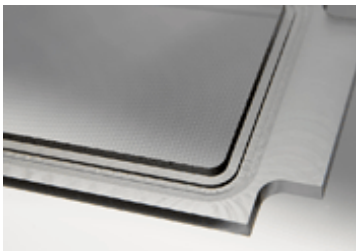
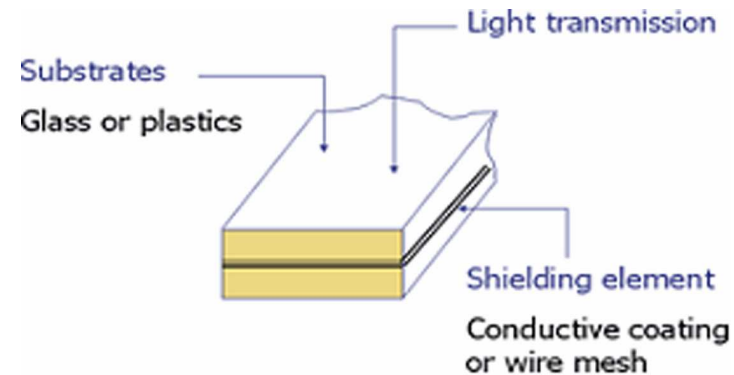
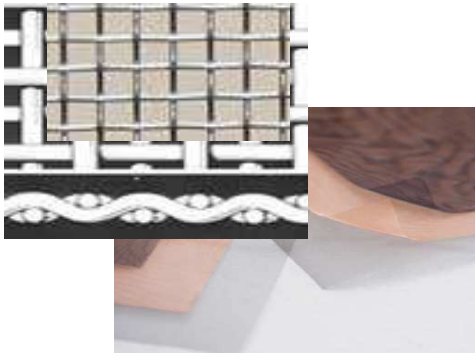


European Optical Display Filter Guide

Product Design & Specifications

What are Shielded Window Displays?

Comprises of 4 key component systems:



- a [substrate](#) that allows visibility & light, as well as providing mechanical strength & protection to suit the application: laminated glass, acrylic or polycarbonate, cast monomer.
- a [conductive medium](#) to provide shielding: a mesh layer or a conductive coating like ITO.
- other [finishes, enhancements](#) to ensure it work in it's environment: anti reflective surface, non-glare hard coating, etc.
- a [termination & gaskets](#): busbar, mesh sealed under conductive tape, mesh extended termination, gasket for bezel mounting, etc.

Value of a Display Filter

- Display Protection
- Glare Reduction
- Improved Readability
- EMC Compliance
- Display Enhancement
- Mechanical Requirements
- Aesthetic Requirements



Typical Applications

- Test Equipment
- Medical Instrument Displays
- Industrial Control Screens
- Ruggedised LCD Displays
- Shielded Rooms (MRI)
- Public Information Displays
- Military Radios & Computers
- Avionics Displays
- GPS & In-Car Entertainment Systems
- Network Comms Systems



European Optical Product Guide

Design Considerations & Specifications



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Key questions for optical specification

- Outside dimensions of window, and viewing area.
- What is the overall thickness of the window.
- Are mounting holes required & what is configuration.
- Are the performance requirements known (EMI, Other)
- Type of termination required (extended mesh, busbar, none).
- Type of busbar, “L” or “U” & dimensions.
- Mesh type - Material, OPI & orientation required?
- Substrate type - Glass, Acrylic, Cast or Polycarbonate?
- Coatings & enhancements required - non-glare etch, anti-reflective, ITO, hard coats, contrast enhancement, anti-mist/fog, UV & chemical resistant.
- What side of the window is the viewing side? Related to coatings and busbar application.
- Does the Window application require a gasket? What type? Where (request drawing or spec)?



Additional application requirements

- Will the display need to be read in bright sunlight conditions?
- Will the filter window require ruggedised properties (anti-vandal, impact resistance)?
- Can we offer graphics & logos directly on our filter window?
- Contrast enhancements?
- Assembly method, how will the filter window be mounted (mechanical, adhesive bonding)?
- Will additional gaskets be required for environmental sealing (conductive, non-conductive)?



