CLAREX

OPTICAL GRADE CAST ACRYLIC

supplied by: ASTRA PRODUCTS

OPTICAL GRADE CELL-CAST ACRYLIC (PMMA) SHEETS

Description

The base substrate for almost all of the other products we offer!

CLAREX Acrylic (aka PMMA or poly-methyl methacrylate) has unsurpassed optical quality and a wide range of customizable features. The batch cell-cast manufacturing process has been optimized to yield the highest quality cast Acrylic sheets available on the market. This same batch process allows for full customization of the material configuration in low volumes up to mass production.

Benefits

- Highly polished mold-sets yield incredibly smooth surfaces
- Low wavefront distortion
- High light transmission – 92% for clear sheets without anti-reflection coating
- Isotropic transmission
- No birefringence or double refraction
- No retardation of polarized light
- The pure liquid monomer results in virtually no autofluorescence
- High long-path transmission
- High molecular weight – 2+ million
- 100% Visually Inspected for Defects
- Excellent weatherability and chemical resistance
- Machines and laser cuts great
- Available from 0.2mm up to 5.0mm
- Relatively tight thickness tolerances

TYPICAL PROPERTIES*

PROPERTY	TEST METHOD	UNITS	VALUE UNCOATED	VALUE W/HARDCOAT
MISC				
Specific gravity	ASTM D-792	-	1.19	1.19
Water absorption	ASTM D-570	%	0.3	0.3
Flammability (>0.7mm)	UL	-	94HB	94HB
OPTICAL (for clear/glossy sheets)				
Refractive index	ASTM D-542	-	1.49	1.49 (material) 1.53 (at surface)
Total light transmission	ASTM D-1003	%	92	92
Haze	ASTM D-1003	%	0.1	0.1
Surface Roughness	-	µm	0.02	0.02
MECHANICAL				
Elongation	ASTM D-638	%	5	3
Tensile Rupture Strength	ASTM D-638	MPa	75	50
Flexural Rupture Strengh	ASTM D-790	MPa	118	60
Flexural Modulus	ASTM D-790	MPa	$3.2x10^3$	$3.2x10^3$
Impact Strength (Izod)	ASTM D-256	kJ/m^2	2.0	-
Rockwell Hardness	ASTM D-785	M Scale	100	-
Pencil Hardness	JIS D0202	-	1-3H	>6H
THERMAL				
Heat Distortion Temperature	ASTM D-638	°C	108	110
Coefficient of Thermal Expansion	ASTM D-638	cm/cm/°C	$7x10^{-5}$	$7x10^{-5}$
Coefficient of Thermal Conductivity	ASTM C-177	cm/m°C	0.17	0.17
Max Recommended Continuous Temp	-	°C	80-85	80-85
**HiTemp formulation is available for 95°C Continuous Temp*				
Heat Forming Temp	-	°C	140-180	N/A
Specific Heat	JIS K7123	J/g°C	1.47	1.47
ELECTRICAL				
Volume Resistance	ASTM D-257	Ωcm	$>10^{16}$	$>10^{16}$
Surface Resistance	ASTM D-257	Ω	$>10^{16}$	$>10^{16}$

**VALUES SHOWN ARE TYPICAL PROPERTIES*

SHEETS ARE 100% VISUALLY INSPECTED TO 80/60 SCRATCH/DIG SPECS	
Maximum Scratch Width: 0.08mm	Maximum Defect Diameter: 0.60mm

THICKNESSES & TOLERANCES (mm)				
0.2 ± 0.05	0.25 ± 0.05	0.3 ± 0.07	0.35 ± 0.07	0.4 ± 0.07
0.5 ± 0.07	0.6 ± 0.07	0.7 ± 0.07	0.8 ± 0.10	1.0 ± 0.12
1.2 ± 0.12	1.5 ± 0.15	2.0 ± 0.20	2.5 ± 0.25	3.0 ± 0.25
3.5 ± 0.25	4.0 ± 0.30	4.5 ± 0.30	5.0 ± 0.30	**Custom Thickness**

some custom features will limit the range of thicknesses available

SHEET SIZES VARY DEPENDING ON THE MATERIAL CONFIGURATION

General rule of thumb:

- Anything 0.2-0.4mm thick: Max sheet size is 400 x 550mm
- AntiReflection Coated: Typically 360 x 290mm. Larger possible.
- NonGlare Textured: Max sheet size is 400 x 550mm
- All others: 400 x 550mm or 500 x 500mm standard. Possibly up to 1000 x 1000mm

