASA ACRYL KR 2007/1	RT 053	Red	
	POLYCASA ACRYL KR 2008/1	RT 055	Red	
		RT 057	Red	
		RT 058	Red	
		RT 059	Red	
		RT 060	Red	
		RT 063	Red	
		RT 064	Red	
		RT 066	Red	
		RT 067	Red	
		RT 068	Red	
		RT 070	Red	
		RT 071	Red	
		RT 072	Red	
		RT 074	Red	
		RT 075	Red	
		RT 076	Red	
		RT 079	Red	
	RT 080	Red		
	OR 002	Yellow		
	OR 005	Yellow		
	OR 007	Yellow		
	OR 008	Yellow		
	OR 013	Yellow		
	OR 028	Yellow		
	OR 037	Yellow		
	OR 050	Yellow		
	OR 072	Yellow		
	OR 078	Yellow		

MFR.**POLYMER BASE****PRODUCT NAME****COLOUR-CODE****RÖHM**TRADITIONALLY
INNOVATIVERoehm America LLC
Röhm GmbH
Roehm Chemical
(Shanghai) Co., Ltdwww.roehm.com
<http://www.acrylite-polymers.com/>
www.Plexiglas.de

(Was Evonik)

PMMA ACRYLITE®/ PLEXIGLAS® unmodified base resins	7N	Clear -- 000 001 9V913
	7M	
	7H	
	H15	
	8N	
PMMA ACRYLITE®/ PLEXIGLAS® Optical	8H	Neutral 543A
	HT	Yellow 13025 23085 1V400 2V404
PMMA ACRYLITE®/ PLEXIGLAS® proTerra	AG100	Amber 23340 23095 23335 13115 23105 2V401 115 Red 3V137 3V136 3V126 3V125 33661 33681 33780(901) 33721 33711 33701 33691 3V401 3V402 3V403 3V408 Green 65122 65542
	AG100 L02	
	8N plus	
	zk4BR	
	zk5BR	
	zk6BR	
	zk6	
	zk20	
	Resist	
	zk30	
	(impact modified) grades	
	zk40	
	zkM	
	zk3BR	
	zk4HC	
	zk5HT	
	zk6HT	
PMMA ACRYLITE®/ PLEXIGLAS® Heatresist	hw55	
	FT15	
PMMI ACRYMID® PLEXIMID®	TT50	
PMMA for edge lighting ACRYLITE®/ PLEXIGLAS® Edgelight	8N LD12	
	8N LD24	
	8N LD48	
	8N LD96	

Note: 8N LD12 cannot be used on or in
front of a reflex reflector**Gray**7V274
7V275
7V273
7V271
7V272
7V270
7V269
7V268
7V265
7V205
7V336
7V337
7V338
7V244
75451
77670
7V244

MFR.

POLYMER BASE

PRODUCT NAME

COLOUR-CODE

Coated Roehm plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

PHC XH100P: See Momentive Materials

Coating Manufacturer in Alphabetical Order




Information on PHC XH100P hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

Note: PHC XH100P tested on Acrylite Resist AG100 clear only

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
 Sabic USA www.sabic.com	LEXAN® LS-1	Polycarbonate	111	White #!
	LEXAN® LS-1A		111C	White #!
	LEXAN® LS-2		111H	White #!
	LEXAN® LS-2A		111J	White #!
	LEXAN® LS-3		111M	White #!
	LEXAN® LSHF (HIGH FLOW)		111S	White #!
	(coated or uncoated)		112	White #!
			51073	Smoke Grey #!
			71127	Smoke Grey #!
			71194	Smoke Grey #!
			71274	Smoke Grey #!
			GY3A578T	Smoke Grey #!
			6111	Red #!
			6162	Red #!
	6164	Red #!		
	61014	Red #!		
	61079	Red #!		
	61228	Red #!		
	414	Yellow #!		
	4135	Yellow #!		
	4158	Yellow #!		
	4168	Yellow #!		
	4169	Yellow #!		
	4173	Yellow #!		
	4194	Yellow #!		
	41105	Yellow #!		
	41152	Yellow #!		
	YW 5005T	Yellow #!		
	21242	Clear Blue #!		
	2148	Clear Blue #!		

Note: LEXAN® Protected Applications were tested behind Coated LS-2-111 Clear

Coated Sabic USA plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings: See Mitsubishi Chemical Corporation

FUJIHARD 2500: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
	FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3372U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3401U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei Co., Ltd.			
	FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, FUJISOFT 2604 coatings: See Fujikura Kasei Co., Ltd.			
	KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100: See KCC Corporation			
	LHP100/LHC100, LHP100/AS4000: See Momentive Performance Materials Inc.			
	MODIHARD 200S: See NOF Corporation			
	NIPPE UVI Coat UT-1678: See Nippon Paint Automotive Coatings Co., Ltd.			
	PHOLUCID No. 130C and PHOLUCID No.180C: See Chugoku Marine Paints, Ltd.			
	PHC200, PHC587, PHC587B, PHC587C, PHC587C2: See Momentive Performance Materials Inc.			
	RayGloss 402: See BASF Coatings GmbH			
	SH-2, SH-41, SH-50 and SH-51: See Stanley Electric Co., Ltd.			
	SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000: See Momentive Performance Materials Inc.			
	UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials Inc.			
	UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot.			
	UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.			
	UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red Spot			
	X-48-5500-A18: See Shin-Etsu Chemical Co., Ltd.			

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coating Manufacturer in Alphabetical Order

Information on RayGloss 402 coatings may be obtained by writing:



BASF Coatings GmbH
 ECO/DT - C422
 D-48165 Muenster
 Germany
www.basf-coatings.com



Information on PHOLUCID No. 130C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No. 130C and PHOLUCID No.180C were tested on Sabic LS-1 111 and Sabic LS-1 111J and Sabic LS-1 111J clear only.



FUJIKURA KASEI

Information on FUJIHARD 2500, FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, and FUJISOFT 2604 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJISOFT 2601 may NOT be used on lenses incorporating a reflex reflector or in front of a reflex reflector.
 Note: FUJIHARD HH2566U-series and HH2567U-series were tested on clear lenses only.
 Note: FUJIHARD HH2540U-series, FUJIHARD HH2570U-series, FUJIHARD HH2561U-series and FUJIHARD HH9986U-series were tested on clear LS-2 plastics only
 Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on LS-1 111 and LS-2 111 only.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000 and KUV-9100 coatings may be obtained by writing:

KCC Corporation
83 Mabook-Dong, Giheung-Gu,
Yongin-Si, Gyunggi-Do
South Korea
www.kccworld.co.kr

Note: KUV-3000, KUV-4000, KUV-5000, KUV-6000, and KUV-9100 were tested on Sabic LS1-111 and LS2-111 clear only.

Note: KUV-1000, and KUV-2000 is suitable for over 6.4 mm LS2-111 clear lenses only.



MITSUBISHI CHEMICAL GROUP Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: Acryking PH-350 was tested on LS-2 with clear lenses only

Note: Acryking PH-710 and Acryking PH-720 were tested on LS-1 and LS-2 with clear lenses only

Note: Acryking PH-511, Acryking PH-700, Acryking PH-800 and Acryking PH-800N5A were tested on LS-1-111 and LS-2-111

Note: LS-1-111J was tested with Acryking PH-710, Acryking PH-720, and Acryking PH-800 only.

Note: Acryking PH-930 was tested on Clear LS-1 111 and LS-2 111 only



Information on LHP100/LHC100, LHP100/AS4000, SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000, PHC200, PHC587, PHC587B, PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50,

UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on LS1 and LS2 clear only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
 Yebis Garden Place Tower 20-3, Ebisu 4-Chome
 Shibuya-Ku, Tokyo 150-6019
 Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on SABIC LS-1 111 Clear in thicknesses 1.6 and 6.4 mm only



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
 2-14-1 Shodai-Ohtani
 Hirakata-City, Osaka 573-1153
 Japan
 Phone: +81-72-857-5530
 Fax: +81-72-857-5640
 Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Lexan LS1-111 and LS2-111.



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
 P.O. Box 418
 Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on clear LS-1, and LS-2



Information of X-48-5500-A18 hard coat may be obtained by writing to the following address:

Shin-Etsu Chemical Co., Ltd.
 4-1, Marunouchi 1-Chome
 Chiyoda-ku, Tokyo 100-0005,
 Japan
www.shinetsu.co.jp


Note: X-48-5500-A18 was tested on SABIC LS1 clear only.
 (Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on SH-2, SH-41, SH-50 and SH-51 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153,
Japan
www.stanley.co.jp

Note: Stanley SH-51 tested on Sabic LS-2 clear only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
 Sabic Brazil www.sabic.com	LEXAN® LS-1	Polycarbonate	111	White #!
	LEXAN® LS-1A		111C	White #!
	LEXAN® LS-2		111H	White #!
	LEXAN® LS-2A		111J	White #!
	LEXAN® LS-3		111M	White #!
	LEXAN® LSHF (HIGH FLOW) (coated or uncoated)		111S	White #!
			112	White #!
			51073	Smoke Grey #!
			71127	Smoke Grey #!
			71194	Smoke Grey #!
			71274	Smoke Grey #!
			GY3A578T	Smoke Grey #!
			6111	Red #!
			6162	Red #!
			6164	Red #!
			61014	Red #!
			61079	Red #!
	61228	Red #!		
	414	Yellow #!		
	4135	Yellow #!		
	4158	Yellow #!		
	4168	Yellow #!		
	4169	Yellow #!		
	4173	Yellow #!		
	4194	Yellow #!		
	41105	Yellow #!		
	41152	Yellow #!		
	YW 5005T	Yellow #!		
	21242	Clear Blue #!		

Coated Sabic Brazil plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings: See Mitsubishi Chemical Corporation

FUJIHARD 2500: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei Co., Ltd.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
	FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3372U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3401U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei Co., Ltd.			
	FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, FUJISOFT 2604 coatings: See Fujikura Kasei Co., Ltd.			
	KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100: See KCC Corporation			
	LHP100/LHC100, LHP100/AS4000: See Momentive Performance Materials Inc.			
	NIPPE UVI Coat UT-1678: See Nippon Paint Automotive Coatings Co., Ltd.			
	PHOLUCID No. 130C and PHOLUCID No.180C: See Chugoku Marine Paints, Ltd.			
	PHC200, PHC587, PHC587B, PHC587C, PHC587C2: See Momentive Performance Materials Inc.			
	RayGloss 402: See BASF Coatings GmbH			
	SH-2, SH-41, SH-50 and SH-51: See Stanley Electric Co., Ltd.			
	SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000: See Momentive Performance Materials Inc.			
	UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials Inc.			
	UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot.			
	UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.			
	UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red Spot			
	X-48-5500-A18: See Shin-Etsu Chemical Co., Ltd.			

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coating Manufacturer in Alphabetical Order

Information on RayGloss 402 coatings may be obtained by writing:



BASF Coatings GmbH
 ECO/DT - C422
 D-48165 Muenster
 Germany
www.basf-coatings.com

Note: BASF RayGloss 402 was tested on LEXAN® LS-1 and LEXAN® LS-2 clear only.



Information on PHOLUCID No. 130C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: 81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No. 130C and PHOLUCID No.180C were tested on Sabic LS-1 111 and Sabic LS-1 111J and Sabic LS-1 111J clear only.



FUJIKURA KASEI

Information on FUJIHARD 2500, FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1,

FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, and FUJISOFT 2604 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJISOFT 2601 may NOT be used on lenses incorporating a reflex reflector or in front of a reflex reflector.
 Note: FUJIHARD HH2566U-series and FUJIHARD HH2567U-series for use on clear lenses only
 Note: FUJIHARD HH2540U-series, FUJIHARD HH2570U-series, FUJIHARD HH2561U-series and FUJIHARD HH9986U-series is for use on clear LS-2 plastics only.
 Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on LS-1 111 and LS-2 111 only.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000 and KUV-9100 coatings may be obtained by writing:

KCC Corporation
 83 Mabook-Dong, Giheung-Gu,
 Yongin-Si, Gyunggi-Do
 South Korea
www.kccworld.co.kr

Note: KUV-3000, KUV-4000, KUV-5000, KUV-6000, and KUV-9100 were tested on Sabic LS1-111 and LS2-111 clear only.

Note: KUV-1000, and KUV-2000 is suitable for over 6.4 mm LS2-111 clear lenses only.



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Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-2 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking PH-350 was tested on LS-2 with clear lenses only

Note: Acryking PH-710 and Acryking PH-720 was tested on LS-1 and LS-2 with clear lenses only

Note: Acryking PH-511, Acryking PH-700, Acryking PH-800 and Acryking PH-800N5A was tested on LS-1-111 and LS-2-111

Note: LS-11-111J was tested with Acryking PH-710, Acryking PH-720, and Acryking PH-800 only.

Note: Acryking PH-930 was tested on Clear LS-1 111 and LS-2 111 only



Information on LHP100/LHC100, LHP100/AS4000, SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000, PHC200, PHC587, PHC587B, PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50,

UVHC3000KZ60 UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Building V7
 51368 Leverkusen
 Germany

Momentive Performance Materials Inc.
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on LS1 and LS2 clear only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
2-14-1 Shodai-Ohtani
Hirakata-City, Osaka 573-1153
Japan
Phone: +81-72-857-5530
Fax: +81-72-857-5640
Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Lexan LS1-111 and LS2-111.



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
Yebis Garden Place Tower
20-3, Ebisu 4-Chome
Shibuya-Ku, Tokyo 150-6019
Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on SABIC LS-1 111 Clear in thicknesses 1.6 and 6.4 mm only



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on clear LS-1, and LS-2

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information of X-48-5500-A18 hard coat may be obtained by writing to the following address:


Shin-Etsu Chemical Co., Ltd.
4-1, Marunouchi 1-Chome
Chiyoda-ku, Tokyo 100-0005,
Japan
www.shinetsu.co.jp

Note: X-48-5500-A18 was tested on SABIC LS1 clear only.

Information on SH-2, SH-41, SH-50 and SH-51 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: Stanley SH-51 tested on Sabic LS-2 clear only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
 Sabic Plastics, Nansha China www.sabic.com	LEXAN® LS-1	Polycarbonate	111	White #!
	LEXAN® LS-1A		111C	White #!
	LEXAN® LS-2		111H	White #!
	LEXAN® LS-2A		111HX	White Q
	LEXAN® LS-3		111M	White #!
	LEXAN® LSHF (HIGH FLOW) (coated or uncoated)		111S	White #!
			112	White #!
			51073	Smoke Grey
			71127	Smoke Grey #!
			71194	Smoke Grey #!
			71274	Smoke Grey #!
			GY3A578T	Smoke Grey #!
			6111	Red #!
			6162	Red #!
			6164	Red #!
			61014	Red #!
			61079	Red #!
			61228	Red #!
			RD4B057T	Red #!
			414	Yellow #!
			4135	Yellow #!
			4158	Yellow #!
			4168	Yellow #!
			4169	Yellow #!
			4173	Yellow #!
			4194	Yellow #!
			41105	Yellow #!
	41152	Yellow #!		
	YW 5005T	Yellow #!		
	21242	Clear Blue #!		
	2148	Clear Blue #!		
	LEXAN® XLS 1110 Protected Application Only	11204	Natural "!"	
	LEXAN® XLS 1210 Protected Application Only	NA9G165T	Clear blue "!"	
		NA9H009T	Clear blue "!"	

Note: LEXAN® Protected Applications were tested behind Coated LS-2-111 Clear

Coated Sabic Nansha, China plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings: See Mitsubishi Chemical Corporation

FUJIHARD 2500: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei Co., Ltd.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
	FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3372U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3401U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei Co., Ltd.			
	FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, FUJISOFT 2604 coatings: See Fujikura Kasei Co., Ltd.			
	KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100: See KCC Corporation			
	LHP100/LHC100, LHP100/AS4000: See Momentive Performance Materials Inc.			
	MODIHARD 200S: See NOF Corporation.			
	NIPPE UVI Coat UT-1678: See Nippon Paint Automotive Coatings Co., Ltd.			
	PHOLUCID No. 130C and PHOLUCID No.180C: See Chugoku Marine Paints, Ltd.			
	PHC200, PHC587, PHC587B, PHC587C, PHC587C2: See Momentive Performance Materials Inc.			
	RayGloss 402: See BASF Coatings GmbH			
	SH-2, SH-41, SH-50 and SH-51: See Stanley Electric Co., Ltd.			
	SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000: See Momentive Performance Materials Inc.			
	UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials Inc.			
	UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot.			
	UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.			

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red Spot

X-48-5500-A18: See Shin-Etsu Chemical Co., Ltd.

Coating Manufacturer in Alphabetical Order

Information on RayGloss 402 coatings may be obtained by writing:



BASF Coatings GmbH
 ECO/DT - C422
 D-48165 Muenster
 Germany
www.basf-coatings.com

Note: BASF RayGloss 402 was tested on LEXAN® LS-1 and LEXAN® LS-2 clear only.



Information on PHOLUCID No. 130C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: 81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No. 130C and PHOLUCID No.180C were tested on Sabic LS-1 111 and Sabic LS-1 111J and Sabic LS-1 111J clear only.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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FUJIKURA KASEI

Information on FUJIHARD 2500, FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, and FUJISOFT 2604 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJISOFT 2601 may NOT be used on lenses incorporating a reflex reflector or in front of a reflex reflector.
 Note: FUJIHARD HH2566U-series and FUJIHARD HH2567U-series for use on clear lenses only
 Note: FUJIHARD HH2540U-series, FUJIHARD HH2570U-series, FUJIHARD HH2561U-series and FUJIHARD HH9986U-series is for use on clear LS-2 plastics only
 Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on LS-1 111 and LS-2 111 only.



Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000 and KUV-9100 coatings may be obtained by writing:

KCC Corporation
 83 Mabook-Dong, Giheung-Gu,
 Yongin-Si, Gyunggi-Do
 South Korea
www.kccworld.co.kr

Note: KUV-3000, KUV-4000, KUV-5000, KUV-6000, and KUV-9100 were tested on Sabic LS1-111 and LS2-111 clear only.
 Note: KUV-1000, and KUV-2000 is suitable for over 6.4 mm LS2-111 clear lenses only.



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 CHEMICAL
 GROUP**

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-3 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking PH-350 was tested on LS-2 with clear lenses only
 Note: Acryking PH-710 and Acryking PH-720 was tested on LS-1 and LS-2 with clear lenses only
 Note: Acryking PH-511, Acryking PH-700, Acryking PH-800 and Acryking PH-800N5A was tested on LS-1-111 and LS-2-111
 Note: LS-1-111J was tested with Acryking PH-710, Acryking PH-720, and Acryking PH-800 only.
 Note: Acryking PH-930 was tested on Clear LS-1 111 and LS-2 111 only

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on LHP100/LHC100, LHP100/AS4000, SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000, PHC200, PHC587, PHC587B, PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50,

UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Building V7
 51368 Leverkusen
 Germany

Momentive Performance Materials Inc.
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on LS1 and LS2 clear only



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
 2-14-1 Shodai-Ohtani
 Hirakata-City, Osaka 573-1153
 Japan
 Phone: +81-72-857-5530
 Fax: +81-72-857-5640
 Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Lexan LS1-111 and LS2-111.



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
 Yebis Garden Place Tower 20-3, Ebisu 4-Chome
 Shibuya-Ku, Tokyo 150-6019
 Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on SABIC LS-1 111 Clear in thicknesses 1.6 and 6.4 mm only

(Coating information continued on the next page)

MFR. **TRADE NAME AND**
FLOW FORMULATION **TYPE OF RESIN** **NUMBER** **COLOR**



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on clear LS-1, and LS-2



Information of X-48-5500-A18 hard coat may be obtained by writing to the following address:


Shin-Etsu Chemical Co., Ltd.
4-1, Marunouchi 1-Chome
Chiyoda-ku, Tokyo 100-0005,
Japan
www.shinetsu.co.jp

Note: X-48-5500-A18 was tested on SABIC LS1 clear only.

Information on SH-2, SH-41, SH-50 and SH-51 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153,
Japan
www.stanley.co.jp

Note: Stanley SH-51 tested on Sabcis LS-2 clear only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
 <p>Sabic Shanghai China</p> <p>www.sabic.com</p>	LEXAN® LS-1	Polycarbonate	111	White #!
	LEXAN® LS-1A		111C	White #!
	LEXAN® LS-2		111H	White #!
	LEXAN® LS-2A		111HX	White Q
	LEXAN® LS-3		111M	White #!
	LEXAN® LSHF (HIGH FLOW) (coated or uncoated)		111S	White #!
			112	White #!
			51073	Smoke Grey
			71127	Smoke Grey #!
			71194	Smoke Grey #!
			71274	Smoke Grey #!
			GY3A578T	Smoke Grey #!
			6111	Red #!
			6162	Red #!
			6164	Red #!
			61014	Red #!
			61079	Red #!
			61228	Red #!
			RD4B057T	Red #!
			414	Yellow #!
			4135	Yellow #!
			4158	Yellow #!
			4168	Yellow #!
			4169	Yellow #!
			4173	Yellow #!
			4194	Yellow #!
			41105	Yellow #!
	41152	Yellow #!		
	YW 5005T	Yellow #!		
	21242	Clear Blue #!		
	2148	Clear Blue #!		
		11204	Natural "!"	
	LEXAN® XLS 1110 Protected Application Only	NA9G165T	Clear blue "!"	
	LEXAN® XLS 1210 Protected Application Only	NA9H009T	Clear blue "!"	

Coated Sabic Shanghai, China plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings: See Mitsubishi Chemical Corporation

FUJIHARD 2500: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9:	See Fujikura Kasei Co., Ltd.			
FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3:	See Fujikura Kasei Co., Ltd.			
FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3:	See Fujikura Kasei Co., Ltd.			
FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2:	See Fujikura Kasei Co., Ltd.			
FUJIHARD HH3372U:	See Fujikura Kasei Co., Ltd.			
FUJIHARD HH3401U:	See Fujikura Kasei Co., Ltd.			
FUJIHARD HH3482U:	See Fujikura Kasei Co., Ltd.			
FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7:	See Fujikura Kasei Co., Ltd.			
FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, FUJISOFT 2604 coatings:	See Fujikura Kasei Co., Ltd.			
KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100:	See KCC Corporation			
LHP100/LHC100, LHP100/AS4000:	See Momentive Performance Materials Inc.			
MODIHARD 200S:	See NOF Coatings			
NIPPE UVI Coat UT-1678:	See Nippon Paint Automotive Coatings Co., Ltd.			
PHOLUCID No. 130C and PHOLUCID No.180C:	See Chugoku Marine Paints, Ltd.			
PHC200, PHC587, PHC587B, PHC587C, PHC587C2:	See Momentive Performance Materials Inc.			
RayGloss 402:	See BASF Coatings GmbH			
SH-2, SH-41, SH-50 and SH-51:	See Stanley Electric Co., Ltd.			
SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000:	See Momentive Performance Materials Inc.			
UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1:	See Momentive Performance Materials Inc.			
UVT200V1, UVT200V2, UVT200V3 and UVT200V5:	See Red Spot.			
UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8:	See Red Spot.			
UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8:	See Red Spot			
X-48-5500-A18:	See Shin-Etsu Chemical Co., Ltd.			

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coating Manufacturer in Alphabetical Order

Information on RayGloss 402 coatings may be obtained by writing:



BASF Coatings GmbH
 ECO/DT - C422
 D-48165 Muenster
 Germany
www.basf-coatings.com

Note: BASF RayGloss 402 was tested on LEXAN® LS-1 and LEXAN® LS-2 clear only.



Information on PHOLUCID No. 130C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No. 130C and PHOLUCID No.180C were tested on Sabic LS-1 111 and Sabic LS-1 111J and Sabic LS-1 111J clear only.



FUJIKURA KASEI

Information on FUJIHARD 2500, FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD

HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, and FUJISOFT 2604 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJISOFT 2601 may NOT be used on lenses incorporating a reflex reflector or in front of a reflex reflector.
 Note: FUJIHARD HH2566U-series and FUJIHARD HH2567U-series for use on clear lenses only
 Note: FUJIHARD HH2540U-series, FUJIHARD HH2570U-series, FUJIHARD HH2561U-series and FUJIHARD HH9986U-series is for use on clear LS-2 plastics only
 Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on LS-1 111 and LS-2 111 only.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000 and KUV-9100 coatings may be obtained by writing:

KCC Corporation
83 Mabook-Dong, Giheung-Gu,
Yongin-Si, Gyunggi-Do,
South Korea
www.kccworld.co.kr

Note: KUV-3000, KUV-4000, KUV-5000, KUV-6000, and KUV-9100 were tested on Sabic LS1-111 and LS2-111 clear only.

Note: KUV-1000, and KUV-2000 is suitable for over 6.4 mm LS2-111 clear lenses only.



**MITSUBISHI
CHEMICAL
GROUP**

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-4 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: Acryking PH-350 was tested on LS-2 with clear lenses only

Note: Acryking PH-710 and Acryking PH-720 were tested on LS-1 and LS-2 with clear lenses only

Note: Acryking PH-511, Acryking PH-700, Acryking PH-800 and Acryking PH-800N5A were tested on LS-1-111 and LS-2-111

Note: LS-1-111J was tested with Acryking PH-710, Acryking PH-720, and Acryking PH-800 only.

Note: Acryking PH-930 was tested on Clear LS-1 111 and LS-2 111 only



Information on LHP100/LHC100, LHP100/AS4000, SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000, PHC200, PHC587, PHC587B, PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50,

UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on LS1 and LS2 clear only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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NOF

Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
Yebis Garden Place Tower 20-3, Ebisu 4-Chome
Shibuya-Ku, Tokyo 150-6019
Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on SABIC LS-1 111 Clear in thicknesses 1.6 and 6.4 mm only



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
2-14-1 Shodai-Ohtani
Hirakata-City, Osaka 573-1153
Japan
Phone: +81-72-857-5530
Fax: +81-72-857-5640
Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Lexan LS1-111 and LS2-111.



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on clear LS-1, and LS-2



Information of X-48-5500-A18 hard coat may be obtained by writing to the following address:

Shin-Etsu Chemical Co., Ltd.
4-1, Marunouchi 1-Chome
Chiyoda-ku, Tokyo 100-0005,
Japan
www.shinetsu.co.jp

Note: X-48-5500-A18 was tested on SABIC LS1 clear only.


(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on SH-2, SH-41, SH-50 and SH-51 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: Stanley SH-51 tested on Sabic LS-2 clear only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
 Sabic Europe www.sabic.com	LEXAN® LS-1	Polycarbonate	111	White #!
	LEXAN® LS-1A		111C	White #!
	LEXAN® LS-2		111H	White #!
	LEXAN® LS-2A		111HX	White #!
	LEXAN® LS-3		111J	White #!
	LEXAN® LSHF (HIGH FLOW) (coated or uncoated)		111M	White #!
			111S	White #!
			111X	White #!
			112	White #!
			51073	Smoke Grey #!
			71127	Smoke Grey #!
			71194	Smoke Grey #!
			71274	Smoke Grey #!
			GY3A578T	Smoke Grey #!
			6111	Red #!
			6162	Red #!
			6164	Red #!
			61014	Red #!
			61079	Red #!
			61228	Red #!
			414	Yellow #!
	4135	Yellow #!		
	4158	Yellow #!		
	4168	Yellow #!		
	4169	Yellow #!		
	4173	Yellow #!		
	4194	Yellow #!		
	41105	Yellow #!		
	41152	Yellow #!		
	YW 5005T	Yellow #!		
	21242	Clear Blue #!		
	2148	Clear Blue #!		
	LEXAN® XLS 1110T Protected Application Only	11204	Natural "!"	
	LEXAN® XLS 1110 Protected Application Only	11204	Natural "!"	
	LEXAN® XLS 1210 Protected Application Only	NA9G165T	Clear Blue "!"	
		NA9H009T	Clear Blue "!"	

Note:LEXAN® Protected Applications were tested behind Coated LS-2-111 Clear

Note: LS-1-111J was tested with Acryking PH-710, Acryking PH-720, and Acryking PH-800 only

Coated Sabic Europe plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings: See Mitsubishi Chemical Corporation

FUJIHARD 2500: See Fujikura Kasei Co., Ltd.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
	FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3372U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3401U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.			
	FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei Co., Ltd.			
	FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, FUJISOFT 2604 coatings: See Fujikura Kasei Co., Ltd.			
	KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100: See KCC Corporation			
	LHP100/LHC100, LHP100/AS4000: See Momentive Performance Materials Inc.			
	MODIHARD 200S: See NOF Coatings			
	NIPPE UVI Coat UT-1678: See Nippon Paint Automotive Coatings Co., Ltd.			
	PHOLUCID No. 130C and PHOLUCID No.180C: See Chugoku Marine Paints, Ltd.			
	PHC200, PHC587, PHC587B, PHC587C, PHC587C2: See Momentive Performance Materials Inc.			
	RayGloss 402: See BASF Coatings GmbH			
	SH-2, SH-41, SH-50 and SH-51: See Stanley Electric Co., Ltd.			
	SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000: See Momentive Performance Materials Inc.			
	UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials Inc.			
	UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot.			

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8:				See Red Spot.
UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8:				See Red Spot
X-48-5500-A18:				See Shin-Etsu Chemical Co., Ltd.

Coating Manufacturer in Alphabetical Order

Information on RayGloss 402 coatings may be obtained by writing:



BASF Coatings GmbH
 ECO/DT - C422
 D-48165 Muenster
 Germany
www.basf-coatings.com

Note: BASF RayGloss 402 was tested on LEXAN® LS-1 and LEXAN® LS-2 clear only.



Information on PHOLUCID No. 130C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No. 130C and PHOLUCID No.180C were tested on Sabic LS-1 111 and Sabic LS-1 111J and Sabic LS-1 111J clear only.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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FUJIKURA KASEI

Information on FUJIHARD 2500, FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, and FUJISOFT 2604 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
6-15 Shibakoen 2-Chome
Minato-Ku, Tokyo 105-0011
Japan
www.fkkasei.co.jp

Note: FUJISOFT 2601 may NOT be used on lenses incorporating a reflex reflector or in front of a reflex reflector.
Note: FUJIHARD HH2566U-series and FUJIHARD HH2567U-series for use on clear lenses only
Note: FUJIHARD HH2540U-series, FUJIHARD HH2570U-series, FUJIHARD HH2561U-series and FUJIHARD HH9986U-series is for use on clear LS-2 plastics only
Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on LS-1 111 and LS-2 111 only.



Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000 and KUV-9100 coatings may be obtained by writing:

KCC Corporation
83 Mabook-Dong, Giheung-Gu,
Yongin-Si, Gyunggi-Do
South Korea
www.kccworld.co.kr

Note: KUV-3000, KUV-4000, KUV-5000, KUV-6000, and KUV-9100 were tested on Sabic LS1-111 and LS2-111 clear only.
Note: KUV-1000, and KUV-2000 is suitable for over 6.4 mm LS2-111 clear lenses only.



**MITSUBISHI
CHEMICAL
GROUP**

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-5 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: Acryking PH-350 was tested on LS-2 with clear lenses only
Note: Acryking PH-710 and Acryking PH-720 were tested on LS-1 and LS-2 with clear lenses only
Note: Acryking PH-511, Acryking PH-700, Acryking PH-800 and Acryking PH-800N5A were tested on LS-1-111 and LS-2-111
Note: LS-1-111J was tested with Acryking PH-710, Acryking PH-720, and Acryking PH-800 only.
Note: Acryking PH-930 was tested on Clear LS-1 111 and LS-2 111 only
(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on LHP100/LHC100, LHP100/AS4000, SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000, PHC200, PHC587, PHC587B, PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50,

UVHC3000KZ60 UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Building V7
 51368 Leverkusen
 Germany

Momentive Performance Materials Inc.
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on LS1 and LS2 clear only



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
 2-14-1 Shodai-Ohtani
 Hirakata-City, Osaka 573-1153
 Japan
 Phone: +81-72-857-5530
 Fax: +81-72-857-5640
 Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Lexan LS1-111 and LS2-111.



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
 Yebis Garden Place Tower 20-3, Ebisu 4-Chome
 Shibuya-Ku, Tokyo 150-6019
 Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on SABIC LS-1 111 Clear in thicknesses 1.6 and 6.4 mm only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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PAINT & VARNISH COMPANY, INC.

Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on clear LS-1, and LS-2



Information of X-48-5500-A18 hard coat may be obtained by writing to the following address:


Shin-Etsu Chemical Co., Ltd.
4-1, Marunouchi 1-Chome
Chiyoda-ku, Tokyo 100-0005,
Japan
www.shinetsu.co.jp

Note: X-48-5500-A18 was tested on SABIC LS1 clear only.

Information on SH-2, SH-41, SH-50 and SH-51 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: Stanley SH-51 tested on Sabcic LS-2 clear only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
 www.sabic.com Sabic India	LEXAN® LS-1 Polycarbonate		111	White #!
	LEXAN® LS-1A		111H	White #!
	LEXAN® LS-2		111X	White #!
	LEXAN® LS-2A		6162	Red #!
	(coated or uncoated)		414	Yellow #!
			71127	Smoke Grey #!
			71194	Smoke Grey #!
			71274	Smoke Grey #!
			GY3A578T	Smoke Grey #!

Note: LEXAN® Protected Applications were tested behind Coated LS-2-111 Clear

Coated Sabic India plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings: See Mitsubishi Chemical Corporation

FUJIHARD 2500: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3372U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3401U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei Co., Ltd.

FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, FUJISOFT 2604 coatings: See Fujikura Kasei Co., Ltd.

KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100: See KCC Corporation

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
LHP100/LHC100, LHP100/AS4000:	See Momentive Performance Materials Inc.			
MODIHARD 200S:	See NOF Coatings			
NIPPE UVI Coat UT-1678:	See Nippon Paint Automotive Coatings Co., Ltd.			
PHOLUCID No. 130C and PHOLUCID No.180C:	See Chugoku Marine Paints, Ltd.			
PHC200, PHC587, PHC587B, PHC587C, PHC587C2:	See Momentive Performance Materials Inc.			
RayGloss 402:	See BASF Coatings GmbH			
SH-2, SH-41, SH-50 and SH-51:	See Stanley Electric Co., Ltd.			
SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000:	See Momentive Performance Materials Inc.			
UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1:	See Momentive Performance Materials Inc.			
UVT200V1, UVT200V2, UVT200V3 and UVT200V5:	See Red Spot.			
UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8:	See Red Spot.			
UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8:	See Red Spot			
X-48-5500-A18:	See Shin-Etsu Chemical Co., Ltd.			

Coating Manufacturer in Alphabetical Order

Information on RayGloss 402 coatings may be obtained by writing:



BASF Coatings GmbH
 ECO/DT - C422
 D-48165 Muenster
 Germany
www.basf-coatings.com

Note: BASF RayGloss 402 was tested on LEXAN® LS-1 and LEXAN® LS-2 clear only.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Information on PHOLUCID No. 130C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No. 130C and PHOLUCID No.180C were tested on Sabc LS-1 111 and Sabc LS-1 111J clear only.



FUJIKURA KASEI

Information on FUJIHARD 2500, FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD

HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, and FUJISOFT 2604 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJISOFT 2601 may NOT be used on lenses incorporating a reflex reflector or in front of a reflex reflector.
 Note: FUJIHARD HH2566U-series and FUJIHARD HH2567U-series for use on clear lenses only
 Note: FUJIHARD HH2540U-series, FUJIHARD HH2570U-series, FUJIHARD HH2561U-series and FUJIHARD HH9986U-series is for use on clear LS-2 plastics only
 Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on LS-1 111 and LS-2 111 only.



Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000 and KUV-6000 coatings may be obtained by writing:

KCC Corporation
 83 Mabook-Dong, Giheung-Gu,
 Yongin-Si, Gyunggi-Do
 South Korea
www.kccworld.co.kr

Note: KUV-3000, KUV-4000, KUV-5000, KUV-6000, and KUV-9100 were tested on Sabc LS1-111 and LS2-111 clear only.
 Note: KUV-1000, and KUV-2000 is suitable for over 6.4 mm LS2-111 clear lenses only.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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**MITSUBISHI
CHEMICAL
GROUP**

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-6 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: Acryking PH-350 was tested on LS-2 with clear lenses only

Note: Acryking PH-710 and Acryking PH-720 were tested on LS-1 and LS-2 with clear lenses only

Note: Acryking PH-511, Acryking PH-700, Acryking PH-800 and Acryking PH-800N5A were tested on LS-1-111 and LS-2-111

Note: LS-1-111J was tested with Acryking PH-710, Acryking PH-720, and Acryking PH-800 only.

Note: Acryking PH-930 was tested on Clear LS-1 111 and LS-2 111 only



Information on LHP100/LHC100, LHP100/AS4000, SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000, PHC200, PHC587, PHC587B, PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50,

UVHC3000KZ60 UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on LS1 and LS2 clear only



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
2-14-1 Shodai-Ohtani
Hirakata-City, Osaka 573-1153
Japan
Phone: +81-72-857-5530
Fax: +81-72-857-5640
Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Lexan LS1-111 and LS2-111.

(Coating information continued on the next page)

MFR. **TRADE NAME AND**
FLOW FORMULATION **TYPE OF RESIN** **NUMBER** **COLOR**



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
Yebis Garden Place Tower 20-3, Ebisu 4-Chome
Shibuya-Ku, Tokyo 150-6019
Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on SABIC LS-1 111 Clear in thicknesses 1.6 and 6.4 mm only



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on clear LS-1, and LS-2



Information of X-48-5500-A18 hard coat may be obtained by writing to the following address:


Shin-Etsu Chemical Co., Ltd.
4-1, Marunouchi 1-Chome
Chiyoda-ku, Tokyo 100-0005,
Japan
www.shinetsu.co.jp

Note: X-48-5500-A18 was tested on SABIC LS1 clear only.

Information on SH-2, SH-41, SH-50 and SH-51 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: Stanley SH-51 tested on Sabcis LS-2 clear only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
 www.sabic.com Sabic Japan	LEXAN® LS-1	Polycarbonate	111	White #!
	LEXAN® LS-1A		71194	Smoke Grey #!
	LEXAN® LS-2		71274	Smoke Grey #!
	LEXAN® LS-2A		6162	Red #!
	LEXAN® LS-3		6164	Red #!
	LEXAN® LSHF (HIGH FLOW)		61228	Red #!
	(coated or uncoated)		414	Yellow #!
			4158	Yellow#!
			2148	Yellow #!

Note:LEXAN® Protected Applications were tested behind Coated LS-2-111 Clear

Coated Sabic Japan plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings: See Mitsubishi Chemical Corporation

FUJIHARD 2500: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3372U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3401U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei Co., Ltd.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, FUJISOFT 2604 coatings: See Fujikura Kasei Co., Ltd.

KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100: See KCC Corporation

LHP100/LHC100, LHP100/AS4000: See Momentive Performance Materials Inc.

MODIHARD 200S: See NOF Coatings

NIPPE UVI Coat UT-1678: See Nippon Paint Automotive Coatings Co., Ltd.

PHOLUCID No. 130C and PHOLUCID No.180C: See Chugoku Marine Paints, Ltd.

PHC200, PHC587, PHC587B, PHC587C, PHC587C2: See Momentive Performance Materials Inc.

RayGloss 402: See BASF Coatings GmbH

SH-2, SH-41, SH-50 and SH-51: See Stanley Electric Co., Ltd.

SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000: See Momentive Performance Materials Inc.

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials Inc.

UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot.

UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.

UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red Spot

X-48-5500-A18: See Shin-Etsu Chemical Co., Ltd.

Coating Manufacturer in Alphabetical Order

Information on RayGloss 402 coatings may be obtained by writing:



BASF Coatings GmbH
 ECO/DT - C422
 D-48165 Muenster
 Germany
www.basf-coatings.com

Note: BASF RayGloss 402 was tested on LEXAN® LS-1 and LEXAN® LS-2 clear only.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on PHOLUCID No. 130C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No. 130C and PHOLUCID No.180C were tested on Sabic LS-1 111 and Sabic LS-1 111J clear only.



FUJIKURA KASEI

Information on FUJIHARD 2500, FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2,

FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, and FUJISOFT 2604 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJISOFT 2601 may NOT be used on lenses incorporating a reflex reflector or in front of a reflex reflector.
 Note: FUJIHARD HH2566U-series and FUJIHARD HH2567U-series for use on clear lenses only
 Note: FUJIHARD HH2540U-series, FUJIHARD HH2570U-series, FUJIHARD HH2561U-series and FUJIHARD HH9986U-series is for use on clear LS-2 plastics only
 Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on LS-1 111 and LS-2 111 only.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000 and KUV-9100 coatings may be obtained by writing:

KCC Corporation
 83 Mabook-Dong, Giheung-Gu
 Yongin-Si, Gyunggi-Do South
 Korea
www.kccworld.co.kr

Note: KUV-3000, KUV-4000, KUV-5000, KUV-6000, and KUV-9100 were tested on Sabic LS1-111 and LS2-111 clear only.

Note: KUV-1000, and KUV-2000 is suitable for over 6.4 mm LS2-111 clear lenses only.



**MITSUBISHI
 CHEMICAL
 GROUP**

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-7 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking PH-350 was tested on LS-2 with clear lenses only

Note: Acryking PH-710 and Acryking PH-720 were tested on LS-1 and LS-2 with clear lenses only

Note: Acryking PH-511, Acryking PH-700, Acryking PH-800 and Acryking PH-800N5A were tested on LS-1-111 and LS-2-111

Note: LS-1-111J was tested with Acryking PH-710, Acryking PH-720, and Acryking PH-800 only.