Key Design Considerations

Design Parameters	Key Considerations
<p>Optical Transmission</p>	<ul style="list-style-type: none"> - Indoor/Outdoor application? A/R or N/G coatings - Light transmission performance of Optical substrates? - Shielding performance vs Light transmission : Higher OPI mesh gives better S/E but lower L/T
<p>Shielding Performance</p>	<ul style="list-style-type: none"> - Mesh type & OPI or ITO coating? - S/E requirements? - Termination style: Busbar or extended mesh?
<p>Environmental & Mechanical</p>	<ul style="list-style-type: none"> - Operating temperature requirements of application - Scratch, impact & chemical resistance - Silk screening, embedded graphics or engraving - Weight & Substrate type -Display size & thickness- - Overall display dimensions & thickness - Stepped edges, radius, holes or groove design
<p>Value Added Capabilities</p>	<ul style="list-style-type: none"> - Touchscreen assembly - Bezel & frame assemblies - Sourcing of labels, films & adhesives - Supply & application of gaskets (FIP, extruded, moulded) - Conductive coatings for enclosure, plastic frames & bezels



Optical display standard components

Substrate Materials	Acrylic, polycarbonate, glass, polyester, cast monomer
Shielding Materials	Woven wire mesh, Indium Tin Oxide (ITO) electrically conductive transparent coating
Shielding Termination	Conductive busbar, foil tape, extended mesh, conductive adhesive, conductive gasket
Anti-glare Control	Non-glare dispersive surface, etch or coating on plastic & glass, multi-layer anti-reflection coating on Glass, Polycarbonate & Acrylic.
Contrast Enhancement	Laminated broadband, high contrast narrow band or sunlight readable, spectrally matched filters & circular polarisers
Size Limit & Thickness Range	<p><u>Stainless steel mesh:</u> 610 x 610mm Wire Diameter 0.001" (0.025mm) Overall Thickness: 1.5mm to 10mm</p> <p><u>Copper mesh:</u> 800 x 1200mm Wire Diameter 0.002" (0.050mm) Overall Thickness: 1.5mm to 10mm</p> <p><u>ITO coated Polyester films Win-Shield F*:</u> 1000 x700mm T=0.13mm</p>



Shielding Performance Considerations

Mesh Type	OPI	Wire diam. (mm)	Shielding Performance (dB attenuation)							Open area (%)
			E-Field			Plane Wave				
			1 MHz	10 MHz	100 MHz	100 MHz	400 MHz	1 GHz	10 GHz	
Copper	100	0.05	107	111	85	70	70	58	-	64
SS	50	0.05	94	90	82	-	58	55	28	82
SS	80	0.025	106	88	82	-	64	60	34	84
SS	100	0.025	128	112	92	77	80	86	74	81

Greater OPI → Better Shielding → but Less Light Transmission

Mesh Performance

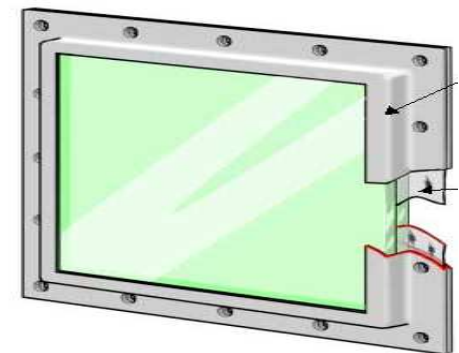
The performance of any RFI / EMC window is dependent on how well it interfaces with the equipment screen.

The table shows the **screening capability of the mesh**, where the mesh only clamped to the screen with no gaskets.

