

MANUFACTURERS OF OPTOLITE CONTRAST ENHANCEMENT FILTERS  
SHIELDED WINDOWS - INSTRUMENT GLASSES  
POLAROID POLARISING FILTERS

## OPTOLITE

### CONTRAST ENHANCEMENT FILTERS FOR ELECTRONIC DISPLAYS

Optolite optical grade acrylic filters have been specifically formulated by Instrument Plastics Ltd to optimise the readability of electronic displays under adverse conditions by enhancing contrast and reducing glare whilst improving the appearance of the display.

#### SERVICES OFFERED

- \* Advice on selection and design of filters
- \* Samples available on request
- \* Range of standard colours to suit most display applications
- \* Choice of standard thicknesses 0.5, 1, 1.5, 2, 3mm.
- \* Selected range of Non-Glare finishes
- \* Preparation of artwork, photography and silk screening
- \* Competitive prices
- \* Fabrication to individual requirements, from one-off prototypes to full production
- \* Rapid Delivery

#### OTHER OPTOLITE PRODUCTS

- \* Flat or curved screens for CRTs with optional bezels
- \* Shielded windows for EMI/RFI protection
- \* Infra Red filters
- \* Diffusers for point light sources and back lit LCDs

#### ALSO AVAILABLE

- \* Accurately cast lenses to +/- 0.1mm thickness tolerance
- \* Colour matching to customer requirements
- \* Non standard thicknesses

Instrument Plastics Ltd are able to draw on wide expertise and are pleased to advise and assist in the design and selection of the most suitable type of filter for each individual application.

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## OPTOLITE CLEAR HSR

### CONTRAST ENHANCEMENT FILTERS FOR ELECTRONIC DISPLAYS

Optolite Clear HSR optical grade filters offer a robust, high temperature, high scratch and impact resistant material. It is especially suited to LCDs and other display applications where these characteristics are of particular importance.

LCDs often suffer from a number of problems:

- \* Soft front surface polariser  
- can be subject to damage from scratching, dirt, moisture, finger marks, etc.
- \* Front surface reflections  
- in certain lighting conditions these may cause display readability difficulties
- \* Restricted viewing angles  
- caused by LCD construction and method of operating
- \* Possible Ultra Violet degradation in strong sunlight
- \* Electromagnetic interference
- \* Sourcing of bezels  
- not always possible or feasible with so many different LCD sizes available.

### Choice of Optolite Clear HSR

Instrument Plastics Ltd offer their Optolite Clear HSR (High Scratch Resistant) filter to overcome these problems on LCDs. It is also recommended in display applications requiring the characteristics mentioned below.

Optolite Clear HSR has both outstanding abrasion resistance, up to 20 times that of acrylics, and excellent impact resistance. It also displays excellent chemical resistance, being immune to the effects of virtually all common solvents.

Further, it is lightweight, approximately half that of glass, and exhibits optical properties comparable to crown glass. Its maximum continuous operating temperature is in excess of 100°C.

Optolite Clear HSR is available with selected optional cast-in non glare finishes to overcome front surface reflections. These finishes can improve readability whilst offering advantages in that they can not chip, peel or rub off.

Optolite Clear HSR sheets are cast in-house down to 0.5mm thickness for applications where maximum viewing angle is required or where space is at a premium. Thicker filters are manufactured for when

impact resistance takes priority. Tight thickness tolerances are supplied for specialised applications.

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An optional Ultra-Violet inhibitor is also available to restrict potentially harmful UV rays when certain displays are operated out-of-doors in strong sunlight conditions.

A further option incorporates a blackened stainless steel mesh for electromagnetic shielding. Full edge termination services are available. These mesh filters typically give a protection of 60-70dB over the frequency range 100KHz to 1GHz. Effective shielding is becoming increasingly important with the introduction of new legislation.

Instrument Plastics Ltd also offers full silk screening services. A silk screened border onto the reverse side of the filter and perhaps incorporating a logo, provides an attractive and inexpensive way of producing a bezel. This may also enhance the aesthetic appearance of the system. Double sided adhesive tape can be used for attaching the filter quickly and easily to the display.