Note: Acryking PH-930 was tested on Clear LS-1 111 and LS-2 111 only



Information on LHP100/LHC100, LHP100/AS4000, SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000, PHC 200, PHC587, PHC587B, PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50,

UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Materials Inc. Building V7
 51368 Leverkusen
 Germany

Momentive Performance
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on LS1 and LS2 clear only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
2-14-1 Shodai-Ohtani
Hirakata-City, Osaka 573-1153
Japan
Phone: +81-72-857-5530
Fax: +81-72-857-5640
Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Lexan LS1-111 and LS2-111.



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
Yebis Garden Place Tower 20-3, Ebisu 4-Chome
Shibuya-Ku, Tokyo 150-6019
Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on SABIC LS-1 111 Clear in thicknesses 1.6 and 6.4 mm only



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on clear LS-1, and LS-2



Information of X-48-5500-A18 hard coat may be obtained by writing to the following address:

Shin-Etsu Chemical Co., Ltd.
4-1, Marunouchi 1-Chome
Chiyoda-ku, Tokyo 100-0005,
Japan
www.shinetsu.co.jp

Note: X-48-5500-A18 was tested on SABIC LS1 clear only.


(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on SH-2, SH-41, SH-50 and SH-51 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: Stanley SH-51 tested on Sabic LS-2 clear only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
 Sabic Korea www.sabic.com	LEXAN® LS-1	Polycarbonate	111	White #!
	LEXAN® LS-2		111H	White #!
	LEXAN® LSHF (HIGH FLOW)		111S	White #!
	(coated or uncoated)		111SL	White #!
			111J	White #!
			111X	White #!
			GY3A578T	Smoke Grey#!
			71127	Smoke Grey#!
			71274	Smoke Grey#!
			71194	Smoke Grey#!
			6162	Red #!
			6164	Red #!
			4158	Yellow #!
			414	Yellow #!

Note:LEXAN® Protected Applications were tested behind Coated LS-2-111 Clear

Coated Sabic Korea plastics may only be treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings: See Mitsubishi Chemical Corporation

FUJIHARD 2500: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei Co., Ltd.

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3372U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3401U: See Fujikura Kasei Co., Ltd.

FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei Co., Ltd.

FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, FUJISOFT 2604 coatings: See Fujikura Kasei Co., Ltd.

KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000, KUV-9100: See KCC Corporation

LHP100/LHC100, LHP100/AS4000: See Momentive Performance Materials Inc.

MODIHARD 200S: See NOF Coatings.

NIPPE UVI Coat UT-1678: See Nippon Paint Automotive Coatings Co., Ltd.

PHOLUCID No. 130C and PHOLUCID No.180C: See Chugoku Marine Paints, Ltd.

PHC200, PHC587, PHC587B, PHC587C, PHC587C2: See Momentive Performance Materials Inc.

RayGloss 402: See BASF Coatings GmbH

SH-2, SH-41, SH-50 and SH-51: See Stanley Electric Co., Ltd.

SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000: See Momentive Performance Materials Inc.

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials Inc.

UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot.

UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.

UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red Spot

X-48-5500-A18: See Shin-Etsu Chemical Co., Ltd.

Coating Manufacturer in Alphabetical Order

Information on RayGloss 402 coatings may be obtained by writing:



BASF Coatings GmbH
 ECO/DT - C422
 D-48165 Muenster
 Germany
www.basf-coatings.com

Note: BASF RayGloss 402 was tested on LEXAN® LS-1 and LEXAN® LS-2 clear only.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on PHOLUCID No. 130C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No. 130C and PHOLUCID No.180C were tested on Sabic LS-1 111 and Sabic LS-1 111J clear only.



FUJIKURA KASEI

Information on FUJIHARD 2500, FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD, HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD

HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and FUJISOFT 2600, FUJISOFT 2601, FUJISOFT 2602, FUJISOFT 2603, and FUJISOFT 2604 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJISOFT 2601 may NOT be used on lenses incorporating a reflex reflector or in front of a reflex reflector.
 Note: FUJIHARD HH2566U-series and FUJIHARD HH2567U-series for use on clear lenses only
 Note: FUJIHARD HH2540U-series, FUJIHARD HH2570U-series, FUJIHARD HH2561U-series and FUJIHARD HH9986U-series is for use on clear LS-2 plastics only
 Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on LS-1 111 and LS-2 111 only.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on KUV-1000, KUV-2000, KUV-3000, KUV-4000, KUV-5000, KUV-6000 and KUV-9100 coatings may be obtained by writing:

KCC Corporation
 83 Mabook-Dong, Giheung-Gu
 Yongin-Si, Gyunggi-Do,
 South Korea
www.kccworld.co.kr

Note: KUV-3000, KUV-4000, KUV-5000, KUV-6000, and KUV-9100 were tested on Sabic LS1-111 and LS2-111 clear only.

Note: KUV-1000, and KUV-2000 is suitable for over 6.4 mm LS2-111 clear lenses only.



**MITSUBISHI
 CHEMICAL
 GROUP**

Acryking F-328, Acryking K-101, Acryking PH-328, Acryking PH-350, Acryking PH-503, Acryking PH-511 or Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-8 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking PH-350 was tested on LS-2 with clear lenses only

Note: Acryking PH-710 and Acryking PH-720 were tested on LS-1 and LS-2 with clear lenses only

Note: Acryking PH-511, Acryking PH-700, Acryking PH-800 and Acryking PH-800N5A were tested on LS-1-111 and LS-2-111

Note: LS-1-111J was tested with Acryking PH-710, Acryking PH-720, and Acryking PH-800 only.

Note: Acryking PH-930 was tested on Clear LS-1 111 and LS-2 111 only



Information on LHP100/LHC100, LHP100/AS4000, SHP300/SHC3000, SHP300/AS4000, SHP401/AS4000, SHP401/SHC4002, SHP470 with AS4700 topcoat, SHC6000, PHC200, PHC587, PHC587B, PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60,

UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Building V7
 51368 Leverkusen
 Germany

Momentive Performance Materials Inc.
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC5000 tested on LS1 and LS2 clear only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
2-14-1 Shodai-Ohtani
Hirakata-City, Osaka 573-1153
Japan
Phone: +81-72-857-5530
Fax: +81-72-857-5640
Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Lexan LS1-111 and LS2-111.



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
Yebis Garden Place Tower 20-3, Ebisu 4-Chome
Shibuya-Ku, Tokyo 150-6019
Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on SABIC LS-1 111 Clear in thicknesses 1.6 and 6.4 mm only



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on clear LS-1, and LS-2

Information on SH-2, SH-41, SH-50 and SH-51 hard coats may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro,
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: Stanley SH-51 tested on Sabcis LS-2 clear only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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SABIC® PC ALS01
SABIC® PC ALS02
(coated only)

Polycarbonate

GC9AT

White Q

Saudi Kayan Petrochemical Co.

www.sabic.com

Coated Saudi Kayan Petrochemical Co. plastics were only tested with the following coatings applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials Inc.

UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8: See Red Spot

Coating Manufacturer in Alphabetical Order



Information on UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

Note: UVHC3000, UVHC3000K, UVHC5000 and UVHC5000K tested on clear SABIC® PC ALS01 and SABIC® PC ALS02




PAINT & VARNISH COMPANY, INC.

Information on UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coating may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested on clear SABIC® PC ALS01 and SABIC® PC ALS02

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
	SABIC® PMMA 20HR SABIC® PMMA 23SP	Polymethyl Methacrylate (PMMA)	00900	Clear

Saudi Methacrylates Company (SAMAC)

www.sabic.com



Q-Lab Test Services

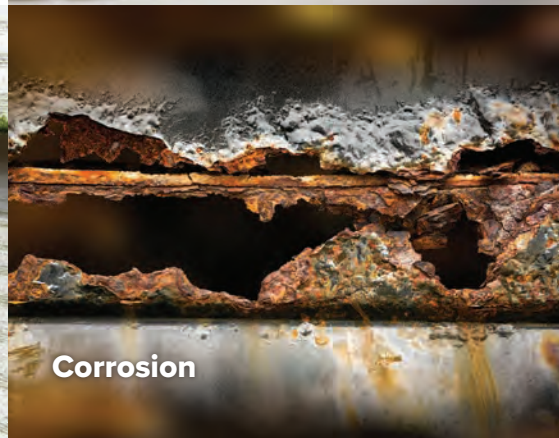
- ▶ Florida & Arizona Outdoor Exposures
- ▶ Accelerated Laboratory Testing
- ▶ Evaluations



Weathering & Outdoor Climatic Testing

If you're concerned about your product's appearance or functional performance in the outdoor environment, you're not alone. Sunlight, heat, and moisture cause billions of dollars in product damage every year. A proper weathering testing program can help you anticipate and prevent a variety of potential product failures, meet durability specifications, and preserve your reputation for quality.

Will your product last outdoors? Don't guess when you can test!



WHY TEST?

Reliable weathering and corrosion data can help you:

- > Avoid unexpected product failures
- > Make the best material selection decisions
- > Validate new or less-expensive materials or additives
- > Improve your competitive advantage
- > Warranty your product's lifetime with confidence

Natural outdoor weathering and corrosion testing give the most realistic prediction of product performance. Accelerated testing, available both outdoors and in the laboratory, gives faster results but with some uncertainty about its accuracy. Many companies combine both approaches to ensure reliable results in the shortest time possible.

WHY CHOOSE Q-LAB?

Experienced and Reliable

Q-Lab provides the highest-quality weathering testing services. Our first natural weathering site opened in 1959. Today, our scientists and engineers participate and offer leadership in ISO, ASTM, IEC, GB, and numerous other professional organizations in creating standardized test methods and procedures.

Instant Credibility

When Q-Lab does your testing, the results have instant credibility with your customers and colleagues. Q-Lab conducts all exposure tests and evaluations in accordance with appropriate test methods from ASTM, ISO, BSI, DIN, JIS, SAE, GB, and other recognized organizations and is accredited by AMECA and AAMA.

Cost-Effective

Q-Lab's state-of-the-art test services are available at a surprisingly affordable price. In many cases, it is less costly to test with Q-Lab than to set up and run tests yourself.

Best Test Sites, Best Technology

South Florida and Arizona, where Q-Lab does most of its outdoor testing, have been recognized for over a century as harsh climates for product testing. If your products perform well in these benchmark locations, they will perform well just about anywhere. Q-Lab uses the most trusted accelerated weathering and corrosion technologies, used by thousands of companies in dozens of industries.



Natural Outdoor Testing

Location is everything. About one hundred years ago, companies in the paint and automotive industries realized that environmental conditions in South Florida and the Arizona desert were the harshest on their products. Several companies operated their own test sites in these locations, and they used what they learned to make their products durable enough to ensure generations of satisfied customers. Today, much of this testing has been consolidated at Q-Lab's sites in Florida and Arizona. Companies around the globe trust Q-Lab to perform their outdoor product testing.

FLORIDA

The subtropical climate of the Miami area has the perfect year-round combination of abundant sunlight, warm temperatures, and plentiful water. Sunshine during the summer months in Miami is quite similar to that of northern temperate regions. However, in the winter the difference is dramatic. The key point is that it is the same sun—just more of it, and for a longer duration each year. The same holds true for temperature, rainfall, dew, and humidity.

The result of this perfect combination of environmental factors is that exposures at Q-Lab Florida are accelerated compared to temperate climates. One year of Florida sunshine can produce the same weathering effects on materials as several years of weathering in most major markets around the world. Specimens that can withstand the sunlight, heat, and water in south Florida can be expected to be durable in most locations around the world.

SOUTH FLORIDA IS PERFECT FOR TESTING:

- > Sunlight (UV) stability
- > Moisture sensitivity
- > Mildew/mold resistance
- > Surface erosion
- > High-temperature resistance
- > Thermal shock response
- > Corrosion behavior
- > Moisture ingress
- > Acid rain resistance

THE GLOBAL BENCHMARK

Q-Lab Florida has more specimens on test than any other outdoor weathering facility in the world.





DESERT TESTING

Arizona features even hotter temperatures and higher levels of sunlight than Florida.

ARIZONA

Arizona’s desert climate is characterized by intense sunlight, very high temperatures, minimal rainfall, and very low humidity. Arizona desert exposures provide a different – in some ways harsher – exposure environment than Florida subtropical tests. Compared with Florida, Arizona is much hotter and receives about 15-20% more annual total solar and UV energy. Arizona experiences large day to night temperature variations, about 17 °C (31 °F) on average. Arizona receives little annual rainfall and has low atmospheric moisture overall. Specimens tested in the Arizona desert can be expected to have superior resistance to sunshine and elevated temperatures.

ARIZONA DESERT IS PERFECT FOR TESTING:

- > Sunlight (UV) stability
- > Heat aging effects
- > Thermal expansion stress resistance
- > Heat deflection and distortion
- > Material durability in low humidity environments

OHIO

Northeast Ohio has a Northern Temperate climate, meaning it experiences four true seasons during the year. Outdoor specimens are subject to a range of exposures to UV light, temperature, and water, including regular freeze/thaw cycles during the winter.

Although Northeast Ohio testing will generally not attain the acceleration of natural outdoor testing in Florida or Arizona, it does deliver conditions experienced by much of the population of the United States and the rest of the world.

Some industries include a benchmark Northern Temperate climate in their certification programs, in addition to Florida and Arizona, to ensure a fully comprehensive program for natural weathering. Ohio is ideal for meeting these requirements.





Accelerated Laboratory Testing

Q-Lab offers a full range of accelerated laboratory weathering and corrosion testing services at our fully-equipped facilities in Florida and Germany. Q-Lab can perform most testing that utilizes xenon arc, fluorescent UV, salt spray, or cyclic corrosion chambers. Contract testing at Q-Lab is an ideal solution for companies that:

- > Have a short-term need for testing but aren't ready to invest in facilities and equipment
- > Need additional testing capacity that the in-house lab can't accommodate
- > Have a special project with a new test cycle that can't be performed in-house
- > Need third-party verification of test results

STANDARD & CUSTOM EXPOSURES

Tests and evaluations are performed to appropriate ASTM, ISO, EN, DIN, JIS, SAE, GB, AATCC, or other standard procedures.

Visit Q-Lab.com/standards or contact Q-Lab to discuss a particular standard.

We can also perform custom exposures to meet your individual testing needs. **More on page 13.**

TWO LABS, ONE STANDARD OF QUALITY

- > Homestead, Florida USA
- > Saarbrücken, Germany

Both locations follow the ISO 17025 accredited Quality System, ensuring the best care for your projects.



Homestead, Florida USA



Saarbrücken, Germany



RAPID RESULTS

Xenon arc test chambers are used to test colorants in paints and plastics.

TYPES OF ACCELERATED TESTS



XENON ARC WEATHERING

For weathering tests that require full sunlight simulation, the **Q-SUN** xenon arc weathering chamber can perform a variety of methods from the automotive, textile, building material, paint, plastics, personal care, or other industries. Xenon arc instruments are usually the best choice for applications where color change is the primary failure mode of concern.



FLUORESCENT UV WEATHERING

When changes to physical properties of polymeric materials are the concern, the **QUV** accelerated weathering tester is an effective tool for comparative testing. Fluorescent UV lamps match the most damaging portion of the sunlight spectrum (UVA and UVB), reproduce degradation from germicidal treatments (UVC), or simulate indoor environments (Cool White).



SALT SPRAY/ CYCLIC CORROSION

Q-FOG cyclic corrosion chambers can perform any test from simple salt spray to tests with precise control of RH and moisture transitions, which is required by most OEM automotive standards. In addition, certain models can also perform demanding modern test protocols like CASS and JASO M609.



Q-TRAC Natural Sunlight Concentrator Testing

Faster test, natural environment. Accelerated outdoor materials testing using a Q-TRAC natural sunlight concentrator delivers the benefits of testing in a natural outdoor environment while at the same time amplifying the sunlight and heat delivered to specimens. This testing is especially useful for highly-durable materials with long expected lifetimes.

SUPER-FAST RESULTS FROM NATURAL SUNLIGHT

The Q-TRAC delivers the same amount of damaging ultraviolet energy in just one year as specimens would experience in five years of Florida sunlight. Like other accelerated tests, sunlight concentrator testing allows products to be brought to market faster, but the Q-TRAC uses natural sunlight to reduce further the risk of generating erroneous test results. In this way, the Q-TRAC delivers dual benefits – the realism of natural exposures and the speed of accelerated laboratory tests.

Q-TRAC IS PERFECT FOR TESTING:

- > Roofing
- > Coil coatings
- > Fluoropolymers
- > Geosynthetics
- > Powder coatings
- > Building materials
- > Industrial coatings
- > Hardboard coatings

ONLY IN ARIZONA

Q-TRAC testing requires a high proportion of direct beam sunlight and low cloud cover that exists only in very dry environments.



ENHANCED SUNLIGHT WITH CONCENTRATING MIRRORS

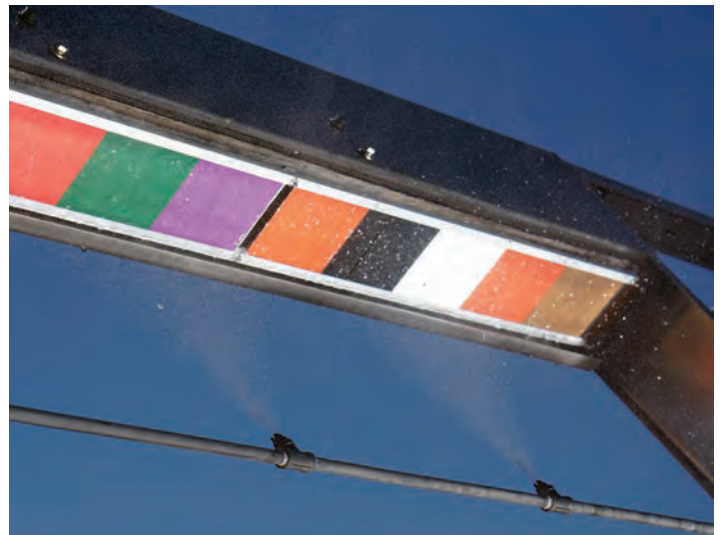
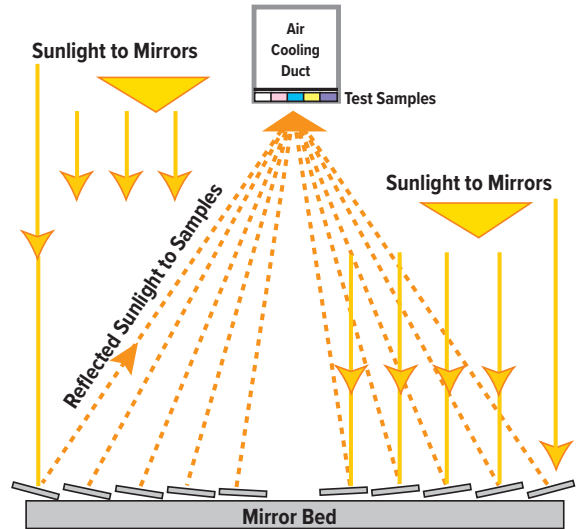
The Q-TRAC system uses an array of 10 flat mirrors to reflect and concentrate natural sunlight onto the test specimens. It further maximizes the exposure by automatically tracking the sun throughout the day in both azimuth (horizontal) and elevation (vertical).

Q-TRAC WATER SPRAY & SPECIAL APPLICATIONS

Water spray during the night time can simulate the time of wetness experienced in Florida, and during the day it can simulate thermal shock associated with rain bursts. During night-time wetting, specimens are oriented facing upward to give increased wetness and realism compared to original natural sunlight concentrator testing. Q-Lab also offers temperature-controlled Q-TRAC testing for more heat-sensitive specimens.

Several standardized cycles—including desert, freeze/thaw, and spray are available to test different materials and end-use application. Standards include:

- > ASTM G90
- > ASTM D4141
- > ASTM D4364
- > ASTM D5105
- > ASTM D5722
- > SAE J1961
- > SAE J576
- > ISO 877-3
- > AAMA 623, 624 and 625



Automotive Interior Testing

Accelerated testing to simulate behind-glass environments. Interior components in automobiles and other behind-glass environments can experience higher temperatures than materials in service outdoors. AIM box testing delivers high temperatures in combination with natural sunlight behind window glass for fast, realistic testing.

AIM BOX

An Automotive Interior Materials (AIM) box is an under-glass enclosure that simulates the sunlight and heat found inside an automobile. Although this technology was developed for the automotive industry, it can be very effective for many applications where glass-filtered sunlight and heat are important stressors, such as building window assemblies and electrical enclosures.

Key test standards for AIM box testing include GMW 14873, GMW 16717, GMW 3417, GM 2617M, GM 3619M, GM 7454M, GM 7455M, GM 9538P, Ford DVM 0020, and ASTM G201.

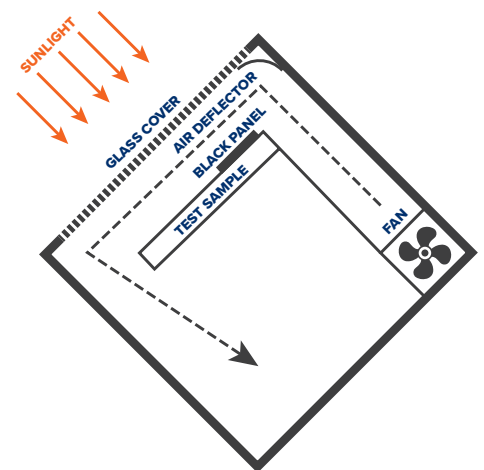
DEGRADATION MODES PRODUCED IN AIM BOX TESTING:

- > Color change
- > Cracking
- > Peeling
- > Oxidation
- > Heat deflection
- > Tackiness

REALISTIC SIMULATION

Testing automotive interiors can be different from testing other materials because air temperatures inside a vehicle can far exceed the temperature outside it. Materials can reach 100 °C or more in warmer climates. Furthermore, the light that reaches internal components is filtered by automotive glass, making it different from natural outdoor sunlight.

The AIM box uses tempered glass - clear or laminated - to simulate the sunlight spectrum experienced inside a car. In addition, a black panel thermometer continuously monitors the environment inside the box. A cooling fan and curtain are used to ensure that specimens are maintained at precise and realistic temperatures.





HIGH TEMPERATURE TESTING

Automotive instrument and dashboard panels are commonly tested in AIM boxes.

ACCELERATION

The AIM box in Arizona can perform precision azimuth tracking of the sun throughout the day. This boosts the total amount of solar radiation reaching the specimens for faster results without sacrificing accuracy.

TRUE AIM BOX

To increase the total amount of solar radiation exposure, Q-Lab's proprietary new TRUE (Tracking Reflecting Ultra Exposure) AIM box uses highly reflective mirrors and dual-axis tracking (azimuth and elevation) to focus more sunlight into the box interior. This technique approximately doubles the total sunlight received every day.



Standard Outdoor Exposures

True benchmarking via standardized testing. Natural outdoor testing according to international test standards gives improved consistency of results from test to test. Having a library of outdoor test data according to recognized test standards gives the best estimate for a product's service life and serves as an excellent basis for comparison to accelerated laboratory testing.

DIRECT EXPOSURE (ASTM G7, ASTM D1435)

Specimens can be securely mounted at a variety of angles for direct exposure to the sun. Various backing techniques are available to simulate the thermal environment of the specimen's intended service application. Plywood backing raises temperatures, while open- or mesh-backed specimens receive maximum natural air flow for cooler temperatures.



UNDER GLASS (ASTM G24, ISO 877-2)

These exposures are used to test interior-use materials, such as textiles and printing inks. Specimens are behind 3 mm window glass which will filter out short-wavelength (UVB) light. Exposures are typically at a 45° or 5° angle from horizontal.



BLACK BOX (ASTM D4141, GMW 14873)

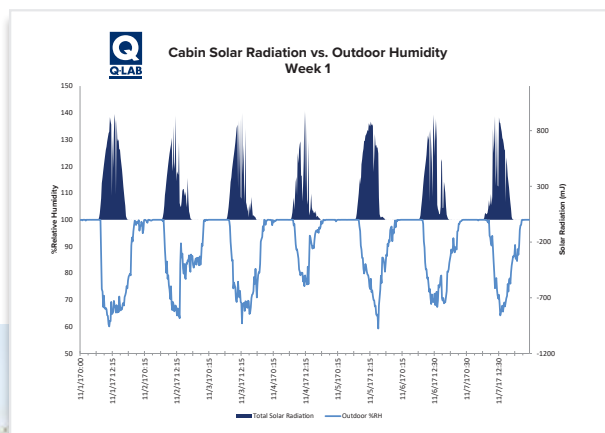
These tests reproduce conditions found on the horizontal surfaces of a vehicle, including higher temperatures and longer wet times. Under glass black box exposures are used to test automotive interior materials or other applications that experience similar conditions.



Other standard outdoor exposure test methods are available, including salt-accelerated, outdoor acid etch, and mildew-enhanced weathering.

Custom Tests & Special Projects

If you need a specialized test for a component, assembly, or complete product, Q-Lab can customize a test program to identify any problem areas quickly. Do you need to measure the temperature profile of multiple areas of your product throughout the day? Or design a test that accurately simulates your product's end use? Whatever your need, our experts can design a customized test solution to fit your budget.



Outdoor weathering testing in a replicated end use environment, like the shed shown above, can demonstrate interactions between components and give a more realistic representation of outdoor product durability.

DETAILED DATA ACQUISITION

Q-Lab can instrument your product to capture the data most important to you, and we always take care to protect confidentiality.



Evaluations & Physical Testing

Exposing your products or materials is only half of the equation. Measuring how they degrade over time is the other half. Q-Lab's engineers and technicians are worldwide experts at identifying and quantifying how your materials change when exposed to weathering or corrosion tests. We have many tools at our disposal to tell you nearly everything you need to know about your product's performance.

VISUAL EVALUATIONS

Visual evaluations detail all defects observed, such as cracking/checking, blistering, chalking, dirt retention, flaking, mildew growth, surface rust, or color change, according to standardized rating scales.

Q-Lab technicians are highly trained and experienced experts in the field of evaluation techniques and reporting scales. Many are actively involved in the organizations that create and maintain the standards relied upon by labs around the world.

COLOR & GLOSS MEASUREMENTS

Instrumental measurements of appearance and surface characteristics include gloss, distinctness of image, and color. These are used in place of or in addition to visual ratings, and are required by many standards. The science of color and appearance measurement can be very complex, and Q-Lab's experts can guide you through your options to ensure you get the correct data for your needs.



Color & Gloss



Mechanical



Photography



VISUAL EVALUATIONS

All visual ratings are made under standard lighting conditions to provide accurate, repeatable results.

MECHANICAL TESTS

Mechanical tests on physical properties are necessary for many products and materials. They include:

- > Drop impact
- > Pencil hardness
- > Tape adhesion
- > Mandrel bend & elongation
- > Tensile strength & elongation
- > Shear & peel adhesion
- > Gravelometer stone chip impact
- > Taber abrasion

PHOTOGRAPHY & SPECIAL HANDLING

A complete test program often includes other special services or handling. Common services include washing, polishing, scribing, and specimen weighing. Q-Lab can also photograph weathering and corrosion changes, which requires special lighting skills and equipment.



OUR GLOBAL NETWORK

We are committed to provide world-class technical, sales, and repair support in each of the over 60 countries in which we operate. Visit [Q-Lab.com/support](https://www.q-lab.com/support) for contact information specific to your location and inquiry type.

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<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Samyang Corporation www.samyang.com (coated or uncoated)	TRIEX 3022L1	Polycarbonate	100	Clear \$ #
	TRIEX 3022L2		R112	Red \$
	TRIEX 3022L3		R212	Red \$
			R312	Red \$
			A115	Yellow \$
			A212	Yellow \$
			A307	Yellow \$
		A412	Yellow \$	

Coated Sam Yang Corporation plastics are only acceptable with the coatings listed below when properly applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101, or Acryking PH-503 hard coats: See Mitsubishi Chemical Corporation

KUV-3000, KUV-4000, KUV-5000, KUV-9000: See KCC Corporation.

LHP100/LHC100, LHP100/AS4000: See Momentive Performance Materials Inc. SHP401/AS4000,

SHP401/SHC4002 hard coats: See Momentive Performance Materials Inc. UVHC3000, UVHC3000K, UVHC5000

and UVHC5000K: See Momentive Performance Materials Inc.

Note: UVHC3000 and UVHC3000K series coatings were tested on TRIEX 3022L1 all had less than 7% haze and are designated by the # mark

UVT200, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7 and UVT610V8 coating: See Red Spot

UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8.: See Red Spot.

Note: UVT610V and UVT820V series coatings all had less than 7% haze and are designated by the # mark.

Coating Manufacturer in Alphabetical Order

Information on KUV-3000, KUV-4000, KUV-5000, KUV-9100 coatings may be obtained by writing:



KCC Corporation
83 Mabook-Dong, Giheung-Gu
Yongin-Si, Gyeonggi-Do South Korea
www.kccworld.co.kr

Note: KUV-3000, KUV-4000, KUV-5000 and KUV-9100 were tested on clear Trirex3022L1 only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on LHP100/LHC100, LHP100/AS4000, SHP401/AS4000, SHP401/SHC4002, UVHC3000, UVHC3000K, UVHC5000 and UVHC5000K hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Materials Inc. Building V7
 51368 Leverkusen
 Germany

Momentive Performance
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC3000, UVHC3000K, UVHC5000 and UVHC5000K tested on Trirex 3022L1 only.



Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking K-101 and Acryking PH-503 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-1 Marunouchi 1-Chome
 Chiyoda-Ku Tokyo 100-8251
 Japan
www.m-chemical.co.jp



Information on UVT200 and UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8. coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
 P.O. Box 418
 Evansville, IN 47703-0418
www.redspot.com

Note: UVT610V and UVT820V series coatings all had less than 7% haze and are designated by the # mark.

Note: UVT610V and UVT820V series coatings were tested on Trirex 3022L1 clear only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Sumitomo Chemical Co., Ltd. www.sumitomo-chem.co.jp	SUMIPEX® HT	Polymethyl	R004	Clear
	SUMIPEX® MG	Methacrylate	R006	Clear
	SUMIPEX® MH		011	Clear
	SUMIPEX® MHF		012	Clear
	SUMIPEX® MHG		014	Clear
	SUMIPEX® MH-EXTRA		020	Clear
	SUMIPEX® MM		0151	Clear
	SUMIPEX® ME		0152	Clear
	SUMIPEX® TR		0153	Clear
	SUMIPEX® MH5		0154	Clear
	SUMIPEX® EPE		0155	Clear
	SUMIPEX® EPM		0161	Clear
	SUMIPEX® K203		0162	Clear
	SUMIPEX® K610		0163	Clear
	SUMIPEX® EP		0164	Clear
	SUMIPEX® HTaaabS		0165	Clear
	SUMIPEX®Meguri® MH		0195	Clear
			0999	Clear
			418(RR)	Red
			4052	Red
Note: SUMIPEX® K202 is now known as SUMIPEX® EPM		4092	Red	
Note: SUMIPEX®MHR is now known as SUMIPEX® MH-EXTRA		4152	Red	
Note: SUMIPEX® MT is now known as SUMIPEX® ME		4162	Red	
Note: SUMIPEX® K206 is now known as SUMIPEX® EP		4172	Red	
Note: For SUMIPEX® HTaaabS, the following numbers are inserted		4182	Red	
aaa: 001-999/b:0-9 or hidden, S=Q~W		4184	Red	
Note: SUMIPEX® HTaaabS is only listed for lenses with thickness		4312	Red	
of 1.6 mm to 3.2 mm		4312-1	Red	
Note: SUMIPEX® HTaaabS is only listed in clear		4314	Red	
Note: Color 4998 in thickness over 3.2mm is not for use in front a reflex		4322	Red	
reflector or as a reflex reflector		4332	Red	
Note: Color 0999 is only listed in thickness 6.4 mm and above		4334	Red	
Note: Color 4406 is only listed in thickness 6.4 mm and above		4401	Red	
		4402	Red	
		4403	Red	
		4404	Red	
		4406	Red	
		4901	Red	
		4902	Red	
		4903	Red	
		4904	Red	
		4906	Red	
		4911	Red	
		4912	Red	
		4913	Red	
		4915	Red	
		4998	Red	
		4999	Red	
		3101	Yellow	
		3111	Yellow	
		3121	Yellow	
		3131	Yellow	
		3231	Yellow	
		3232	Yellow	

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Sumitomo Chemical Co., Ltd. www.sumitomo-chem.co.jp	SUMIPEX® HT	Polymethyl Methacrylate	3311	Yellow
	SUMIPEX® MG		3321	Yellow
	SUMIPEX® MH		3331	Yellow
	SUMIPEX® MHF		3421	Yellow
	SUMIPEX® MHG		3901	Yellow
	SUMIPEX® MH-EXTRA		3902	Yellow
	SUMIPEX® MM		3904	Yellow
	SUMIPEX® ME		3906	Yellow
	SUMIPEX® TR		3910	Yellow
	SUMIPEX® MH5		3911	Yellow
	SUMIPEX® EPE		3914	Yellow
	SUMIPEX® EPM		3916	Yellow
	SUMIPEX® K203		3917	Yellow
	SUMIPEX® K610		3918	Yellow
	SUMIPEX® EP		3925	Yellow
	SUMIPEX® HTaaabS		9001	Gray
	SUMIPEX® Meguri® MH		9002	Gray
			9003	Gray
			9004	Gray
			9005	Gray
	9007	Gray		
	9175	Gray		
Note: SUMIPEX® K202 is now known as SUMIPEX® EPM		9176	Gray	
Note: SUMIPEX® MHR is now known as SUMIPEX® MH-EXTRA		9177	Gray	
Note: SUMIPEX® MT is now known as SUMIPEX® ME		9178	Gray	
Note: SUMIPEX® K206 is now known as SUMIPEX® EP		9179	Gray	
Note: For SUMIPEX® HTaaabS, the following numbers are inserted		9180	Gray	
aaa: 001-999/b:0-9 or hidden, S=Q~W		9181	Gray	
Note: SUMIPEX® HTaaabS is only listed for lenses with thickness of		9182	Gray	
1.6 mm-3.2 mm		9183	Gray	
Note: SUMIPEX® HTaaabS is only listed in clear		9184	Gray	
Note: Color 4998 in thickness over 3.2mm is not for use in front a reflex		9185	Gray	
reflector or as a reflex reflector		9186	Gray	
Note: Color 0999 is only available in thickness 6.4 mm and above		9187	Gray	
Note: Color 4406 is only listed in thickness 6.4 mm and above		9188	Gray	
		9189	Gray	
		9191	Gray	
		9260	Brown	
		9261	Brown	
		9262	Brown	
		9263	Brown	
		9265	Brown	

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Sumitomo Chemical Asia PTE Ltd.	SUMIPEX® HT	Polymethyl Methacrylate	R004	Clear
	SUMIPEX® MG		R006	Clear
http://sumitomo-chem.com.sg	SUMIPEX® MH		011	Clear
	SUMIPEX® MHF		012	Clear
	SUMIPEX® MHG		014	Clear
	SUMIPEX® MH-EXTRA		020	Clear
	SUMIPEX® MM		0151	Clear
	SUMIPEX® ME		0152	Clear
	SUMIPEX® TR		0153	Clear
	SUMIPEX® MH5		0154	Clear
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	SUMIPEX® EPM		0161	Clear
	SUMIPEX® K203		0162	Clear
	SUMIPEX® K610		0163	Clear
	SUMIPEX® EP		0164	Clear
	SUMIPEX® HTaaabS		0165	Clear
	SUMIPEX® Meguri® MH		0195	Clear
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		4404	Red	
		4406	Red	
		4901	Red	
		4902	Red	
		4903	Red	
		4904	Red	
		4906	Red	
		4911	Red	
		4912	Red	
		4913	Red	
		4915	Red	
		4998	Red	
		4999	Red	
		3101	Yellow	
		3111	Yellow	
		3121	Yellow	
		3131	Yellow	
		3231	Yellow	
		3232	Yellow	
		3311	Yellow	
		3321	Yellow	
		3331	Yellow	
		3421	Yellow	
		3901	Yellow	
		3902	Yellow	
		3904	Yellow	
		3906	Yellow	

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Sumitomo	SUMIPEX® HT	Polymethyl	3910	Yellow
Chemical	SUMIPEX® MG	Methacrylate	3911	Yellow
Asia	SUMIPEX® MH		3914	Yellow
PTE., Ltd.	SUMIPEX® MHF		3916	Yellow
	SUMIPEX® MHG		3917	Yellow
http://sumitomo-chem.com.sg	SUMIPEX® MH-EXTRA		3918	Yellow
	SUMIPEX® MM		3925	Yellow
	SUMIPEX® ME		9001	Gray
	SUMIPEX® TR		9002	Gray
	SUMIPEX® MH5		9003	Gray
	SUMIPEX® EPE		9004	Gray
	SUMIPEX® EPM		9005	Gray
	SUMIPEX® K203		9007	Gray
	SUMIPEX® K610		9175	Gray
	SUMIPEX® EP		9176	Gray
	SUMIPEX® HTaaabS		9177	Gray
	SUMIPEX® Meguri® MH		9178	Gray
			9179	Gray
			9180	Gray
			9181	Gray
Note: SUMIPEX® K202 is now known as SUMIPEX® EPM			9182	Gray
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Note: SUMIPEX® HTaaabS is only listed in clear			9191	Gray
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reflector or as a reflex reflector			9261	Brown
Note: Color 0999 is only available in thickness 6.4 mm and above			9262	Brown
Note: Color 4406 is only listed in thickness 6.4 mm and above			9263	Brown
			9265	Brown

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>	
Sumitomo Chemical Europe S.A./N.V.	SUMIPEX® HT	Polymethyl Methacrylate	R004	Clear	
	SUMIPEX® MG		R006	Clear	
www.sumitomo-chem.be	SUMIPEX® MH		011	Clear	
	SUMIPEX® MHF		012	Clear	
	SUMIPEX® MHG		014	Clear	
	SUMIPEX® MH-EXTRA		020	Clear	
	SUMIPEX® MM		0151	Clear	
	SUMIPEX® ME		0152	Clear	
	SUMIPEX® TR		0153	Clear	
	SUMIPEX® MH5		0154	Clear	
	SUMIPEX® EPE		0155	Clear	
	SUMIPEX® EPM		0161	Clear	
	SUMIPEX® K203		0162	Clear	
	SUMIPEX® K610		0163	Clear	
	SUMIPEX® EP		0164	Clear	
	SUMIPEX® HTaaabS		0165	Clear	
	SUMIPEX® Meguri® MH		0195	Clear	
				0999	Clear
				418(RR)	Red
				4052	Red
	Note: SUMIPEX® K202 is now known as SUMIPEX® EPM			4092	Red
	Note: SUMIPEX® MHR is now known as SUMIPEX® MH-EXTRA			4152	Red
	Note: SUMIPEX® MT is now known as SUMIPEX® ME			4162	Red
Note: SUMIPEX® K206 is now known as SUMIPEX® EP			4172	Red	
Note: For SUMIPEX® HTaaabS, the following numbers are inserted			4182	Red	
aaa: 001-999/b:0-9 or hidden, S=Q~W			4184	Red	
Note: SUMIPEX® HTaaabS is only listed for lenses with thickness of 1.6mm-3.2 mm			4312	Red	
			4312-1	Red	
Note: SUMIPEX® HTaaabS is only listed in clear			4314	Red	
Note: Color 4998 in thickness over 3.2mm is not for use in front a reflex reflector or as a reflex reflector			4322	Red	
			4332	Red	
Note: Color 0999 is only available in thickness 6.4 mm and above			4334	Red	
Note: Color 4406 is only listed in thickness 6.4 mm and above			4401	Red	
			4402	Red	
			4403	Red	
			4404	Red	
			4406	Red	
			4901	Red	
			4902	Red	
			4903	Red	
			4904	Red	
			4906	Red	
			4911	Red	
			4912	Red	
			4913	Red	
			4915	Red	
			4998	Red	
			4999	Red	
			3101	Yellow	
			3111	Yellow	
			3121	Yellow	
			3131	Yellow	
			3231	Yellow	
			3232	Yellow	

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Sumitomo	SUMIPEX® HT	Polymethyl	3241	Yellow
Chemical	SUMIPEX® MG	Methacrylate	3311	Yellow
Europe	SUMIPEX® MH		3321	Yellow
S.A./N.V.	SUMIPEX® MHF		3331	Yellow
	SUMIPEX® MHG		3421	Yellow
www.sumitomo-chem.be	SUMIPEX® MH-EXTRA		3901	Yellow
	SUMIPEX® MM		3902	Yellow
	SUMIPEX® ME		3904	Yellow
	SUMIPEX® TR		3910	Yellow
	SUMIPEX® MH5		3911	Yellow
	SUMIPEX® EPE		3914	Yellow
	SUMIPEX® EPM		3916	Yellow
	SUMIPEX® K203		3917	Yellow
	SUMIPEX® K610		3918	Yellow
	SUMIPEX® EP		3925	Yellow
	SUMIPEX® HTaaabS		9001	Gray
	SUMIPEX® Meguri® MH		9002	Gray
			9003	Gray
			9004	Gray
			9005	Gray
			9007	Gray
			9175	Gray
Note: SUMIPEX® K202 is now known as SUMIPEX® EPM			9176	Gray
Note: SUMIPEX® MHR is now known as SUMIPEX® MH-EXTRA			9177	Gray
Note: SUMIPEX® MT is now known as SUMIPEX® ME			9178	Gray
Note: SUMIPEX® K206 is now known as SUMIPEX® EP			9179	Gray
Note: For SUMIPEX® HTaaabS, the following numbers are inserted			9180	Gray
aaa: 001-999/b:0-9 or hidden, S=Q~W			9181	Gray
Note: SUMIPEX® HTaaabS is only listed for lenses with thickness			9182	Gray
of 1.6 mm-3.2 mm			9183	Gray
Note: SUMIPEX® HTaaabS is only listed in clear			9184	Gray
Note: Color 4998 in thickness over 3.2mm is not for use in front a reflex			9185	Gray
reflector or as a reflex reflector			9186	Gray
Note: Color 0999 is only available in thickness 6.4 mm and above			9187	Gray
Note: Color 4406 is only listed in thickness 6.4 mm and above			9188	Gray
			9189	Gray
			9191	Gray
			9260	Brown
			9261	Brown
			9262	Brown
			9263	Brown
			9265	Brown

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Sumika	SD POLYCA™ 303-10	Polycarbonate	30003	White \$
Polycarbonate Ltd.	SD POLYCA™ 303-30 (coated or uncoated)		30004	White \$
www.scpc.jp			160039	Red \$
			150038	Yellow \$

Formerly Sumika Stylon Polycarbonate Limited

Coated Sumika Polycarbonate Limited plastics are only acceptable with the coatings listed below when properly applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7, FUJIHARD HH3035U-3, and FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei Co., Ltd.