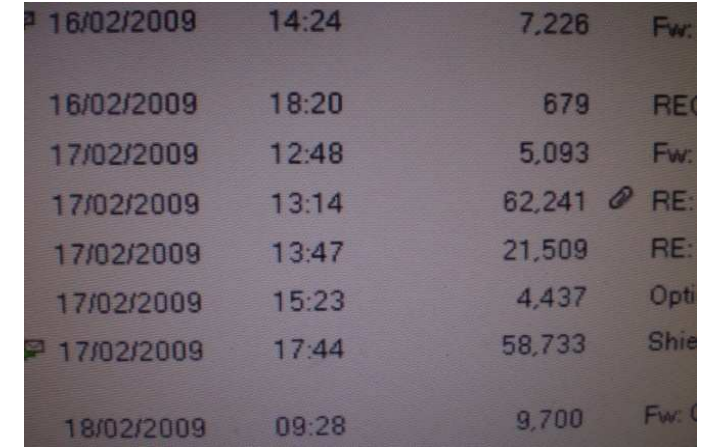
Shielding Performance

The size of the test window is 300 x 300mm. Shielding performance improves as the window size reduces, due to the performance characteristics of the aperture.

Mesh selection should be based on required performance and with the method in which it interacts with your chosen display.



Elimination of Image Distortion and Moiré Fringing



100 OPI BCU Mesh 0.002"
Wire Dia, held against display
monitor at 90° orientation.

Image distortion and Moire
fringing effects are present

Orientate mesh
against display
screen until
distortion and Moire
effects disappear
and image is clear

100 OPI BCU Mesh 0.002"
Wire Dia, held against
display monitor at **33 to 45°**
orientation.

Image distortion and Moire
fringing effects disappear

Moiré Effect

Apply Orientation

Clear Image



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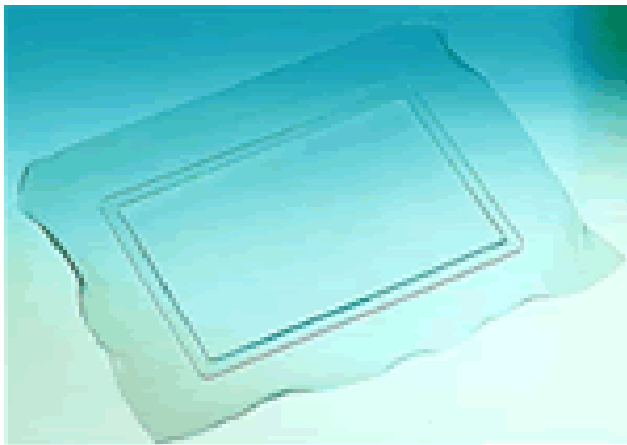
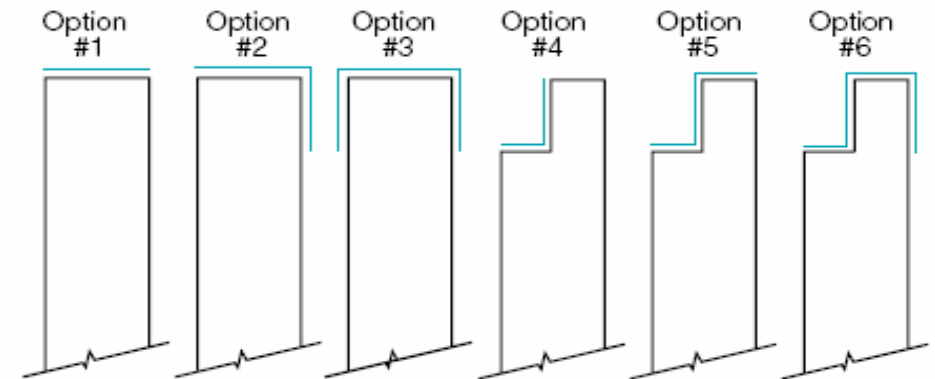


Shielded Window Termination Options

- Silver Epoxy Busbar
- Silver Epoxy Busbar with conductive gasket
- Mesh sealed under conductive tape
- Mesh extended termination

Correct termination is critical

Termination/Edge Options:
(Colored lines represent silver paint or foil busbar.)