#### TECHNICAL DATA - OPTOLITE CLEAR HSR

MECHANICAL PROPERTIES	TEST	UNITS	VALUES
Abrasion Resistance	D1044	(X Acrylic)	20
Hardness	D785	Rockwell	M95 - M100
Tensile Strength	D638	MPa	34 - 41
Compressive Strength	D695	MPa	155
Flexural Yield Strength	D790	MPa	52 - 59
Flexural Modulus	D790	GPa	17 - 23
THERMAL PROPERTIES	TEST	UNITS	VALUES
Mx. Recommended Operating Temp (no load)			100°C
Intermittent (1 Hr)			150°C
Specific Heat	C351	KJ/Kg/K	2.3
Coeff. of Linear Thermal Expansion	D696	Linear Coeff/°C	8-14 x 10 <sup>-5</sup>
Thermal Conductivity	C177	J/S/M/K	0.2
Burning Rate	D635	mm/min	<2
Combustion (Self Ignition)	D1829	°C	382

#### TECHNICAL DATA - OPTOLITE CLEAR HSR

OTHER PROPERTIES	TEST	UNITS	VALUES
Specific Gravity @ 25°C (Glass)	D792	g/cm <sup>3</sup>	1.31 (2.5)
Refractive Index @ 546Nm @ 20°C (Glass)	D542		1.500 (1.52)
Light Transmission		%	90

#### RESISTANCE TO CHEMICAL REAGENTS

(% Increase in Weight after 7 days Immersion at 25°C)

ACID	% CHANGE	SOLVENTS	% CHANGE
30% Sulphuric Acid	0.5	95% Ethyl Alcohol	0.1
10% Nitric Acid	0.7	Acetone	0.5
10% Hydrochloric Acid	0.4	Carbon Tetrachloride	0.6
ALKALI		Gasoline	0.1
10% Amm. Hydroxide	0.8	Benzene	0.7
10% Sodium Hydroxide	0.5	Toluene	0.6
		Distilled Water	0.7

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## OPTOLITE SHIELDED FILTER WINDOWS

Optolite shielded filter windows have been designed for electronic displays, combining a high level of electromagnetic shielding with excellent contrast enhancement.

They are used extensively to minimise radio frequency emissions generated by enclosed electronic equipment and to protect electronic equipment from electromagnetic interference arising from external sources.

### FEATURES

- \* Up to 70dB attenuation
- \* In Clear HSR (High Scratch Resistance) or selected coloured band pass filters to suit most displays
- \* Available flat or curved
- \* Excellent impact abrasion, heat and chemical resistance for Optolite Clear HSR
- \* Light Weight
- \* Robust Construction
- \* Optional Blackened wire mesh to reduce mesh reflections
- \* Cast-in non glare finishes to cut down front surface reflections
- \* Mesh incorporated at any desired angle
- \* Edge termination services available
- \* Fabricated to customer requirements

Optolite shielded windows have a highly conductive micro-fine wire mesh which attenuates EMI/RFI emissions. Different meshes to suit varying applications are available.

Optolite filter sheets are cast in-house as a one piece sheet with the mesh totally encapsulated. This approach offers customers a more cost-effective and robust solution to shielding problems, totally eliminating delamination and optical imperfections which can affect ordinary laminated windows.

### Typical Applications of Optolite Shielded Windows

- \* Aerospace and Defence
- \* Radio and Telecommunications
- \* Industrial Manufacturing Equipment
- \* Medical and Scientific Apparatus
- \* Information Technology Equipment
- \* Flat Panel Displays in Electronic Equipment

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## PROPERTIES

### Shielding

Absorption of electromagnetic energy is mainly dependent on the mesh conductivity, wire diameter, wave density, electrical contact between intersecting wires, mesh material and edge terminations.

The shielding effectiveness, measured by using the "Hole-in-the-Wall" technique, is typically between 60dB and 70dB from 100KHz to 1GHz for blackened stainless steel meshes.

### Optical Characteristics

It is important to colour match band pass filters to the particular Display characteristics (for further detail see Optolite Brochure). Optical transmission, absorption and reflectance are dependant on the filter band pass colour, mesh density and non glare finish. Also, by casting the material as a one piece filter, the transmission is improved by reducing the number of internal reflecting surfaces from four to two compared to laminated windows.

### Physical Design

Optolite shielded windows are supplied fabricated to customer requirements. Overall standard thicknesses are 2.5, 3, 4, 6mm. Other, non-standard thicknesses, from 2.5mm upwards, are also available and can be ordered with an optional non glare finish.

### Mesh

Various types of mesh are offered which can be treated to produce a matt black non reflective finish. Alternatively, a standard metallic finish can be incorporated in band pass filters where the colour reduces the need for blackened mesh. Typically, the wire diameters range from .025mm to .05mm and the weave densities vary from 50 O.P.I. (Opening per Inch) to 200 O.P.I. mesh. The mesh can be set at any angle up to 45° in more demanding applications to restrict the possibility of moiré fringes where this is important.