Coating Manufacturer in Alphabetical Order



FUJIKURA KASEI

Information on FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3 coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
6-15 Shibakoen 2-Chome
Minato-Ku, Tokyo, 105-0011
Japan
www.fkkasei.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Sumika	SD POLYCA™ SD2133V	Polycarbonate	AA059	White \$
Polycarbonate Ltd.	SD POLYCA™ SD2143V (Coated only) -	Polycarbonate	AA087	White \$

www.scpc.jp

Formerly Sumika Stylon Polycarbonate Limited

Coated Sumika Polycarbonate Ltd. plastics are only acceptable with the coatings listed below when properly applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking PH-328 hard coats: See Mitsubishi Chemical Corporation


Coating Manufacturer in Alphabetical Order



Information on Mitsubishi Chemical Corporation Acryking PH-328 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-1 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Sumika Polycarbonate Ltd. (coated or uncoated) www.scpc.jp	SD POLYCA™ TR0601A SD POLYCA™ TR0601A4	Inner Lens Polycarbonate		Clear !
Formerly Sumika Stylon Polycarbonate Limited				
Sumika Polycarbonate Limited inner lens plastics are only listed when tested behind clear coated Covestro AL2447				

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
	Suzhou Double Elephant Optical Material Co., Ltd. <hr/> Chongqing Double Elephant Optical Material Co., Ltd.	SX-304	PMMA	Clear

Note: Suzhou Double Elephant Optical Material Co., Ltd. and Chongqing Double Elephant Optical Material Co., Ltd. Is listed from 1.6 to 2.3 mm only.

Manufacturer contact information:

Suzhou Double Elephant Optical Material Co., Ltd.
 Add: No. 18, Donghai Road
 Yangtze River International Chemical
 Industrial Park,
 Zhangjiagang, Jiangsu
 P.R. China
 TEL: +86-512-80152090
<http://www.jiangsusx.com/en/szqxcl/>

Chongqing Double Elephant Optical Material Co., Ltd.
 Add: Room 1-1, No.20 Qixin Avenue, Yanjia Street,
 Changshou District, Chongqing,
 P.R. China
 Tel: 18013601067
<http://www.jiangsusx.com/en/cqgxcl/>

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Teijin Limited	Panlite L-1225V (coated)	Polycarbonate	100-M	Clear Q2

www.teijin.co.jp

Coated Teijin Limited Panlite L-1225V plastic is only acceptable with the coatings listed below when properly applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

PH-328, PH-700, Acryking PH-720: See Mitsubishi Chemical Corporation

SH-50: See Stanley Electric Co., Ltd.

Coating Manufacturer in Alphabetical Order



**MITSUBISHI
CHEMICAL
GROUP**

Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking F-700 and Acryking PH-720 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: Acryking F-328, Acryking F-700 and Acryking PH-720 were tested on clear L-1225Z only.

Information on Stanley Electric SH-50 coating may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153-8636
Japan
www.stanley.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Teijin Limited	Panlite L-1225VE (coated)	Polycarbonate	100-M	Clear Q2
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www.teijin.co.jp

Coated Teijin Limited Panlite L-1225VE plastic is only acceptable with the coatings listed below when properly applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

SH-50: See Fujikura Kasei Electric

Coating Manufacturer in Alphabetical Order

Information on Stanley Electric SH-50 coating may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
 2-9-13, Nakameguro
 Meguro-Ku, Tokyo 153-8636
 Japan
www.stanley.co.jp

Teijin Limited	Panlite L-1225Z	Polycarbonate	100	Clear #
	Panlite L-1225ZA		100-C	Clear #
	Panlite L-1225ZL		100-L	Clear #
	Panlite L-1225Z U (see Note below)		100-K	Clear #
	Panlite L-1250Z		100-M	Clear #
	(coated or uncoated)		110	Clear #
			1000	Clear #
			1100	Clear #
			1200	Clear #
			1300	Clear #
			1400	Clear #
			200	Red #
			206	Red #
			210	Red #
			216	Red #
			220	Red #
			226	Red #
	230	Red #		
	236	Red #		
	240	Red #		
	246	Red #		
	250	Red #		
	260	Red #		
	270	Red #		
	280	Red #		
	290	Red #		

Color numbers listed for Teijin Limited (other than the numbers for above already having suffixes) can have suffixes represented by the following alphabets: -L, -LM, -M, -K

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Teijin Limited	Panlite L-1225Z	Polycarbonate	2000	Red #
	Panlite L-1225ZA		2100	Red #
	Panlite L-1225ZU (See Note)		2200	Red #
	Panlite L-1225ZL		2300	Red #
	Panlite L-1250Z		2400	Red #
	(coated or uncoated)		2500	Red #
			2600	Red #
			2700	Red #
			2800	Red #
			2900	Red #
			300	Yellow #
			310	Yellow #
			320	Yellow #
	330	Yellow #		
	340	Yellow #		
	350	Yellow #		
	360	Yellow #		
	370	Yellow #		
	380	Yellow #		
	390	Yellow #		
	400	Yellow #		
	410	Yellow #		
	420	Yellow #		
	430	Yellow #		
	440	Yellow #		
	3000	Yellow #		
	3100	Yellow #		
	3200	Yellow #		
	3300	Yellow #		
	3400	Yellow #		
	3500	Yellow #		
	3600	Yellow #		
	3700	Yellow #		
	3800	Yellow #		
	3900	Yellow #		
	7000	Gray #		
	7100	Gray #		
	7200	Gray #		
	7300	Gray #		
	7400	Gray #		
	7500	Gray #		
	7600	Gray #		
	7700	Gray #		
	7800	Gray #		
	7900	Gray #		

www.teijin.co.jp

Color numbers listed for Teijin Limited (other than the numbers for the above already having suffixes) can have suffixes represented by following alphabets: -L, -LM, -M, -K

Teijin Limited Panlite L-1225ZU must be coated to pass weathering.

Coated Teijin Limited Plastics are only acceptable with the coatings listed below when properly applied to the molded lens.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101S, Acryking PH-328, Acryking PH-511, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-750 Acryking PH-800, Acryking PH-800N5A and Acryking PH-930: See Mitsubishi Chemical Corporation

CD-2M12: See HIPRO Polymer Materials (Jiangsu) Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2605, FUJIHARD HH2610, FUJIHARD HH3176: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH3372U: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH3401U: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.

Fujikura NH: See Fujikura Kasei, Co., Ltd.

KUV-5000, KUV-6000: See KCC Corporation.

MODIHARD 200S: See NOF Corporation

PHOLUCID No.150C and PHOLUCID No.180C: See Chugoku Marine Paints, Ltd.

SH-41, SH-50, SH-51 and SH-61: See Stanley Electric

SM710, SM115 hard coat: See Teijin Limited

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, and UVHC3000KZ60: Momentive Performance Materials Inc.

UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials.

UVHC8100: Momentive Performance Materials Inc.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8.: See Red Spot.

Coating Manufacturer in Alphabetical Order



Information on PHOLUCID No.150C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542 www.cmp.co.jp

Note: PHOLUCID No.150C was tested on Panlite L-1225Z 100K clear only.

Note: PHOLUCID No.180C was tested on Panlite L-1225ZA and Panlite L-1225Z 100K clear only.



FUJIKURA KASEI

Information on FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH2605, FUJIHARD HH2610, FUJIHARD HH3176, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and Fujikura NH coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJIHARD coatings were tested on Panlite L-1225Z only

Note: FUJIHARD HH3401U coatings was tested on Panlite L-1225Z 100 only

Note: Panlite L-1225ZU is only available on Fujikura NH coatings

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on HIPRO Polymer Materials (Jiangsu) CD-3M12 may be obtained by writing to the following address:

HIPRO Polymer Materials (Jiangsu) Co., Ltd.
 North Industrial Park Wuxi, Jiangsu
 P.R. China
 Tel.: +86-510-87855326
 Website: www.hiprocoating.com

Note: HIPRO CD-3M12 is NOT suitable for use with or in front of a reflex reflector
 Note: HIPRO CD-3M12 was only tested on Teijin L-1225Z 100K Clear.



Information on KUV-5000 and KUV-6000 coatings may be obtained by writing:

KCC Corporation
 83 Mabook-Dong, Giheung-Gu,
 Yongin-Si, Gyunggi-Do
 South Korea
www.kccworld.co.kr

Note: KUV-5000 and KUV-6000 were tested on Panlite L-1225Z only
 Note: Panlite L-1225ZU is not available with KCC Corporation coatings



Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking K-101S, Acryking PH-328, Acryking PH-511, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-750 Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-1 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking F-328, Acryking K-101S, Acryking PH-328, Acryking PH-511, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-750, Acryking PH-800 and Acryking PH-800N5A were tested on clear L-1225Z only.
 Note: Panlite L-1225ZU is available with MRC-720 only above 3.2 mm
 Note: Acryking PH-930 was tested on clear Panlite L-1225Z and Panlite L-1225ZA

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, UVHC5000K1, and UVHC8100 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Materials Inc. Building V7
 51368 Leverkusen
 Germany

Momentive Performance
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: Panlite L-1225ZU is not available with Momentive coatings
 Note: UVHC5000 series were tested on L-1225Z clear only.
 Note: UVHC8100 was tested on Panlite L-1225Z-100, L-1225-100K, L-1225Z-100M



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
 Yebis Garden Place Tower 20-3, Ebisu 4-Chome
 Shibuya-Ku, Tokyo 150-6019
 Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on Panlite L-1225V 100K Clear in thicknesses 1/11 to 1/4 inch only.



Information on Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8. coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
 P.O. Box 418
 Evansville, IN 47703-0418
www.redspot.com

Note: UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 were tested L-1225Z, L-1225ZL and L-1250Z clear only.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on Stanley Electric SH-41, SH-50, SH-51 and SH-61 may be obtained by writing to the following company:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: Stanley SH-51 only tested on clear Panlite plastics.

Note: Stanley SH-61 only tested on clear Panlite L-1225Z 100-M.

Note: Panlite L-1225ZU is not to be used in front of a reflex reflector in lens thicknesses of 3.2mm

Information on SM710 coating or SM115 hard coat may be obtained by writing to the following address:

Teijin Limited
Plastics Sales Division
Kasumigaseki Common Gate West Tower
2-1, Kasumigaseki 3-Chome, Chiyoda-
Ku, Tokyo, 100-8585
Japan
www.teijin.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Teijin Polycarbonate China Ltd.	Panlite L-1225V (coated)	Polycarbonate	100-M	Clear &
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www.teijin.co.jp

Coated Teijin Polycarbonate China Panlite L-1225V 100-M plastic is only acceptable with the coatings listed below when properly applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking PH-328, Acryking PH-700, Acryking PH-720 : See Mitsubishi Chemical Corporation

SH-50: See Stanley Electric

Coating Manufacturer in Alphabetical Order



**MITSUBISHI
CHEMICAL
GROUP**

Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking PH-700 and Acryking PH-720 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: Acryking F-328, Acryking PH-700 and Acryking PH-720 were tested on clear L-1225Z only.

Information on Stanley Electric SH-50 coating may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153-8636
Japan
www.stanley.co.jp

Teijin Polycarbonate China, Ltd.	Panlite L-1225Z	Polycarbonate	100	Clear #
	Panlite L-1225ZA		100-C	Clear #
	Panlite L-1225ZL		100-L	Clear #
	Panlite L-1250Z		100-K	Clear #
www.teijin.co.jp	(coated or uncoated)		100-M	Clear #
			110	Clear #
Color numbers listed for Teijin Polycarbonate China, Ltd. (other than the numbers for above already having suffixes) can have suffixes represented by the following alphabets: -L, -LM, -M, -K			1000	Clear #
			1100	Clear #
			1200	Clear #
			1300	Clear #
			1400	Clear #
			200	Red #
			206	Red #
			210	Red #
			216	Red #
			220	Red #

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Teijin	Panlite L-1225Z	Polycarbonate	226	Red #
Polycarbonate	Panlite L-1225ZA		230	Red #
China, Ltd.	Panlite L-1225ZL		236	Red #
	Panlite L-1250Z		240	Red #
	(coated or uncoated)		246	Red #
			250	Red #
			260	Red #
			270	Red #
			280	Red #
			290	Red #
			2000	Red #
			2100	Red #
			2200	Red #
			2300	Red #
			2400	Red #
			2500	Red #
			2600	Red #
			2700	Red #
			2800	Red #
			2900	Red #
			300	Yellow #
			310	Yellow #
			320	Yellow #
			330	Yellow #
			340	Yellow #
			350	Yellow #
			360	Yellow #
			370	Yellow #
			380	Yellow #
			390	Yellow #
			400	Yellow #
			410	Yellow #
			420	Yellow #
			430	Yellow #
			440	Yellow #
			3000	Yellow #
			3100	Yellow #
			3200	Yellow #
			3300	Yellow #
			3400	Yellow #
			3500	Yellow #
			3600	Yellow #
			3700	Yellow #
			3800	Yellow #
			3900	Yellow #
			7000	Gray #
			7100	Gray #
			7200	Gray #
			7300	Gray #
			7400	Gray #
			7500	Gray #
			7600	Gray #
			7700	Gray #
			7800	Gray #
			7900	Gray #

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coated Teijin Polycarbonate China Ltd. plastics are only acceptable with the coatings listed below when properly applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101S, Acryking PH-328, Acryking PH-511, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-750 Acryking PH-800, Acryking PH-800N5A and Acryking PH-930: See Mitsubishi Chemical Corporation

CD-2M12: See HIPRO Polymer Materials (Jiangsu) Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2605, FUJIHARD HH2610, FUJIHARD HH3176: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH3372U: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH3401U: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.

MODIHARD 200S: See NOF Coatings

PHOLUCID No.150C and PHOLUCID No.180C: See Chugoku Marine Paints, Ltd.

SH-41, SH-50, SH-51 and SH-61: See Stanley Electric

SM710, SM115 hard coat: See Teijin Limited

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC3000K1, UVHC3000K-Z: Momentive Performance Materials Inc.

UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials.

UVHC8100: Momentive Performance Materials Inc.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.

Coating Manufacturer in Alphabetical Order



Information on PHOLUCID No.150C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No.150C was tested on Panlite L-1225Z 100K clear only.

Note: PHOLUCID No.180C was tested on Panlite L-1225ZA and Panlite L-1225Z 100K clear only.



FUJIKURA KASEI

Information on FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH2605, FUJIHARD HH2610,

FUJIHARD HH3176, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and Fujikura NH coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan www.fkkasei.co.jp

Note: FUJIHARD coatings were tested on Panlite L-1225Z only

Note: FUJIHARD HH3401U coatings was tested on Panlite L-1225Z 100 only

Note: Panlite L-1225ZU is only available on Fujikura NH coatings

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on HIPRO Polymer Materials (Jiangsu) CD-3M12 may be obtained by writing to the following address:

HIPRO Polymer Materials (Jiangsu) Co., Ltd.
 North Industrial Park Wuxi, Jiangsu
 P.R. China
 Tel.: +86-510-87855326
 Website: www.hiprocoating.com

Note: HIPRO CD-3M12 is NOT suitable for use with or in front of a reflex reflector
 Note: HIPRO CD-3M12 was only tested on Teijin L-1225Z 100K Clear.



**MITSUBISHI
 CHEMICAL
 GROUP**

Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking K-101S, Acryking PH-328, Acryking PH-511, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-1 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking F-328, Acryking K-101S, Acryking PH-328, Acryking PH-511, Acryking PH-710, Acryking PH-720, Acryking PH-750 and Acryking PH-800 and Acryking PH-800N5A were tested on clear L-1225Z only.
 Note: Acryking PH-930 was tested on clear Panlite L-1225Z and Panlite L-1225ZA



Information on Information on UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC3000K1, UVHC3000K-Z, UVHC5000, UVHC5000K, UVHC5000K1 and UVHC8100 hard coat may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Building V7
 51368 Leverkusen
 Germany

Momentive Performance Materials Inc.
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: Panlite L-1225ZU is not available with Momentive coatings
 Note: UVHC5000 series were tested on L-1225Z clear only.
 Note: UVHC8100 was tested on Panlite L-1225Z-100, L-1225-100K, L-1225Z-100M

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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NOF

Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
Yebis Garden Place Tower 20-3, Ebisu 4-Chome
Shibuya-Ku, Tokyo 150-6019
Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on Panlite L-1225V 100K Clear in thicknesses 1/11 to 1/4 Inch.



PAINT & VARNISH COMPANY, INC.

Information on Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Information on Stanley Electric SH-41, SH-50, SH-51 and SH-61 coating may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153-8636
Japan
www.stanley.co.jp

Note: Stanley SH-51 only tested on clear Panlite plastics.

Note: Stanley SH-61 only tested on clear Panlite L-1225Z 100-M.

Information on SM710 coating or SM115 hard coat may be obtained by writing to the following address:

Teijin Limited
Plastics Sales Division
Kasumigaseki Common Gate West Tower
2-1, Kasumigaseki 3-Chome,
Chiyoda-Ku, Tokyo, 100-8585
Japan
www.teijin.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Teijin Polycarbonate Singapore PTE Ltd.	Panlite L-1225V (coated)	Polycarbonate	100-m	Clear #
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www.teijin.co.jp

Coated Teijin Polycarbonate Singapore PTE Panlite L-1225V 100-M plastic is only acceptable with the coatings listed below when properly applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking PH-328, Acryking PH-700 and Acryking PH-720: See Mitsubishi Chemical Corporation

SH-50: See Stanley Electric

Coating Manufacturer in Alphabetical Order



Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking PH-700 and Acryking PH-720 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: Acryking F-328, and Acryking PH-720 were tested on clear L-1225Z only.

Information on Stanley Electric SH-50 coating may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153-8636
Japan
www.stanley.co.jp

Teijin	Panlite L-1225Z	Polycarbonate	100	Clear #
Polycarbonate	Panlite L-1225ZA		100-C	Clear #
Singapore	Panlite L-1225ZL		100-L	Clear #
PTE Ltd.	Panlite L-1250Z		100-K	Clear #
	(coated or uncoated)		100-M	Clear #
			110	Clear #
			1000	Clear #
Color numbers listed for Teijin Polycarbonate Singapore PTE Ltd. (other than the numbers for above already having suffixes)			1100	Clear #
can have suffixes represented by the following alphabets: -L, -LM, -M, -K			1200	Clear #
			1300	Clear #
			1400	Clear #
			200	Red #
			206	Red #
			210	Red #

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Teijin	Panlite L-1225Z	Polycarbonate	216	Red #
Polycarbonate	Panlite L-1225ZA		220	Red #
Singapore	Panlite L-1225ZL		226	Red #
PTE Ltd.	Panlite L-1250Z		230	Red#
	(coated or uncoated)		236	Red #
www.teijin.co.jp			240	Red #
			246	Red #
Color numbers listed for Teijin Polycarbonate Singapore PTE Ltd.			250	Red #
(other than the numbers for above already having suffixes) can			260	Red #
have suffixes represented by the following alphabets: -L, -LM, -M, -K			270	Red #
			280	Red #
			290	Red #
			2000	Red #
			2100	Red #
			2200	Red #
			2300	Red #
			2400	Red #
			2500	Red #
			2600	Red #
			2700	Red #
			2800	Red #
			2900	Red #
			300	Yellow #
			310	Yellow #
			320	Yellow #
			330	Yellow #
			340	Yellow #
			350	Yellow #
			360	Yellow #
			370	Yellow #
			380	Yellow #
			390	Yellow #
			400	Yellow #
			410	Yellow #
			420	Yellow #
			430	Yellow #
			440	Yellow #
			3000	Yellow #
			3100	Yellow #
			3200	Yellow #
			3300	Yellow #
			3400	Yellow #
			3500	Yellow #
			3600	Yellow #
			3700	Yellow #
			3800	Yellow #
			3900	Yellow #
			7000	Gray #
			7100	Gray #
			7200	Gray #
			7300	Gray #
			7400	Gray #
			7500	Gray #
			7600	Gray #
			7700	Gray #
			7800	Gray #
			7900	Gray #

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Coated Teijin Polycarbonate Singapore PTE Ltd. are only acceptable when treated with the following coatings applied to the molded lens:

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101S, Acryking PH-328, Acryking PH-511, Acryking PH-710, Acryking PH-700, Acryking PH-720, Acryking PH-750 Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 : See Mitsubishi Chemical Corporation

CD-2M12: See HIPRO Polymer Materials (Jiangsu) Co., Ltd.

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH2605, FUJIHARD HH2610, FUJIHARD HH3176: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH3372U: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH3401U: See Fujikura Kasei, Co., Ltd.

FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.

MODIHARD 200S: NOF Corporation

PHOLUCID No.150C and PHOLUCID No.180C: See Chugoku Marine Paints, Ltd.

SH-41, SH-50, SH-51 and SH-61: See Stanley Electric

SM710, SM115 hard coat: See Teijin Limited

UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC3000K1, UVHC3000K-Z: See Momentive Performance Materials Inc.

UVHC5000, UVHC5000K, and UVHC5000K1: See Momentive Performance Materials.

UVHC8100: See Momentive Performance Materials Inc.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8: See Red Spot.

Coating Manufacturer in Alphabetical Order



Information on PHOLUCID No.150C and PHOLUCID No.180C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
 Tokyo Club Building,
 2-6, Kasumigaseki 3-Chome
 Chiyoda-Ku, Tokyo, 100-0013
 Japan
 Telephone: 81-3-3506-3971
 Facsimile: +81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No.150C was tested on Panlite L-1225Z 100K clear only.

Note: PHOLUCID No.180C was tested on Panlite L-1225ZA and Panlite L-1225Z 100K clear only.



FUJIKURA KASEI

Information on FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2566U, FUJIHARD HH2566U-1, FUJIHARD HH2566U-2, FUJIHARD HH2566U-3, FUJIHARD HH2567U, FUJIHARD HH2567U-1, FUJIHARD HH2567U-2, FUJIHARD HH2567U-3, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH2605, FUJIHARD HH2610,

FUJIHARD HH3176, FUJIHARD HH3372U, FUJIHARD HH3401U, FUJIHARD HH3482U, FUJIHARD HH9986U-N3, FUJIHARD HH9986U-N5, FUJIHARD HH9986U-N7 and Fujikura NH coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJIHARD coatings were tested on Panlite L-1225Z only.



Information on HIPRO Polymer Materials (Jiangsu) CD-3M12 may be obtained by writing to the following address:

HIPRO Polymer Materials (Jiangsu) Co., Ltd.
 North Industrial Park Wuxi, Jiangsu
 P.R. China
 Tel.: +86-510-87855326
 Website: www.hiprocoating.com

Note: HIPRO CD-3M12 is NOT suitable for use with or in front of a reflex reflector

Note: HIPRO CD-3M12 was only tested on Teijin L-1225Z 100K Clear.

(Coating information continued on the next page)

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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**MITSUBISHI
CHEMICAL
GROUP**

Information on Mitsubishi Chemical Corporation Acryking F-328, Acryking K-101S, Acryking PH-328, Acryking PH-511, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-750, Acryking PH-800 and Acryking PH-800N5A coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
1-1 Marunouchi, 1-Chome
Chiyoda-Ku, Tokyo 100-8251
Japan
www.m-chemical.co.jp

Note: Acryking F-328, Acryking K-101S, Acryking PH-328, Acryking PH-511, Acryking PH-700, Acryking PH-710, Acryking PH-720, Acryking PH-750 Acryking PH-800 and Acryking PH-800N5A were tested on clear L-1225Z only.

Note: Acryking PH-930 was tested on clear Panlite L-1225Z and Panlite L-1225ZA



Information on UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC3000K1, UVHC3000K-Z, UVHC5000, UVHC5000K, UVHC5000K1, and UVT8100 hard coat may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

Note: Panlite L-1225ZU is not available with Momentive coatings

Note: UVHC5000 series were tested on L-1225Z clear only.

Note: UVHC8100 was tested on Panlite L-1225Z-100, I-1225-100K, L-1225Z-100M



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
Yebis Garden Place Tower 20-3, Ebisu 4-Chome
Shibuya-Ku, Tokyo 150-6019
Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on Panlite L-1225V 100K Clear in thicknesses 1/11 to 1/4 Inch only.

(Coating information continued on the next page)

MFR. **TRADE NAME AND**
FLOW FORMULATION **TYPE OF RESIN** **NUMBER** **COLOR**



PAINT & VARNISH COMPANY, INC.

Information on Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Information on Stanley Electric SH-41, SH-50 and SH-51 coating may be obtained by writing to the following address:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153-8636
Japan
www.stanley.co.jp

Note: Stanley SH-51 only tested on clear Panlite plastics.
Note: Stanley SH-61 only tested on clear Panlite L-1225Z 100-M.

Information on SM710 coating or SM115 hard coat may be obtained by writing to the following address:

Teijin Limited
Plastics Sales Division
Kasumigaseki Common Gate West Tower
2-1, Kasumigaseki 3-Chome,
Chiyoda-Ku, Tokyo, 100-8585
Japan
www.teijin.co.jp

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Thai Polycarbonate Co., Ltd.	IUPILON ML-100	Polycarbonate	001	Clear #
	IUPILON ML-200		0001	Clear #
	IUPILON ML-300		R591A	Clear #
www.tpcc-tpac.com	IUPILON ML-300AH		R530B	Clear #!
	IUPILON ML-350		R591C	Clear #
	IUPILON ML-400		R591B	Clear #
	IUPILON ML-100R		R591S	Clear #
	IUPILON ML-200R		101	Red #
	IUPILON ML-300R		102	Red #
	IUPILON ML-350R		103	Red #
	IUPILON ML-400R		104	Red #
	IUPILON HL-3003		R138J	Red #
	IUPILON HL-3503		1001	Red #
	(coated or uncoated)		1002	Red #
			301	Yellow #
			300	Yellow #

Note:	ML-300/R1GYH, ML-300/R1BWH, ML-400/R148A, ML-300/R265E, ML-400R/R206F, HL-3003/N414, HL-3003/N418, HL-3003/N424, HL-3003/N428	ML-300/R1GYH	Red!
	HL-3503/N414, HL-3503/N418 HL-3503/N424, and HL-3503/N428 are for protected applications only	ML-300/R1BWH	Red!
		ML-400/R148A	Red!
		ML-300/R265E	Yellow!
		ML-400R/R206F	Yellow!
		HL-3003/N414	Clear!
		HL-3003/N418	Clear!
Note:	All Mitsubishi Engineering protected application materials were tested behind clear coated ML-300 or ML-350	HL-3003/N424	Clear!
		HL-3003/N428	Clear!
		HL-3503/N414	Clear!
		HL-3503/N418	Clear!
		HL-3503/N424	Clear!
		HL-3503/N428	Clear!

Coated Thai Polycarbonate Co., Ltd. Iupilon plastics may only be treated with the following coatings listed below.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-503, Acryking PH-700, Acryking PH-710 Acryking PH-720, Acryking PH-750, Acryking PH-800, Acryking PH-800N5A and Acryking PH-930: See Mitsubishi Chemical Corporation

FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2: See Fujikura Kasei

FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2561U-3: See Fujikura Kasei

FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9: See Fujikura Kasei

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
	FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2:			See Fujikura Kasei
	FUJIHARD HH3372U:			See Fujikura Kasei
	FUJIHARD HH3401U:			See Fujikura Kasei
	FUJIHARD HH3482U:			See Fujikura Kasei
	IUPIILON Coat UV:			See Mitsubishi Engineering Plastics Corp.
	MODIHARD 200S:			See NOF Corporation
	NIPPE UVI Coat UT-1678:			See Nippon Paint Automotive Coatings Co., Ltd.
	PHC587C, PHC587C2:			See Momentive Performance Materials Inc.
	PHOLUCID No.180C and 185C:			See Chugoku Marine Paints Ltd..
	SH-41, SH-50, and SH-51:			See Stanley Electric
	UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60:			See Momentive Performance Materials Inc.
	UVHC5000, UVHC5000K, and UVHC5000K1:			See Momentive Performance Materials
	UVHC8100:			See Momentive Performance Materials
	UVT200V1, UVT200V2, UVT200V3 and UVT200V5, :			See Red Spot.
	UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, and UVT610V8:			See Red Spot.
	UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8:			See Red Spot

Coating Manufacturer in Alphabetical Order



Information on PHOLUCID No.180C and 185C coatings may be obtained by writing:

Chugoku Marine Paints, Ltd.
Tokyo Club Building,
2-6, Kasumigaseki 3-Chome
Chiyoda-Ku, Tokyo, 100-0013
Japan
Telephone: 81-3-3506-3971
Facsimile: 81-3-5511-8542
www.cmp.co.jp

Note: PHOLUCID No.180C was tested on lupilon ML-300AH R591C and lupilon ML-300 R591B clear only.

Note: PHOLUCID No.185C was tested on lupilon ML-300AH R591C Clear only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on FUJIHARD HH2540U, FUJIHARD HH2540U-1, FUJIHARD HH2540U-2, FUJIHARD HH2551U, FUJIHARD HH2551U-1, FUJIHARD HH2551U-2, FUJIHARD HH2551U-3, FUJIHARD HH2561U-6, FUJIHARD HH2561U-7, FUJIHARD HH2561U-8, FUJIHARD HH2561U-9, FUJIHARD HH2570U, FUJIHARD HH2570U-1, FUJIHARD HH2570U-2, FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
 6-15 Shibakoen 2-Chome
 Minato-Ku, Tokyo 105-0011
 Japan
www.fkkasei.co.jp

Note: FUJIHARD HH2540U series, HH2551U series, HH2561U series and HH2570U series were tested on ML-300 clear only

Note: FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on ML-300 and ML-350 Clear Only

Information on IUPILON COAT UV may be obtained by writing to the following address:

Mitsubishi Engineering Plastics Corp.
 Plastics Sales Department
 5-2, Marunouchi 2-Chome
 Chiyoda-Ku, Tokyo
 Japan
www.m-ep.co.jp



Information on Acryking F-328, Acryking K-101-S, Acryking PH-220, Acryking PH-328, Acryking PH-503, Acryking PH-700, Acryking PH-710 Acryking PH-720, Acryking PH-750 Acryking PH-800, Acryking PH-800N5A and Acryking PH-930 coatings may be obtained by writing to the following company:

Mitsubishi Chemical Corporation
 1-1 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp

Note: Acryking PH-503, PH-700, PH-710, Acryking PH-720, PH-750 Acryking PH-800 and Acryking PH-800N5A were tested on ML- 300 clear only

Note: Acryking PH-930 was tested on clear IUPILON ML-300 and IUPILON ML-300AH only

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Information on PHC587C, PHC587C2, UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K, UVHC3000K1, UVHC3000K-Z, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60, UVHC5000, UVHC5000K, and UVHC5000K1 hard coats may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Building V7
 51368 Leverkusen
 Germany

Momentive Performance Materials Inc.
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com

Note: UVHC3000K, UVHC3000K1-40, UVHC3000K1-50, and UVHC3000KZ60 only tested on Lupilon ML-300 / ML-350

Note: UVHC3000 only tested on Lupilon ML-350

Note: UVHC8100 was tested on clear Lupilon ML-300 and Lupilon ML-350



Information on NIPPE UVI Coat UT-1678 coating may be obtained by writing to the following address:

Nippon Paint Automotive Coatings Co., Ltd.
 2-14-1 Shodai-Ohtani
 Hirakata-City, Osaka 573-1153
 Japan
 Phone: +81-72-857-5530
 Fax: +81-72-857-5640
 Website: www.nipponpaint-automotive.com

Note: NIPPE UVI Coat UT-1678 was tested on Lupilon ML-300 and ML-350 clear.



Information on MODIHARD 200S coatings may be obtained by writing to the following address:

NOF Corporation
 Yebis Garden Place Tower 20-3, Ebisu 4-Chome,
 Shibuya-Ku, Tokyo 150-6019
 Japan
www.nof.co.jp

Note: MODIHARD 200S is acceptable on ML-300 Clear in thicknesses 2.3-6.4 mm only

(Coating information continued on the next page)

MFR. **TRADE NAME AND**
FLOW FORMULATION **TYPE OF RESIN** **NUMBER** **COLOR**



Information on UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT200V1, UVT200V2, UVT200V3, UVT200V5, UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 UVT820V1, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 is only acceptable on clear ML-300 and ML-350.

Information on Stanley Electric SH-41, SH-50 and SH-51 may be obtained by writing to the following company:

Stanley Electric Co., Ltd.
2-9-13, Nakameguro
Meguro-Ku, Tokyo 153
Japan
www.stanley.co.jp

Note: SH-41 may be used be used in front of a reflex reflector. Material would have code Q

Note: Stanley SH-51 only tested on clear IUPILON ML-300

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Trinseo	ALTUGLAS™/PLEXIGLAS™	Polymethyl	78048	Bronze
Altuglas Division	ALTUGLAS™ R-Life	Methacrylate	78072	Bronze
Altuglas S.r.l. (Italy)	PLEXIGLAS™ R-Life		770	Blue
Trinseo Korea Ltd.	DR		779	Blue
Altuglas Division	DRF		48268	Blue
www.trinseo.com	GR 8		LPL	Clear
www.plexiglas.com	GR 8C		11	Clear
www.altuglas.com	GR 9D		100	Clear
	GR 9DX		101	Clear
	GR 9E		102	Clear
	H		P2	Clear
	HT(121)		UVA5	Clear
	IMPLEX®		7082	Gray
	MC		7090	Gray
	MI-2T		7132	Gray
	MI-4T		7137	Gray
	MI-7		7155	Gray
	MI-7T		7157	Gray
	V(022)		7161	Gray
	V(040)		7189	Gray
	V(052)		7191	Gray
	V(052i)		7192	Gray
	V(415)		7215	Gray
	V(811)		7280	Gray
	V(811)UVA		7082	Gray
	V(825)		7090	Gray
	V825T CR50		7132	Gray
	V(825)T		7137	Gray
	V(825)TP		7155	Gray
	V(826)		7157	Gray
	V(920)		7161	Gray
	V(920)T		7189	Gray
	V(922)		7191	Gray
			7192	Gray
			7215	Gray
			7280	Gray
			7283	Gray
			56072	Gray
			56507	Gray
			56101	Gray
			58102	Gray
			58200	Gray
			58224	Gray

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Trinseo	ALTUGLAS™/PLEXIGLAS™	Polymethyl	58225	Gray
Altuglas Division	ALTUGLAS™ R-Life	Methacrylate	58235	Gray
Altuglas S.r.l. (Italy)	PLEXIGLAS™ R-Life		58247	Gray
Trinseo Korea Ltd.	DR		58294	Gray
Altuglas Division	DRF		58308	Gray
www.trinseo.com	GR 8		13	Red
www.plexiglas.com	GR 8C		119	Red
www.altuglas.com	GR 9D		126	Red
	GR 9DX		145	Red
	GR 9E		180	Red
	H		366	Red
	HT(121)		461	Red
	IMPLEX®		610	Red
	MC		616	Red
	MI-2T		659	Red
	MI-4T		756	Red
	MI-7		868	Red
	MI-7T		908	Red
	V(022)		957	Red
	V(040)		1003	Red
	V(052)		1025	Red
	V(052i)		1032	Red
	V(415)		1101	Red
	V(811)		1108	Red
	V(811)UVA		1110	Red
	V(825)		1115	Red
	V825T CR50		1116	Red
	V(825)T		1118	Red
	V(825)TP		1120	Red
	V(826)		1132	Red
	V(920)		1175	Red
	V(920)T		1180	Red
	V(922)		1185	Red
			1190	Red
			1191	Red
			1195	Red
			1794	Red
			15000	Red
			15003	Red
			16020	Red
			16021	Red
			16030	Red
			16031	Red
			16048	Red

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Trinseo	ALTUGLAS™/PLEXIGLAS™	Polymethyl	16500	Red
Altuglas Division	ALTUGLAS™ R-Life	Methacrylate	16501	Red
Altuglas S.r.l. (Italy)	PLEXIGLAS™ R-Life		18008	Red
Trinseo Korea Ltd.	DR		18016	Red
Altuglas Division	DRF		18035	Red
www.trinseo.com	GR 8		18036	Red
www.plexiglas.com	GR 8C		18037	Red
www.altuglas.com	GR 9D		18039	Red
	GR 9DX		18040	Red
	GR 9E		18042	Red
	H		18043	Red
	HT(121)		18044	Red
	IMPLEX®		18046	Red
	MC		18047	Red
	MI-2T		18048	Red
	MI-4T		18134	Red
	MI-7		18152	Red
	MI-7T		18165	Red
	V(022)		18166	Red
	V(040)		18175	Red
	V(052)		18176	Red
	V(052i)		18181	Red
	V(415)		18210	Red
	V(811)		18213	Red
	V(811)UVA		18227	Red
	V(825)		18228	Red
	V825T CR50		18229	Red
	V(825)T		18241	Red
	V(825)TP		18242	Red
	V(826)		18244	Red
	V(920)		18249	Red
	V(920)T		18250	Red
	V(922)		18254	Red
			18274	Red
			18287	Red
			18301	Red
			18309	Red
			119/10	Red
			119/3	Red
			119/8	Red
			18236	White
			18258	White

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Trinseo	ALTUGLAS™/PLEXIGLAS™	Polymethyl	18259	White
Altuglas Division	ALTUGLAS™ R-Life	Methacrylate	48361	White
Altuglas S.r.l. (Italy)	PLEXIGLAS™ R-Life		237	Yellow
Trinseo Korea Ltd	DR		245	Yellow
Altuglas Division	DRF		263	Yellow
www.trinseo.com	GR 8		268	Yellow
www.plexiglas.com	GR 8C		282	Yellow
www.altuglas.com	GR 9D		283	Yellow
	GR 9DX		283/3	Yellow
	GR 9E		283/8	Yellow
	H		283/B-3	Yellow
	HT(121)		283/B-8	Yellow
	IMPLEX®		883	Yellow
	MC		885	Yellow
	MI-2T		937	Yellow
	MI-4T		938	Yellow
	MI-7		951	Yellow
	MI-7T		2361	Yellow
	V(022)		2820	Yellow
	V(040)		2821	Yellow
	V(052)		2830	Yellow
	V(052i)		2831	Yellow
	V(415)		2833	Yellow
	V(811)		2838	Yellow
	V(811)UVA		25000	Yellow
	V(825)		25001	Yellow
	V825T CR50		25004	Yellow
	V(825)T		26022	Yellow
	V(825)TP		26038	Yellow
	V(826)		26045	Yellow
	V(920)		26500	Yellow
	V(920)T		26501	Yellow
	V(922)		26505	Yellow
			28019	Yellow
			28020	Yellow
			28021	Yellow
			28029	Yellow
			28033	Yellow
			28039	Yellow
			28040	Yellow
			28041	Yellow

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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Connecting ideas with solutions

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Trinseo.	ALTUGLAS™/PLEXIGLAS™	Polymethyl	28042	Yellow
Altuglas Division	ALTUGLAS™ R-Life	Methacrylate	28043	Yellow
Altuglas S.r.l. (Italy)	PLEXIGLAS™ R-Life		28044	Yellow
Trinseo Korea Ltd.	DR		28090	Yellow
Altuglas Division	DRF		28107	Yellow
www.trinseo.com	GR 8		28152	Yellow
www.plexiglas.com	GR 8C		28154	Yellow
www.altuglas.com	GR 9D		28161	Yellow
	GR 9DX		28162	Yellow
	GR 9E		28163	Yellow
	H		28198	Yellow
	HT(121)		28209	Yellow
	IMPLEX®		28210	Yellow
	MC		28213	Yellow
	MI-2T		28223	Yellow
	MI-4T		28226	Yellow
	MI-7		28921	Yellow
	MI-7T		H 285	Yellow
	V(022)			
	V(040)			
	V(052)			
	V(052i)			
	V(415)			
	V(811)			
	V(811)UVA			
	V(825)			
	V825T CR50			
	V(825)T			
	V(825)TP			
	V(826)			
	V(920)			
	V(920)T			
	V(922)			

Note: Red 16021 is listed in 4 mm and 5 mm thickness only.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Trinseo Netherlands b.v. CALIBRE C303HP-22	CALIBRE C303HP-15	Polycarbonate	30003	Clear \$

(Formerly Styron Netherlands BV)

Coated Trinseo Netherlands b.v. plastics may only be treated with the following coatings applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

SHP401/AS4000: See Momentive Performance Materials Inc.