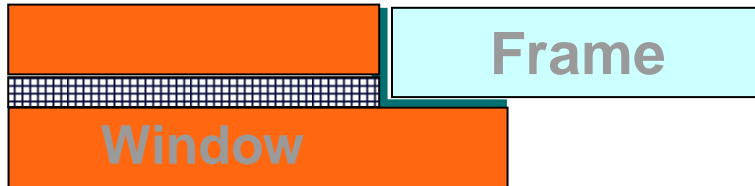
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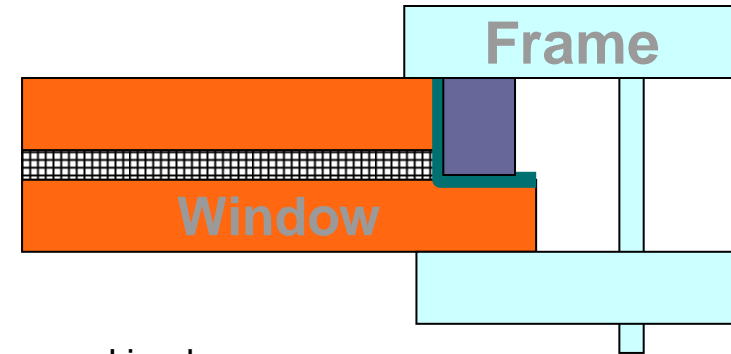
Shielded Window Termination Options

Silver Epoxy Busbar



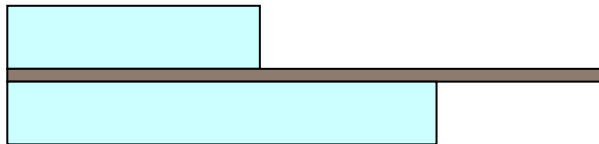
- Glued or clamped in place
- 5 to 10 dB attenuation losses
- Very cost effective

Silver Busbar & Gasket

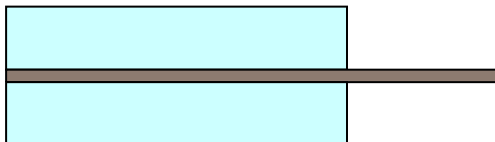


- Clamped in place
- Attenuation losses depend on gasket type.

Extended mesh – square edge

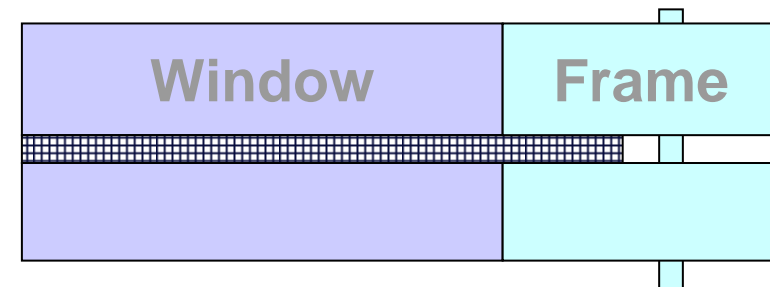


Extended mesh – stepped edge



This option is only available with fully laminated Glass, Acrylic & Polycarbonate Shielded Windows.

Terminations with mesh extensions



- Extended mesh is grounded directly onto bezel
- Highest shielding values (no interfaces)
- Very efficient termination.