### Weight

For larger displays, weight can be an extremely important consideration in the design of shielded filters. Optolite Clear HSR and Optolite coloured acrylic filters weigh only half as much as glass. Additionally, an acrylic filter is up to five times as resistant to breakage as a comparable glass filter.

### Edge Termination

In one piece filters, the conductive mesh is exposed along the edge of the Optolite filter after it is cut to size. A silver conductive bussbar is added to the edge and then extended, if required, to the front or rear surface.

The conductive circuit from the mesh is then completed either through the bussbar or else via a conductive elastomer gasket attached to the bussbar. Other edge termination methods are also available.

### Gasket

The conductive gasket consists typically of aluminium or monel wires, which are crimped for maximum pressure. The wires are oriented perpendicular to the mating surfaces and integrally bonded into a silicone elastomer. The elastomer acts either as an environmental seal or as a pressure seal. Again, other types of gaskets are also available.

Instrument Plastics Ltd will be pleased to advise on the design and construction of Optolite shielded windows for specific applications.

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## OPTOLITE FILTER APPLICATION SUMMARY

DISPLAY TYPE	COLOUR									
	Dark Red Light Red Ultra Light Red	Orange Amber	Yellow Amber	Dark Green Light Green Green VT Green BL	Neutral	Dark Blue Light Blue	Yellow Clear			
1. LED Standard Red H. E. Red Orange Yellow Green	*	*	*	*	*	*	*	*	*	*
2. Vacuum Fluorescent		*	*	*	*	*	*			
3. Electro Luminescent			*		*					
4. Plasma Displays		*			*					
5. LCDs								*		
6. CRT (+)		*	*	*	*	*	*			

+ Filter Depends on CRT Phosphor

Thickness: 0.5, 1, 1.5, 2, 3mm

### NON GLARE FINISHES (Gloss Levels, Relative Reflectance)

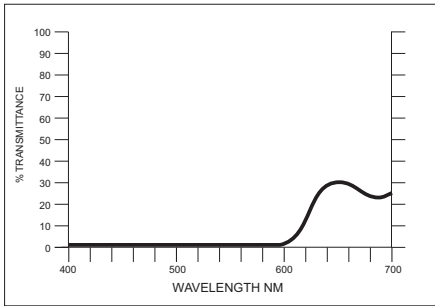
NG Grade C      15 units  
NG Grade M      30 units  
NG Grade F      50 units

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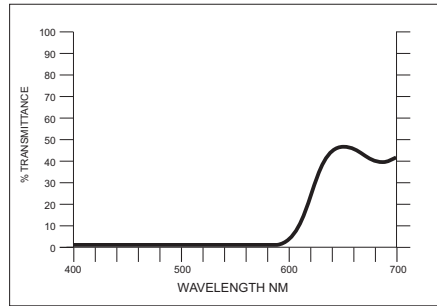