UVHC3000: See Momentive Performance Materials Inc.

Coating Manufacturer in Alphabetical Order



Information on SHP401/AS4000 and UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60 hard coat may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Unigel Plastics	Acrigel® ECP100	Polymethyl	CR001	Clear
	Acrigel® LEP100	Methacrylate	RB011	Red
	Acrigel® LEP250		RB322	Red
	Acrigel® ECL400		AB111	Yellow
Formerly Polycarbonatos Do Brasil and Resarbras Da Bahia				
Unigel Plastics	DUROLON V-1900	Polycarbonate	C901	Clear (See note)
			C902	Clear (See note)
	C903		Clear (See note)	
	R901		Red (See note)	
	R902		Red (See note)	
	R903		Red (See note)	
	R904		Red (See note)	
	R905		Red (See note)	
	Y901		Yellow (See note)	
	Y902		Yellow (See note)	
	Y903		Yellow (See note)	
Y904	Yellow (See note)			
Y905	Yellow (See note)			
DUROLON V-2200				

Coated Unigel Plastics plastics are only acceptable with the coatings listed below when properly applied to the molded lens.

Note: Uncoated V1900 is only acceptable for thickness of 6.4 mm

Note: V-1900 with UVHC300 is only acceptable for use in a lens with, or in front of, a reflex reflector for the 6.4mm thickness

Note: V-1900 with UVHC300 is acceptable for use in a lens without a reflex reflector for any thickness

Note: V-1900 with UVT200 is only acceptable for use in a lens with, or in front of, a reflex reflector for the 1.6mm thickness

Note: V-1900 with UVT200 is acceptable for use in a lens without a reflex reflector for any thickness

Uncoated V2200 is only acceptable for thicknesses of 3.2 to 6.4 mm

Note: V-2200 with UVHC 3000 is acceptable for any use on any lamp for all thicknesses

Note: V-2200 with UVT200 is only acceptable for use for a lens with, or in front of, a reflex reflector in the 3.2mm thickness.

Note: V-2200 with UVT200 is acceptable for use a lens without reflex reflectors for all thicknesses.

Coating in Alphabetical Order and Corresponding Manufacturer

Acryking K-101: See Mitsubishi Chemical Corporation

Tarfloncoat 101, and Tarfloncoat 201: See Idemitsu Kosan Co., Ltd.

(Coating information continued on the next page)

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
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UVHC3000: See Momentive Performance Materials, Inc.

UVT200V1, UVT200V2, UVT200V3 and UVT200V5: See Red Spot.

Coating Manufacturer in Alphabetical Order

Information on Tarfloncoat 101 and Tarfloncoat 201 coatings may be obtained by writing to the following address:

Idemitsu Kosan Co., Ltd.
 1-1, Marunochi 3-Chome,
 Chiyoda-Ku, Tokyo 100
 Japan
www.idss.co.jp/



**MITSUBISHI
 CHEMICAL
 GROUP**

Information on Mitsubishi Chemical Corporation Acryking K-101 coating may be obtained by writing to the following address:

Mitsubishi Chemical Corporation
 1-1 Marunouchi, 1-Chome
 Chiyoda-Ku, Tokyo 100-8251
 Japan
www.m-chemical.co.jp



Information on UVHC3000, UVHC3000CC, UVHC3000LS, UVHC3000K1-40, UVHC3000K1-50, UVHC3000KZ60 hard coat may be obtained by writing to the following address:

Momentive Performance Materials GmbH
 Building V7
 51368 Leverkusen
 Germany

Momentive Performance Materials Inc.
 260 Hudson River Road
 Waterford, NY 12118
www.momentive.com



PAINT & VARNISH COMPANY, INC.

Information on UVT200V1, UVT200V2, UVT200V3 and UVT200V5 coatings may be obtained by writing to the following address:

Red Spot Paint & Varnish Co., Inc.
 P.O. Box 418
 Evansville, IN 47703-0418
www.redspot.com

Note: UVT200 not suitable for use in front of a reflex reflector.

<u>MFR.</u>	<u>TRADE NAME AND FLOW FORMULATION</u>	<u>TYPE OF RESIN</u>	<u>NUMBER</u>	<u>COLOR</u>
Unitika Ltd.	U-POLYMER P-1001	POLYARYLATE		Clear
	U-POLYMER P-1001A		1010	Clear
	U-POLYMER P-1001S		2403	Red
www.unitika.co.jp	U-POLYMER P-3001S		2410	Red
			5-2094	Red
			10-2051	Red
			3071	Yellow
			3301	Yellow
			3401	Yellow
			3410	Yellow
			4410	Yellow
			5-3091	Yellow
			05-3060	Yellow
			10-4032	Yellow
			050-3070	Yellow
			079-3070	Yellow
			P-1001A 5050	Selective Yellow

Note: Unitika U-Polymer polyarylate not to be used as a reflex reflector or in front of a reflex reflector.

MFR.	TRADE NAME AND FLOW FORMULATION	TYPE OF RESIN	NUMBER	COLOR
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Wanhua Chemical Group Co., Ltd. No. 59 Chongqing Street YEDA, Yantai, Shandong, China www.whchem.com	ACRYPLAS® HD01	Polymethyl Methacrylate		Clear
			R01	Red
	ACRYPLAS® HD03	Polymethyl Methacrylate		Clear

Color R01 is listed from 2.3-6.4mm only.

Wanhua Chemical Group Co., Ltd. No. 59 Chongqing Street YEDA, Yantai, Shandong China www.whchem.com	HL6157	Polycarbonate	9103	Clear Q
	HL6227			

Wanhua Chemical Group Co., Ltd. polycarbonate plastics are only acceptable with the coatings listed below when properly applied to the molded lens.

Coating in Alphabetical Order and Corresponding Manufacturer

FUJIHARD HH2540U, FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U: See Fujikura Kasei Co., Ltd.

UVHC3000, UVHC5000, UVHC5000K, UVHC5000K1: See Momentive Performance Materials, Inc.

UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7,
UVT610V8 See Red Spot.

UVT820: See Red Spot.

Coating Manufacturer in Alphabetical Order



FUJIKURA KASEI

Information on FUJIHARD HH2540U, FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U coatings may be obtained by writing to the following address:

Fujikura Kasei Co., Ltd.
6-15 Shibakoen 2-Chome
Minato-Ku, Tokyo 105-0011
Japan
www.fkkasei.co.jp

Note: FUJIHARD HH2540U, FUJIHARD HH3372U, FUJIHARD HH3401U and FUJIHARD HH3482U were tested on HL6157 clear only

Note: FUJIHARD HH3401U is only acceptable in 1.6, 2.3 and 3.2 mm thicknesses

(Coating information continued on the next page)



Information on UVHC3000, UVHC5000, UVHC5000K, UVHC5000K1 hard coat may be obtained by writing to the following address:

Momentive Performance Materials GmbH
Building V7
51368 Leverkusen
Germany

Momentive Performance Materials Inc.
260 Hudson River Road
Waterford, NY 12118
www.momentive.com



Information on UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8 and UVT820 coatings may be obtained by writing to the following address:

PAINT & VARNISH COMPANY, INC.

Red Spot Paint & Varnish Co., Inc.
P.O. Box 418
Evansville, IN 47703-0418
www.redspot.com

Note: Red Spot UVT610V1, UVT610V2, UVT610V3, UVT610V4, UVT610V5, UVT610V6, UVT610V7, UVT610V8, UVT820V2, UVT820V3, UVT820V4, UVT820V5, UVT820V6, UVT820V7 and UVT820V8 was tested on clear HL6157.

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Appendix A: AMECA Accredited Laboratory Information

Arizona Desert Testing
21212 West Patton Road
Wittman, Arizona 85361
Tel: (623) 388-9500
FAX: (623) 388-9007
Website: www.aztest.com

Atlas Weathering Services Group
DSET Laboratories
45601 N. 47th Avenue
Phoenix, Arizona 85027-7042
Tel: (623) 465-7356; (800) 255-DSET
FAX: (623) 465-9409
Website: www.atlas-mts.com

Atlas Weathering Services Group
South Florida Test Services Everglades Division
16100 S.W. 216th Street
Miami, Florida 33170
Tel: (305) 245-3659
FAX: (305) 245-9122
Website: www.atlas-mts.com

Q-Lab Arizona Test Services
24742 West Durango Street
Buckeye, Arizona 85326
Tel: (623) 386-5140
FAX: (623) 386-5143
Website: www.q-lab.com

Q-Lab Florida Test Services and
1005 S.W. 18th Avenue, P.O.
Box 349490
Homestead, Florida 33034
Tel: (305) 245-5600
FAX: (305) 245-5656
Website: www.q-lab.com

Definitions in FMVSS 108

Coated materials means a material which has a coating applied to the surface of the finished sample to impart some protective properties. Coating identification means a mark of the manufacturer's name, formulation designation number, and recommendations for application.

Color Fundamental definitions of color are expressed by Chromaticity Coordinates according to the CIE 1931 Standard Colorimetric System, as described in the CIE 1931 Chromaticity Diagram (incorporated by reference, see § 571.5).

Color bleeding means the migration of color out of a plastic part onto the surrounding surface.

Cracking means a separation of adjacent sections of a plastic material with penetration into the specimen.

Crazing means a network of apparent fine cracks on or beneath the surface of materials.

Exposed means material used in lenses or optical devices exposed to direct sunlight as installed on the vehicle.

Excerpts from Section 14 from FMVSS 108

Plastic and Coating Requirements

S14.1.2 Plastic optical materials. All plastic materials used for optical parts such as lenses and reflectors on lamps or reflective devices required or allowed by this standard must conform to the material test requirements of S14.4.2.

S14.1.3 All coatings used on optical materials must have added to their formulations an optical brightener, whose presence is detectable by ultraviolet light, to aid in testing for their presence. Other equivalent industry accepted methods may be used as an alternative.

Color Specifications

S14.4.1 *Color test.* The requirement applies to the overall effective color of light emitted by the device and not to the color of the light from a small area of the lens. It does not apply to any pilot, indicator, or tell-tale lights. The color of the sample device must comply when tested by either the Visual Method or the Tristimulus Method.

S14.4.1.3 *Visual method.*

S14.4.1.3.1 *Visual method procedure.* The color of light from the sample device must be compared visually with the color of the light from a standard. The standard may consist of a filter or limit glass. In the case of white, CIE Source A is used only as a color reference. The chromaticity coordinates of the color standards must be as close as possible to the limits listed. The color of the standard filters is determined spectro-photometrically.

S14.4.1.3.2 *Visual method performance requirements.* The color must comply with the applicable requirement.

S14.4.1.3.2.1 *Red.* Red is not acceptable if it is less saturated (paler), yellower, or bluer than the limit standards.

S14.4.1.3.2.2 *Yellow (Amber)*. Yellow is not acceptable if it is less saturated (paler), greener, or redder than the limit standards.

S14.4.1.3.2.3 *White*. White is not acceptable if its color differs materially from that of CIE Source A.

S14.4.1.3.2.4 *Green*. Green is not acceptable if it is less saturated (paler), yellower, or bluer than the limit standards.

S14.4.1.3.2.5 *Blue*. Blue is not acceptable if it is less saturated (paler), greener, or redder than the limit standards.

S14.4.1.4 *Tristimulus method*.

S14.4.1.4.1 *Tristimulus method procedure*.

S14.4.1.4.1.1 The color of light from the H–V point of a sample device must be measured by photoelectric receivers with spectral responses that approximate CIE standard spectral tristimulus values.

S14.4.1.4.1.2 A sphere may be used to integrate light from a colored source provided that the color shift that results from the spectral selectivity of the sphere paint be corrected by the use of a filter, correction factor, or an appropriate calibration.

S14.4.1.4.1.3 Where the sample device does not have uniform spectral characteristics in all useful directions, color measurements must be made at as many directions of view as are required to evaluate the color for those directions that apply to the end use of the device.

S14.4.1.4.2 *Tristimulus method performance requirements*. The color must comply with the applicable requirement.

S14.4.1.4.2.1 *Red*. The color of light emitted must fall within the following boundaries:

$$y = 0.33 \text{ (yellow boundary)}$$

$$y = 0.98 - x \text{ (purple boundary)}$$

S14.4.1.4.2.2 *Yellow (Amber)*. The color of light emitted must fall within the following boundaries:

$$y = 0.39 \text{ (red boundary)}$$

$$y = 0.79 - 0.67x \text{ (white boundary)}$$

$$y = x - 0.12 \text{ (green boundary)}$$

S14.4.1.4.2.3 *White (achromatic)*. The color of light emitted must fall within the following boundaries:

$$x = 0.31 \text{ (blue boundary)}$$

$$y = 0.44 \text{ (green boundary)}$$

$$x = 0.50 \text{ (yellow boundary)}$$

$$y = 0.15 + 0.64x \text{ (green boundary)}$$

$y = 0.38$ (red boundary)
 $y = 0.05 + 0.75x$ (purple boundary)

S14.4.1.4.2.4 Green. The color of light emitted must fall within the following boundaries:

$y = 0.73 - 0.73x$ (yellow boundary)
 $x = 0.63y - 0.04$ (white boundary)
 $y = 0.50 - 0.50x$ (blue boundary)

S14.4.1.4.2.5 Restricted Blue. The color of light emitted must fall within the following boundaries:

$y = 0.07 + 0.81x$ (green boundary)
 $x = 0.40 - y$ (white boundary)
 $x = 0.13 + 0.60y$ (violet boundary)

S14.4.1.4.2.6 Signal Blue. The color of light emitted must fall within the following boundaries:

$y = 0.32$ (green boundary)
 $x = 0.16$ (white boundary)
 $x = 0.40 - y$ (white boundary)
 $x = 0.13 + 0.60y$ (violet boundary)

Plastic optical materials tests

S14.4.2 Plastic optical materials tests. Accelerated weathering procedures are not permitted.

S14.4.2.1 Samples.

S14.4.2.1.1 Samples of materials shall be injection molded into polished metal molds to produce test specimens with two flat and parallel faces. Alternative techniques may be used to produce equivalent specimens.

S14.4.2.1.2 Test specimens shape may vary, but each exposed surface must contain a minimum uninterrupted area of 32 sq cm.

S14.4.2.1.3 Samples must be furnished in thicknesses of 1.6 +/- 0.25 mm, 2.3 +/- 0.25 mm, 3.2 +/- 0.25 mm, and 6.4 +/- 0.25 mm. *S14.4.2.1.4* All samples must conform to the applicable color test requirement of this standard prior to testing.

S14.4.2.1.5 A control sample, kept properly protected from influences which may change its appearance and properties of each thickness, must be retained.

S14.4.2.2 Outdoor exposure test.

S14.4.2.2.1 Outdoor exposure tests of 3 years in duration must be made on samples of all materials, including coated and uncoated versions, used for optical parts of devices covered by this standard. Tests are to be conducted in Florida and Arizona.

S14.4.2.2.2 Concentrations of polymer components and additives used in plastic materials may be changed without outdoor exposure testing provided the changes are within the limits of composition represented by higher and lower

concentrations of these polymer components and additives previously tested to this section and found to meet its requirements.

S14.4.2.2.3 Procedure. S14.4.2.2.3.1 One sample of each thickness of each material must be mounted at each exposure site so that at least a minimum uninterrupted area of 32 sq cm of the exposed upper surface of the sample is at an angle of 45 degrees to the horizontal facing south. The sample must be mounted in the open no closer than 30 cm (11.8 in) to its background.

S14.4.2.2.3.2 During the exposure time the samples must be cleaned once every three months by washing with mild soap or detergent and water, and then rinsing with distilled water. Rubbing must be avoided.

S14.4.2.2.4 *Performance requirements.* Plastic lenses, other than those incorporating reflex reflectors, used for inner lenses or those covered by another material and not exposed directly to sunlight must meet the optical material test requirements when covered by the outer lens or other material.

S14.4.2.2.4.1 After completion of the outdoor exposure test the haze and loss of surface luster as measured by ASTM D1003–92 (incorporated by reference, see § 571.5) must not be greater than:

- (a) 30% for materials used for outer lenses, other than those incorporating reflex reflectors;
- (b) 7% for materials used for reflex reflectors and lenses used in front of reflex reflectors.

S14.4.2.2.4.2 After completion of the outdoor exposure test materials used for headlamp lenses must show no deterioration.

S14.4.2.2.4.3 After completion of the outdoor exposure test all materials, when compared with the unexposed control samples, must not show physical changes affecting performance such as color bleeding, delamination, crazing, or cracking. Additionally materials used for reflex reflectors and lenses used in front of reflex reflectors must not show surface deterioration or dimensional changes.

S14.4.2.2.4.4 After completion of the outdoor exposure test all materials, when compared with the unexposed control samples, must not have their luminous transmittance changed by more than 25% when tested in accordance with ASTM E308–66 (incorporated by reference, see § 571.5) using CIE Illuminant A (2856K). S14.4.2.2.4.5 After completion of the outdoor exposure test all materials must conform to the color test of this standard in the range of thickness stated by the material manufacturer.

S14.4.2.3 *Heat test.*

S14.4.2.3.1 *Procedure.* Two samples of each thickness of each material must be supported at the bottom, with at least 51 mm of the sample above the support, in the vertical position in such a manner that, on each side, the minimum uninterrupted area of exposed surface is not less than 3225 sq mm. The samples are placed in a circulating air oven at 79 Degrees +/- 3 Degrees for Two hours.

S14.4.2.3.2 *Performance requirements.*

After completion of the heat exposure and cooling to room ambient temperature, a test specimen must show no change in shape and general appearance discernable to the naked eye when compared with an unexposed specimen and continue to conform to the applicable color test requirement of this standard.

Appendix C: DOT Interpretation Files and Supplemental Lab Information



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(54) **HARD-COAT INFUSED POLYCARBONATE HEADLAMP LENS AND RELATED METHOD**

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(57) **ABSTRACT**

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A headlamp lens includes a polycarbonate substrate and an infused protective skin covering on at least one surface of the polycarbonate substrate.

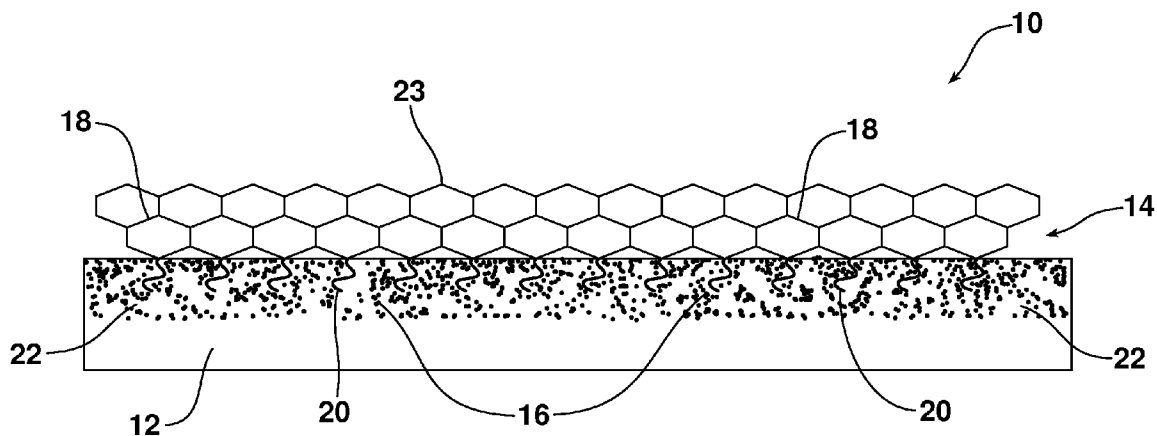
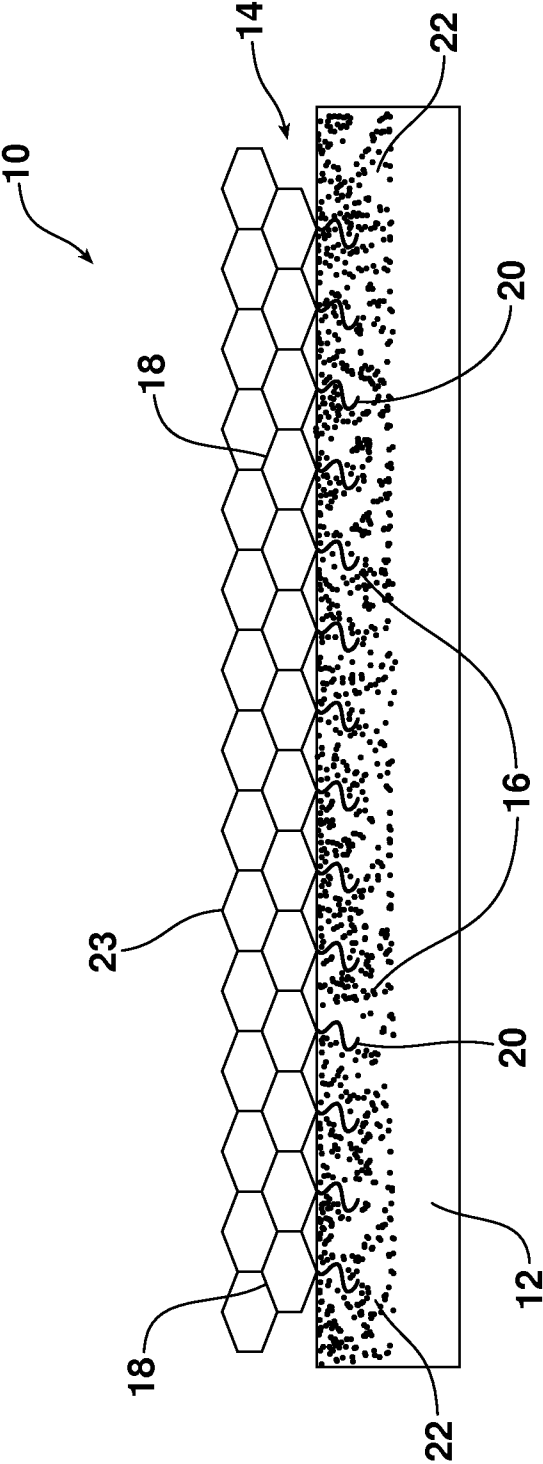


FIG. 1



HARD-COAT INFUSED POLYCARBONATE HEADLAMP LENS AND RELATED METHOD

[0001] This application claims the benefit of U.S. provisional patent application Ser. No. 62/086,965 filed on 3 Dec. 2014, the full disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] This document relates generally to the vehicle equipment field and, more particularly, to a hard-coat infused polycarbonate lens that is less expensive to produce and provides better performance including, particularly, better resistance to UV degradation over time so as to remain clear for the free passage of light for the life of the vehicle.

BACKGROUND

[0003] Currently, headlamp lenses are molded from optically clear polycarbonate. In order to protect the headlamp lenses from both abrasion and ultraviolet (UV) weathering degradation, a clear silica hard-coat and anti-UV additives are applied to the forward surface of the headlamp. Silica hard-coated polycarbonate headlamp lenses provide excellent resistance to scratches and excellent impact performance. However, silica hard-coated polycarbonate headlamp lenses suffer a number of drawbacks.

[0004] More specifically, the silica hard-coating process is very expensive and typically requires large facility expense in order to implement. Further, exposure to UV radiation from the rays of the sun attacks both the coating and the lens base polycarbonate substrate. Current state-of-the-art UV protection lasts up to 3000 hours of accelerated weathering. However, it should be appreciated that many vehicles including, for example, those in the Sun Belt areas of the United States are exposed to substantial UV radiation that, over time, breaks down the substrate leading to yellowing and clouding which reduces headlamp performance. Further, as the UV rays of the sun degrade the substrate, the silica hard-coat may delaminate from the polycarbonate substrate accelerating the substrate degradation. This also leads to degradation of the impact performance of the lens. Still further, the hard-coat process relies upon volatile organic compounds (VOCs) which are an environmental concern.

[0005] This document relates to a new and improved method that provides similar or improved scratch resistance and significantly better UV performance than found in current polycarbonate headlamp lenses. As a result, impact resistance and clarity may be better maintained for the life of the vehicle. Further, the method utilized to provide this increased performance is more affordable than and does not release VOCs into the atmosphere like the prior art process.

SUMMARY

[0006] In accordance with the purposes and benefits described herein, a headlamp lens is provided. That headlamp lens comprises a polycarbonate substrate and an infused protective skin covering at least one surface of the polycarbonate substrate.

[0007] In one possible embodiment, the infused protective skin includes a scratch-resistant agent and a UV inhibitor. In one possible embodiment, the scratch-resistant agent is silicone-based. In one possible embodiment, the scratch-resistant agent is selected from a group of materials consisting of

vinyl (mono-, di- and tri-alkoxysilanes), phenyl (mono-, di- and tri-alkoxysilanes), diphenyldialkoxysilanes, vinyltri-alkoxysilanes, and other silicone-based molecules and mixtures thereof.

[0008] In one possible embodiment, the UV inhibitor is selected from a group of materials consisting of benzophenone, a benzotriazole and mixtures thereof. Still further, in one possible embodiment, the infused protective skin further includes a UV stabilizer. In one possible embodiment, that UV stabilizer may be a hindered amine light stabilizer.

[0009] Still further, the polycarbonate substrate in any embodiment may include a plurality of pores. Further, the scratch-resistant agent may comprise silicon-based molecules having relatively large heads and relatively narrow tails wherein the heads rest on a surface of the substrate overlying the pores and the tails penetrate the pores and act as an anchor for the heads.

[0010] In accordance with an additional aspect, a method is provided of manufacturing a polycarbonate headlamp lens with an infused skin providing scratch resistance and UV protection. That method may be described as comprising the steps of molding the headlamp lens substrate from polycarbonate material, cleaning the polycarbonate substrate following molding and infusing a surface of the polycarbonate substrate with a protective skin to produce polycarbonate infused headlamp lenses. This is then followed by rinsing and drying the lenses.

[0011] In one possible embodiment, the method further includes increasing the thickness of the protective skin following infusing. In one possible embodiment, this is done by chemically enhanced physical vapor deposition.

[0012] In one possible embodiment, the method includes incorporating a scratch resistant agent and a UV inhibitor in the protective skin. That scratch resistant agent may be selected from a group of materials consisting of vinyl (mono-, di- and tri-alkoxysilanes), phenyl (mono-, di- and tri-alkoxysilanes), diphenyldialkoxysilanes, vinyltrimethoxysilanes, other silicone-based molecules and mixtures thereof. Further, the method may include selecting the UV inhibitors from a group of materials consisting of benzophenone, a benzotriazole, other UV inhibitor compounds and mixtures thereof. Further, the method may include incorporating one or more UV stabilizers in the protective skin.

[0013] In one possible embodiment, the method includes cooling the headlamp lens substrate after molding and prior to cleaning to a temperature between 65° C. and room temperature. Further, the method includes infusing by dipping the substrate into an infusion tank including an infusion solution bath for a period of time between 10 to 60 seconds at a temperature between 65-90° C. so as to open pores in the substrate to allow superficial infusion of the protective skin to the substrate. In one possible embodiment, the scratch resistant agent and the UV inhibitor are infused in a single step. In another possible embodiment, the scratch resistant agent and the UV inhibitor are infused in multiple steps for the purposes of building up the desired thickness of the hard coating. In addition, the method may include the step of performing a scratch resistance test to select infused lenses and adjusting the concentration of additives in the infusion solution bath as required until the desired results are achieved.

[0014] In the following description there are shown and described several preferred embodiments of the headlamp lens. As should be realized, the headlamp lens is capable of other, different embodiments and its several details are

capable of modification in various, obvious aspects, all without departing from the headlamp lens as described in the following claims.

[0015] Accordingly, the drawings and descriptions should be regarded as illustrative in nature and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWING FIGURE

[0016] The accompanying drawing figure incorporated herein and forming a part of the specification, illustrates several aspects of the infused headlamp lens and together with the description serves to explain certain principles thereof.

[0017] FIG. 1 is a schematic representation of the polycarbonate lens with an infused protective coating.

[0018] Reference will now be made in detail to the present preferred embodiments of the headlamp lens, an example of which is illustrated in the accompanying drawing figure.

DETAILED DESCRIPTION

[0019] Reference is now made to FIG. 1 illustrating the headlamp lens 10. That headlamp lens 10 comprises a polycarbonate substrate 12 and an infused protective skin 14 covering at least one surface (i.e. the forward surface) of the polycarbonate substrate and an optional PECVD (Plasma Enhanced Chemical Vapor Deposition) build-up.

[0020] In one embodiment, the infused protective skin 14 includes a scratch resistance agent and a UV inhibitor. In one possible embodiment, the scratch resistance agent is silicone-based. Such a scratch resistance agent may be selected from a group of materials consisting of vinyl (mono-, di- and tri-alkoxysilanes), phenyl (mono-, di- and tri-alkoxysilanes), diphenyldialkoxysilanes, vinyltrimethoxysilanes, and other silicone-based molecules and mixtures thereof.

[0021] In one embodiment the UV inhibitor is selected from a group of materials consisting of a benzophenone, a benzotriazole, or other compounds like hydroxyphenyltriazines and mixtures thereof. Further, in one possible embodiment the infused protective skin further includes one or more UV stabilizers. The UV stabilizer may take the form of a hindered amine light stabilizer.

[0022] As illustrated in FIG. 1, in any of the embodiments the polycarbonate substrate 12 includes a plurality of pores 16. In one possible embodiment, the scratch resistance agent comprises silicone-based molecules having relatively large heads 18 and relatively narrow tails 20 wherein the heads rest on a surface of the substrate 12 overlying the pores 16 so as to provide a hard, impact resistant protective coating while the tails 20 penetrate the pores and act as an anchor for the heads. Advantageously, this structure provides a chemical bond between the infused protective skin 14 and the polycarbonate substrate 12 that is (a) far superior to and (b) resists the delamination characteristic of mechanically bonded hard-coats provided on headlamp lenses made in accordance with methods known in the art. It also serves to seal in the UV inhibitor 22 that has penetrated and been deposited deep in other pores 16.

[0023] In accordance with an additional aspect, a method is provided for manufacturing a polycarbonate headlamp lens 10 having a polycarbonate substrate 12 and an infused skin 14 providing scratch resistance and UV protection. That method may be broadly described as comprising the steps of molding the headlamp lens substrate 12 from the polycarbonate mate-

rial, cleaning the polycarbonate substrate following molding, infusing a surface of the polycarbonate substrate with a protective skin 14 and adding an optional PECVD layer 23 to produce an infused headlamp lens 10, rinsing the lens and drying the lens. The method may also include incorporating a scratch resistance agent and a UV inhibitor in the protective skin 14. Further, the method may include selecting a scratch resistance agent from a group of materials consisting of vinyl (mono-, di- and tri-alkoxysilanes), phenyl (mono-, di- and tri-alkoxysilanes), diphenyldialkoxysilanes, vinyltrimethoxysilanes, and other silicone-based molecules and mixtures thereof.

[0024] In addition the method may include the selecting of the UV inhibitor from a group of materials consisting of a benzophenone, a benzotriazole, other compounds like hydroxyphenyltriazines and mixtures thereof. Further the method may include incorporating a UV stabilizer in the protective skin 14.

[0025] Still more specifically, the method may include cooling the headlamp lens substrate 12 after molding and prior to cleaning to a temperature of between 65° C. and room temperature. Further the infusing step may include dipping the substrate 12 into an infusion tank including an infusion solution bath for a period of time of between 10 to 60 seconds at a temperature between 65-90° C. so as to open the pores 16 in the substrate to allow superficial infusion of the protective skin 14 into the substrate. In one possible embodiment, the scratch resistance agent and the UV inhibitor are infused in a single step. In another possible embodiment, the scratch resistance agent and the UV inhibitor are infused in multiple steps. In another embodiment, the method includes performing a scratch resistance test to selected infused lenses and adjusting the concentrations of additives in the infusion solution bath as required until the desired results are achieved.

[0026] Another embodiment is to increase the depth of the silica layer by using an additional deposition process such as PECVD or other deposition process.

[0027] In yet another embodiment, the thickness of the infused skin may be further increased by appropriate physical or chemical conditioning or both. A potential way of achieving this is by chemically enhanced physical vapor deposition (CEPVD). In this technique, the infused polycarbonate is placed inside a chamber where silica and related silicon-based compounds (precursors) are ionized and vaporized under partial vacuum at moderate or near ambient temperatures and the vapors are allowed to deposit and condense onto the infused polycarbonate. Final hard coating thicknesses are controlled by the selection of the type of precursor and the chamber time/temperature/vacuum pressure to which the polycarbonate is exposed. In one possible embodiment, the thickness of the infused protection skin is between 1 and 10 microns. In another possible embodiment the protective skin has a thickness of about 7 microns. Where CEPVD is used to increase the thickness of the protective skin, the infused silica surface is receptive to chemical bonding and physical binding with the vaporized silica and related silicon-based compounds to provide a hard, scratch resistant layer.

[0028] In one possible embodiment, the polycarbonate headlamp lens substrate may be removed from the molding tool using an overhead conveyor transport. The molded lens may then be cooled to a temperature between 65° C. and room temperature by air circulation or other means prior to cleaning. Cleaning may be completed by dipping the lens 10 into a

tank filled with distilled, deionized water for 10 to 30 seconds. That water is maintained at anywhere from room temperature to 65° C.

[0029] After cleaning, the lens is dipped into an infusion tank holding an infusion solution bath for from 10 to 60 seconds wherein the bath is held at 65 the 90° C. The bath opens the pores **16** in the surface of the substrate **12** to allow superficial infusion of the additives in the infusion solution to a depth of 0.1-10 μ or more as desired.

[0030] If the scratch resistance agent and the UV inhibitor are infused in a single step, the infusion solution bath includes an aqueous mixture of surface active agents including ionic and nonionic surfactants (emulsifiers). These surfactants hold two or more immiscible liquids, solids and mixtures in suspension. Proper emulsification is essential to the satisfactory performance of the carrier. Emulsifiers can be ionic (anionic, cationic, and amphoteric) and non-ionic.

[0031] Sodium stearate (a soap)—is an example of an anionic surfactant;

[0032] Trimethylhexadecyl ammonium bromide—is an example of a cationic surfactant;

[0033] Cocoamidopropylbetaine—is an example of an amphoteric surfactant; and

[0034] Polyethylene ethoxylate—is an example of a non-ionic surfactant.

[0035] Additional chemicals in the infusion solution bath may further include ethanol, other solvents, dispersants, plasticizers and leveling agents. If the scratch resistance agent and the UV inhibitor are infused in a single step, the infusion solution bath may further include hard coating materials based on the hard coating formula and the UV protection formula described below. In the event the scratch resistance agent and the UV inhibitor are to be infused in multiple steps, the first infusion path would include either the hard coating formula or the UV protection formula and a second infusion coating bath would include the other of the hard coating formula or UV protection formula.

[0036] For purposes of this document the hard coating formula may be described as comprising a number of silicone-based molecules that are suitable for the hard coating infusion of the polycarbonate lens **12**. As previously noted, these may include vinyl (mono-, di- and tri-alkoxysilanes), phenyl (mono-, di- and tri-alkoxysilanes), diphenyldialkoxysilanes, vinyltrimethoxysilane, other silicone-based molecules and mixtures thereof. Such molecules have long chain organic tails **20** that are able to penetrate the polycarbonate pores **16** and act as chemical anchor sites.

[0037] For purposes of this document the UV protection formula may be described as including UV absorbers based on conjugated compounds (containing double bonds) that absorb the UV radiation and re-emit it in the lower energy infrared range. These include benzophenones and benzotriazoles. Additionally, the UV protection, may include UV stabilizers. One of the most effective and important stabilizers are the hindered amine light stabilizers (HALS). Rather than simply absorbing the light energy, these stabilizers work by interrupting the photo degradation process before it can get destructively underway. The mechanisms used include “free radical scavenging”, “peroxide decomposition” as well as energy absorption.

[0038] With the exception for water and alcohol, concentrations of the various chemicals may range from 0.01% to 10% each by weight or by volume. Concentrations of water and alcohol can range from 10 to 90% by volume.

[0039] Rinsing of the lens following infusion may comprise dipping the lens **10** in a second rinse tank of distilled ionized water for 10 to 30 seconds that has a temperature anywhere from room temperature to 65° C. The lens **10** is then removed from the tank and air dried such as by means of a drying fan. After performing any necessary scratch resistance testing on a selected test sample specimen, the remaining lenses **10** in the group of lenses being manufactured together are packaged for shipment. As should be appreciated all the steps may be performed by utilizing a robotic system with precise timing and sequencing protocol. Further, it should be appreciated that the headlamp lenses **10** may be infused at the molding site or at a remote facility any time after molding.

[0040] The foregoing has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the embodiments to the precise form disclosed. Obvious modifications and variations are possible in light of the above teachings. All such modifications and variations are within the scope of the appended claims when interpreted in accordance with the breadth to which they are fairly, legally and equitably entitled.

What is claimed:

1. A headlamp lens, comprising:
a polycarbonate substrate; and
an infused protective skin covering at least one surface of said polycarbonate substrate.
2. The lens of claim 1, wherein said infused protective skin includes a scratch resistance agent and a UV inhibitor.
3. The lens of claim 2, wherein said scratch resistance agent is silicone based.
4. The lens of claim 3, wherein said scratch resistance agent is selected from a group of materials consisting of vinyl (mono-, di- and tri-alkoxysilanes), phenyl (mono-, di- and tri-alkoxysilanes), diphenyldialkoxysilanes, vinyltrimethoxysilane, other silicone-based molecules and mixtures thereof.
5. The lens of claim 4, wherein said UV inhibitor is selected from a group of materials consisting of a benzophenone, a benzotriazole, a hydroxyphenyltriazine, and mixtures thereof.
6. The lens of claim 5, wherein said infused protective skin further includes a UV stabilizer.
7. The lens of claim 6, wherein said UV stabilizer is a hindered amine light stabilizer.
8. The lens of claim 3, wherein said polycarbonate substrate includes a plurality of pores.
9. The lens of claim 8, wherein said scratch resistance agent comprises silicone based molecules having relatively large heads and relatively narrow tails wherein said heads rest on a surface of said substrate overlying said pores and said tails penetrate said pores and act as an anchor for said heads.
10. A method of manufacturing a polycarbonate headlamp lens with an infused skin providing scratch resistance and UV protection, comprising:
molding said headlamp lens substrate from polycarbonate material;
cleaning said polycarbonate substrate following molding;
infusing a surface of polycarbonate substrate with a protective skin to produce polycarbonate infused headlamp lens;
rinsing said lens; and
drying said lens.
11. The method of claim 10, further including increasing thickness of said protective skin following infusing.

12. The method of claim **11**, including increasing thickness of said protective skin by chemically enhanced physical vapor deposition.

13. The method of claim **11**, including incorporating a scratch resistance agent and a UV inhibitor in said protective skin.

14. The method of claim **13**, including selecting said scratch resistance agent from a group of materials consisting of vinyl (mono-, di- and tri-alkoxysilanes), phenyl (mono-, di- and tri-alkoxysilanes), diphenyldialkoxysilanes, vinyltrimethoxysilanes, and other silicone-based molecules and mixtures thereof.

15. The method of claim **14**, including selecting said UV inhibitors from a group of materials consisting of a benzophenone, a benzotriazole, a hydroxyphenyltriazine, and other UV inhibitor compounds and mixtures thereof.

16. The method of claim **15**, including incorporating a UV stabilizer in said protective skin.

17. The method of claim **11**, further including cooling said headlamp lens substrate after molding and prior to cleaning to a temperature between 65° C. and room temperature.

18. The method of claim **13**, wherein infusing includes dipping said substrate into an infusion tank including an infusion solution bath for a period of time of between 10-60 seconds at a temperature of between 65-90° C. so as to open pores in said substrate to allow superficial infusion of said protective skin into said substrate.

19. The method of claim **18**, wherein said scratch resistance agent and said UV inhibitor are infused in (a) a single step or (b) in multiple steps for the purposes of building up the desired thickness of the hard coating.

20. The method of claim **18**, including performing a scratch resistance test to selected infused lenses and adjusting concentration of additives in said infusion solution bath as required until desired results are achieved.

* * * * *

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Dear Mr. Aihara:

This is in reply to your letter of June 10, 1999, presented at a meeting with NHTSA representatives that day, asking for an interpretation of S5.1.2 of Federal Motor Vehicle Safety Standard No. 108. I am sorry that we were unable to provide you a response by July 6 as you requested in your letter of June 28 to Taylor Vinson of this Office.

Your company has developed a new rear turn signal lamp, consisting of an outer plastic lens, an inner cap, and an uncolored filament bulb. The color of the lens is "pale (light) pink color, and, this plastic material complies with the requirements of SAE J576c . . . excluding the color requirement." You tell us that the trichromaticity coordinates of the plastic material used in the outer lens do not fall within either the red or the white areas of the chromaticity chart of SAE J578c. However, when illuminated, the lamp provides an amber color that fall within the coordinates specified in SAE J578c. You have asked whether this design is acceptable under S5.1.2 relating to plastic materials used in optical parts of motor vehicle lighting devices.