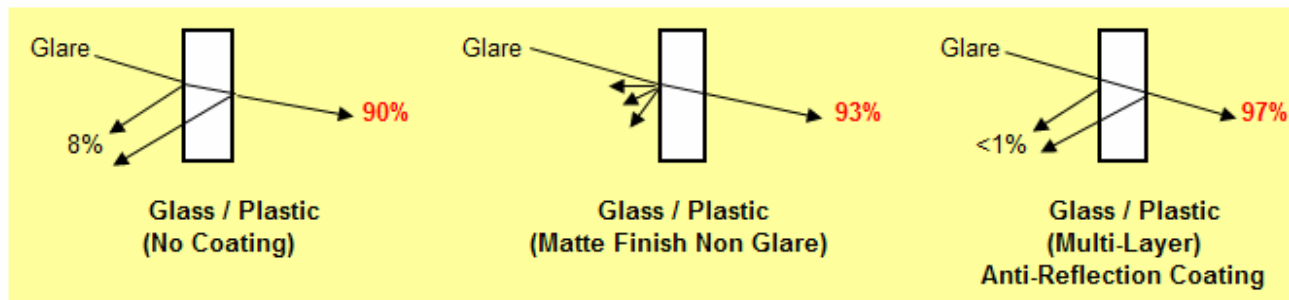
Non-Glare vs Anti-Reflective Surfaces

- Non-Glare surface materials are easier to manufacture thus less expensive. Applied by wet coating & UV cured roll to roll.

Appropriate for indoor applications

- Anti-Reflective materials are much more complex to manufacture, thus more expensive. Sputter coated inline with multiple steps.

Use for outdoor applications or wireless applications requiring sunlight or harsh light readability.



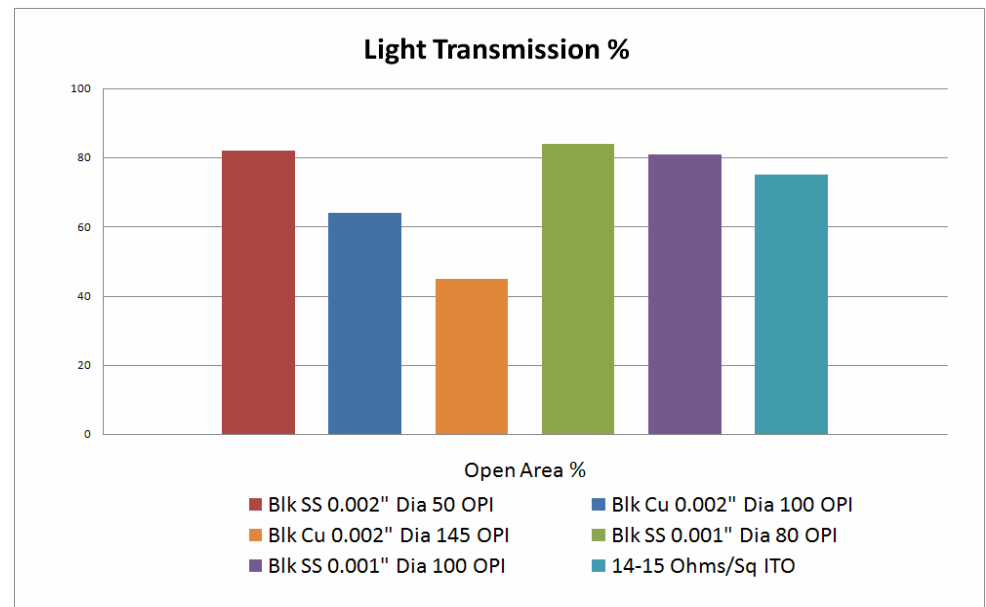
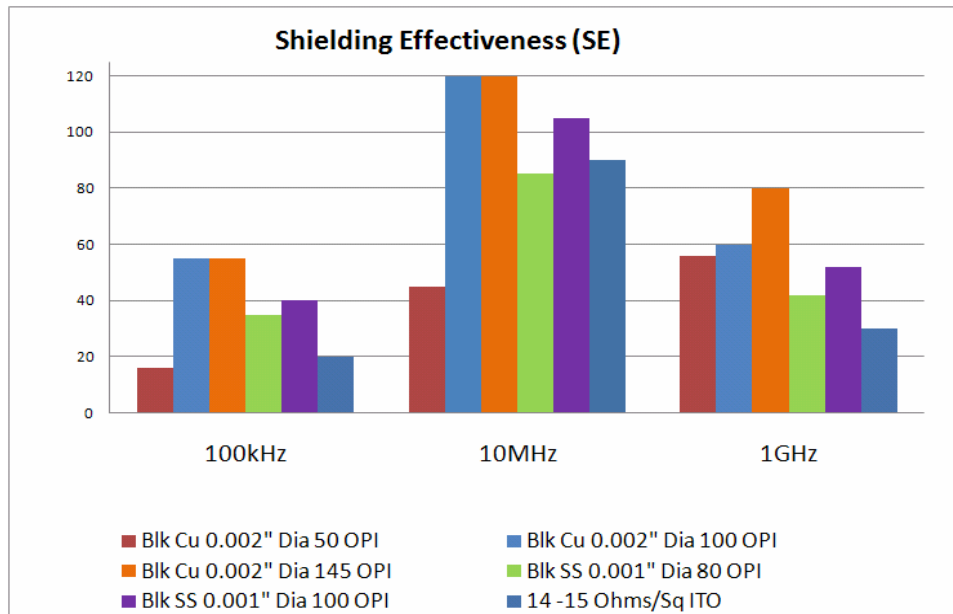
Operational Temperature Ranges