# OPTOLITE TRANSMISSION

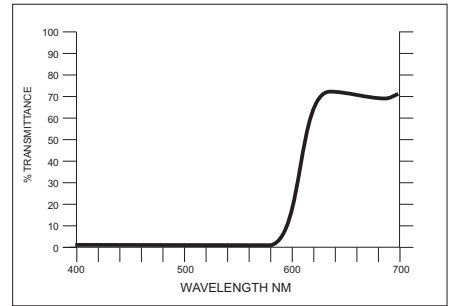
**DARK RED**



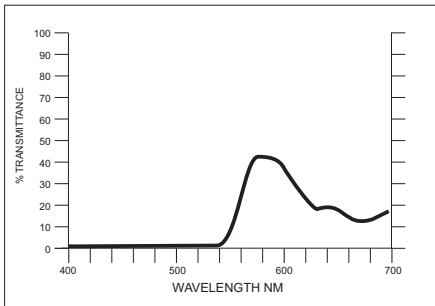
**LIGHT RED**



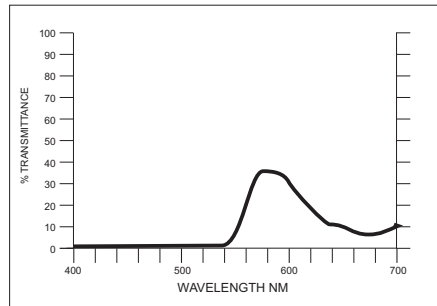
**ULTRA LIGHT RED**



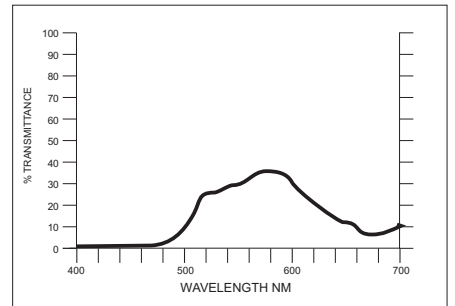
**ORANGE AMBER**



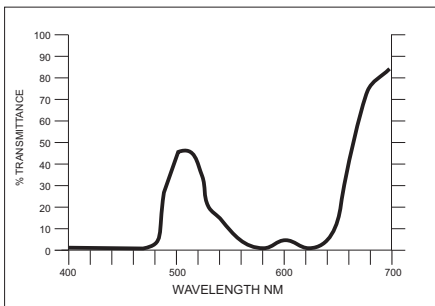
**YELLOW AMBER**



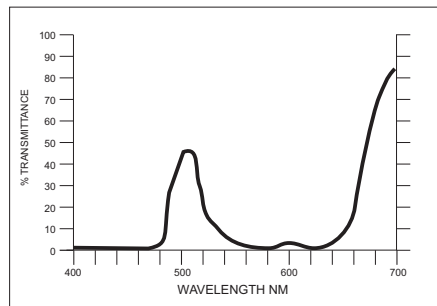
**DARK GREEN**



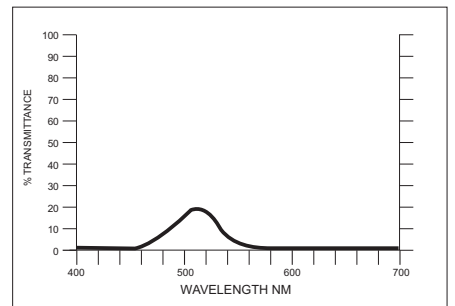
**LIGHT GREEN**



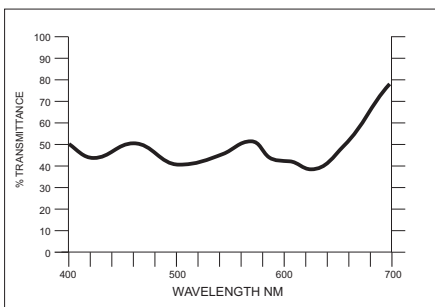
**GREEN VT**



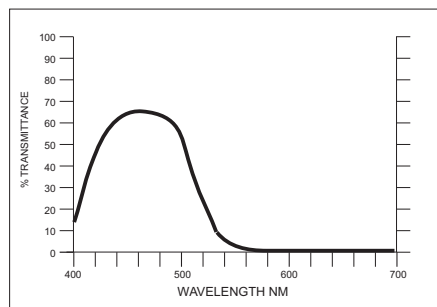
**GREEN BL**



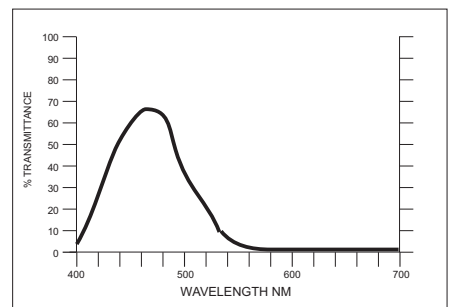
**NEUTRAL**



**LIGHT BLUE**



**DARK BLUE**



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## SELECTION OF FILTERS

### Readability

The most important factor for all types of electronic display is readability, which can be difficult under conditions ranging from darkness to bright sunlight. Also, reflected light from the display can cause further viewing difficulties.

### Method of Operation

Optolite optical grade filters have been developed to overcome these problems. Readability is improved by increasing the relative contrast between the lit and unlit parts of the display. Band pass filters increase contrast by passing the wavelengths of light from the display whilst partially absorbing other wavelengths of ambient light. Selected Optolite colours are available which are matched to the transmission characteristics of the display.

### Factors to Consider

should be given to the transmission curve, shape, attenuation at peak wavelength, and front surface reflectance. The design needs to consider aesthetics as the appearance of the finished product should also be enhanced. Optolite filters provide the most cost-effective answer to display improvement where the performance of a circular polariser may be partially traded off against price.

### Non Glare Finishes

Optolite filters are available with various grades of optional cast-in non-glare finishes. They are manufactured to customer specifications to produce either filters or display panels. The cast-in offers advantages in that it cannot chip, peel or rub off.

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