CHEMICAL RESISTANCE					
Chemical	Resistance		Chemical	Resistance	
	Uncoated	w/Hardcoat		Uncoated	w/Hardcoat
Glacial Acetic Acid (specific Gravity 1.05)	✓	✓	Oleic Acid	✓	✓
Acetic Acid (5%)	✓	✓	Citric Acid	✓	✓
Hydrochloric Acid (10%)	✓	✓	Olive Oil	✓	✓
Hydrochloric Acid (35%)	✓	✓	Cotton Seed Oil	✓	✓
Hydrogen Peroxide (3%)	✓	✓	Pure Water	✓	✓
Aqueous Ammonia (specific gravity 0.9)	✓	✓	Seawater	✓	✓
Aqueous Ammonia (10%)	✓	✓	Dichloromethane	Dissolved	✓
Acetone	✓	✓	di-Ethylether	Cracked	✓
Ethyl Acetate	✓	✓	Sodium Carbonate (2%)	✓	✓
Ethyl Alcohol (50%)	✓	✓	Sodium Carbonate (20%)	✓	✓
Ethyl Alcohol (95%)	✓	✓	di-Isobutylene	✓	✓
Isopropyl Alcohol	✓	✓	di-Methyl Horamide	Dissolved	✓
Methyl Alcohol	Swollen	✓	Sodium Hypochlorite (10%)	✓	✓
Benzene	Dissolved	✓	Sulfuric Acid (specific gravity 1.84)	Dissolved	✓
Kerosene	✓	✓	Sulfuric Acid (3%)	✓	✓
Nitric Acid (specific gravity 1.42)	Swollen	✓	Sulfuric Acid (30%)	✓	✓
Nitric Acid (10%)	✓	✓	2-Ethyl Hexoic Acid	✓	✓
Nitric Acid (40%)	✓	✓	Carbon Tetrachloride	Cracked	✓
Caustic Soda (1%)	✓	✓	Toluene	Dissolved	✓
Caustic Soda (10%)	✓	✓	n-Heptane	✓	✓
Caustic Soda (48%)	✓	✓			

WEATHERABILITY with and without Hardcoat		
Property	Test Condition	Test Result
Heat Resistance	85°C x 250 hrs	No Change
Cold Resistance	-40°C x 250 hrs	No Change
Thermal Cycle	-40°C to 85°C 200 cycles @ 30min each	No Change
Humidity Resistance	60°C x 90% RH x 250hrs	No Change
UV Resistance	Fademeter x 1000hrs	No Change

CHECK OUT ALL THE DIFFERENT TRANSMISSION CURVES ON OUR WEBSITE

CUSTOMIZABLE FEATURES	
COMBINE DIFFERENT FEATURES TO BUILD YOUR OWN CUSTOM OPTICAL GRADE SHEET	**FROM LOW VOLUMES (1 SHEET) UP TO MASS PRODUCTION**

STEP1 – CHOOSE THICKNESS & SHEET SIZE

- From 0.2mm up to 5.0mm Thick
- Sheets range from 360x290mm up to 1000x1000mm
- Different features will limit/determine the available thicknesses and sheet sizes

STEP2 – CHOOSE BASE FORMULATION OPTIONS (THEY'RE ALL OPTICAL GRADE ACRYLIC)

- Standard
- UV Transmit – None of the standard UV Inhibitors
- UV Block – Added UV Inhibitors
- High Temperature – Good to 95°C
- Low Moisture Absorption

STEP3 – CHOOSE ADDITIVES – COLOR DYES & PIGMENTS AND DIFFUSION PARTICLES

- Transparent, Translucent, and Opaque colors
- Neutral Density (smoke)
- We can color match if we don't already have the color you need in our portfolio
- NIR Pigments (High-Pass, blocks visible and transmits NIR ,with several options for cut-in)
- Particles for Light Diffusion

STEP4 – CHOOSE SURFACE TEXTURES

- Smooth/Glossy – Optics quality with incredibly low surface roughness
- High Gloss Textures for Newton Ring Elimination or Partial Glare Reduction
- Medium Gloss Nonglare (Antiglare) Textures for Glare Reduction, Optimized for use in front of Displays
- Low Gloss (Heavy Matte) Textures for Light Diffusion
- Can select different textures for each side of the sheet
- Surface textures are cast into the sheet (not coatings based)
- Coatings could be applied on top of the textured surfaces without filling in the texture (*UNIQUE TO CLAREX*)

STEP5 – CHOOSE SURFACE COATINGS - MECHANICAL

- Standard Hardcoat – 6-8H Pencil Hardness & Increased Chemical Resistance
- Super Hardcoat – 9H Pencil Hardness
- Anti-Bacterial Hardcoat
- Flood Printed if opaque or reflective backing is required
- Oleophobic/AntiSmudge – Typically added to AntiReflection Coated Surfaces

STEP6 – CHOOSE OPTICAL COATINGS

- Standard AntiReflection (AR) Coating for Visible Light
- Custom Tuned AntiReflection Coating, such as for UV and NIR applications
- NIR-Blocking/NIR-Cut for NVIS and Heat Reduction
- Mirror coatings – 1st Surface, 2nd Surface, Partial with tunable transmission, Colored

STEP7 – FABRICATION OPTIONS (ISO 9001 & IATF 16949 CERTIFIED)

- None – Take as full sheets (with protective removable masking both sides)
- CNC Laser Cut for most 2-Dimensional shapes and/or features
- CNC Router Cut for 2.5-Dimension features such as step cuts, pockets, and beveled edges
- Laser Etching
- Printing – Bezels/Frames, Logos, Deadfront, Light Guides
- Adhesive application using 2-side adhesive films/tapes
- NIST Traceable Inspection Equipment

PLEASE GIVE US A CALL OR EMAIL TO DISCUSS ALL THESE DIFFERENT OPTIONS