WIN-SHIELD P	Polycarbonate	-55 to +70°C
WIN-SHIELD G	Glass	-55 to +80°C
WIN-SHIELD A	Acrylic	-55 to +60°C
WIN-SHIELD C	Cast monomer	-60 to +100°C
WIN-SHIELD ITO	ITO Film	-45 to +100°C

High end operating temperature of laminate options is governed by temperature specification of the interlayer adhesives



Mesh & ITO coating – Typical Properties



Shielding Performance values are based on 5" x 5" square window tested to TSETS-01 based on modified Mil Std 285



Light Transmittance

Substrate Light Transmittance

Substrate	Light Transmittance
Plain "float" glass	90-92%
Clear Polycarbonate	85-90%
Clear Acrylic	85-90%
Clear Polyester	83-92%
Cast	90-92%

Finish Light Transmittance Reduction

Substrate Finish	Light Transmittance Reduction
Non-glare coatings (60-70 gloss)	2-3%
Non-glare coatings (80-90 gloss)	1%
Clear hard coat	<1%
MLAR coating on glass	<1%



Dimensional & Thickness Tolerances

Dimension tolerances

Substrate	Dimensions		Tolerances	
	mm	inches	mm	inches
Acrylic & Polycarb.	<250	<9.85	± 0.2	± 0.008
	251-500	9.86-19.69	± 0.2	± 0.012
	>500	>19.69	± 0.5	± 0.020
Glass	<250	<9.85	± 0.2	± 0.008
	251-350	9.86-13.78	± 0.2	± 0.012
	>350	>13.78	± 0.5	± 0.020
Cast	All	All	± 0.1	± 0.004

Thickness Tolerances

Substrate	Dimensions		Tolerances	
	mm	inches	mm	inches
Acrylic & Polycarb.	<1.5	<0.059	± 0.4	± 0.016
	>1.51	>0.060	± 0.5	± 0.020
Glass	All	All	± 0.5	± 0.020
Cast	All	All	± 0.2	± 0.008



European Optical Product Guide

Optical Product Range



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Parker Chomerics Optical Product Range

- Broad range of optical solutions to fit all applications: Glass, Polycarbonate, Acrylic & Cast materials.
- Various enhancement options such as gaskets, bezels, & frames to provide custom designs.
- Complete range of finish options to meet all specific requirements: Anti-Glare, Anti-Reflective, Hard coating, Printable Surface, etc.
- Integrated EMI shielded assemblies to offer a complete EMI shielding solution