Although this does not affect our answer to your question, please note, in Standard No. 108, that SAE Recommended Practice J576c of 1970 has been replaced by SAE J576 JUL91 as the applicable standard for plastic materials used in lighting devices. However, J578c remains the Federal standard for color.

We regret to inform you that this design is not acceptable. Although S1, *Scope*, of SAE J578c states that "The specification applies to the overall effective color of light emitted by the device," regardless of the color of its lens, both SAE J576 JUL91 and Standard No. 108 apply the color requirement to plastic components of lamps as well. S5.1.2(e) of Standard No. 108 requires the trichromatic coordinates of the plastic samples, tested according to that paragraph, to conform to the requirements of SAE J578c. Paragraphs 4.1 and 4.2.2 of SAE J576 JUL91 also require conformance of plastic samples to the chromaticity coordinate requirements of SAE J578c. This standard specifies color coordinates only for red, white, yellow (amber), green, and blue. Because the lens of your lamp does not meet any of the coordinates of SAE J578c, Standard No. 108 does not permit its use.

At the meeting, we noted that the inner lens was a greenish color. It, too, must comply with the color coordinate requirements of paragraphs 4.1 and 4.2.2 of SAE J576 JUL91.

At that time, you also asked if it were acceptable to use a plastic fabricated from the mix of two resins, each of which complied with the requirements of SAE J576. You cannot assume, when two complying resins are blended, that the resulting plastic will also comply with SAE J576 JUL91, and we recommend that you test the blended plastic to ensure that it meets all the specifications of S5.1.2 and SAE J576 JUL91. This would be the case whether it was the intent to create a new color, or whether the rejected molded parts are reground and plastics of differing compositions are mixed and recycled into newly-molded lamp lenses. As we said in the preamble to the 1995 final rule amending S5.1.2, "it is incumbent upon the vehicle or equipment manufacturer . . . not to change the composition of the plastics materials [obtained from the plastics manufacturer] in a manner that would cause it to be noncomplying." 60 FR 46066, copy enclosed.

Sincerely,
Frank Seales, Jr.
Chief Counsel
Enclosure
ref:108
d.8/27/99

KOITO

SHIZUOKA WORKS
500, KITAWAKI
SHIMIZU-SHI, SHIZUOKA-KEN
JAPAN
TEL NO. 0543-45-2573
FAX NO. 0543-45-3437

DEPT. OF TRANSPORTATION
POCKETS
KOITO MANUFACTURING CO., LTD.

MAKERS



2005 OCT 12 A 11:27
CONTRACTORS

HEAD OFFICE
4-8-3, TAKANAWA
MINATO-KU TOKYO
JAPAN
TEL NO. 03-3443-7111
FAX NO. 03-3447-1520

4 August, 2005

U.S. Dept. of Transportation
NHTSA
Office of the Chief Counsel
400 seventh Street SW
Washington DC 20590

HTSA-05-22709-2

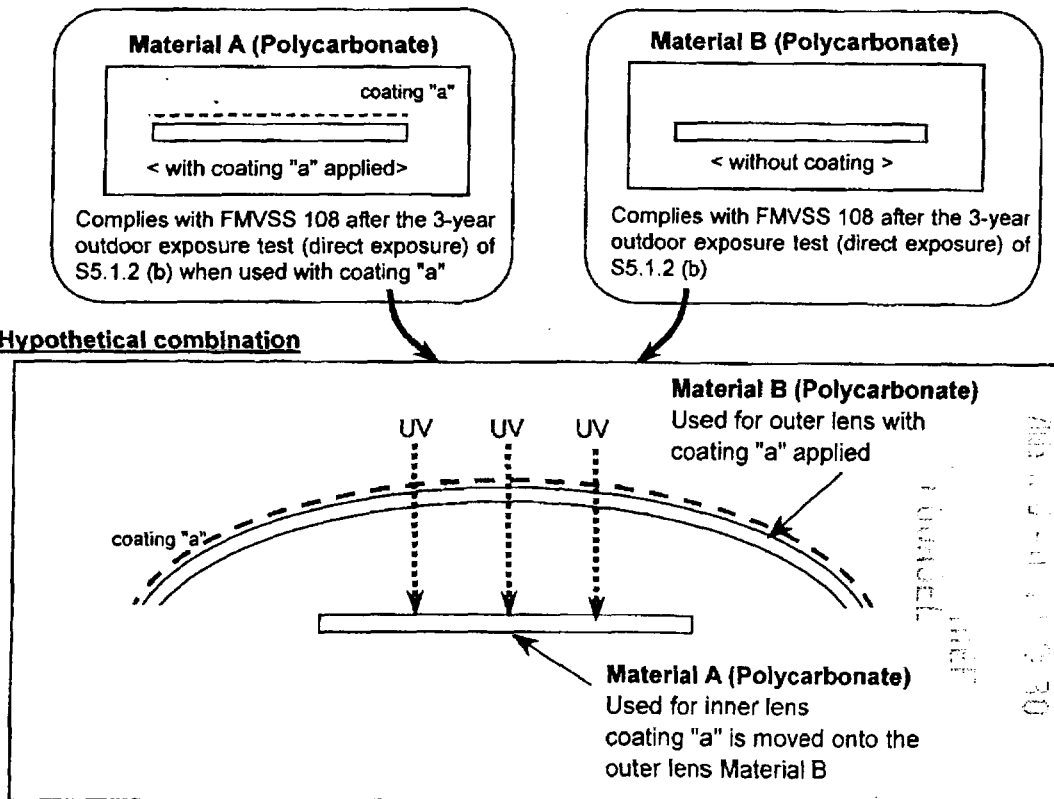
Request for Interpretation: Necessity of carrying out a 3-year outdoor exposure test

Dear Sir:

Koito would like to thank you in advance for your consideration of our request for an interpretation and clarification of the Federal Motor Vehicle Safety Standard (FMVSS) No.108 concerning the necessity of carrying out a 3-year outdoor exposure test in a certain combination of plastic and coating material as explained below.

The Question: Necessity of carrying out a 3-year outdoor exposure test when "material A", which is suitable for direct exposure of FMVSS108 S5.1.2 (b), is used with a covering lens "material B", also suitable for direct exposure of FMVSS108 S5.1.2 (b), and a coating material "a" which was originally on the exterior surface of "material A" is moved to the exterior surface of "material B".

We are contemplating a new combination of plastic lens and coating material for use in an inner lens optics of automotive lamps. In this hypothetical new combination, "material A" (polycarbonate), which is suitable for direct exposure of FMVSS108 S5.1.2 (b) after completion of the 3-year outdoor exposure test when used with coating material "a", is going to be used in the inner lens. "Material B" (polycarbonate), which is also suitable for direct exposure of FMVSS108 S5.1.2 (b), but without coating, is going to be used in the outer lens. Despite that both materials meet FMVSS108 S5.1.2(b) in direct exposure condition, coating material "a" which was originally on the exterior surface of the inner lens "material A" when performing a 3-year exposure test is going to be moved onto the exterior surface of the outer lens "material B", and material A loses the coating "a" from its own surface. (See Figure-1)



< Figure-1 >

We construe that no further testing of this hypothetical material / coating combination is required for the evaluation of the cumulative haze. Inner lens "material A" is still used with the coating material "a", although the coating itself is moved onto the exterior surface of the outer lens "material B". Also, in view of the vast reduction in ultraviolet exposure of inner lens which is afforded by the outer lens "material B", the inner lens "material A" would experience negligible haze when protected by an outer lens. This will further support the argument that haze performance of this material / coating combination is already ensured by the direct exposure of both materials A and B which were confirmed satisfactory to the FMVSS108 S5.1.2 (b) criteria after completion of the 3-year outdoor exposure tests.

Koito Manufacturing thanks you in advance for your early confirmation on this matter.

Sincerely,

A handwritten signature in black ink, appearing to read "K. Hyodo", with a horizontal line extending to the right.

Kiminori Hyodo
Deputy General Manager, Regulation & Certification
Koito Manufacturing Co., Ltd.



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

DEPT. OF TRANSPORTATION
DOCKETS

OCT - 4 2005

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Docket SVC-124
Std 108

400 Seventh St., S.W.
Washington, D.C. 20590

NHTSA-05-22709-1

Mr. Kiminori Hyodo
Deputy General Manager, Regulations & Certification
Koito Manufacturing Co., Ltd.
4-8-3, Takanawa
Minato-ku Tokyo
Japan

Dear Mr. Hyodo:

This responds to your recent letter, in which you asked whether it would be necessary to carry out a three-year, outdoor exposure test on a new combination of plastic lens and coating material under Federal Motor Vehicle Safety Standard (FMVSS) No. 108, Lamps, Reflective Devices, and Associated Equipment. Specifically, your letter stated that you plan to use two existing types of polycarbonate materials, each of which independently meets the requirements of S5.1.2 of Standard No. 108 (*i.e.*, Material A with a coating, and Material B without a coating). However, we understand that you now intend to combine these materials, such that Material A is used as an inner lens without a coating, and Material B is used as an outer lens with the same coating that had been applied to Material A. In response to your question, FMVSS No. 108 does not specifically require manufacturers to conduct testing, but it is the manufacturer's responsibility to produce a product that complies with all applicable requirements of our standard when tested in accordance with the standard, and to properly certify compliance.

By way of background, the National Highway Traffic Safety Administration (NHTSA) is authorized to issue FMVSSs that set performance requirements for new motor vehicles and items of motor vehicle equipment. NHTSA does not provide approval of motor vehicles or motor vehicle equipment. Instead, it is the responsibility of manufacturers to self-certify that their products conform to all applicable safety standards that are in effect on the date of manufacture (see 49 U.S.C. 30115 and 49 CFR Part 567, Certification).

We note further that the agency's safety standards specify the test conditions and procedures that NHTSA will use to evaluate the performance of the vehicle or equipment being tested for compliance with the particular safety standard. NHTSA follows the test procedures and conditions applicable and in effect at the time of certification when conducting its compliance testing.



VEHICLE SAFETY HOTLINE
888-327-4236

A manufacturer is responsible for ensuring that its product complies with applicable standards when tested in accordance with NHTSA procedures. A manufacturer may choose a valid means other than NHTSA performance test procedures for evaluating its products to determine whether the vehicle or equipment will comply with the safety standards when tested by the agency according to the procedures specified by the standard and to provide a basis for its certification of compliance.

If the agency has reason to believe that an apparent noncompliance exists in a vehicle or item of motor vehicle equipment, the manufacturer is asked to show the basis for its certification that the vehicle or equipment complies with the relevant safety standard(s). If in fact the vehicle or equipment does not comply with a Federal motor vehicle safety standard when tested according to procedures specified by the standard, the manufacturer will have to recall the product to bring it into compliance at no charge to the customer.

In addition, the manufacturer will be subject to civil penalties, unless it can establish that it had no reason to know, despite exercising "reasonable care" in the design and manufacture of the product to ensure compliance, that the product did not in fact comply with the safety standard(s) (49 U.S.C. 30115(a) and 30165). This agency has long said that it is unable to judge what efforts would constitute "reasonable care" in advance of the actual circumstances in which a noncompliance occurs.

As you are aware, the requirements for lighting equipment are contained in FMVSS No. 108, which provides in relevant part:

S5.1.2 Plastic materials used for optical parts such as lenses and reflectors shall conform to SAE Recommended Practice J576 [Society of Automotive Engineers (SAE) Recommended Practice J576, Plastic Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices] JUL91, except that:

- (a) Plastic lenses (other than those incorporating reflex reflectors) used for inner lenses or those covered by another material and not exposed directly to sunlight shall meet the requirements of paragraphs 3.3 and 4.2 of SAE J576 JUL91 when covered by the outer lens or other material;

- (b) After the outdoor exposure test, the haze and loss of surface luster of plastic materials (other than those incorporating reflex reflectors) used for outer lenses shall not be greater than 30 percent haze as measured by ASTM D 1003-92, *Haze and Luminous Transmittance of Transparent Plastic*;

...

- (g) All outdoor exposure tests shall be 3 years in duration, whether the material is exposed or protected. Accelerated weathering procedures are not permitted.

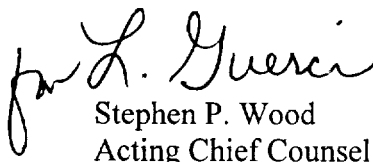
We note that neither SAE J576 nor Standard No. 108 specifically requires use of a coating.

Thus, the standard sets forth the test that NHTSA follows in conducting compliance testing. Specifically, under SAE J576 (incorporated by reference in FMVSS No. 108), the agency will subject plastic materials used for optical parts to an unaccelerated, three-year outdoor exposure test.

In short, Koito must ensure that its lamps as manufactured conform to all applicable requirements of FMVSS No 108, including that the plastic materials meet the exposure test requirements under S5.1.2. Again, our standards do not compel manufacturers to test the motor vehicles or motor vehicle equipment that they produce under NHTSA's test procedures, although many choose to do so in order to provide a basis for their certification. However, if the agency subjected the lamp in question to compliance testing, the lamp's plastic materials would need to meet the requirements of FMVSS No. 108, as certified.

If you have further questions, please feel free to contact Eric Stas of my staff at this address or by telephone at (202) 366-2992.

Sincerely,


Stephen P. Wood
Acting Chief Counsel

HONDA

American Honda Motor Co., Inc.
1919 Torrance Boulevard
Torrance, CA 90501-2746
Phone (310) 783-2000

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NYS-215

2004 JUN -1 A 9 51

OFFICE OF
DEFECTS INVESTIGATION

04V-257
(3 pages)

May 27, 2004

Mr. Kenneth N. Weinstein,
Associate Administrator
Office of Safety Assurance
NATIONAL HIGHWAY TRAFFIC SAFETY
ADMINISTRATION
400 Seventh St., S.W.
Washington, DC 20590

Dear Mr. Weinstein:

On May 20, 2004, Honda Motor Co., Ltd. (HMC) determined the existence of a noncompliance with Federal Motor Vehicle Safety Standard No. 108, "Lamps, Reflective Devices, and Associated Equipment" in the motor vehicles listed below. The following information is submitted pursuant to the requirements of 49 CFR 573.8.

573.8(c)(1)

Name of manufacturer: Honda Motor Co., Ltd. (HMC)
Manufacturer's agent: William R. Wilton
American Honda Motor Co., Inc. (AHM)
1919 Torrance Blvd.
Torrance, CA 90501-2746
Name of tail lamp manufacturer: Koto Manufacturing Co., Ltd.

573.8(c)(2)

Identification of potentially affected vehicles:

<u>Make/Model</u>	<u>Description</u>	<u>VIN/Dates of Manufacture</u>
Honda S2000	Certain 2000 models	JHMAP114*YT000049 - JHMAP114*YT007115 June 8, 1999 to April 5, 2000

Description of the basis for the determination of the recall population:

The 2000 model year was the introductory year of the S2000. The affected lenses of the side marker lamp and side reflex reflector in the tail lamp assembly were identified based on manufacturing records. The VIN range and manufacturing dates are inclusive of all vehicles that could potentially have a noncomplying lens installed by the factory.

573.8(c)(3)

Total number of vehicles potentially affected: 7,067

573.8(c)(4)

Percentage of affected vehicles that contain the noncompliance: Unknown

573.6(c)(5)

Noncompliance description:

Summary

The lens of the side marker lamp and side reflex reflector in the tail lamp assembly were manufactured with incorrect dye that, under the circumstances of use, does not retain its color over time and, therefore, does not comply with the requirements of Federal Motor Vehicle Safety Standard No. 108, "Lamps, Reflective Devices, and Associated Equipment."

Detail

The lens of the side marker lamp and side reflex reflector in the tail lamp assembly were manufactured using Diazole-base dye instead of Perinone-base dye. The chemical unit of Diazole-base dye, when used in the circumstances of the S2000, is more susceptible to UV and high temperature decomposition. As a result, the red color could fade, which does not comply with the deterioration requirement of Federal Motor Vehicle Safety Standard No. 108, "Lamps, Reflective Devices, and Associated Equipment."

573.6(c)(7)

Determination of noncompliance:

On June 17, 2003, HMC received a report that the color of the tail lamp side marker lens had faded. HMC initiated an investigation. According to Koito's accelerated test, the lens was projected to comply with the deterioration requirement of FMVSS 108. On May 14, 2004, Honda and Koito met with NHTSA to discuss compliance implications. In accordance with NHTSA's opinion, HMC determined the existence of a noncompliance.

573.6(c)(8)(i)

Program for remedying the noncompliance:

The owners of all affected vehicles will be notified by mail to take their vehicle to an authorized Honda dealer. The dealer will replace all affected tail lamp assemblies, free of charge.

573.6(c)(8)(ii)

The estimated date to e-mail preliminary notification to dealers:	Jun. 4, 2004
The estimated date to provide service bulletin to dealers:	Jun. 18, 2004
The estimated date to begin sending notifications to owners:	Jul. 7, 2004
The estimated date of completion of the notification:	Jul. 7, 2004

573.6(c)(9)

Representative copies of all notices, bulletins and other communications:

A copy of the dealer service bulletin and text of the final customer notification letter will be submitted to your office as soon as possible.

573.6(c)(10)

Proposed owner notification letter submission:

A draft of the owner notification letter will be submitted to your office as soon as possible.

Mr. Kenneth N. Weinstein
May 27, 2004
Page 3

573.6(c)(11)

Manufacturer's campaign number:

The number will be submitted to your office as soon as possible.

Sincerely,

AMERICAN HONDA MOTOR CO., INC.



William R. Willen
Managing Counsel
Product Regulatory Office

WRW:ka

Weaverville is located within the prohibited co-channel minimum distance separation of 280.8 kilometers (174.5 miles) to the Sacramento-Stockton television market, one of the designated television markets affected by the Commission's current freeze on allotments and applications pending the outcome of an inquiry into the use of advanced television systems in broadcasting. (See *Order, Advanced Television Systems and Their Impact on Existing Television Broadcasting Service*, 52 Fed. Reg. 28346, July 29, 1987). However, Channel 32 is allotted to Weaverville in compliance with the terms of the freeze *Order* at a restricted site. Interested parties should note that any application submitted for Channel 32 at Weaverville which does not specify a site beyond the "freeze zone" governing the allotment will not be accepted for filing.

List of Subjects in 47 CFR Part 73

Television broadcasting.

Part 73 of title 47 of the Code of Federal Regulations is amended as follows:

PART 73—[AMENDED]

1. The authority citation for part 73 continues to read as follows:

Authority: Secs. 303, 48 Stat., as amended, 1082; 47 U.S.C. 154, as amended.

§ 73.606 [Amended]

2. Section 73.606(b), the Table of TV Allotments under California, is amended by adding Weaverville, Channel 32.

Federal Communications Commission.

John A. Karousos,

Chief, Allocations Branch, Policy and Rules Division, Mass Media Bureau.

[FR Doc. 95-21907 Filed 9-1-95; 8:45 am]

BILLING CODE 6712-01-F

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. 94-37; Notice 2]

RIN 2127-AF 22

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices and Associated Equipment

AGENCY: National Highway Traffic Safety Administration (NHTSA), DOT.

ACTION: Final rule.

SUMMARY: This notice adopts amendments to the Federal Motor

Vehicle Safety Standard on lighting to replace the currently incorporated SAE J576c with the more recent SAE J576 JUL91 as the referenced standard on plastics materials, to replace ASTM D 1003-61 with the more recent ASTM D 1003-92 in the test procedures, and to allow alternative processing techniques, sample sizes and thickness tolerances to those presently specified. These amendments represent the choice of Option 1 from the notice of proposed rulemaking published in November 1994.

DATES: The effective date of the final rule is March 1, 1996.

FOR FURTHER INFORMATION CONTACT: Kenneth O. Hardie, Office of Rulemaking, NHTSA (202-366-6987).

SUPPLEMENTARY INFORMATION: Heraeus DSET Laboratories, Inc. ("DSET"), of Phoenix, Arizona, petitioned NHTSA for rulemaking to amend Federal Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*. Specifically, DSET asked that paragraph S5.1.2 be amended "to update the test specimen processing requirements of plastic material used for optical parts such as lenses and reflectors." Currently, these materials are required to conform to Society of Automotive Engineers (SAE) Recommended Practice J576c, May 1970. DSET wants NHTSA

to allow alternative processing techniques besides injection molding to produce test specimens, to allow test specimen sizes other than a 3 inch diameter disc and to change the specimen thickness tolerances from ± 0.005 inch to ± 0.010 inch.

Those requirements for injection molding and for the diameter and thickness of the test specimen are set forth in J576c, May 1970.

NHTSA granted the petition and published a notice of proposed rulemaking in response to it on November 2, 1994 (59 FR 54881). The notice proposed two alternative amendments of S5.1.2 as a means of implementing its grant of DSET's petition. The agency asked commenters for their views on each of the alternatives.

Option 1. This option would substitute SAE J576 JUL91 for SAE J576c, May 1970, and make conforming amendments in the text of S5.1.2. Option 1 would also replace American Society for Testing and Materials (ASTM) D 1003-61 with ASTM D 1003-92 with respect to measurement of haze (which, as currently specified, would not exceed 7 percent). A specimen thickness tolerance of ± 0.25 mm (0.010 in.) would also be allowed as there is no technical reason to limit the test

specimen thickness tolerance to ± 0.005 in., and the value proposed by NHTSA as recommended by DSET appears to be a more reasonable tolerance for test specimens.

Option 2. This option would retain the current SAE and ASTM specifications but would allow processing techniques other than injection molding to produce equivalent test specimens, test specimens other than a disc of 3-inch diameter, and a test specimen thickness tolerance of ± 0.010 inch.

Seven comments were received, five of which supported Option 1. These were from Flxible Corporation ("Flxible"), Transportation Safety Equipment Institute ("TSEI"), Robert Bosch, GmbH ("Bosch"), American Automobile Manufacturers Association ("AAMA"), and Ford Motor Company ("Ford"). Miles, Inc. opposed Option 1 and supported Option 2. The Plastics Division of General Electric Corporation ("GE") did not express a preference for either alternative.

Each of the commenters supporting Option 1 had a different concern. Flxible suggested that NHTSA adopt the base number of each SAE and ASTM standard/recommended practice, with the suffix notation "Latest Revision." In the company's view, this would eliminate the need to revise older materials and ensure that the safety standards reflect contemporary industry practice.

While this is an attractive notion, there are legal constraints against it. The SAE and ASTM materials per se are only guidelines and advisory in nature. Once they are incorporated into the Federal motor vehicle safety standards, they become "the law of the land", and a manufacturer must comply with them or face civil sanctions. Under the Administrative Procedure Act, a regulation imposing a substantive burden cannot be adopted in the absence of adequate public notice and an opportunity to comment. Under the approach suggested by Flxible, automatic updating of the safety standards to incorporate the latest SAE and ASTM revisions would occur with no prior public notice or opportunity to comment, and hence violate the Administrative Procedure Act. Further, NHTSA has found that many updated and revised materials change the previous materials in substantive ways. Some changes may not be in the interests of safety; the elimination of the heat test from SAE J576 JUL91 is one example of this. Other changes may increase, rather than reduce, a substantive burden upon industry. Regulated persons and the public must

be apprised of these changes before they are adopted.

NHTSA may, however, adopt an updated version without prior notice where there appears to be no substantive change since such an adoption is in the nature of a technical amendment. The agency is adopting an updated version in this final rule on the basis of a comment from TSEI. Under proposed paragraph S5.1.2(e), after exposure to the heat test, the samples shall conform to the color requirements of SAE J578a October 1966. TSEI pointed out that current paragraph S5.1.5 references SAE J578c February 1977. It recommended that NHTSA change both references to the specification of J578 MAY88.

NHTSA has compared the 1988 and 1977 versions of J578 with that of 1966. It finds no substantive difference between the 1966 and 1977 versions. The 1988 version, however, contains a third method of color measurement to be used "as a referee approach when the commonly used methods produce questionable results." In addition, the Appendix in the latter has added a section of "Color Measurements of Gaseous Discharge Lighting Devices." NHTSA ought to have comment on these changes before adopting SAE J578 MAY88, and, for this reason, has not followed TSEI's suggestion. On the other hand, because of the lack of substantive change between the other two versions, paragraph S5.1.2(e) is added with an update of the J578 reference to 1977 from the 1966 version which was proposed.

The wording of present paragraph S5.2.1 concerned Ford and AAMA. Under this paragraph, phrases such as "It is recommended that" and "should be," which appear in materials incorporated by reference, are to be read as setting forth mandatory requirements. Ford and AAMA commented that these phrases should not be interpreted as applying to SAE J576 JUL91. In NHTSA's view, the result of adopting Ford's and AAMA's comments would be to make compliance of plastic materials used for optical parts a voluntary affair. This would defeat the purpose of the rulemaking.

Proposed paragraph S5.1.2(e) would require test samples, after the heat test, to "show no discernable change in shape and general appearance when compared with an unexposed specimen." This language comes from J576 itself, with the exception that the SAE uses "significant" rather than "discernable." Ford and AAMA objected to this substitution, arguing that it would establish a higher standard to be met by plastics, and that there is

no need to change language that has been a requirement for years. They recommended use of the word "significant." In their view, a change that is "discernable" is not necessarily one that is "significant."

In its proposal, NHTSA had no intention of increasing the burden on any regulated party. The agency proposed the word "discernable" with care, because it is objective, while "significant" is not. Motor vehicle safety standards are required by law to be "objective", 49 U.S.C. 30111(a). The agency has concluded that "discernable" is more appropriate for a requirement specifically expressed in the text of Standard No. 108 (as compared with one incorporated by reference). However, NHTSA wishes to make clear that it views the words as essentially synonymous in this context. If a post-test change in shape or general appearance is discernable, NHTSA considers that to be significant. Such a change indicates the potential for degradation of a lens in use, with a corresponding effect upon color and photometrics of the lamp on which it is installed. To add even greater objectivity, the final rule expresses the requirement as "discernable to the naked eye." Should a change be discernable to the naked eye after testing, and a manufacturer believe that such a change is not "significant," the manufacturer may file a Part 573 Noncompliance Notification Report simultaneously with an application to NHTSA for a determination that the change resulting from that testing is inconsequential to motor vehicle safety.

GE did not choose between the alternatives in its comment. It did, however, recommend the adoption of SAE J576 JUL91 in its entirety, and that NHTSA not carry over the heat test from the previous version of J576. In its view, the heat tests of SAE J575 are adequate until further work is done on thermal issues suitable for incorporation into J576.

Having considered the comments in response to the NPRM, NHTSA is amending Standard No. 108 to add the two new paragraphs proposed, maintaining the performance requirements required of plastic materials by SAE J576c for the heat test and specifying positioning of test samples during the test. These have been omitted by the SAE from J576 JUL91. NHTSA has chosen to retain the existing heat test as one that is familiar to industry and one which meets the need for motor vehicle safety. It is a minimum requirement, intended to establish a margin of safety between the temperatures at which plastic reflectors

and lenses may fail from internal heat, and temperatures on the exterior surface induced by exposure to sunlight. Lamp manufacturers use J575 or similar tests to determine whether the particular design characteristics of their lamps require use of premium materials in the lenses. It is a test of the finished lens as installed on the lamp, rather than a test of the materials used in finished products. Use of material with insufficient high temperature performance can result in reflectors that lose color and reflectivity.

The positioning of test samples will allow the sample to droop if its strength is adversely affected by the test.

In order to retain the current 3-year outdoor exposure time test requirements for plastic lenses used or covered by another material and not exposed directly to sunlight, NHTSA is adding a new paragraph S5.1.2(g) to specify that paragraph 3.3.3.1 of SAE J576 JUL91 does not apply as regards protected materials. For the same reason, NHTSA is not adopting paragraph 3.3.3.2. of SAE J576 JUL91 which allows an accelerated 6-month outdoor exposure test time. New paragraph S5.1.2(g) will not change the stringency or flexibility of the standard as it exists, but will ensure that the integrity of plastic materials is maintained by not permitting a lesser exposure time for materials which may be protected when in use.

Miles, Inc., a manufacturer of polycarbonate resin used as a material in lenses and reflectors, objected to Option 1. In its view, this alternative places an additional testing burden on the resin manufacturer, as compared with the present requirements. For this reason, it supported Option 2. Specifically, Miles opposes SAE J576 JUL91 because of Section 3.1 *Materials to be Tested*. This section reads:

Outdoor exposure tests shall be made on each material * * * offered for use in optical parts * * *. Concentrations of polymer components and additives such as plasticizer, lubricants, colorants, weathering stabilizers, and antioxidants in plastic materials and/or coatings may be changed without outdoor exposure testing if: the changes are within the limits of composition represented by higher and lower concentrations of these polymer components and additives have been tested in accordance with 3.3 and found to meet the requirements of Section 4.

Miles interprets this language to mean that changes in dye concentrations would only be permissible if samples containing lower and higher concentrations of dye had been exposure tested. Miles believes that this, in effect, would double the samples to

be tested when compared with the present requirements.

The present requirements are those of section 3.1 of SAE J576c, May 1970. These state, in pertinent part, that "[a] test of one color and formulation shall cover variations in dye concentration, but shall not cover changes in dye materials or changes in polymers." Miles interprets this as meaning that a new exposure test need not be conducted under the 1970 version if the only change in the product is a variation in dye concentration. Its present practice is to test for exposure materials incorporating new dyes only at the expected concentration level of the dye. One exposure test covers each new dye, but Miles will accept the test results as valid when there are small variations in dye concentration.

Miles is correct that SAE J576c allows a single test to cover variations in dye concentration. SAE J576 JUL91 may be interpreted as calling for the testing of two samples by specifying that dye concentrations in material to be used in motor vehicle optical parts must fall within the upper and lower limits of dye concentrations tested if there are variations in dye concentration. Miles believes the newer requirement will double its testing burden.

NHTSA does not agree that this is the inevitable result of the adoption of this portion of SAE J576 JUL 91. What paragraph S5.1.2 is intended to ensure is that lenses and reflectors, as manufactured for use on motor vehicles, are fabricated from plastic materials that meet SAE J576. The key issue is whether the equipment satisfies the performance requirements of the standard, not the number of tests conducted on the materials used in the equipment. Ultimately, the manufacturer of the vehicle in certifying compliance with all applicable Federal motor vehicle safety standards, is certifying that the lenses and reflectors on the vehicle are made from plastics materials that meet J576. If the lens or reflector is manufactured as replacement equipment, the certification responsibility is that of the manufacturer of the equipment. Thus, it is incumbent upon the vehicle or equipment manufacturer to assure itself that the materials it obtains from the plastics manufacturer comply with SAE J576 (and, furthermore, not to change the composition of the plastics materials so obtained in a manner that would cause it to be noncomplying). The documentation needed for such assurance, including the quantum of testing performed by the plastics manufacturer and by the vehicle or equipment manufacturer, is a decision

that each equipment or vehicle manufacturer must make under the particular circumstances. NHTSA, of course, expects manufacturers to exercise reasonable care in certifying their products, and, in the event of a noncompliance, the manufacturer may claim that it had no reason to know, despite exercising reasonable care, that the vehicle or equipment failed to comply. However, the allocation of that responsibility is a matter of contract between the manufacturer with the Federal certification responsibility and its plastic materials supplier. Plastic materials are not completed items of motor vehicle equipment subject to Standard No. 108 so the Federal certification responsibility does not fall upon Miles. If Miles or other materials manufacturers are satisfied, based on their extensive experience with dyes, that changes in dye concentration would not cause the plastic material to fail the specified performance requirements, they may be able to persuade their purchasers that additional testing is not needed.

Effective Date

The effective date of the final rule is March 1, 1996.

Rulemaking Analyses and Notices

Executive Order 12866 and DOT Regulatory Policies and Procedures. This final rule was not reviewed under Executive Order 12866. It has been determined that the rulemaking action is not significant under Department of Transportation regulatory policies and procedures. The purpose of the rulemaking action is to update testing procedures. Since the final rule will have no significant cost or other impacts, preparation of a full regulatory evaluation is not warranted.

National Environmental Policy Act. NHTSA has analyzed this rulemaking action for the purposes of the National Environmental Policy Act. The final rule will not have a significant effect upon the environment. The composition of plastic materials used in optical parts will not change from those presently in production.

Regulatory Flexibility Act. The agency has also considered the impacts of this rulemaking action in relation to the Regulatory Flexibility Act. I certify that this rulemaking action does not have a significant economic impact upon a substantial number of small entities. Accordingly, no regulatory flexibility analysis has been prepared. Manufacturers of motor vehicles and motor vehicle equipment, those affected by the rulemaking action, are generally not small businesses within the

meaning of the Regulatory Flexibility Act. Further, small organizations and governmental jurisdictions will not be significantly affected because the price of new vehicles and vehicle equipment will not be impacted.

Executive Order 12612 (Federalism). This rulemaking action has also been analyzed in accordance with the principles and criteria contained in Executive Order 12612, and NHTSA has determined that this rulemaking action does not have sufficient Federalism implications to warrant the preparation of a federalism Assessment.

Civil Justice. The final rule will not have any retroactive effect. Under 49 U.S.C. 30103, whenever a Federal motor vehicle safety standard is in effect, a state may not adopt or maintain a safety standard applicable to the same aspect of performance which is not identical to the Federal standard. 49 U.S.C. 30161 sets forth a procedure for judicial review of final rules establishing, amending or revoking Federal motor vehicle safety standards. That section does not require submission of a petition for reconsideration or other administrative proceedings before parties may file suit in court.

List of Subjects in 49 CFR Part 571

Imports, Motor vehicle safety, Motor vehicles

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

In consideration of the foregoing, 49 CFR part 571 is amended as follows:

1. The authority citation for part 571 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117 and 30166; delegation of authority at 49 CFR 1.50.

2. Section 571.108 is amended by revising paragraph S5.1.2, to read as follows:

§ 571.108 Motor Vehicle Safety Standard No. 108; Lamps, reflective devices, and associated equipment.

* * * * *

S5.1.2 Plastic materials used for optical parts such as lenses and reflectors shall conform to SAE Recommended Practice J576 JUL91, except that:

(a) Plastic lenses (other than those incorporating reflex reflectors) used for inner lenses or those covered by another material and not exposed directly to sunlight shall meet the requirements of paragraphs 3.3 and 4.2 of SAE J576 JULY91 when covered by the outer lens or other material;

(b) After the outdoor exposure test, the haze and loss of surface luster of

plastic materials (other than those incorporating reflex reflectors) used for outer lenses shall not be greater than 30 percent haze as measured by ASTM D 1003-92, *Haze and Luminous Transmittance of Transparent Plastic*;

(c) After the outdoor exposure test, plastic materials used for reflex reflectors and for lenses used in front of reflex reflectors shall not show surface deterioration, crazing, dimensional changes, color bleeding, delamination, loss of surface luster, or haze that exceeds 7 percent as measured under ASTM D 1003-92.

(d) The thickness of the test specimens specified in paragraph 3.2.2 of SAE J576 JUL91 may vary by as much as ±0.25 mm.

(e) After exposure to the heat test as specified in subparagraph (f) of this paragraph, and after cooling to room ambient temperature, a test specimen shall show no change in shape and general appearance discernable to the naked eye when compared with an unexposed specimen. The trichromatic coefficients of the samples shall conform to the requirements of SAE J578c, "Color Specification for Electric Signal Lighting Devices", February 1977.

(f) Two samples of each thickness of each plastic material are used in the heat test. Each sample is supported at the bottom, with at least 51 mm. of the sample above the support, in the vertical position in such a manner that, on each side, the minimum uninterrupted area of exposed surface is not less than 3225 sq. mm. The samples are placed for two hours in a circulating air oven at 79 ± 3 degrees C.

(g) All outdoor exposure tests shall be 3 years in duration, whether the material is exposed or protected. Accelerated weathering procedures are not permitted.

* * * * *

Issued on August 29, 1995.

Ricardo Martinez,
Administrator.

[FR Doc. 95-21865 Filed 9-1-95; 8:45 am]
BILLING CODE 4910-59-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 672

[Docket No. 950206041-5041-01; I.D. 082895A]

Groundfish of the Gulf of Alaska; Pacific Cod with Jig and Pot Gear for Processing by the Inshore Component in the Central Regulatory Area

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Modification of a closure.

SUMMARY: NMFS is opening directed fishing for Pacific cod by vessels catching Pacific cod with jig and pot gear for processing by the inshore component in the Central Regulatory Area of the Gulf of Alaska (GOA). This action is necessary to use the total allowable catch (TAC) for Pacific cod in this area.

EFFECTIVE DATE: 12 noon, Alaska local time (A.l.t.), September 1, 1995, until 12 midnight, A.l.t., December 31, 1995.

FOR FURTHER INFORMATION CONTACT: Andrew N. Smoker, 907-586-7228.

SUPPLEMENTARY INFORMATION: The groundfish fishery in the GOA exclusive economic zone is managed by NMFS according to the Fishery Management Plan for Groundfish of the Gulf of Alaska (FMP) prepared by the North Pacific Fishery Management Council under authority of the Magnuson Fishery Conservation and Management Act. Fishing by U.S. vessels is governed by regulations implementing the FMP at 50 CFR parts 620 and 672.

In accordance with § 672.20(c)(1)(ii)(B), the allocation of Pacific cod for the inshore component in the Central Regulatory Area of the GOA was established by the Final 1995 Harvest Specifications of Groundfish (60 FR 8470, February 14, 1995) as 41,085 metric tons (mt). The directed fishery for Pacific cod by vessels catching Pacific cod for processing by the inshore component in the Central Regulatory Area of the GOA was closed under § 672.20(c)(2)(ii) on March 22, 1995, in order to reserve amounts anticipated to be needed for incidental catch in other fisheries (60 FR 15521, March 24, 1995). NMFS has determined that as of August 8, 1995, 4,313 mt remain unharvested.

The Director, Alaska Region, NMFS, has determined that the 1995 TAC for Pacific cod for processing by the inshore component in the Central Regulatory Area of the GOA has not been reached.

Therefore, NMFS is terminating the previous closure and is opening directed fishing for Pacific cod by vessels catching Pacific cod for processing by the inshore component in the Central Regulatory Area of the GOA. All other closures remain in full force and effect.

This action opens the directed fishery for Pacific cod by vessels catching Pacific cod with jig and pot gear for processing by the inshore component in the Central Regulatory Area of the GOA. Directed fishing for groundfish with hook-and-line and trawl gear is currently prohibited (60 FR 26694, May 18, 1995; 60 FR 37600, July 21, 1995; 60 FR 37601, July 21, 1995).

Classification

This action is taken under 50 CFR 672.20 and is exempt from review under E.O. 12866.

Authority: 16 U.S.C. 1801 *et seq.*

Dated: August 29, 1995.

Richard H. Schaefer,
Director, Office of Fisheries Conservation and Management, National Marine Fisheries Service.

[FR Doc. 95-21948 Filed 8-30-95; 3:43 pm]
BILLING CODE 3510-22-F

50 CFR Part 672

[Docket No. 950206041-5041-01; I.D. 082995A]

Groundfish of the Gulf of Alaska; Trawling in the Western Regulatory Area

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Inseason adjustment; request for comments.

SUMMARY: NMFS issues an inseason adjustment closing the season for all groundfish by vessels using trawl gear, except fishing for pollock by vessels using pelagic trawl gear, in the Western Regulatory Area of the Gulf of Alaska (GOA). This action is necessary to prevent overfishing of Pacific ocean perch (POP).

DATES: Effective 12 noon, Alaska local time (A.l.t.), September 1, 1995, until 12 midnight, A.l.t., December 31, 1995. Comments must be received no later than 4:30 p.m., A.l.t., September 18, 1995.

ADDRESSES: Comments may be sent to Ronald J. Berg, Chief, Fisheries Management Division, Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802, Attn. Lori Gravel, or be delivered

Mr. Shigeyoshi Aihara
Project Manager
Regulation and Compliance
Engineering Administration Department
Ichikoh Industries, Ltd.
80 Itado Ishehara City
Kanagawa Pref.
250-1192 Japan

Dear Mr. Aihara:

This is in reply to your letter of June 10, 1999, presented at a meeting with NHTSA representatives that day, asking for an interpretation of S5.1.2 of Federal Motor Vehicle Safety Standard No. 108. I am sorry that we were unable to provide you a response by July 6 as you requested in your letter of June 28 to Taylor Vinson of this Office.

Your company has developed a new rear turn signal lamp, consisting of an outer plastic lens, an inner cap, and an uncolored filament bulb. The color of the lens is "pale (light) pink color, and, this plastic material complies with the requirements of SAE J576c . . . excluding the color requirement." You tell us that the trichromaticity coordinates of the plastic material used in the outer lens do not fall within either the red or the white areas of the chromaticity chart of SAE J578c. However, when illuminated, the lamp provides an amber color that fall within the coordinates specified in SAE J578c. You have asked whether this design is acceptable under S5.1.2 relating to plastic materials used in optical parts of motor vehicle lighting devices.

Although this does not affect our answer to your question, please note, in Standard No. 108, that SAE Recommended Practice J576c of 1970 has been replaced by SAE J576 JUL91 as the applicable standard for plastic materials used in lighting devices. However, J578c remains the Federal standard for color.