Product Range - Format Availability

Product Line	Win-Shield P	Win-Shield G	Win-Shield A	Win-Shield C	Win-Shield ITO	Win-Shield F	Duralan P	Duralan G
Substrate Type	Laminated Polycarb.	Laminated Glass	Laminated Acrylic	Cast Monomer	ITO Coating	ITO Polyester Films	Non Shielded Polycarb.	Non Shielded Glass
Operating Temp Range	-55°C to +70°C	-55°C to +80°C	-55°C to +60°C	-60°C to +100°C	Substrate Dependant	-45°C to +100°C	-55°C to +70°C	-55°C to +80°C
Optical Properties								
Substrate only transmission (%)	85-89	92	90	90	Ref to substrate spec	80	85-89	92
Index of Refraction	1.59	1.529	1.48-1.51	1.50-1.57	Ref to substrate spec	N/A	1.59	1.52
Sheet properties								
Thickness Range	1.5 to 6mm	1.5 to 6mm	1.5 to 6mm	1.5 to 6mm	0.2 to 10mm	0.13mm	0.2 to 10mm	1.5 to 6mm
Max Sheet Size	800x1350mm	800x1350mm	800x1350mm	450x600mm	1000x1000mm	700x1000mm	1200x2400mm	800x1350mm
Thickness Tolerance	± 0.5mm	± 0.5mm	± 0.5mm	± 0.25mm	± 0.2mm	N/A	± 0.25mm	± 0.5mm
Dimensional Tolerance	± 0.2mm	± 0.2mm	± 0.2mm	± 0.1mm	± 0.2mm	± 0.2mm	± 0.25mm	± 0.2mm
Termination Options								
Silver Busbar	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A
Extended Mesh	Yes	Yes	Yes	No	N/A	N/A	N/A	N/A
Specific Gravity	1.2	2.52	1.2	1.32	Ref to substrate spec	N/A	1.2	2.25
Coating Options								
Anti-Reflective	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Non-Glare	Yes	Yes	Yes	Yes - Cast only	Yes	No	Yes	Yes
Clear Hard Coat	Yes	Not Required	Yes	Not Required	Yes	N/A	Yes	Not Required
Anti-Mist	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Mechanical Properties								
Hardness (Rockwell)	M70	N/A	M80	M95	Ref to substrate spec	N/A	M70	N/A
Scratch Resistance	Hard Coat Required	Excellent	Hard Coat Required	Good	Ref to substrate spec	Hard Coat Required	Hard Coat Required	Excellent
Chemical Resistance	Coating Required	Good	Coating Required	Excellent	Ref to substrate spec	Coating Required	Coating Required	Good
Impact Resistance	Excellent	Poor	Good	Good	Ref to substrate spec	N/A	Excellent	Poor
Surface Skill Screen Graphics	Yes	No	Yes	Yes	Yes	N/A	No	No
Embedded Graphics	No	No	No	No	No	N/A	Yes	No
UL Rating	V2/V0*	Untested	HB	HB	Ref to substrate spec	UL VTM 2	V2/V0*	Untested
Shielding Effectiveness (dB)	100KHz 10MHz 1GHz	100KHz 10MHz 1GHz	100KHz 10MHz 1GHz	100KHz 10MHz 1GHz	100KHz 10MHz 1GHz	100KHz 10MHz 1GHz	100KHz 10MHz 1GHz	100KHz 10MHz 1GHz
Blk Cu 0.002" Dia 50 OPI	Not Applicable	16dB 45dB 56dB	16dB 45dB 56dB	16dB 45dB 56dB	16dB 45dB 56dB	Not Applicable	Not Applicable	Not Applicable
Blk Cu 0.002" Dia 100 OPI	Not Applicable	55dB 120dB 60dB	55dB 120dB 60dB	55dB 120dB 60dB	55dB 120dB 60dB	Not Applicable	Not Applicable	Not Applicable
Blk Cu 0.002" Dia 145 OPI	Not Applicable	55dB 120dB 60dB	55dB 120dB 60dB	55dB 120dB 60dB	55dB 120dB 60dB	Not Applicable	Not Applicable	Not Applicable
Blk SS 0.001" Dia 80 OPI	35dB 85dB 42dB	35dB 85dB 42dB	35dB 85dB 42dB	35dB 85dB 42dB	35dB 85dB 42dB	Not Applicable	Not Applicable	Not Applicable
Blk SS 0.001" Dia 100 OPI	40dB 105dB 52dB	40dB 105dB 52dB	40dB 105dB 52dB	40dB 105dB 52dB	40dB 105dB 52dB	Not Applicable	Not Applicable	Not Applicable
14-15 Ohms/Sq ITO	Not Applicable	Not Applicable	Not Applicable	Not Applicable	20dB 90dB 80dB	20dB 90dB 80dB	Not Applicable	Not Applicable