We regret to inform you that this design is not acceptable. Although S1, *Scope*, of SAE J578c states that "The specification applies to the overall effective color of light emitted by the device," regardless of the color of its lens, both SAE J576 JUL91 and Standard No. 108 apply the color requirement to plastic components of lamps as well. S5.1.2(e) of Standard No. 108 requires the trichromatic coordinates of the plastic samples, tested according to that paragraph, to conform to the requirements of SAE J578c. Paragraphs 4.1 and 4.2.2 of SAE J576 JUL91 also require conformance of plastic samples to the chromaticity coordinate requirements of SAE J578c. This standard specifies color coordinates only for red, white, yellow (amber), green, and blue. Because the lens of your lamp does not meet any of the coordinates of SAE J578c, Standard No. 108 does not permit its use.

At the meeting, we noted that the inner lens was a greenish color. It, too, must comply with the color coordinate requirements of paragraphs 4.1 and 4.2.2 of SAE J576 JUL91.

At that time, you also asked if it were acceptable to use a plastic fabricated from the mix of two resins, each of which complied with the requirements of SAE J576. You cannot assume, when two complying resins are blended, that the resulting plastic will also comply with SAE J576 JUL91, and we recommend that you test the blended plastic to ensure that it meets all the specifications of S5.1.2 and SAE J576 JUL91. This would be the case whether it was the intent to create a new color, or whether the rejected molded parts are reground and plastics of differing compositions are mixed and recycled into newly-molded lamp lenses. As we said in the preamble to the 1995 final rule amending S5.1.2, "it is incumbent upon the vehicle or equipment manufacturer . . . not to change the composition of the plastics materials [obtained from the plastics manufacturer] in a manner that would cause it to be noncomplying." 60 FR 46066, copy enclosed.

Sincerely,
Frank Seales, Jr.
Chief Counsel
Enclosure
ref:108
d.8/27/99

Docket SVC-124
Std 108



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

MAR 27 2009

1200 New Jersey Avenue SE.
Washington, DC 20590

DEPT OF TRANSPORTATION
DOCKETS

MAR 10 A 10:10

Mr. Kiminori Hyodo
Deputy General Manager, Regulation & Certification
Koito Manufacturing Co., Ltd.
4-8-3, Takanawa
Minato-Ku Tokyo
Japan

Dear Mr. Hyodo:

This responds to your letter, in which you ask about test requirements for plastic materials for use in lenses under Federal Motor Vehicle Safety Standard (FMVSS) No. 108, Lamps, Reflective Devices, and Associated Equipment. Specifically, you asked whether you could exclude the presence of metal particles contained within a plastic lens from the outdoor exposure test incorporated by reference into Standard No. 108. You also asked what the term "lens" means under S5.1.2 of FMVSS No. 108. Our responses are presented below.

By way of background, the National Highway Traffic Safety Administration (NHTSA) is authorized to issue FMVSSs that set performance requirements for new motor vehicles and items of motor vehicle equipment (see 49 U.S.C. Chapter 301). NHTSA does not provide approvals of motor vehicles or motor vehicle equipment. Instead, manufacturers are required to self-certify that their products conform to all applicable safety standards that are in effect on the date of manufacture. NHTSA selects a sampling of new vehicles and regulated equipment each year to determine their compliance with applicable FMVSSs. If our testing or examination reveals an apparent noncompliance, we may require the manufacturer to remedy the noncompliance, and may initiate an enforcement proceeding if necessary to ensure that the manufacturer takes appropriate action.

Do the metal particles need to be included in the "haze test?"

Your first question relates to the presence of a layer of metal particles on the lens. According to your letter, a process called "half-metalization" allows you to create a semitransparent metallic layer on your lens, between the lens and a protective coating. This half-metalized layer effectively reduces light transmission to about 30% of a non-metalized lens.

As you state in your letter, FMVSS No. 108 requires that optical parts be certified to comply with the testing procedures in SAE Recommended Practice J576 (JUL 91), "Plastic Materials for use in Optical Parts such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices," incorporated by reference into paragraph S5.1.2 of the standard. Part of this practice specifies that materials be subject to a three year outdoor exposure test. Your specific question asked if you could exclude the presence of the metal particles from the three year exposure test. In asking this question, you state that metals are inorganic and do not excite plastics and also, since half-metalization is applied on the inner surface and protected by the coating, it would not be oxidized.

In responding to your question as to whether you can exclude the metal particles from the test, we note that each of this agency's safety standards specifies the test conditions and procedures that this agency will use to evaluate the performance of the vehicle or equipment being tested for compliance with the particular safety standard. NHTSA follows these specified test procedures and conditions when conducting its compliance testing.

Manufacturers are not required to test their products in the manner specified in the relevant safety standard, or even to test the product at all, as their basis for certifying that the product complies with all relevant standards. A manufacturer may choose any valid means of evaluating its products to determine whether the vehicle or equipment will comply with the safety standards when tested by the agency according to the procedures specified in the standard and to provide a basis for its certification of compliance.

If we tested this product, the outdoor exposure test would include the presence of the metal particles. There is nothing in FMVSS No. 108, including the relevant items incorporated by reference, that specifies excluding the particles. We also note that much like protective coatings, these particles have a substantial effect on the transparency and endurance of the lens, and we therefore believe they should be included as part of the lens in all relevant test requirements.

Definition of the term "lens"

Your second question concerned the definition of the term "lens" under S5.1.2 of FMVSS No. 108, and whether that definition would include a half-metalized area surrounding the effective projected luminous lens area. You stated that the non-metalized portion of the lens would meet all photometric requirements of the standard, and that it would be surrounded by a half-metalized portion of the lens, which would emit only a small amount of light for decorative purposes.

The term "lens," while not explicitly defined in Standard No. 108, is commonly understood within automotive lighting lamp applications as a component of a lamp that as installed allows light to pass through it. For the purposes of S5.1.2, all plastic portions of this component that allow light to pass through it are part of the "lens," subject to the haze test, including the half-metalized area that you state would emit a small amount of light.

Are the non-EPLLA portions of the lens subject to the S5.1.2 requirements?

You followed up your second question by asking, "when half-metalization is applied only to the part surrounding the effective projected luminous lens area, would it be excluded from [the] S5.1.2 requirement?" Our answer is no.

It is our opinion that all portions of the lens, including the half-metalized areas that only emit small amounts of light for decorative purposes, are subject to the requirements of S5.1.2, which specify haze and weathering requirements similar to those described in SAE Recommended Practice J576.

The language of S5.1.2 reads, "Plastic materials used for optical parts such as lenses and reflectors shall conform to [SAE J576]...." When testing plastic materials, however, the agency does not simply test a plastic plaque alone. Instead, the plastic plaque is tested with its coating, which frequently is necessary to protect the plastic from the effects of weathering. The coating on the plastic is an integral feature in protecting the plastic from moisture, ultraviolet light, and other agents.

You described your lens as having a semitransparent metallic layer between the lens and the coating. In addition to the effect this has on the transparency of that portion of the lens, it may also affect the weathering aspects. For example, if the metal layer affected the bonding of the coating to the plastic, it could have substantial affect on whether the lens could tolerate weathering.

Because, as described above, the lens is a single piece, if even a decorative, half-metalized portion of the lens were to fail the weathering requirements in S5.1.2, it could have a substantial affect on the entire lens. For example, moisture could enter the lens, affecting the non-metalized portion's transparency.

For these reasons, when testing the lens you described, the half-metalized portion of the lamp design described in your letter would be included as an item subject to the testing requirements of S5.1.2 of FMVSS No. 108.

If you have any further questions, please contact Ari Scott of my staff at (202) 366-2992.

Sincerely yours,



Stephen P. Wood
Acting Chief Counsel

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MAKERS  CONTRACTORS
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12 October, 2007

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U.S. Dept. of Transportation
NHTSA
Office of the Chief Counsel
400 seventh Street SW
Washington DC 20590

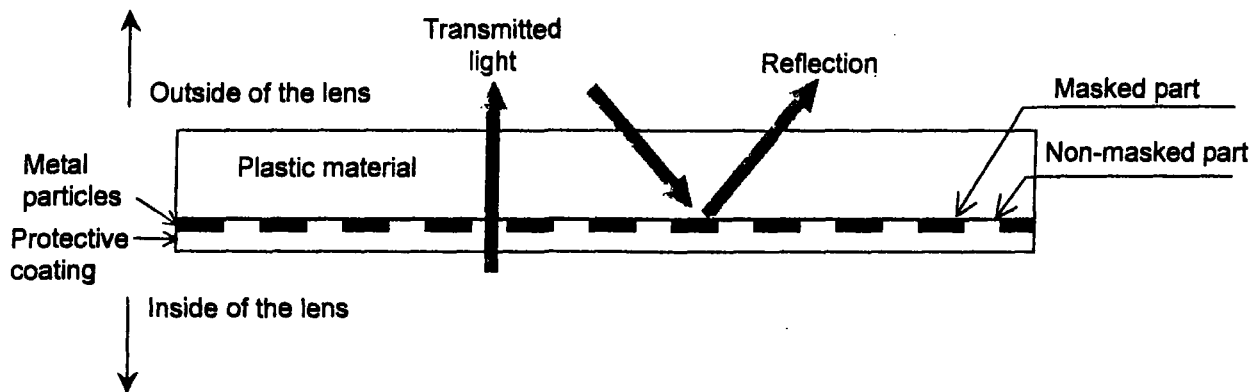
Request for Interpretation

Dear Mr. Anthony M. Cooke,

Koito would like to thank you in advance for your consideration of our request for an interpretation and clarification of the Federal Motor Vehicle Safety Standard (FMVSS) No.108 concerning the necessity of carrying out a 3-year outdoor exposure test in a certain combination of plastic and protective coating material with metal particles in between.

Description:

We are contemplating a new technique called "half-metalization (evapolization)", which is to be applied on the inner surface of a plastic lens of automotive lamps. "Half-metalization" is an expanded application of metal evaporation which is widely used for the surface treatment of lamp reflectors. In this new technique, careful conditioning of the metal density enables us to make a specular appearance of the lens surface, where the light transmission would be lowered to e.g. 30% of a non-metalized lens.



< Figure 1: Composition of half-metalization >

As you see in the figure above, in a microscopic view, the metal particles placed between the plastic and protective coating create partial maskings on the lens, whereas the light passes from the non-masked part only. However, when used in a lamp, this reduced transmission will be balanced out by other designing factors so that the lamp satisfies all the FMVSS108 requirements (e.g. photometric, color) applicable to it.

Question No.1: Can we exclude the presence of metal particles from the target of SAE J576 3-year outdoor exposure test?

FMSSS 108 requires that plastic materials used for optical parts must be in compliance with SAE J576 JUL91 (S5.1.2.) including the 3-year outdoor exposure test. We basically understand that the target of 3-year outdoor exposure test (i.e. measurement of luminous transmittance, haze, and compliance with SAE J578 chromaticity and appearance requirement as required under S4.2 of SAE J576 JUL91) is a combination of plastic and coating, whereas if they comply with the 3-year outdoor exposure requirement, the metal particles on the lens (where the light does not pass) can be excluded from the test. In this case, however, the lamp using half-metalized lens must be designed to satisfy all the applicable requirements (e.g. photometric and color) required by FMVSS108.

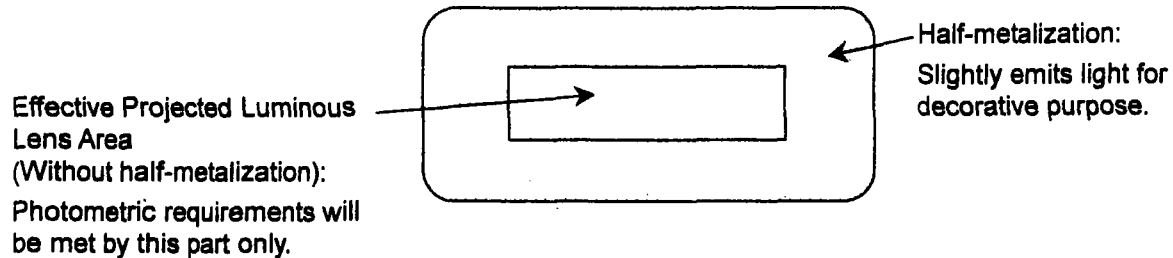
Supporting this discussion, we can say that metals are inorganic and do not excite plastics. Also, since half-metalization is applied on the inner surface and protected by the coating, it would not be oxidized.

CHIEF COUNSEL
 OCT 17 P
 2007

Question No.2: What the term "lens" means under S5.1.2. of FMVSS108?

S5.1.2. of FMVSS108 requires that plastic materials used for optical parts such as lenses and reflectors shall conform to SAE J576 JUL91. Does the term "lens" under S5.1.2. indicate the effective part of the lens (corresponding to the effective projected luminous lens area) only, or whole part of the lens?

In conjunction with above question, when half-metalization is applied only to the part surrounding the effective projected luminous lens area, would it be excluded from S5.1.2. requirement? (In this case, of course, photometric requirements will be met by the effective projected luminous lens area only, and the half-metalized part slightly emits light for decorative purpose.)



< Figure 2: Half-metalization outside EPLLA >

Koito Manufacturing thanks you in advance for your early confirmation on this matter.

Sincerely,

Kiminori Hyodo
Deputy General Manager, Regulation & Homologation
Koito Manufacturing Co., Ltd.

were amended in 2005. Reinstating the specific language in the regulations will therefore not increase the paperwork burden on those manufacturers.

H. Executive Order 13045

Executive Order 13045 applies to any rule that (1) is determined to be “economically significant” as defined under E.O. 12866, and (2) concerns an environmental, health, or safety risk that NHTSA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, we must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned rule is preferable to other potentially effective and reasonably feasible alternatives considered by us. This rulemaking is not economically significant and does not concern an environmental, health, or safety risk.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law 104–113, section 12(d) (15 U.S.C. 272) directs NHTSA to use voluntary consensus standards in its regulatory activities unless doing so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies, such as the Society of Automotive Engineers (SAE). The NTTAA directs the agency to provide Congress, through the OMB, with explanations when we decide not to use available and applicable voluntary consensus standards.

In this final rule, we are adding to 49 CFR 576.4(g)(5) the requirement that manufacturers include in the certification labels that they affix to certain types of motor vehicles a statement certifying that the vehicle conforms to all applicable FMVSS. This language was inadvertently omitted from the regulation in 2005 and we are adopting no substantive changes to the regulation nor do we propose any technical standards. For these reasons, Section 12(d) of the NTTAA would not apply.

J. Regulation Identifier Number (RIN)

The Department of Transportation assigns a regulation identifier number (RIN) to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified

Agenda in April and October of each year. You may use the RIN contained in the heading at the beginning of this document to find this action in the Unified Agenda.

List of Subjects in 49 CFR Part 567

Labeling, Motor vehicle safety, Motor vehicles.

In consideration of the foregoing, Part 567, Certification, in Title 49 of the Code of Federal Regulations is amended as follows:

PART 567—CERTIFICATION

■ 1. The authority citation for part 567 is revised to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, 30166, 32502, 32504, 33101–33104, 33108, and 33109; delegation of authority at 49 CFR 1.95.

■ 2. Amend § 567.4 by adding paragraph (g)(5)(iv) to read as follows:

§ 567.4 Requirements for manufacturers of motor vehicles.

* * * * *

(g) * * *

(5) * * *

(iv) For all other vehicles, the statement: “This vehicle conforms to all applicable Federal motor vehicle safety standards in effect on the date of manufacture shown above.” The expression “U.S.” or “U.S.A.” may be inserted before the word “Federal”.

* * * * *

Issued on: November 28, 2012.

Daniel C. Smith,

Senior Associate Administrator for Vehicle Safety.

[FR Doc. 2012–29132 Filed 12–3–12; 8:45 am]

BILLING CODE 4910–59–P

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. NHTSA–2012–0171]

RIN 2127–AK99

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices, and Associated Equipment

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: NHTSA is amending the Federal motor vehicle safety standard (FMVSS) on lamps, reflective devices, and associated equipment to restore the

blue and green color boundaries that were removed when the agency published a final rule reorganizing that standard on December 4, 2007.

DATES: *Effective date:* December 4, 2012.

Petitions for reconsideration: Petitions for reconsideration of this final rule must be received not later than January 18, 2013.

ADDRESSES: Any petitions for reconsideration should refer to the docket number of this document and be submitted to: Administrator, National Highway Traffic Safety Administration, 1200 New Jersey Avenue SE, West Building, Ground Floor, Docket Room W12–140, Washington, DC 20590.

FOR FURTHER INFORMATION CONTACT: For technical issues: Ms. Marisol Medri, Office of Crash Avoidance Standards, NHTSA, 1200 New Jersey Avenue SE, West Building, Washington, DC 20590 (Telephone: (202) 366–6987) (Fax: (202) 366–7002).

For legal issues: Mr. Thomas Healy, Office of the Chief Counsel, NHTSA, 1200 New Jersey Avenue SE, West Building, Washington, DC 20590 (Telephone: (202) 366–2992) (Fax: (202) 366–3820).

SUPPLEMENTARY INFORMATION:

I. Background

FMVSS No. 108, *Lamps, Reflective Devices and Associated Equipment*, has been in existence since 1968. The standard had been amended on an *ad hoc* basis over time resulting in a patchwork organization of the standard. NHTSA published a final rule on December 4, 2007,¹ amending FMVSS No. 108 by reorganizing the regulatory text so that it provides a more straightforward and logical presentation of the applicable regulatory requirements; incorporating important agency interpretations of the existing requirements; and reducing reliance on third-party documents incorporated by reference. The preamble of the final rule stated that the rewrite of FMVSS No. 108 was administrative in nature and would have no impact on the substantive requirements of the standard. The December 4, 2007 final rule made several changes to the proposal contained in the Notice of Proposed Rulemaking for that rule including removing the blue and green color boundary requirements from paragraph S14.4.1.3.2 and eliminating references to three additional SAE documents.

¹ 72 FR 68234, (Dec. 4, 2007). The agency published the Notice of Proposed Rulemaking proposing to reorganize the standard on December 30, 2005. 70 FR 77454, (Dec. 30, 2005).

SABIC Innovative Plastics US LLC (SABIC-IP) sent a letter to NHTSA on August 11, 2008, after the final rule comment period was over. In this letter, SABIC-IP stated that the agency did not allow for public comment when it made the decision to remove the blue and green color boundaries from the standard. SABIC-IP further stated that in removing the blue and green color boundaries from paragraph S14.4.1.3.2, the agency substantively changed the requirements of FMVSS No. 108 during the rewrite process. On July 13, 2011, NHTSA published a NPRM² initiating this rulemaking to replace the color boundaries that were removed during the administrative rewrite of the standard.

In the NPRM, the agency explained that while neither blue nor green are directly permitted by the standard, it is possible to use these color boundaries to certify a material to the outdoor exposure test. Once individually certified to the three year outdoor exposure test, the blue and clear material could be mixed to produce a clear material with a blue tint, which could then be used in a lamp lens provided the lamp itself emits light within the white color boundary. Under the standard, the mixed material can be certified to the outdoor exposure test without an additional three years of testing. The pre-rewrite version of the standard contained two tests for determining compliance with the color requirements in the standard, the Visual Method or the Tristimulus Method. The blue and green color boundary definitions that were removed are part of the color requirements of the Tristimulus method procedure. The NPRM proposed to amend FMVSS No. 108 to restore the color boundary definitions for green, restricted blue and signal blue so that the requirements of the rewrite coincide with those of the old standard.

II. Public Comments on NPRM

NHTSA received four public comments in response to the Notice of Proposed Rulemaking for this rulemaking.³ All of the comments supported reinstating the color boundary definitions for green, restricted blue and signal blue to FMVSS No. 108.

The Alliance of Automobile Manufacturers (the "Alliance") supported the rulemaking but stated that the agency omitted the color

requirements for green and blue when tested according to the visual method. The Alliance claimed that these requirements from SAE J578c *Color Specification for Electric Signal Lighting Devices*, (FEB 1977) (the third party standard from which the color boundaries were derived) were incorporated into the NPRM proposing the reorganization of the standard but were not incorporated into the December 4, 2007 Final Rule. The Alliance recommended that these requirements be reinstated into the standard as sections 14.4.1.3.2.4 and 14.4.1.3.2.5.

SABIC-IP submitted a comment urging the agency to restore the green and blue color boundaries to FMVSS No. 108. SABIC-IP also requested that the agency clarify that polymers and additives would not have to be retested to the three year outdoor exposure test after the effective date of the administrative rewrite before being combined to create new materials. SABIC-IP stated that the rewrite of the standard creates ambiguity as to whether combinations of individually certified materials can continue to be mixed to create new material and then certified to the outdoor exposure test without an additional three years of testing as was permitted under the pre-rewrite version of the standard. SABIC-IP requested that NHTSA amend paragraph S14.4.2.2.2 to state that materials and additives used in plastics could be changed without outdoor exposure testing if the materials had previously been tested to FMVSS No. 108 and found to meet the requirements. Paragraph S14.4.2.2.2 currently states that materials and additives used in plastics can be changed without outdoor exposure testing if the materials have previously been tested to "this section" and found to meet the requirements. SABIC-IP believes that it is possible to interpret the use of the words "this section" in paragraph S14.4.2.2.2 to require that materials be retested to the outdoor exposure test in the new paragraph S14.4.2.2.2, published in December 2007, before they can be used to create new materials. SABIC-IP stated that this interpretation would go against the stated goal of the rewrite of the standard to refrain from making any substantive change to the requirements.

SABIC-IP also asked the agency to clarify that the lower concentration of additive of previously tested materials used to create a new material according to S14.4.2.2.2 paragraph can be represented by a composition of zero.

III. Agency Decision

Since it was not the agency's intention to create any substantive modifications to the standard, we have decided to amend FMVSS No. 108 to add the color boundary definitions for green, restricted blue and signal blue to the Tristimulus method procedure as proposed in the NPRM and to include the two missing color requirements from the visual method procedure so that the requirements of the rewrite coincide with those of the old standard.

We have decided not to amend paragraph S14.4.2.2.2 of FMVSS No. 108 as requested by SABIC-IP over the course of the rewrite rulemaking. We attempted, where ever possible, to avoid changes to the language of the standard. We note that the phrase "this section" refers to the requirements of paragraph S14.4.2.2 in general, not to a specific version of the standard. Thus, so long as the additives and polymers have previously been tested to and found to comply with the same substantive requirements as they appear in FMVSS No. 108, they can be added to create new materials without additional outdoor exposure testing. However, if the requirements of S14.4.2.2 were changed, previously tested additives and polymers would no longer have been tested to "this section" and would have to be retested to the outdoor exposure test before being used to create new materials under paragraph S14.4.2.2.2.

The agency will respond to SABIC-IP's comment about the lower concentration of additive used to create new materials being represented by a composition of zero in a letter of interpretation from the NHTSA Office of Chief Counsel.

IV. Effective Date

The National Highway and Motor Vehicle Safety Act states that an FMVSS issued by NHTSA cannot become effective before 180 days after the standard is issued unless the agency makes a good cause finding that a different effective date is in the public interest. Additionally, the Administrative Procedure Act (5 U.S.C. 553(d)) requires that a rule be published 30 days prior to its effective date unless one of three exceptions applies. One of these exceptions is when the agency finds good cause for a shorter period. We have determined that it is in the public interest for this final rule to have an immediate effective date so that the effective date of this final rule coincides as closely as possible with the effective date of the 2007 rewrite of the standard. An effective date for this final rule that

² 76 FR 41181. (July 13, 2011).

³ The Alliance of Automobile Manufacturers, SABIC-IP and two private individuals submitted comments in response to the NPRM.

closely coincides with the 2007 rewrite of the standard will ensure that the requirements of FMVSS No. 108 remain consistent so as to avoid unnecessary changes in the requirements of the standard that would force regulated parties to change their compliance strategies, potentially imposing costs on manufacturers while not improving safety.

V. Regulatory Notices and Analyses

A. Executive Order 12866, Executive Order 13563, and DOT Regulatory Policies and Procedures

NHTSA has considered the impact of this rulemaking action under Executive Order 12866, Executive Order 13563, and the DOT's regulatory policies and procedures. This final rule was not reviewed by the Office of Management and Budget (OMB) under E.O. 12866, "Regulatory Planning and Review." It is not considered to be significant under E.O. 12866 or the Department's regulatory policies and procedures.

This Final Rule restores existing requirements to the standard thereby maintaining flexibility in compliance for manufacturers who choose to use these colors to certify materials to the outdoor exposure test. Because this Final Rule merely restores existing requirements it is not expected to have any costs. The agency expects some minor unquantifiable benefits to manufacturers due to the continued availability of the green and blue color boundaries to certify to the outdoor exposure test. Because there are not any costs associated with this rulemaking and only minor unquantifiable benefits, we have not prepared a separate economic analysis for this rulemaking.

B. Executive Order 13609: Promoting International Regulatory Cooperation

The policy statement in section 1 of Executive Order 13609 provides, in part:

The regulatory approaches taken by foreign governments may differ from those taken by U.S. regulatory agencies to address similar issues. In some cases, the differences between the regulatory approaches of U.S. agencies and those of their foreign counterparts might not be necessary and might impair the ability of American businesses to export and compete internationally. In meeting shared challenges involving health, safety, labor, security, environmental, and other issues, international regulatory cooperation can identify approaches that are at least as protective as those that are or would be adopted in the absence of such cooperation. International regulatory cooperation can also reduce, eliminate, or prevent unnecessary differences in regulatory requirements.

NHTSA is not aware of any conflicting regulatory approach taken by a foreign

government concerning the subject matter of this rulemaking.

C. Regulatory Flexibility Act

In compliance with the Regulatory Flexibility Act, 5 U.S.C. 601 *et seq.*, NHTSA has evaluated the effects of this action on small entities. I hereby certify that this rule would not have a significant impact on a substantial number of small entities. The final rule would affect manufacturers of motor vehicle light equipment, but the entities that qualify as small businesses would not be significantly affected by this rulemaking because the agency is restoring requirements that previously existed in an older version of the regulation. This rulemaking is not expected to affect the cost of manufacturing motor vehicle lighting equipment.

D. Executive Order 13132

NHTSA has examined today's rule pursuant to Executive Order 13132 (64 FR 43255, August 10, 1999) and concluded that no additional consultation with States, local governments or their representatives is mandated beyond the rulemaking process. The agency has concluded that the rulemaking would not have sufficient federalism implications to warrant consultation with State and local officials or the preparation of a federalism summary impact statement. The final rule would not have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government."

NHTSA rules can preempt in two ways. First, the National Traffic and Motor Vehicle Safety Act contains an express preemption provision: "When a motor vehicle safety standard is in effect under this chapter, a State or a political subdivision of a State may prescribe or continue in effect a standard applicable to the same aspect of performance of a motor vehicle or motor vehicle equipment only if the standard is identical to the standard prescribed under this chapter." 49 U.S.C. 30103(b)(1). It is this statutory command by Congress that preempts any non-identical State legislative and administrative law addressing the same aspect of performance.

The express preemption provision set forth above is subject to a savings clause under which "[c]ompliance with a motor vehicle safety standard prescribed under this chapter does not exempt a person from liability at common law." 49 U.S.C. 30103(e) Pursuant to this

provision, State common law tort causes of action against motor vehicle manufacturers that might otherwise be preempted by the express preemption provision are generally preserved. However, the Supreme Court has recognized the possibility, in some instances, of implied preemption of such State common law tort causes of action by virtue of NHTSA's rules, even if not expressly preempted. This second way that NHTSA rules can preempt is dependent upon there being an actual conflict between an FMVSS and the higher standard that would effectively be imposed on motor vehicle manufacturers if someone obtained a State common law tort judgment against the manufacturer, notwithstanding the manufacturer's compliance with the NHTSA standard. Because most NHTSA standards established by an FMVSS are minimum standards, a State common law tort cause of action that seeks to impose a higher standard on motor vehicle manufacturers will generally not be preempted. However, if and when such a conflict does exist—for example, when the standard at issue is both a minimum and a maximum standard—the State common law tort cause of action is impliedly preempted. See *Geier v. American Honda Motor Co.*, 529 U.S. 861 (2000).

Pursuant to Executive Order 13132 and 12988, NHTSA has considered whether this rule could or should preempt State common law causes of action. The agency's ability to announce its conclusion regarding the preemptive effect of one of its rules reduces the likelihood that preemption will be an issue in any subsequent tort litigation.

To this end, the agency has examined the nature (e.g., the language and structure of the regulatory text) and objectives of today's rule and finds that this rule, like many NHTSA rules, prescribes only a minimum safety standard. As such, NHTSA does not intend that this rule preempt state tort law that would effectively impose a higher standard on motor vehicle manufacturers than that established by today's rule. Establishment of a higher standard by means of State tort law would not conflict with the minimum standard announced here. Without any conflict, there could not be any implied preemption of a State common law tort cause of action.

E. National Environmental Policy Act

NHTSA has analyzed this final rule for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action would not have any

significant impact on the quality of the human environment.

F. Paperwork Reduction Act

Under the procedures established by the Paperwork Reduction Act of 1995, a person is not required to respond to a collection of information by a Federal agency unless the collection displays a valid OMB control number. This final rule would not establish any new information collection requirements.

G. National Technology Transfer and Advancement Act

Under the National Technology Transfer and Advancement Act of 1995 (NTTAA) (Public Law 104-113), "all Federal agencies and departments shall use technical standards that are developed or adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments." This Final Rule would not adopt or reference any new industry or consensus standards that were not already present in FMVSS No. 108.

H. Civil Justice Reform

With respect to the review of the promulgation of a new regulation, section 3(b) of Executive Order 12988, "Civil Justice Reform" (61 FR 4729, February 7, 1996) requires that Executive agencies make every reasonable effort to ensure that the regulation: (1) Clearly specifies the preemptive effect; (2) clearly specifies the effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct, while promoting simplification and burden reduction; (4) clearly specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. This document is consistent with that requirement.

Pursuant to this Order, NHTSA notes as follows. The preemptive effect of this final rule is discussed above. NHTSA notes further that there is no requirement that individuals submit a petition for reconsideration or pursue other administrative proceeding before they may file suit in court.

I. Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act of 1995 requires agencies to prepare a written assessment of the costs, benefits and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local or tribal governments, in the

aggregate, or by the private sector, of more than \$100 million annually (adjusted for inflation with base year of 1995). This final rule would not result in expenditures by State, local or tribal governments, in the aggregate, or by the private sector in excess of \$100 million annually.

J. Executive Order 13211

Executive Order 13211 (66 FR 28355, May 18, 2001) applies to any rulemaking that: (1) Is determined to be economically significant as defined under E.O. 12866, and is likely to have a significantly adverse effect on the supply of, distribution of, or use of energy; or (2) that is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action. This rulemaking is not subject to E.O. 13211.

K. Regulation Identifier Number (RIN)

The Department of Transportation assigns a regulation identifier number (RIN) to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. You may use the RIN contained in the heading at the beginning of this document to find this action in the Unified Agenda.

L. Privacy Act

Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (70 FR 19477-19478).

List of Subjects in 49 CFR Part 571

Imports, Motor vehicle safety, Motor vehicles, and Tires.

In consideration of the foregoing, NHTSA amends 49 CFR part 571 as set forth below.

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

■ 1. The authority citation for Part 571 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117 and 30166; delegation of authority at 49 CFR 1.50.

■ 2. Section 571.108 is amended by adding paragraphs S14.4.1.3.2.4, S14.4.1.3.2.5, S14.4.1.4.2.4, S14.4.1.4.2.5, and S14.4.1.4.2.6 to read as follows:

§ 571.108 Standard No.108; Lamps, reflective devices, and associated equipment.

* * * * *

S14.4.1.3.2.4 Green. Green is not acceptable if it is less saturated (paler), yellower, or bluer than the limit standards.

S14.4.1.3.2.5 Blue. Blue is not acceptable if it is less saturated (paler), greener, or redder than the limit standards.

* * * * *

S14.4.1.4.2.4 Green. The color of light emitted must fall within the following boundaries:

y = 0.73 - 0.73x (yellow boundary)
 x = 0.63y - 0.04 (white boundary)
 y = 0.50 - 0.50x (blue boundary)

S14.4.1.4.2.5 Restricted Blue. The color of light emitted must fall within the following boundaries:

y = 0.07 + 0.81x (green boundary)
 x = 0.40 - y (white boundary)
 x = 0.13 + 0.60y (violet boundary)

S14.4.1.4.2.6 Signal Blue. The color of light emitted must fall within the following boundaries:

y = 0.32 (green boundary)
 x = 0.16 (white boundary)
 x = 0.40 - y (white boundary)
 x = 0.13 + 0.60y (violet boundary)

* * * * *

Issued on: November 28, 2012.

David L. Strickland,
Administrator.

[FR Doc. 2012-29284 Filed 12-3-12; 8:45 am]

BILLING CODE 4910-59-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 648

[Docket No. 120321209-2643-02]

RIN 0648-BC08

Fisheries of the Northeastern United States; Atlantic Mackerel, Squid, and Butterfish Fisheries; Framework Adjustment 5

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: NMFS is broadening the scope of individuals and entities approved to complete vessel fish hold capacity certifications for vessels issued Tier 1 and 2 limited access Atlantic mackerel permits under the Atlantic

List of Subjects in 48 CFR Parts 2, 11, 23, and 52

Government procurement.

Dated: July 6, 2011.

Laura Auletta,

Acting Director, Office of Governmentwide Acquisition Policy, Office of Acquisition Policy.

Therefore, DoD, GSA, and NASA propose amending 48 CFR parts 2, 11, 23, and 52 as set forth below:

1. The authority citation for 48 CFR parts 2, 11, 23, and 52 continues to read as follows:

Authority: 40 U.S.C. 121(c); 10 U.S.C. chapter 137; and 42 U.S.C. 2473(c).

PART 2—DEFINITIONS OF WORDS AND TERMS**§ 2.101 [Amended]**

2. Amend section 2.101 by removing from paragraph (b)(2), in the definition “biobased product”, the words “(including plant, animal, and marine materials) or” and adding “and” in its place.

PART 11—DESCRIBING AGENCY NEEDS

3. Amend section 11.302 by revising paragraph (c)(2) to read as follows:

§ 11.302 Policy.

* * * * *

(c) * * *

(2) For biobased products, agencies may not require, as a condition of purchase of such products, the vendor or manufacturer to provide more data than would typically be provided by other business entities offering products for sale to the agency, other than data confirming the biobased content of a product (see 7 CFR 2902.8).

PART 23—ENVIRONMENT, ENERGY AND WATER EFFICIENCY, RENEWABLE ENERGY TECHNOLOGIES, OCCUPATIONAL SAFETY, AND DRUG-FREE WORKPLACE**§ 23.404 [Amended]**

4. Amend section 23.404 by removing from paragraph (e)(1) the words “(including plant, animal, and marine materials)”.

5. Amend section 23.405 by revising paragraph (a)(2) and adding (a)(3) to read as follows:

§ 23.405 Procedures.

(a) * * *

(2) *Biobased products.* Contracting officers should refer to USDA’s list of USDA-designated items (available through the Internet at [http://](http://www.biopreferred.gov)

www.biopreferred.gov) and to their agencies’ affirmative procurement program when purchasing supplies that contain biobased material or when purchasing services that could include supplies that contain biobased material.

(3) When acquiring recovered material or biobased products, the contracting officer may request information or data on such products, including on the recycled or biobased content or related standards of the products (see 11.302(c)).

* * * * *

§ 23.406 [Amended]

6. Amend section 23.406 by removing from paragraph (b) “<http://www.usda.gov/biopreferred>” and adding “<http://www.biopreferred.gov>” in its place.

PART 52—SOLICITATION PROVISIONS AND CONTRACT CLAUSES

7. Amend section 52.223–2 by—

a. Revising the date of the clause;

b. Removing from paragraph (b) “<http://www.usda.gov/biopreferred>” and adding <http://www.biopreferred.gov> in its place; and

c. Adding paragraphs (c) and (d) to read as follows:

52.223–2 Affirmative Procurement of Biobased Products Under Service and Construction Contracts

* * * * *

Affirmative Procurement of Biobased Products Under Service and Construction Contracts (Date)

* * * * *

(c) In the performance of this contract, the Contractor shall—

(1) Report to the cognizant Contracting Officer and the agency environmental manager on the product types and dollar value of any USDA-designated biobased products purchased by the Contractor during the previous year, between October 1 and September 30, in this contract;

(2) Submit this report no later than—

(i) October 31 of each year during contract performance; and

(ii) At the end of contract performance; and
(iii) Contact the cognizant environmental manager to obtain the preferred submittal format, if that format is not specified in this contract.

(d) The cognizant environmental manager for this contract is: _____.

[Contracting Officer shall insert full name, phone number, and email address or Web site for reporting.]

[FR Doc. 2011–17453 Filed 7–12–11; 8:45 am]

BILLING CODE 6820–EP–P

DEPARTMENT OF TRANSPORTATION**National Highway Traffic Safety Administration****49 CFR Part 571**

[Docket No. NHTSA–2011–0101]

RIN 2127–AK99

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices, and Associated Equipment

AGENCY: Department of Transportation (DOT), National Highway Traffic Safety Administration (NHTSA).

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: NHTSA is proposing to restore the blue and green color boundaries to Federal Motor Vehicle Safety Standard (FMVSS) No. 108, *Lamps, Reflective Devices and Associated Equipment*, that were removed when the agency published a final rule reorganizing the standard on December 4, 2007.

DATES: Comments to this proposal must be received on or before September 12, 2011.

ADDRESSES: You may submit comments, identified by the docket number in the heading of this document, by any of the following methods:

- *Federal eRulemaking Portal:* Go to <http://www.regulations.gov>. Follow the instructions for submitting comments on the electronic docket site by clicking on “Help” or “FAQ.”

- *Mail:* Docket Management Facility, M–30, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building, Ground Floor, Room W12–140, Washington, DC 20590.

- *Hand Delivery:* U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building, Ground Floor, Room W12–140, between 9 a.m. and 5 p.m. Eastern Time, Monday through Friday, except Federal holidays.

- *Fax:* 202–493–2251.

Regardless of how you submit comments, you should mention the docket number of this document.

You may call the Docket Management Facility at 202–366–9826.

Instructions: For detailed instructions on submitting comments and additional information on the rulemaking process, see the Public Participation heading of the Supplementary Information section of this document. Note that all comments received will be posted without change to <http://www.regulations.gov>, including any personal information provided.

Privacy Act: Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, *etc.*). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477–78) or you may visit <http://www.dot.gov/privacy.html>.

Docket: For access to the docket to read background documents or comments received, go to <http://www.regulations.gov>, or the street address listed above. Follow the online instructions for accessing the dockets.

FOR FURTHER INFORMATION CONTACT: For technical issues: Mr. Markus Price, Office of Crash Avoidance Standards, NHTSA, 1200 New Jersey Avenue, SE., West Building, Washington, DC 20590 (Telephone: (202) 366–0098) (Fax: (202) 366–7002).

For legal issues: Mr. Thomas Healy, Office of the Chief Counsel, NHTSA, 1200 New Jersey Avenue, SE., West Building, Washington, DC 20590 (Telephone: (202) 366–2992) (Fax: (202) 366–3820).

SUPPLEMENTARY INFORMATION:

I. Background

NHTSA published a NPRM on December 30, 2005¹ to reorganize FMVSS No. 108 and improve the clarity of the standard's requirements thereby increasing its utility for regulated parties. It was the agency's goal during the rewrite process to make no substantive changes to the requirements of the standard.

FMVSS No. 108 has been in existence since 1968. The standard had been amended on an *ad hoc* basis over time resulting in a patchwork organization of the standard. Regulated parties had stated that the standard was difficult to interpret because of its organization. In response to these concerns the agency sought to rewrite the standard to make it more understandable by adopting a simplified numbering scheme, to improve organization by grouping related materials in a more logical and consistent sequence, and to reduce the certification burden of regulated parties who previously needed to review a few dozen third-party documents. The agency issued the December 30, 2005, NPRM in an attempt to address these concerns.

Based on the comments received in response to the NPRM, NHTSA published a final rule on December 4,

2007,² amending FMVSS No. 108 by reorganizing the regulatory text so that it provides a more straightforward and logical presentation of the applicable regulatory requirements; incorporating important agency interpretations of the existing requirements; and reducing reliance on third-party documents incorporated by reference. The preamble of the final rule again stated that the rewrite of FMVSS No. 108 was administrative in nature and would have no impact on the substantive requirements of the standard. The final rule made several changes to the proposal contained in the NPRM including removing the blue and green color boundary requirements from paragraph S14.4.1.3.2.

On August 11, 2008, SABIC Innovative Plastics sent a letter to NHTSA claiming that the agency did not allow for public comment when it made the decision to remove the blue and green color boundaries from the standard. SABIC further argued that in removing the blue and green color boundaries from paragraph S14.4.1.3.2, the agency substantively changed the requirements of FMVSS No. 108 during the rewrite process.

II. Green and Blue Color Boundaries

Previous to the rewrite of the standard, paragraph S5.1.5 of FMVSS No. 108 required that the color of all lamps required by the standard comply with SAE J578c, *Color Specification for Electric Signal Lighting Devices*, (FEB 1977). SAE J578c contained color boundary definitions for red, yellow, white, green, restricted blue, and signal blue light. The NPRM included the boundary definition for the colors blue and green, but left out restricted blue. In the final rule the agency removed the color boundary definitions for green and blue from paragraph S14.4.1.3.2, retaining only the definitions for the red, yellow, and white color boundaries.

The agency is aware that, although neither blue nor green are directly used within the standard, it is possible to use these color boundaries to certify a material to the outdoor exposure test located in the paragraphs of S14.4.2.2. Prior to the reorganization final rule, a manufacturer could separately certify both a clear (white) material and a blue material to the haze test. The blue material alone could not be used in a lamp because the lamp itself would not emit the color of light required by the standard (only white, amber, and red lights are permitted). Once individually certified to the three year haze test, however, the blue and clear material

could be mixed to produce a clear material with a blue tint, which could then be used in a lamp lens provided the lamp itself emits light within the white color boundary. Under the standard, the mixed material can be certified to the haze test without an additional three years of testing.

The agency recognizes that removing the color definitions for blue and green creates a substantive change to the requirements of FMVSS No. 108. Since it was not the agency's intention to create any substantive modifications to the standard, as stated in the NPRM and preamble of the final rule, the agency is proposing to amend FMVSS No. 108 to add color boundary definitions for green, restricted blue and signal blue so that the requirements of the rewrite coincide with those of the old standard. Further, the agency notes that these additional color boundary definitions have no impact on color that any lamp must emit. The agency is not proposing to change the color requirements for any lamp mandated by FMVSS No. 108.

III. Costs, Benefits, and the Proposed Compliance Date

Because this proposal only restores an existing requirement to the standard, the agency does not anticipate that there would be any costs or benefits associated with this rulemaking action. Accordingly, the agency did not conduct a separate economic analysis for this rulemaking.

The agency proposes an effective date of December 1, 2012, should a final rule be issued, to coincide with the effective date of the FMVSS No. 108 administrative rewrite.

IV. Public Participation

How do I prepare and submit comments?

Your comments must be written and in English. To ensure that your comments are correctly filed in the Docket, please include the docket number of this document in your comments. Your comments must not be more than 15 pages long.³ We established this limit to encourage you to write your primary comments in a concise fashion. However, you may attach necessary additional documents to your comments. There is no limit on the length of the attachments.

Please submit your comments by any of the following methods:

- *Federal eRulemaking Portal:* go to <http://www.regulations.gov>. Follow the instructions for submitting comments on the electronic docket site by clicking on "Help" or "FAQ."

¹ 70 FR 77454, (Dec. 30, 2005).

² 72 FR 68234, (Dec. 4, 2007).

³ See 49 CFR 553.21.

- *Mail:* Docket Management Facility, M-30, U.S. Department of Transportation, West Building, Ground Floor, Rm. W12-140, 1200 New Jersey Avenue, SE., Washington, DC 20590.

- *Hand Delivery or Courier:* West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue, SE., between 9 a.m. and 5 p.m. Eastern Time, Monday through Friday, except Federal holidays.

- *Fax:* (202) 493-2251.

If you are submitting comments electronically as a PDF (Adobe) file, we ask that the documents submitted be scanned using an Optical Character Recognition (OCR) process, thus allowing the agency to search and copy certain portions of your submissions.⁴

Please note that pursuant to the Data Quality Act, in order for substantive data to be relied upon and used by the agency, it must meet the information quality standards set forth in the Office of Management and Budget (OMB) and DOT Data Quality Act guidelines. Accordingly, we encourage you to consult the guidelines in preparing your comments. OMB's guidelines may be accessed at <http://www.whitehouse.gov/omb/fedreg/reproducible.html>. DOT's guidelines may be accessed at <http://dmses.dot.gov/submit/DataQualityGuidelines.pdf>.

How can I be sure that my comments were received?

If you submit your comments by mail and wish Docket Management to notify you upon its receipt of your comments, enclose a self-addressed, stamped postcard in the envelope containing your comments. Upon receiving your comments, Docket Management will return the postcard by mail.

How do I submit confidential business information?

If you wish to submit any information under a claim of confidentiality, you should submit three copies of your complete submission, including the information you claim to be confidential business information, to the Chief Counsel, NHTSA, at the address given above under **FOR FURTHER INFORMATION CONTACT**. When you send a comment containing information claimed to be confidential business information, you should include a cover letter setting forth the information specified in our confidential business information regulation.⁵

In addition, you should submit a copy, from which you have deleted the

claimed confidential business information, to the Docket by one of the methods set forth above.

Will the agency consider late comments?

We will consider all comments received before the close of business on the comment closing date indicated above under **DATES**. To the extent possible, we will also consider comments received after that date. Therefore, if interested persons believe that any new information the agency places in the docket affects their comments, they may submit comments after the closing date concerning how the agency should consider that information for the final rule.

If a comment is received too late for us to consider in developing a final rule (assuming that one is issued), we will consider that comment as an informal suggestion for future rulemaking action.

How can I read the comments submitted by other people?

You may read the materials placed in the docket for this document (e.g., the comments submitted in response to this document by other interested persons) at any time by going to <http://www.regulations.gov>. Follow the online instructions for accessing the dockets. You may also read the materials at the Docket Management Facility by going to the street address given above under **ADDRESSES**. The Docket Management Facility is open between 9 a.m. and 5 p.m. Eastern Time, Monday through Friday, except Federal holidays.

V. Regulatory Notices and Analyses

A. Executive Order 12866, Executive Order 13563, and DOT Regulatory Policies and Procedures

NHTSA has considered the impact of this rulemaking action under Executive Order 12866, Executive Order 13563, and the Department of Transportation's regulatory policies and procedures. This rulemaking document was not reviewed by the Office of Management and Budget under E.O. 12866, "Regulatory Planning and Review." It is not considered to be significant under E.O. 12866 or the Department's regulatory policies and procedures.

B. National Environmental Policy Act

We have reviewed this proposal for the purposes of the National Environmental Policy Act and determined that it would not have a significant impact on the quality of the human environment.

C. Regulatory Flexibility Act

Pursuant to the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (*i.e.*, small businesses, small organizations, and small governmental jurisdictions). The Small Business Administration's regulations at 13 CFR part 121 define a small business, in part, as a business entity "which operates primarily within the United States." 13 CFR 121.105(a). No regulatory flexibility analysis is required if the head of an agency certifies the rule will not have a significant economic impact on a substantial number of small entities.

NHTSA has considered the effects of the proposed rule under the Regulatory Flexibility Act. I certify that this proposed rule would not have a significant economic impact on a substantial number of small entities. This proposal restores the green and blue color boundaries contained in the currently applicable version of FMVSS No. 108 to the administrative rewrite of FMVSS No. 108 which has not yet taken effect. Accordingly, we do not anticipate that this proposal would have a significant economic impact on a substantial number of small entities.

D. Executive Order 13132 (Federalism)

NHTSA has examined today's final rule pursuant to Executive Order 13132 (64 FR 43255, August 10, 1999) and concluded that no additional consultation with States, local governments or their representatives is mandated beyond the rulemaking process. The agency has concluded that the rulemaking would not have sufficient federalism implications to warrant consultation with State and local officials or the preparation of a federalism summary impact statement. The final rule would not have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government."

E. Executive Order 12988 (Civil Justice Reform)

Pursuant to Executive Order 12988, "Civil Justice Reform,"⁶ NHTSA has

⁴ Optical character recognition (OCR) is the process of converting an image of text, such as a scanned paper document or electronic fax file, into computer-editable text.

⁵ See 49 CFR part 512.

⁶ 61 FR 4729 (Feb. 7, 1996).

considered whether this rulemaking would have any retroactive effect. This proposed rule does not have any retroactive effect.

F. Unfunded Mandates Reform Act

Section 202 of the Unfunded Mandates Reform Act of 1995 (UMRA) requires Federal agencies to prepare a written assessment of the costs, benefits, and other effects of a proposed or final rule that includes a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of more than \$100 million in any one year (adjusted for inflation with base year of 1995).

Before promulgating a rule for which a written statement is needed, section 205 of the UMRA generally requires NHTSA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows NHTSA to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the agency publishes with the final rule an explanation why that alternative was not adopted.

This proposed rule is not anticipated to result in the expenditure by state, local, or tribal governments, in the aggregate, or by the private sector in excess of \$100 million annually. The cost impact of this proposed rule is expected to be \$0. Therefore, the agency has not prepared an economic assessment pursuant to the Unfunded Mandate Reform Act.

G. Paperwork Reduction Act

Under the procedures established by the Paperwork Reduction Act of 1995 (PRA), a person is not required to respond to a collection of information by a Federal agency unless the collection displays a valid OMB control number. This proposed rule does not contain any collection of information requirements requiring review under the PRA.

H. Executive Order 13045

Executive Order 13045⁷ applies to any rule that: (1) Is determined to be economically significant as defined under E.O. 12866, and (2) concerns an environmental, health or safety risk that NHTSA has reason to believe may have a disproportionate effect on children. If

the regulatory action meets both criteria, we must evaluate the environmental health or safety effects of the proposed rule on children, and explain why the proposed regulation is preferable to other potentially effective and reasonably feasible alternatives considered by us.

This proposed rule does not pose such a risk for children. The primary effects of this proposal are to amend the lighting standard to restore the green and blue color boundaries.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act (NTTAA) requires NHTSA to evaluate and use existing voluntary consensus standards in its regulatory activities unless doing so would be inconsistent with applicable law (e.g., the statutory provisions regarding NHTSA's vehicle safety authority) or otherwise impractical.

Voluntary consensus standards are technical standards developed or adopted by voluntary consensus standards bodies. Technical standards are defined by the NTTAA as "performance-based or design-specific technical specification and related management systems practices." They pertain to "products and processes, such as size, strength, or technical performance of a product, process or material."

Examples of organizations generally regarded as voluntary consensus standards bodies include the American Society for Testing and Materials (ASTM), the Society of Automotive Engineers (SAE), and the American National Standards Institute (ANSI). If NHTSA does not use available and potentially applicable voluntary consensus standards, we are required by the Act to provide Congress, through OMB, an explanation of the reasons for not using such standards.

This proposal would not adopt or reference any new industry or consensus standards that were not already present in FMVSS No. 108.

J. Executive Order 13211

Executive Order 13211⁸ applies to any rule that: (1) Is determined to be economically significant as defined under E.O. 12866, and is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) that is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action. If the

regulatory action meets either criterion, we must evaluate the adverse energy effects of the proposed rule and explain why the proposed regulation is preferable to other potentially effective and reasonably feasible alternatives considered by NHTSA.

This proposal restores the green and blue color boundaries contained in the currently applicable version of FMVSS No. 108 to the administrative rewrite of FMVSS No. 108 which has not yet taken effect. Therefore, this proposed rule will not have any adverse energy effects. Accordingly, this proposed rulemaking action is not designated as a significant energy action.

K. Regulation Identifier Number (RIN)

The Department of Transportation assigns a regulation identifier number (RIN) to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. You may use the RIN contained in the heading at the beginning of this document to find this action in the Unified Agenda.

L. Plain Language

Executive Order 12866 requires each agency to write all rules in plain language. Application of the principles of plain language includes consideration of the following questions:

- Have we organized the material to suit the public's needs?
- Are the requirements in the rule clearly stated?
- Does the rule contain technical language or jargon that isn't clear?
- Would a different format (grouping and order of sections, use of headings, paragraphing) make the rule easier to understand?
- Would more (but shorter) sections be better?
- Could we improve clarity by adding tables, lists, or diagrams?
- What else could we do to make the rule easier to understand?

If you have any responses to these questions, please include them in your comments on this proposal.

M. Privacy Act

Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an organization, business, labor union, etc.). You may review DOT's complete Privacy Act statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70; Pages 19477–78) or you

⁷ 62 FR 19885 (Apr. 23, 1997).

⁸ 66 FR 28355 (May 18, 2001).

may visit <http://www.dot.gov/privacy.html>.

In consideration of the foregoing, NHTSA proposes to amend 49 CFR part 571 as set forth below.

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

1. The authority citation for part 571 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, 30166; delegation of authority at 49 CFR 1.50.

§ 571.108 [Amended]

Section 571.108 is amended effective December 1, 2012 by adding paragraphs S14.4.1.4.2.4, S14.1.4.2.5, and S14.4.1.4.2.6 to read as follows:

* * * * *

S14.4.1.4.2.4 Green. The color of light emitted must fall within the following boundaries:

$y = 0.73 - 0.73x$ (yellow boundary);

$y = 0.50 - 0.50x$ (blue boundary);

$x = 0.63y - 0.04$ (white boundary).

S14.4.1.4.2.5 Restricted Blue. The color of light emitted must fall within the following boundaries:

$y = 0.07 + 0.81x$ (green boundary);

$x = 0.40 - y$ (white boundary);

$x = 0.13 + 0.60y$ (violet boundary).

S14.4.1.4.2.6 Signal Blue. The color of light emitted must fall within the following boundaries:

$y = 0.32$ (green boundary);

$x = 0.40 - y$ (white boundary);

$x = 0.16$ (white boundary);

$x = 0.13 + 0.60y$ (violet boundary).

* * * * *

Issued on: July 7, 2011.

Christopher J. Bonanti,

Associate Administrator for Rulemaking.

[FR Doc. 2011-17658 Filed 7-12-11; 8:45 am]

BILLING CODE 4910-59-P



October 22, 2013

The Honorable David L. Strickland
Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue S.E., West Building
Washington D.C. 20590-0001

RE: Notice of update of SAE J576 to include specification for Diffusion Polymers for automotive lighting applications


Dear Administrator Strickland:

The purpose of this letter is to provide notification of an update to SAE J576-*Plastic Material or Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices*, effective February 2010. This updated version of J576 includes a method to evaluate “degradation in performance caused by weathering exposure of diffusion material(s) that cannot be measured by current test methods.”

The changes in SAE J576 (FEB 2010) provide for the use of controlled light scattering plastic materials, herein referred to as Diffusing Plastic Materials. Diffusing Plastic Materials intentionally scatter transmitted light to specific intended levels as defined in SAE J576 (FEB 2010) as having an initial unexposed haze value greater than 30% when measured in accordance with ASTM D1003. The ASTM D1003 scope does not allow for materials with measured values greater than 30%. Diffusing Plastic Materials cannot be evaluated for durability using the conventional "increase of haze" methodology since measurement of haze of Diffusing Plastic Materials is not within the scope of ASTM D1003. This new evaluation methodology is limited to Diffusing Plastic Materials only and requires a more stringent maintenance of luminous transmittance. All other existing exposure, testing and requirements remain unchanged for all materials. No other changes have been made or allowed in the February 2010 revision for transparent plastic materials. Definitions have been incorporated as necessary to define this Diffusing Plastic Materials.

SAE and the SAE Lighting Systems Group believe that this revised document strives to maintain the relevance of standards within the context of changing technologies in the automotive lighting field that could not be anticipated or addressed at the time of the publication of the existing text (SAE J576 JUL91). SAE and the SAE Lighting Systems Group further believe that if and when NHTSA amends the current FMVSS lighting standard, referencing SAE J576 (FEB 2010) would benefit the safety of the public as well as that of the automotive industry.

Sincerely,

A handwritten signature in black ink, appearing to read "Jack Pokrzywa". The signature is fluid and cursive, with a long horizontal stroke at the end.

Jack Pokrzywa
Business Unit Leader
Global Ground Vehicle Standards

cc: Mr. Timothy P. Mellon, Director, Government Affairs, SAE International
Mr. Bart P. Terburg, Chairman, SAE Lighting Systems Group



U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

NOV 6 2009

1200 New Jersey Avenue SE,
Washington, DC 20590

Mr. Jim Wilson
Marketing Director, Lighting
Sabic Innovative Plastics
Two Towne Square
Southfield, MI 48076

Dear Mr. Wilson:

This responds to your letter regarding requirements for inner lenses in Federal Motor Vehicle Safety Standard (FMVSS) No. 108, Lamps, Reflective Devices, and Associated Equipment. Specifically, you asked whether inner lenses are subject to certain performance requirements of the version of FMVSS No. 108 that are scheduled to take effect on December 1, 2009. The answer is that inner lenses are required to meet the haze test requirements, similar to the way they are in the currently applicable version of FMVSS No. 108.

By way of background, the National Highway Traffic Safety Administration (NHTSA) is authorized by the National Traffic and Motor Vehicle Safety Act (Safety Act) to issue FMVSSs that set performance requirements for new motor vehicles and new items of motor vehicle equipment (see 49 U.S.C. Chapter 301). NHTSA does not provide approvals of motor vehicles or motor vehicle equipment. Instead, manufacturers are required to self-certify that their products conform to all applicable safety standards that are in effect on the date of manufacture. NHTSA selects a sampling of new vehicles and equipment each year to determine their compliance with applicable FMVSSs. If our testing or examination reveals an apparent noncompliance, we may require the manufacturer to remedy the noncompliance, and may initiate an enforcement proceeding if necessary to ensure that the manufacturer takes appropriate action.

In your letter, you state you seek confirmation that FMVSS No. 108 does not require plastic materials used for inner lenses to meet the performance requirements in S14.4.2.2.4 when they are covered by outer material meeting the requirements of that section and not exposed directly to sunlight. Neither the currently applicable version of FMVSS No. 108, nor the version of the standard that becomes effective on December 1, 2009 (hereinafter, "the rewrite)," supports that position.



For reference, paragraph S5.1.2 of FMVSS No. 108 reads as follows:

S5.1.2 Plastic materials used for optical parts such as lenses and reflectors shall conform to SAE Recommended Practice J576 JUL91, except that:
(a) Plastic lenses (other than those incorporating reflex reflectors) used for inner lenses or those covered by another material and not exposed directly to sunlight *shall meet the requirements* of paragraphs 3.3 and 4.2 of SAE J576 JUL91 *when covered by the outer lens or other material*; [emphasis added]¹

We interpret this requirement as follows. The requirement in S5.1.2 which states that plastic materials shall conform to SAE J576 JUL91 is the general requirement. The subparagraphs ((a) through (g)), are exceptions to this requirement. Therefore, the exception described in subparagraph (a) requires plastic lenses used for inner lenses to meet the specifications of paragraphs 3.3 and 4.2 of SAE J576 JUL91 *while covered by the outer lens*. This is instead of being required to meet these specifications while directly exposed to sunlight.² The inner lenses are not, as you suggest, fully excluded from the general test requirements in S5.1.2.

We believe that the relevant paragraph S14.4.2.2.4 in the rewrite is substantively identical. For reference, that paragraph reads as follows:

S14.4.2.2.4 *Performance requirements.* Plastic lenses, other than those incorporating reflex reflectors, used for inner lenses or those covered by another material and not exposed directly to sunlight must meet the optical material test requirements when covered by the outer lens or other material.

We interpret this paragraph to establish the same requirements as paragraph S5.1.2 and S5.1.2(a) in the current standard. With regard to plastic used for inner lenses, and not exposed directly to sunlight, they must “meet the optical material test requirements” when covered by the outer lens. This is the same as is currently required by FMVSS No. 108.

You also provide an analysis as to why you believe that inner lenses are not required to be certified to the specifications of S5.1.2. We respond to that analysis below.

In your letter, you state that in a 1970 final rule (35 FR 16840, October 31, 1970), NHTSA “made clear that inner lenses would be considered to be protected when covered by an outer lens and not directly exposed to sunlight.” We have reviewed the final rule at

¹ For reference, paragraphs 3.3 and 4.2 of SAE Recommended Practice J576, “Plastic Materials for Use in Optical Parts such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices,” revised July 1991, relate to the “Outdoor Exposure Tests” and the “After Outdoor Exposure” requirements, respectively. SAE J576 has been incorporated by reference into FMVSS No. 108.

² The language in paragraph 3.3 of SAE J576 JUL91 does not specify that protected inner lenses can be covered by the outer lens during the outdoor exposure tests. It specifies a shorter, but otherwise similar, outdoor exposure test than the one for exposed outer lenses.

issue and have not found a relevant difference between that version and the current version. It too states that “[p]lastic materials used as inner lenses... and not exposed directly to sunlight shall meet the requirements of paragraphs 3.4 and 4.2 of SAE J576b when covered by the outer lens or other material.”³

Finally, we note you argued that “the fact that inner lenses are ‘protected’ is critical when applying the SAE Recommended Practice upon which the standard is based.” We agree that the lenses you describe in this letter would be considered “protected.” However, merely because a lens is protected does not mean it is not subject to a weathering test. Instead, according to the SAE Recommended Practice referenced in FMVSS No. 108 (SAE J576 JUL91), protected lenses are subject to test requirements – albeit less stringent requirements than “exposed” lenses (a 6-month weathering period, instead of 3 years).

If you have any further questions, please contact Ari Scott of my staff at (202) 366-2992.

Sincerely,



O. Kevin Vincent
Chief Counsel

³ 70 FR 16843.

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WEATHERING TESTING INSTRUMENTS & SERVICES

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- ◆ Best-in-class uniformity for irradiance, temperature, relative humidity and spray
- ◆ Intuitive touch screen controls
- ◆ Custom testing capabilities

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The most widely used flatbed xenon test chambers available in tabletop or free standing models to meet lower testing capacity needs. Features include:

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- ◆ A variety of accessories ideal for testing realistic end-use conditions
- ◆ Best-in-class flatbed irradiance and temperature uniformity

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These premium air-cooled accelerated weathering instruments offer an array of options to meet virtually all global weathering and lightfastness testing requirements.

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- ◆ On-rack radio-controlled sensor technology for superior monitoring of light and temperature
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An economical fluorescent/UV weathering test instrument for product screening at lower operating costs.

- ◆ Simple touch screen operation and control in several languages
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- ◆ Remote Ethernet data acquisition application
- ◆ Recirculating spray water option

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The most sophisticated and versatile corrosion and salt fog cabinets available. Capable of replicating automatic cycling between several environmental conditions to reduce the need to move or otherwise handle test specimens.

- ◆ Design maximizes testing volume
- ◆ Large solution reservoir
- ◆ Optional features allow for simulation of several environmental conditions

Flammability Chambers



Atlas flammability chambers offer unmatched accuracy, repeatability and safety when determining the burn rates and resistance of various materials.

- ◆ All chambers are easy to install and operate
- ◆ Specimen holders available to accommodate a variety of material types
- ◆ Chambers are available for appliance, aircraft and automotive applications

Solar Simulation Systems



Atlas Custom Systems designs and builds custom solar simulation systems such as walk-in chambers or full-scale test facilities. These full scale test facilities use a series of highly coordinated metal halide lights to provide uniform radiant energy to meet the demanding testing needs of many industries.

Solar Environmental Chambers



A group of integrated, easy-to-use test chambers for various solar and environmental applications. These instruments combine environmental simulation with metal halide lighting technology and are ideal for testing medium to large sized automotive, plastics, electronics and 3D components, finished products as well as PV modules.

Technical Lighting Systems



Atlas/KHS technical lighting systems are designed for high-speed photography and video. These systems are ideal for crash testing and other safety experiments, custom designed to match the complex illumination requirements of various test configurations. Available with conventional HMI light sources or the latest LED technology, these lighting systems offer an array of solutions for analytical testing of high speed events.

Our mission is to help our customers worldwide provide the most reliable and durable product solutions through our combined experience and expertise in weathering instruments and testing, custom capabilities, consulting and global support.

Services

Natural & Accelerated Weathering Testing ❖ Evaluations ❖ Consulting ❖ Technical Support ❖ Client Education

Natural Weathering Services



Atlas offers outdoor weathering sites worldwide to ensure factors from a variety of climates can be tested.

- ◆ Static Exposure Testing
- ◆ Sun Tracking Exposure Testing
- ◆ EMMAQUA® Accelerated Outdoor Testing
- ◆ Ultra-Accelerated Weathering Testing
- ◆ Automotive Exposure Testing (Samples, Components, Complete Vehicles)

Accelerated Laboratory Weathering Services



Atlas Weathering Services Group operates one of the largest networks of ISO/IEC 17025 accredited accelerated weathering testing laboratories in the world. Our indoor exposure labs offer artificial accelerated weathering tests and a variety of other environmental test programs, all designed to accurately simulate true end-use conditions and meet global weathering standards.

Evaluation Services



Atlas offers a wide range of evaluation and measurement services for your specimens during and after the weathering process.

- ◆ Instrumental Color/Gloss Measurements
- ◆ Visual Evaluations
- ◆ Photography/IR Imaging
- ◆ Emittance
- ◆ Spectral Transmittance/Reflectance
- ◆ Solar Reflectance Index
- ◆ Additional Optical Property Measurements

Consulting Solutions



Atlas Consulting Solutions offers design and implementation of environmental durability testing methods, programs, and strategies. Our international group of weathering experts help you achieve your objectives through all stages of the value chain from materials to components, systems to end-use products.

Worldwide Technical Support



Proper maintenance is critical in order for your instrument to operate at peak performance. Atlas' AMECARE Performance Services Program ensures that your instrument will operate optimally at all times. Benefits include:

- ◆ Preventative maintenance inspections
- ◆ Scheduled ISO accredited calibrations (where available)
- ◆ Detailed service reports with professional assessment of key components

Client Education & Training



Atlas offers an array of resources designed to advance your weathering education and provide you with the knowledge you need to successfully meet your testing requirements. Events include:

- ◆ Seminars
- ◆ Workshops
- ◆ Webcasts
- ◆ In-House Programs
- ◆ Technical Conferences

Solar Industry Solutions



Atlas offers a complete portfolio of testing services to evaluate the performance, durability and reliability of solar cells, modules, complete arrays, concentrated solar power products and solar thermal collectors. Atlas also offers its proprietary Atlas 25® long-term durability testing program for solar modules.

Ultra-Accelerated EMMA[®]



THE BENEFITS OF ULTRA-ACCELERATED TESTING

What is the Ultra-Accelerated EMMA®?

The Ultra-Accelerated EMMA (UA-EMMA) is Atlas' latest advancement in natural exposure testing. This new outdoor testing device delivers approximately 10-12 years of equivalent radiation exposure as would be received in a standard outdoor testing rack in South Florida in a single year.

The system achieves this accelerated exposure through a patented "cool mirror" technology that has very high reflectance in the UV and near visible wavelength ranges while attenuating reflectance in the longer wavelength visible and IR portions of the solar spectrum.

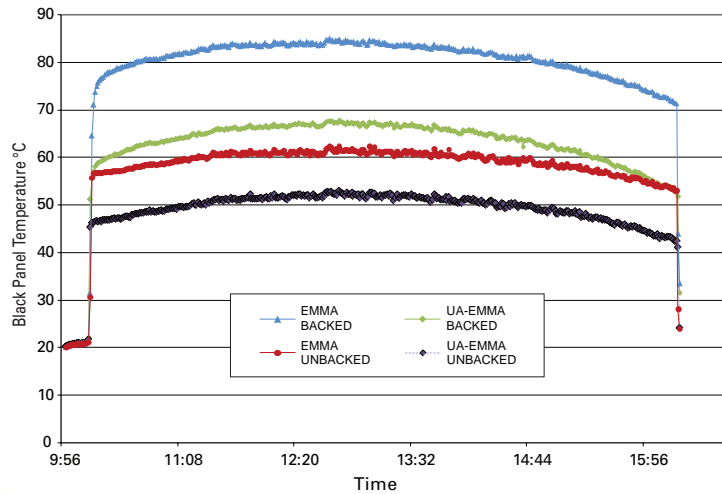


What are the Advantages?

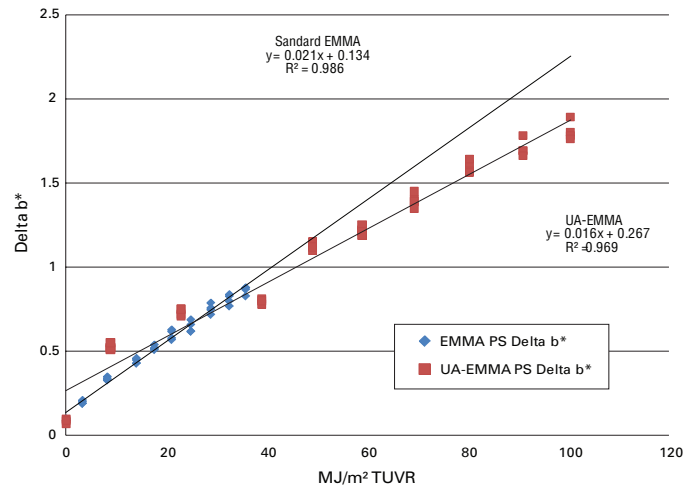
The new UA-EMMA system allows for greatly accelerated testing while fulfilling three critical testing requirements:

- Exposes many different types of materials to ultra-high UV irradiance
- Maintains high fidelity to the natural solar UV spectrum
- Keeps specimens at acceptable exposure temperatures

Black Panel Temperature Performance
UA-EMMA vs. Standard EMMA Data



Comparison of Polystyrene (PS) Reference Material in Standard EMMA and UA-EMMA by UV Radiant Exposure



Ideal Materials for UA-EMMA® Testing

- Materials that require a long service life
- Transparent and glazed materials
- Temperature sensitive materials such as PVC
- Coatings applied to metal panels
- Materials that perform well in EMMA or EMMAQUA exposure testing

Applications

- Adhesives
- Agricultural Films
- Automotive Exteriors
- Building Materials
- Elastomers
- Glass (Architectural & Automotive)
- Packaging
- Paints & Coatings
- Plastics
- Roofing
- Sealants

EMMAQUA® Weathering Standards

The table below lists selected standards for EMMAQUA exposure. For details, refer to the individual standards. Test methods which are proprietary to individual companies and which also specify Fresnel-based exposure methods are not listed here.

EMMAQUA STANDARD	SCOPE	COUNTRY
ISO 877-3	Plastics	International
ASTM D3841	Glass-fiber reinforced polyester	USA
ASTM D4141	Coatings	USA
ASTM D4364	Plastics	USA
ASTM D5722	Coated hardboard	USA
ASTM E1596	PV modules	USA
ASTM G90	Non-metallic materials	USA
SAE J576	Optical automotive plastics	USA
SAE J1961	Automotive exterior	USA
SAE-AMS-T-22085	Preservation sealing tape	USA
JIS Z2381	General	Japan



1958

Atlas' DSET Laboratories relocates from Phoenix to New River, Arizona. The EMMAQUA device is redesigned with a steel framework and more efficient spray delivery system.



1969

The first EMMAQUA® device, constructed with a wooden frame and sheet metal skin, is patented, manufactured and placed into service.



1986

EMMAQUA+, the next generation of accelerated weathering devices, is introduced. Advancements include individual cycle programming, black panel temperature control, and altazimuth solar tracking for more efficient delivery of full-spectrum solar energy.

The MQ3K is launched, utilizing state-of-the-art technology in computer-controlled cycle programming, more accurate altazimuth solar tracking, one-touch start/stop, error sensing feedback and the most-specular mirrors available.



1999



2004

Atlas introduces the UA-EMMA, the latest advancement in outdoor accelerated testing. This device couples the EMMA platform with a new patented mirror system, optimizing real-world correlation.

Atlas introduces four patented suites of Temperature-Controlled EMMAQUA. (Static, Night, Dynamic Temperature and Variable Irradiance Control). This breakthrough allows for the testing of materials that are sensitive to thermal buildup.

2014





Global Support, Weathering Exposure Sites & Laboratories

■ Corporate Offices

Chicago, Illinois USA ■ Linsengericht, Germany ■ Shanghai, China ■ São Paulo, Brazil
Élancourt, France ■ Mörfelden-Walldorf, Germany ■ Bangalore, India ■ Leicester, United Kingdom

● Outdoor Exposure Sites & Laboratories

Miami, Florida USA • Phoenix, Arizona USA • Sanary, France • Chicago, Illinois USA • Duisburg, Germany • Leicester, United Kingdom
Hoek van Holland, The Netherlands • Chennai, India • Prescott, Arizona USA • Loveland, Colorado USA • Medina, Ohio USA
Keys, Florida USA • Jacksonville, Florida USA • Alberta, Michigan USA • Hainan, China • Guangzhou, China
Seosan, Korea • Miyakojima, Okinawa, Japan • Choshi, Japan • Kirishima, Japan
Singapore • Melbourne, Australia • Townsville, Australia • Novorossiysk, Russia
Gelendzhik, Russia • Moscow, Russia

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DEPLOYING PRECISION AND SPEED FOR REAL-WORLD RESULTS



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arizona desert testing llc



Welcome

to Arizona Desert Testing, LLC (AZTEST),
where capability, climate and client service
deliver **rapid** and **accurate** weathering test results.

From accelerated to natural, exterior to interior, our range of weathering solutions provide data-driven and empirical findings to evaluate product and material performance.

It is a fact that time and the elements take their toll on products;
ensure yours pass the test with our spectrum of weathering services.

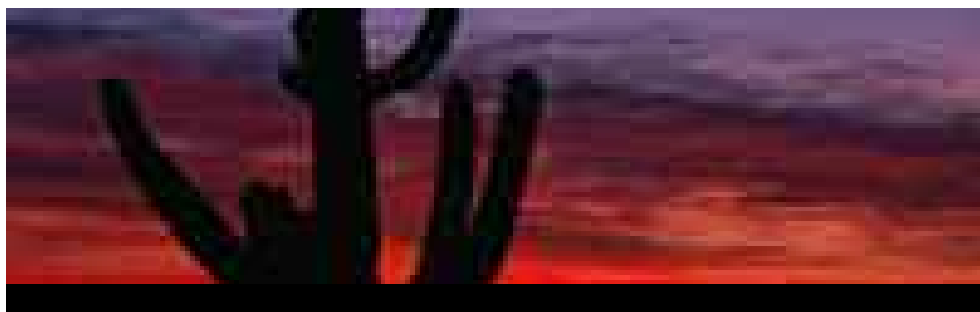


data generation

precise monitoring

extreme conditions : ideal environment

scientific method



ANALYZING
 PRODUCT PERFORMANCE
 OVER TIME IS KEY
 TO ITS SUCCESS

ACCELERATE YOUR RESULTS
 WITH AZTEST SERVICES

The Arizona desert is an ideal environment for weathering studies. Blistering heat, extreme aridity and near-constant sunshine combine to create a virtually unmatched outdoor laboratory for benchmarking product durability under harsh conditions.

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high irradiance : accelerated weathering

ACUVEX



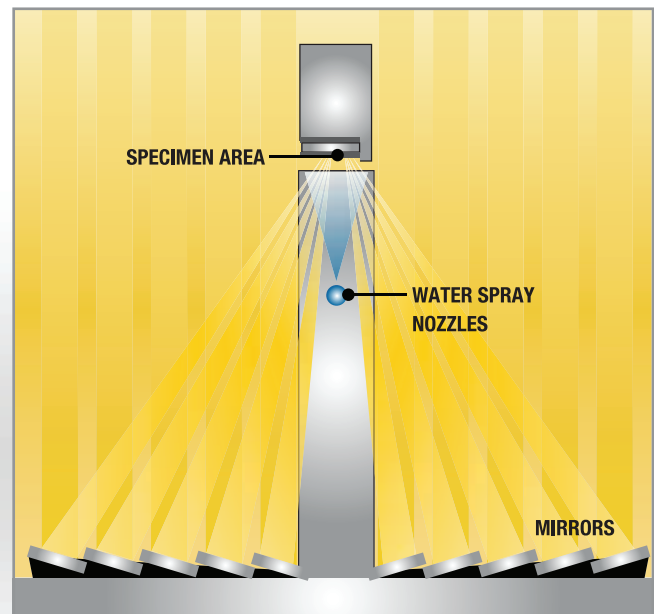
ACUVEX® for exterior materials

AZTEST's proprietary ACUVEX® for Exterior Materials—Accurate Controlled Ultra Violet Exposure—is an engineered solution that accelerates the effects of material weathering. Its innovative design concentrates sunlight for maximum intensity and measures the related effects on materials.

HOW ACUVEX WORKS

Each ACUVEX tracker contains 10 specular—highly reflective—mirrors that focus sunlight onto an air-cooled specimen area as required by ASTM G90—**Standard Practice for Performing Accelerated Outdoor Weathering Using Concentrated Natural Sunlight**. Specimens face the mirrors and are mounted upside down onto a specimen target area. Tracker units consist of two ACUVEX test machines mounted on a single tracker, which moves in azimuth (rotation) and elevation to keep the specimen area in focus. Temperatures are maintained by a fan blowing ambient air over the specimen surfaces.

Because of AZTEST's technology and the desert climate, ACUVEX specimens receive about five times more ultraviolet radiation in a year as compared to a southern Florida outdoor exposure.





HOW ACUVEX® TESTS WATER EFFECTS

High-purity water sprays are used to simulate the effects of more humid climates like Florida. The water must contain less than 1.0 ppm TDS (total dissolved solids) and less than 0.2 ppm silica to comply with ASTM G90. ACUVEX spray cycles are shown below:

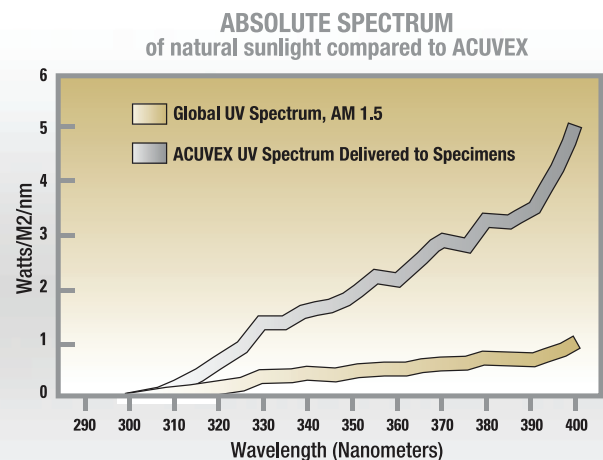
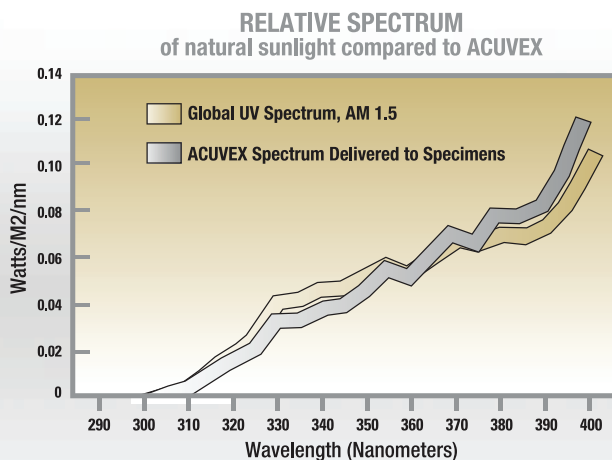
SPRAY CYCLE	DESCRIPTION
CYCLE 1*	8-minute water sprays every hour during the day with three 8-minute water sprays at night
CYCLE 2*	No water sprays
CYCLE 3*	3-minute water sprays every 15 minutes at night
AZTEST Extended	8-minute water sprays every hour during the day with 3-minute water sprays every 15 minutes at night

*As listed in ASTM G90

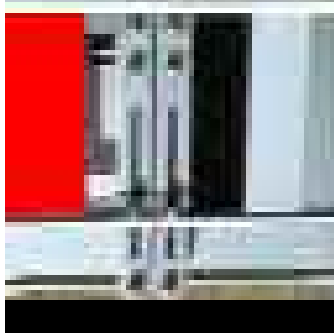
ACUVEX NATURAL SUNLIGHT

The graph depicts the relative spectrum of natural sunlight compared to ACUVEX. When contrasted with other accelerated weathering test methods, ACUVEX—which complies with ASTM G90—provides the closest match to natural sunlight in ultraviolet terms.

This graph portrays the absolute spectrum of natural sunlight compared to ACUVEX. With the ACUVEX unit, radiation intensity at the specimen surface is much greater than with natural sunlight exposure—providing faster tests.



continuous monitoring



HOW ACUVEX® CONTROLS AND CAPTURES DATA

Each ACUVEX tracker in the exposure field contains a dedicated onboard computer to control all operation phases, powered by a DC power supply with battery backup. Totally automatic, trackers safely shut down

during power outages until power returns. Each tracker's computer receives input from solar cells and turns on motors to automatically keep

specimens in focus during the day. Other automatic functions include controlling water sprays, switching tracking on and off, and continuously monitoring machine operation.

At AZTEST, our ACUVEX trackers, field weather station, and office computers are connected via a dedicated network. Emergency conditions are reported to office computers, facilitating fast repairs to minimize downtime. Conditions recorded at each test machine are archived to provide a history of exposure conditions. Each ACUVEX tracker has a black and white panel thermometer (as shown at left) mounted in the specimen area alongside test specimens. These are used to monitor machine operations and record exposure-test history.

HOW ACUVEX SUPPORTS DIVERSE TESTING REQUIREMENTS

Specimens generally are flat with a maximum dimension of 15 cm, (6 in), along one edge. A typical specimen size is 7.5 x 13 cm (3 x 5 in). However, many sizes can be accommodated as long as one dimension does not exceed 15 cm (6 in). Specimens larger than 15 cm (6 in) can often be accommodated with special mounting.

Specimen thickness is usually 3 mm (1/8 in) or less, but thicker specimens can be accommodated with special mounting. Specimens are mounted unbacked, which allows both front and back surfaces to be cooled; however, backed mounting can be used to provide higher specimen temperatures.



HOW TO ESTIMATE TEST TIME AND COST

Each product's testing is as unique as its profile—to best estimate cost and duration of a specific ACUVEX test exposure, go to:

www.aztest.com/acucal

This online calculator will provide a close assessment of your requirements as shown below:

Month Shipped	June	Est. Start	Jul 1, 2009
Water Sprays?	<input checked="" type="radio"/> with <input type="radio"/> without	Test Method	ASTM G90 Cycle 1/3 (sprays)
Duration	360 UV MJ/m2	Duration	360 UV MJ/m2
Measure	<input checked="" type="radio"/> Specimens <input type="radio"/> Lineal	Est. # Days	83
# Specimens	15	# Specimens	15
Dimensions	13 by 7.5 cm	Dimensions	13 by 7.5 cm
	Thickness cannot exceed 0.5in (1.25cm)	Lineal Length	112.5 cm
	<input type="button" value="Estimate"/>	Est. Cost*	\$1,066.09

*The cost shown does not include shipping, inspections, measurements, or cyclic exposure tests. Computed using ACU-CAL Web Version on August 4, 2008 2:53:13 PM MST.

tracking specimen monitoring

ASTM D5722/ SOAK-FREEZE-THAW TESTING

To test pre-finished hardboard and simulate Midwestern US climates, ASTM Committee D01.52 developed test procedure ASTM D5722, "Performing Accelerated Outdoor Weathering of Factory-Coated Embossed Hardboard Using Concentrated Natural Sunlight and a Soak-Freeze-Thaw Procedure."



Testing subjects samples to a series of daily soak-freeze-thaw cycles that include:

1. Daily exposure using ASTM G90 Cycle 1
2. A one-hour soak using de-ionized water
3. A 12-hour freeze at or near -18°C (0°F)
4. A one-hour thaw under ambient conditions

The cycle pattern was chosen because of its good correlation to field failures in climates with freeze-thaw cycles.

TEST STANDARDS

—
ACUVEX COMPLIES WITH
THE FOLLOWING NATIONAL
AND INTERNATIONAL TEST
STANDARDS:

ASTM G90
ASTM D4364
ASTM D5722
ASTM D4141
SAE J1961
ISO 877

Contact AZTEST Customer Service at
wsales@aztest.com for more information
on how AZTEST can meet
your specific test requirements.

accelerated weathering : real-world accuracy



AZTEST® Enclosures

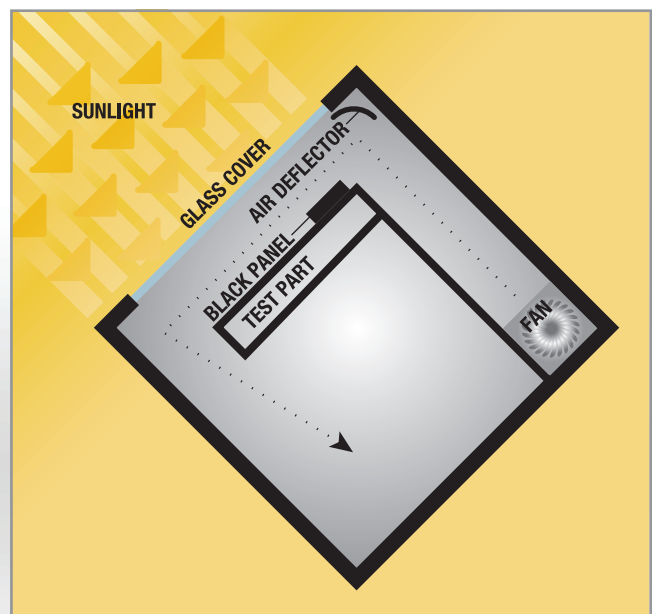
for automotive interior parts and materials

AZTEST Enclosures for Automotive Interior Materials provide vital data and real-world results for interior weathering performance. Automotive interior materials can reach soaring temperatures—exceeding 110° C (230° F) on a summer day in Arizona. Heat and the altered light spectrum from window glass, significantly affects interiors. Add in time, and the effects are both measurable and dramatic.

AZTEST's accelerated weathering test cabinets simulate vehicle interiors and are adjusted to create specific conditions to analyze product performance. AZTEST offers approximately 300 test cabinets ideally suited for evaluating the weatherability of automotive interior materials. In addition, AZTEST is the solar-exposure laboratory for GM interior validation testing and meets automotive standards that include GMW3417, GM2617M, and FORD DVM0020.

HOW AZTEST ENCLOSURES WORK

Enclosures are sealed, under-glass test fixtures designed with temperature-limiting fans to control the maximum black panel temperature. Black-panel temperature is regulated by a black sensor, which continuously monitors temperatures. As sunlight enters the enclosure, the temperatures of both the cabinet and specimens rise. If the preset temperature is exceeded, recirculating fans automatically cool the interior. Temperatures generally are set in a range from 85° C to 110° C.



interiors - automotive

HOW AZTEST® ENCLOSURES WORK—continued

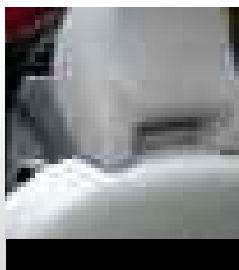
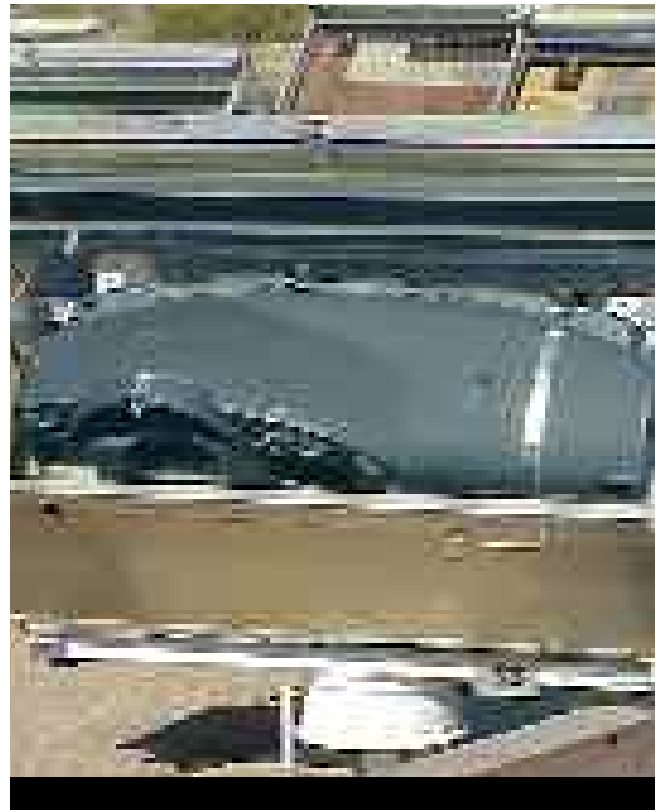
Standard test cabinets placed on sun-tracking mounts follow the sun in azimuth (rotation) to accelerate the weathering process. Enclosures generally are set at a fixed tilt angle (usually 51 degrees from the horizontal) and tracked as they follow the sun in azimuth. This approach provides more solar radiation and faster tests compared to fixed-angle exposures. Plus, azimuth tracking reduces test times without compromising test accuracy—representing a fast and economical alternative to xenon-arc weathering tests.

TEMPERATURE-NORMALIZED RADIATION

AZTEST deploys a unique methodology to normalize solar radiant exposure based on temperature. As the sensors measure internal temperatures, TNR (Temperature Normalized Radiation) is calculated with the following equation:

$$TNR = \sum_{\text{start}}^{\text{end}} R * e^{(13.643 - [5000 / (T + 273.15)])}$$

This technique minimizes differences for tests run at different times of the year. For a detailed description of this equation, go to www.aztest.com.



HOW AZTEST ENCLOSURES SUPPORT DIVERSE TESTING REQUIREMENTS

Two types of specimens are evaluated in the test enclosures—small, flat automotive interior trim specimens and full-size automotive interior parts, including instrument panels, door panels, fabrics, leather, seat cushions, package trays, seat belts, and steering wheels.

All specimens are mounted to within 50 to 100 mm (2 in to 4 in) from the glass cover. To test in accordance with GMW 3417 and GM9538P, the glass covers are either clear tempered or clear laminated, depending on the test component's location in the vehicle.

automatic sensors

ADVANCED FEATURES

Every enclosure in the test field is monitored by dedicated onboard computers that control all phases of operation. Each is powered by a DC power supply. Totally automatic, enclosures safely shut down during power outages until power returns. Each enclosure computer receives input from solar cells and turns on motors to automatically keep specimens in focus during the day. Other automatic functions include maintaining black-panel temperatures, switching tracking on and off, and continuously monitoring machine operation.

The AZTEST® enclosures, field weather station, and office computers are connected via a dedicated network. Emergency conditions are reported to office computers, facilitating fast repairs to minimize downtime. Conditions recorded at each test machine are archived to provide a history of exposure conditions.



HOW TO MEET AUTOMOTIVE VALIDATION STANDARDS

AZTEST is the Solar Exposure Laboratory for performing testing in accordance with GMW 3417 and GM 9538P. For these applications, test enclosures are configured as follows:

- Follow-the-sun operation in azimuth with a fixed altitude tilt angle of 51°
- Circulating fans that switch on when black panel temperature reaches 85°C, 93°C, 102°C, or 110°C, depending on the parts type and location in a vehicle
- Exposure timing based on TNR Langleys (Temperature Normalized Radiation)
- Clear laminated or clear tempered glass cover



TYPICAL TEST TIMES FOR SELECTED INTERIOR PARTS (based on GM 2617M)

PART	REQUIREMENT	TYPICAL TEST DURATION
Instrument Panel	100,000 TNR Langleys at 102°C	4.5 to 7 months
Door Panel Upper / Armrest	50,000 TNR Langleys at 85°C	4 to 6 months
Door Panel Vertical	5,000 TNR Langleys at 85°C	less than one month
Console (horizontal portion)	30,000 TNR Langleys at 93°C	2 to 3 months
Overhead Parts	10,000 TNR Langleys at 85°C	1 to 1.5 months



accuracy
real-world results



ACCELERATED AZTEST MIRRORED ENCLOSURES

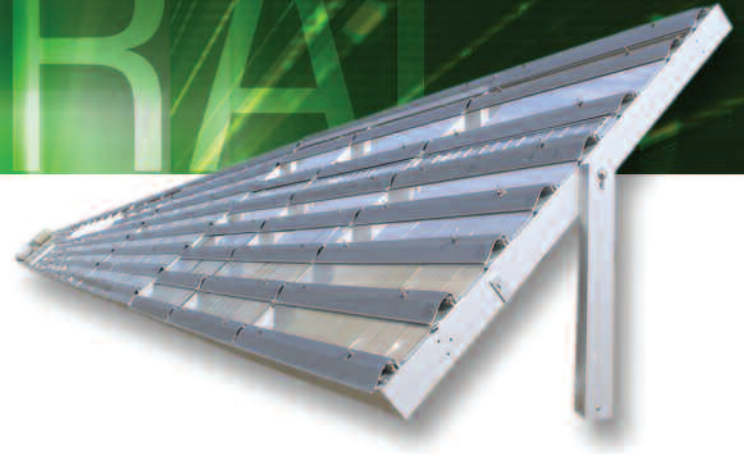
AZTEST® offers Mirrored Enclosures for further acceleration. Developed by personnel at GM's Desert Proving Grounds, mirrored enclosures offer significantly faster acceleration over standard enclosures.

This technique allows specimens to accumulate TNR Langleys or MJ/m² nearly two times faster than normal azimuth tracking enclosures. Because of the additional light energy provided to specimens, these enclosures typically are operated only at black-panel temperatures greater than or equal to 102°C. Results on these enclosures are generally accepted by GM for hard plastics.

Contact AZTEST Customer Service at wsales@aztest.com for more information on how AZTEST can meet your specific test requirements.

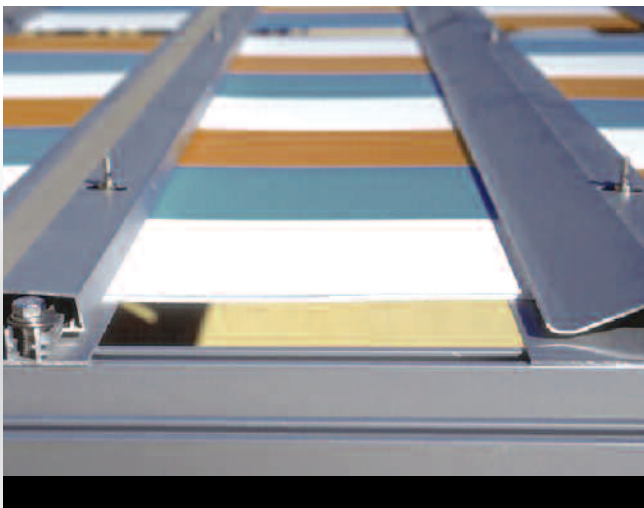
NATURAL

true environmental effects : outdoor exposure



Natural Outdoor Weathering

AZTEST's desert location offers excellent opportunities for natural weathering evaluations. Extremely hot and dry, the Arizona environment is the standard climatic measurement for any outdoor weathering needs. Natural weathering is the only true benchmark for weathering tests. Although very good, accelerated tests can never exactly simulate reactions to real outdoor settings with their inherent climatic changes. Natural weathering not only tests environmental effects, but also respects environmental integrity—using far less electricity than artificial weathering.



NATURAL WEATHERING STANDARDS

Our testing procedures meet numerous requirements for outdoor weathering, including these industry standards: ASTM G7, G24, D 1435, D 4141, SAE J576, SAE J1976, GM 9163P, GMW 14873, Ford B1-160, and ISO 877. Outdoor exposure tests are typically performed on aluminum exposure racks capable of handling specimens of various dimensions.

outdoor weathering

TYPES OF NATURAL WEATHERING

Direct Weathering

Direct weathering exposes specimens directly to the elements. Specimens are mounted on aluminum exposure racks capable of handling various dimensions and evaluated per industry standards. Factors that affect exposure findings include specimen backing, orientation and test duration.

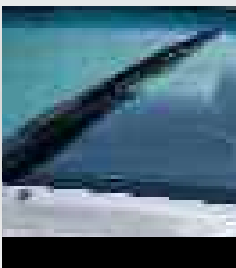
Under Glass Weathering

Under glass weathering specimens are mounted under or behind glass. Specimens usually are samples of test materials used inside a building or automobile. Test materials are exposed in cabinets, which protects them from rainfall while letting sunlight pass through a sheet of glass. The glass filters the sunlight, removing (at a minimum) shorter ultraviolet wavelengths in solar radiation. Enclosures are either well-ventilated or sealed, depending on customer requirements. Some of the factors that affect exposure findings include glass type, specimen backing, orientation, and test duration.

Backing

Backing has a direct effect upon material temperature. The common backing types are:

BACKING TYPE	TYPICAL USE
UNBACKED	Coil coatings, sign material, automotive
BACKED	Siding, roofing, building products, automotive
EXPANDED METAL	Automotive
BLACK BOX	Automotive



backing direct exposure under glass

EXPOSURE ANGLES

Specimens can be exposed at any angle facing south. The following table lists the most common exposure angles used in weathering tests:

ANGLE*	TYPICAL APPLICATION
5°	Most automotive specifications
34°	Same as site latitude: generally the most accumulated radiant exposure in a typical year among the common exposure angles
45°	Most popular exposure angle
90°	Siding and other materials used at vertical orientation
Variable 14° – 34° – 54°	Maximizes radiant exposure with four angle changes per year with an overall increase over 34° of about 15 %

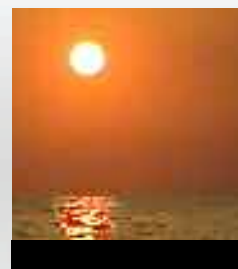
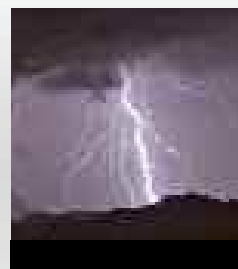
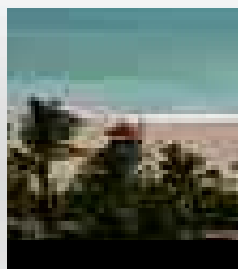
* Measured from the horizontal, facing south

EXPOSURE DURATION

The duration of weathering is based on elapsed time (days, weeks, months, or years), or based on accumulated radiant exposure—either total (all wavelengths) or ultraviolet. Periodic inspections, measurements and/or returns are recommended.

FLORIDA WEATHERING

AZTEST can arrange for exposure tests in Florida and other locations. Contact wsales@aztest for more information.



SAE J 576 TESTING

AZTEST provides SAE J576 compliant testing services to meet automotive plastic lens material requirements as required by the Federal Motor Vehicle Safety Standard No. 571.108.

SAE J576 also allows accelerated testing in accordance with ASTM D 4364. This standard is based on ASTM Standard G 90, "Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight."

Accelerated and Natural Arizona and Florida Weathering tests are available, including all the required instrumental measurement and visual evaluations.

Federal Motor Vehicle Safety Standard No. 571.108, Lamps, Reflective Devices, and Associated Equipment requires the following tests:

TEST	REQUIREMENT
Material Thickness	Required thickness 1.6 mm, 2.3 mm, 3.2 mm, 6.4 mm
Heat Test	2 hours in circulating oven at $79 \pm 3^\circ \text{C}$
Outdoor Weathering	3 years Arizona and Florida — SAE J576
Haze	After weathering, haze cannot exceed 30% as measured by ASTM D1003 for plastic materials used for outer lenses; 7% for plastic materials used as reflex reflectors or for lenses used in front of reflex reflectors.
Luminous Transmittance	After weathering, the luminous transmittance measured in accordance with ASTM E308 shall not have changed more than 25% compared to unexposed measurements.
Color	Must meet SAE J578 color specification before and after weathering
Visual Evaluations	After weathering, must not have color bleeding, delamination, crazing, or cracking. Materials used for reflex reflectors and for materials used in front of reflex materials must not have surface deterioration or dimensional changes.
Minimum number of specimens per material, coating and color type	20 specimens (Five of each thickness).



As an A2LA and AMECA accredited lab, AZTEST can perform all weathering tests required by AMECA and SAE specifications related to automotive lighting lens materials.

diverse : flexible : custom



AZTEST

complete service suite

Recognizing the diversity of customer testing goals, AZTEST is pleased to offer testing and evaluation services that span numerous color measurement requirements, visual inspection data, and special project objectives.

COLOR AND GLOSS MEASUREMENTS

AZTEST performs color measurements using a Hunterlab Ultrascan XE spectrophotometer. This instrument features:

- Dual beam optics
- Integrating sphere
- Pulsed Xenon light source
- Capability to measure transparent, translucent, and opaque materials
- Small area (6 mm - 1/4 inch) optional view area
- Improved accuracy and repeatability
- Integrated color measurement software

Typically, color measurements are first performed prior to exposure and then re-assessed after weathering exposure to determine color change. AZTEST can perform color measurements with any common illuminant scale and observer, as well as report measurements using standard scales, including XYZ, CIE Lab, and Hunter Lab. Color measurements also can be performed using portable X-Rite spectrophotometers.

In addition, AZTEST performs gloss measurements using Byk-Gardner and Hunterlab gloss meters with available geometries of 20°, 60° and 85°.

INSPECTIONS

AZTEST visual inspections are performed in accordance with ASTM and ISO standards. The following criteria (if appropriate) can be included in inspection reports:

- General Appearance
- Checking/Cracking
- Chalking (ASTM and ISO)
- Blistering
- Erosion
- Dirt Retention
- Flaking/Scaling

Digital photography is available as part of AZTEST inspection services.

SPECIAL PROJECTS

AZTEST is well-versed in conducting special projects that include the following:

- Temperature measurements
- Custom facility design such as:
 - Test Cabinets
 - Solar Simulators
 - Accelerated Weathering Facilities
 - Conventional Test Racks
- Driving evaluations
- Software development

Internet Data Access



AZTEST clients have the option of password-protected Internet access to their test data through our secure Web site. Clients can perform the following operations:

- Get current “real-time” program status
- View results from color gloss and visual inspection evaluations
- View scanned documents
- View digital start and end of test photographs
- Reset passwords

Client confidentiality of data is protected through our SSL (secure socket layer) Web site and password-protected system.



Testing Certificate # 1507.01

ISO 17025 Accreditation

AZTEST’s Wittmann location is fully accredited by A2LA (American Association for Laboratory Accreditation) to ISO Guide 17025 (Certificate # 1507.01). For a copy of our A2LA Scope of Accreditation, go to www.aztest.com. AZTEST also is accredited by AMECA, the Automotive Manufacturers Equipment Compliance Agency for testing automotive lighting to FMVSS 571.108 and SAE J576 .

convenient : quick : secure

ORDER

How To Order

Contact AZTEST Customer Service at wsales@aztest.com for more information on how AZTEST can meet your specific test requirements. The sales team will provide guidance on how to create a test, ship your samples and set parameters to evaluate products.

TO CREATE AN ORDER:

- Go to www.aztest.com
- Click on "Download" at the top of the home page
- Select "Order Forms" from the drop down menu
- Select order form format
- Complete and submit to wsales@aztest.com

GUIDELINES FOR ORDERING, PACKING AND SHIPPING*:

From US locations—

- Carefully package test samples for shipment
- Non-fabric specimens should be wrapped in a soft paper product (we recommend Kimtech Kimwipes Delicate Task Wipers)
- Do not use newspaper
- Wrap entire package in bubble wrap and secure with tape
- Place package in sturdy box or container and fill gaps with packing material

From international locations—

- Follow US location packaging instructions above
- Complete a Commercial Invoice to accompany samples
- Assign a \$1.00 value on shipping documents (we recommend sample description as follows: "Test Samples. No Commercial Value")

*INSTRUCTIONS ALSO AVAILABLE AT www.AZTEST.COM

SEND PACKAGED SPECIMENS, ORDER FORM (OPTIONAL) AND PURCHASE ORDER TO:

Arizona Desert Testing LLC
21212 West Patton Road
Wittmann, Arizona 85361
USA

To contact AZTEST:

call: +1-623-388-9500
fax: +1-623-388-9007
e-mail: wsales@aztest.com
visit: www.aztest.com

write: 21212 West Patton Road
Wittmann, Arizona 85361
USA

A photograph of a desert landscape featuring sand dunes in the foreground and a bright sun in a hazy, overcast sky. The sun is positioned in the lower right quadrant, creating a lens flare effect. The overall color palette is muted, with various shades of gray and beige.

AZTEST

arizona desert testing llc



AZTEST

arizona desert testing llc

21212 West Patton Road
Wittmann, Arizona 85361
USA

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+1-623-388-9007 fax
wsales@aztest.com

www.aztest.com



Q-Lab Test Services

- ▶ Florida & Arizona Outdoor Exposures
- ▶ Accelerated Laboratory Testing
- ▶ Evaluations



Weathering & Outdoor Climatic Testing

If you're concerned about your product's appearance or functional performance in the outdoor environment, you're not alone. Sunlight, heat, and moisture cause billions of dollars in product damage every year. A proper weathering testing program can help you anticipate and prevent a variety of potential product failures, meet durability specifications, and preserve your reputation for quality.

Will your product last outdoors? Don't guess when you can test!



WHY TEST?

Reliable weathering and corrosion data can help you:

- > Avoid unexpected product failures
- > Make the best material selection decisions
- > Validate new or less-expensive materials or additives
- > Improve your competitive advantage
- > Warranty your product's lifetime with confidence

Natural outdoor weathering and corrosion testing give the most realistic prediction of product performance. Accelerated testing, available both outdoors and in the laboratory, gives faster results but with some uncertainty about its accuracy. Many companies combine both approaches to ensure reliable results in the shortest time possible.

WHY CHOOSE Q-LAB?

Experienced and Reliable

Q-Lab provides the highest-quality weathering testing services. Our first natural weathering site opened in 1959. Today, our scientists and engineers participate and offer leadership in ISO, ASTM, IEC, GB, and numerous other professional organizations in creating standardized test methods and procedures.

Instant Credibility

When Q-Lab does your testing, the results have instant credibility with your customers and colleagues. Q-Lab conducts all exposure tests and evaluations in accordance with appropriate test methods from ASTM, ISO, BSI, DIN, JIS, SAE, GB, and other recognized organizations and is accredited by AMECA and AAMA.

Cost-Effective

Q-Lab's state-of-the-art test services are available at a surprisingly affordable price. In many cases, it is less costly to test with Q-Lab than to set up and run tests yourself.

Best Test Sites, Best Technology

South Florida and Arizona, where Q-Lab does most of its outdoor testing, have been recognized for over a century as harsh climates for product testing. If your products perform well in these benchmark locations, they will perform well just about anywhere. Q-Lab uses the most trusted accelerated weathering and corrosion technologies, used by thousands of companies in dozens of industries.



Natural Outdoor Testing

Location is everything. About one hundred years ago, companies in the paint and automotive industries realized that environmental conditions in South Florida and the Arizona desert were the harshest on their products. Several companies operated their own test sites in these locations, and they used what they learned to make their products durable enough to ensure generations of satisfied customers. Today, much of this testing has been consolidated at Q-Lab's sites in Florida and Arizona. Companies around the globe trust Q-Lab to perform their outdoor product testing.

FLORIDA

The subtropical climate of the Miami area has the perfect year-round combination of abundant sunlight, warm temperatures, and plentiful water. Sunshine during the summer months in Miami is quite similar to that of northern temperate regions. However, in the winter the difference is dramatic. The key point is that it is the same sun—just more of it, and for a longer duration each year. The same holds true for temperature, rainfall, dew, and humidity.

The result of this perfect combination of environmental factors is that exposures at Q-Lab Florida are accelerated compared to temperate climates. One year of Florida sunshine can produce the same weathering effects on materials as several years of weathering in most major markets around the world. Specimens that can withstand the sunlight, heat, and water in south Florida can be expected to be durable in most locations around the world.

SOUTH FLORIDA IS PERFECT FOR TESTING:

- > Sunlight (UV) stability
- > Moisture sensitivity
- > Mildew/mold resistance
- > Surface erosion
- > High-temperature resistance
- > Thermal shock response
- > Corrosion behavior
- > Moisture ingress
- > Acid rain resistance

THE GLOBAL BENCHMARK

Q-Lab Florida has more specimens on test than any other outdoor weathering facility in the world.





DESERT TESTING

Arizona features even hotter temperatures and higher levels of sunlight than Florida.

ARIZONA

Arizona's desert climate is characterized by intense sunlight, very high temperatures, minimal rainfall, and very low humidity. Arizona desert exposures provide a different – in some ways harsher – exposure environment than Florida subtropical tests. Compared with Florida, Arizona is much hotter and receives about 15-20% more annual total solar and UV energy. Arizona experiences large day to night temperature variations, about 17 °C (31 °F) on average. Arizona receives little annual rainfall and has low atmospheric moisture overall. Specimens tested in the Arizona desert can be expected to have superior resistance to sunshine and elevated temperatures.

ARIZONA DESERT IS PERFECT FOR TESTING:

- > Sunlight (UV) stability
- > Heat aging effects
- > Thermal expansion stress resistance
- > Heat deflection and distortion
- > Material durability in low humidity environments

OHIO

Northeast Ohio has a Northern Temperate climate, meaning it experiences four true seasons during the year. Outdoor specimens are subject to a range of exposures to UV light, temperature, and water, including regular freeze/thaw cycles during the winter.

Although Northeast Ohio testing will generally not attain the acceleration of natural outdoor testing in Florida or Arizona, it does deliver conditions experienced by much of the population of the United States and the rest of the world.

Some industries include a benchmark Northern Temperate climate in their certification programs, in addition to Florida and Arizona, to ensure a fully comprehensive program for natural weathering. Ohio is ideal for meeting these requirements.





Accelerated Laboratory Testing

Q-Lab offers a full range of accelerated laboratory weathering and corrosion testing services at our fully-equipped facilities in Florida and Germany. Q-Lab can perform most testing that utilizes xenon arc, fluorescent UV, salt spray, or cyclic corrosion chambers. Contract testing at Q-Lab is an ideal solution for companies that:

- > Have a short-term need for testing but aren't ready to invest in facilities and equipment
- > Need additional testing capacity that the in-house lab can't accommodate
- > Have a special project with a new test cycle that can't be performed in-house
- > Need third-party verification of test results

STANDARD & CUSTOM EXPOSURES

Tests and evaluations are performed to appropriate ASTM, ISO, EN, DIN, JIS, SAE, GB, AATCC, or other standard procedures.

Visit Q-Lab.com/standards or contact Q-Lab to discuss a particular standard.

We can also perform custom exposures to meet your individual testing needs. **More on page 13.**

TWO LABS, ONE STANDARD OF QUALITY

- > Homestead, Florida USA
- > Saarbrücken, Germany

Both locations follow the ISO 17025 accredited Quality System, ensuring the best care for your projects.



Homestead, Florida USA



Saarbrücken, Germany



RAPID RESULTS

Xenon arc test chambers are used to test colorants in paints and plastics.

TYPES OF ACCELERATED TESTS



XENON ARC WEATHERING

For weathering tests that require full sunlight simulation, the **Q-SUN** xenon arc weathering chamber can perform a variety of methods from the automotive, textile, building material, paint, plastics, personal care, or other industries. Xenon arc instruments are usually the best choice for applications where color change is the primary failure mode of concern.



FLUORESCENT UV WEATHERING

When changes to physical properties of polymeric materials are the concern, the **QUV** accelerated weathering tester is an effective tool for comparative testing. Fluorescent UV lamps match the most damaging portion of the sunlight spectrum (UVA and UVB), reproduce degradation from germicidal treatments (UVC), or simulate indoor environments (Cool White).



SALT SPRAY/ CYCLIC CORROSION

Q-FOG cyclic corrosion chambers can perform any test from simple salt spray to tests with precise control of RH and moisture transitions, which is required by most OEM automotive standards. In addition, certain models can also perform demanding modern test protocols like CASS and JASO M609.



Q-TRAC Natural Sunlight Concentrator Testing

Faster test, natural environment. Accelerated outdoor materials testing using a Q-TRAC natural sunlight concentrator delivers the benefits of testing in a natural outdoor environment while at the same time amplifying the sunlight and heat delivered to specimens. This testing is especially useful for highly-durable materials with long expected lifetimes.

SUPER-FAST RESULTS FROM NATURAL SUNLIGHT

The Q-TRAC delivers the same amount of damaging ultraviolet energy in just one year as specimens would experience in five years of Florida sunlight. Like other accelerated tests, sunlight concentrator testing allows products to be brought to market faster, but the Q-TRAC uses natural sunlight to reduce further the risk of generating erroneous test results. In this way, the Q-TRAC delivers dual benefits – the realism of natural exposures and the speed of accelerated laboratory tests.

Q-TRAC IS PERFECT FOR TESTING:

- > Roofing
- > Coil coatings
- > Fluoropolymers
- > Geosynthetics
- > Powder coatings
- > Building materials
- > Industrial coatings
- > Hardboard coatings

ONLY IN ARIZONA

Q-TRAC testing requires a high proportion of direct beam sunlight and low cloud cover that exists only in very dry environments.



ENHANCED SUNLIGHT WITH CONCENTRATING MIRRORS

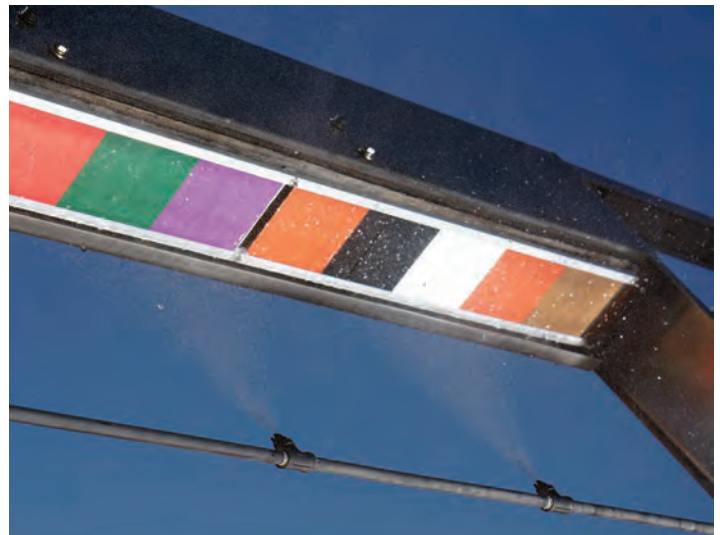
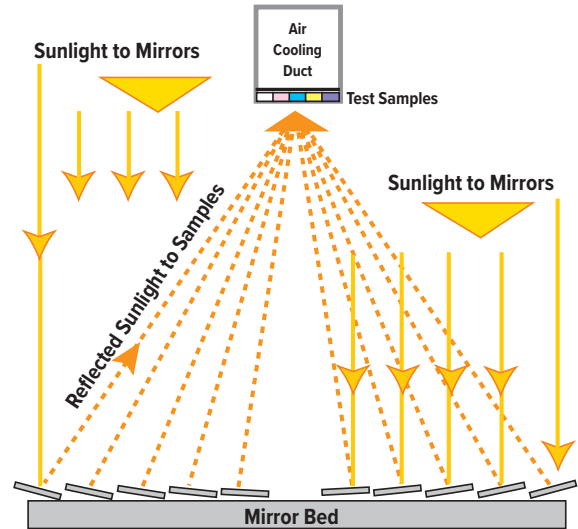
The Q-TRAC system uses an array of 10 flat mirrors to reflect and concentrate natural sunlight onto the test specimens. It further maximizes the exposure by automatically tracking the sun throughout the day in both azimuth (horizontal) and elevation (vertical).

Q-TRAC WATER SPRAY & SPECIAL APPLICATIONS

Water spray during the night time can simulate the time of wetness experienced in Florida, and during the day it can simulate thermal shock associated with rain bursts. During night-time wetting, specimens are oriented facing upward to give increased wetness and realism compared to original natural sunlight concentrator testing. Q-Lab also offers temperature-controlled Q-TRAC testing for more heat-sensitive specimens.

Several standardized cycles—including desert, freeze/thaw, and spray are available to test different materials and end-use application. Standards include:

- > ASTM G90
- > ASTM D4141
- > ASTM D4364
- > ASTM D5105
- > ASTM D5722
- > SAE J1961
- > SAE J576
- > ISO 877-3
- > AAMA 623, 624 and 625



Automotive Interior Testing

Accelerated testing to simulate behind-glass environments. Interior components in automobiles and other behind-glass environments can experience higher temperatures than materials in service outdoors. AIM box testing delivers high temperatures in combination with natural sunlight behind window glass for fast, realistic testing.

AIM BOX

An Automotive Interior Materials (AIM) box is an under-glass enclosure that simulates the sunlight and heat found inside an automobile. Although this technology was developed for the automotive industry, it can be very effective for many applications where glass-filtered sunlight and heat are important stressors, such as building window assemblies and electrical enclosures.

Key test standards for AIM box testing include GMW 14873, GMW 16717, GMW 3417, GM 2617M, GM 3619M, GM 7454M, GM 7455M, GM 9538P, Ford DVM 0020, and ASTM G201.

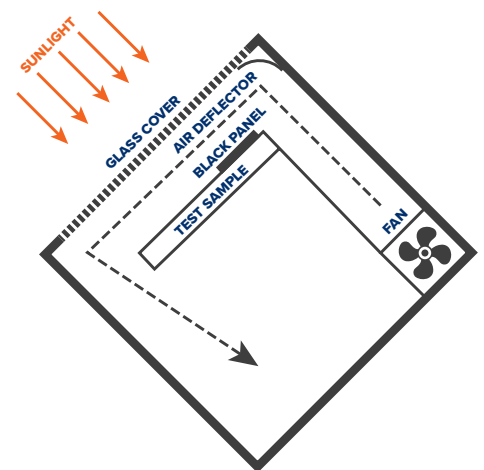
DEGRADATION MODES PRODUCED IN AIM BOX TESTING:

- > Color change
- > Cracking
- > Peeling
- > Oxidation
- > Heat deflection
- > Tackiness

REALISTIC SIMULATION

Testing automotive interiors can be different from testing other materials because air temperatures inside a vehicle can far exceed the temperature outside it. Materials can reach 100 °C or more in warmer climates. Furthermore, the light that reaches internal components is filtered by automotive glass, making it different from natural outdoor sunlight.

The AIM box uses tempered glass - clear or laminated - to simulate the sunlight spectrum experienced inside a car. In addition, a black panel thermometer continuously monitors the environment inside the box. A cooling fan and curtain are used to ensure that specimens are maintained at precise and realistic temperatures.





HIGH TEMPERATURE TESTING

Automotive instrument and dashboard panels are commonly tested in AIM boxes.

ACCELERATION

The AIM box in Arizona can perform precision azimuth tracking of the sun throughout the day. This boosts the total amount of solar radiation reaching the specimens for faster results without sacrificing accuracy.

TRUE AIM BOX

To increase the total amount of solar radiation exposure, Q-Lab's proprietary new TRUE (Tracking Reflecting Ultra Exposure) AIM box uses highly reflective mirrors and dual-axis tracking (azimuth and elevation) to focus more sunlight into the box interior. This technique approximately doubles the total sunlight received every day.



Standard Outdoor Exposures

True benchmarking via standardized testing. Natural outdoor testing according to international test standards gives improved consistency of results from test to test. Having a library of outdoor test data according to recognized test standards gives the best estimate for a product's service life and serves as an excellent basis for comparison to accelerated laboratory testing.

DIRECT EXPOSURE (ASTM G7, ASTM D1435)

Specimens can be securely mounted at a variety of angles for direct exposure to the sun. Various backing techniques are available to simulate the thermal environment of the specimen's intended service application. Plywood backing raises temperatures, while open- or mesh-backed specimens receive maximum natural air flow for cooler temperatures.



UNDER GLASS (ASTM G24, ISO 877-2)

These exposures are used to test interior-use materials, such as textiles and printing inks. Specimens are behind 3 mm window glass which will filter out short-wavelength (UVB) light. Exposures are typically at a 45° or 5° angle from horizontal.



BLACK BOX (ASTM D4141, GMW 14873)

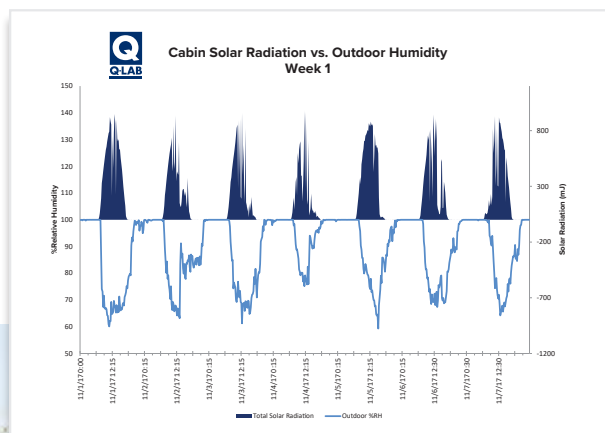
These tests reproduce conditions found on the horizontal surfaces of a vehicle, including higher temperatures and longer wet times. Under glass black box exposures are used to test automotive interior materials or other applications that experience similar conditions.



Other standard outdoor exposure test methods are available, including salt-accelerated, outdoor acid etch, and mildew-enhanced weathering.

Custom Tests & Special Projects

If you need a specialized test for a component, assembly, or complete product, Q-Lab can customize a test program to identify any problem areas quickly. Do you need to measure the temperature profile of multiple areas of your product throughout the day? Or design a test that accurately simulates your product's end use? Whatever your need, our experts can design a customized test solution to fit your budget.



Outdoor weathering testing in a replicated end use environment, like the shed shown above, can demonstrate interactions between components and give a more realistic representation of outdoor product durability.

DETAILED DATA ACQUISITION

Q-Lab can instrument your product to capture the data most important to you, and we always take care to protect confidentiality.



Evaluations & Physical Testing

Exposing your products or materials is only half of the equation. Measuring how they degrade over time is the other half. Q-Lab's engineers and technicians are worldwide experts at identifying and quantifying how your materials change when exposed to weathering or corrosion tests. We have many tools at our disposal to tell you nearly everything you need to know about your product's performance.

VISUAL EVALUATIONS

Visual evaluations detail all defects observed, such as cracking/checking, blistering, chalking, dirt retention, flaking, mildew growth, surface rust, or color change, according to standardized rating scales.

Q-Lab technicians are highly trained and experienced experts in the field of evaluation techniques and reporting scales. Many are actively involved in the organizations that create and maintain the standards relied upon by labs around the world.

COLOR & GLOSS MEASUREMENTS

Instrumental measurements of appearance and surface characteristics include gloss, distinctness of image, and color. These are used in place of or in addition to visual ratings, and are required by many standards. The science of color and appearance measurement can be very complex, and Q-Lab's experts can guide you through your options to ensure you get the correct data for your needs.



Color & Gloss



Mechanical



Photography



VISUAL EVALUATIONS

All visual ratings are made under standard lighting conditions to provide accurate, repeatable results.

MECHANICAL TESTS

Mechanical tests on physical properties are necessary for many products and materials. They include:

- > Drop impact
- > Pencil hardness
- > Tape adhesion
- > Mandrel bend & elongation
- > Tensile strength & elongation
- > Shear & peel adhesion
- > Gravelometer stone chip impact
- > Taber abrasion

PHOTOGRAPHY & SPECIAL HANDLING

A complete test program often includes other special services or handling. Common services include washing, polishing, scribing, and specimen weighing. Q-Lab can also photograph weathering and corrosion changes, which requires special lighting skills and equipment.



OUR GLOBAL NETWORK

We are committed to provide world-class technical, sales, and repair support in each of the over 60 countries in which we operate. Visit [Q-Lab.com/support](https://www.q-lab.com/support) for contact information specific to your location and inquiry type.

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