* 2mm Standard V2

* 3 to 5mm V0



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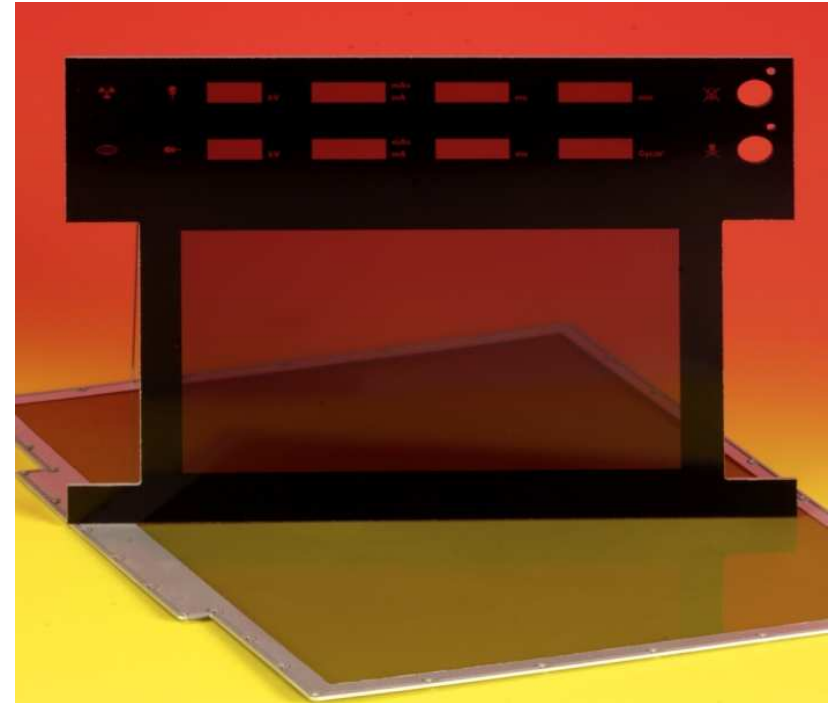


Win-Shield C: Shielded Cast Display Filters

Features high level physical properties of cast monomer combined with the outstanding shielding performance & optical clarity of micro-fine mesh.

Product Features include:

- Thickness range: 1.5 mm to 6.0 mm.
- Light Transmission: Close to crown glass.
- **Operating Temperature: -60°C to 100°C.**
- Graphic & printing: Available with 2 pack inks.
- Non-Glare Finish – Cast in two options fine & medium.
- **Chemical resistance: High resistance to solvent and chemicals.**
- Scratch Resistance: Better than hard coated plastics.
- **Light Weight: Less than half the weight of glass.**
- Termination: Silver busbar termination only.
- **Shielding medium is mesh only**



Win-Shield G, A & P: Fully Laminated Shielded Display Filters

- Glass Win-Shield G
 - Acrylic Win-Shield A
 - Polycarbonate Win-Shield P
-
- The above options allow for selection of appropriate substrate type based on application requirements and the following key factors :
 - Optical Performance
 - Environment - Operating Temperature
 - Mechanical Requirements - Impact Resistance



Win-Shield G, A & P: Fully Laminated Shielded Display Filters

Optional Features include:

- Non-Glare and Clear Hard Coats
- Multi-Layer Anti-Reflective Coatings
- Silver Busbar or Extended Mesh Terminations
- Complex Fabrication - Stepped Edges, Grooves, Mounting Holes
- Printed Graphics
- Conductively Bonded and Terminated into custom bezel or frame assemblies



Chemically toughened glass
Bonded using Cho Bond between mesh & bezel



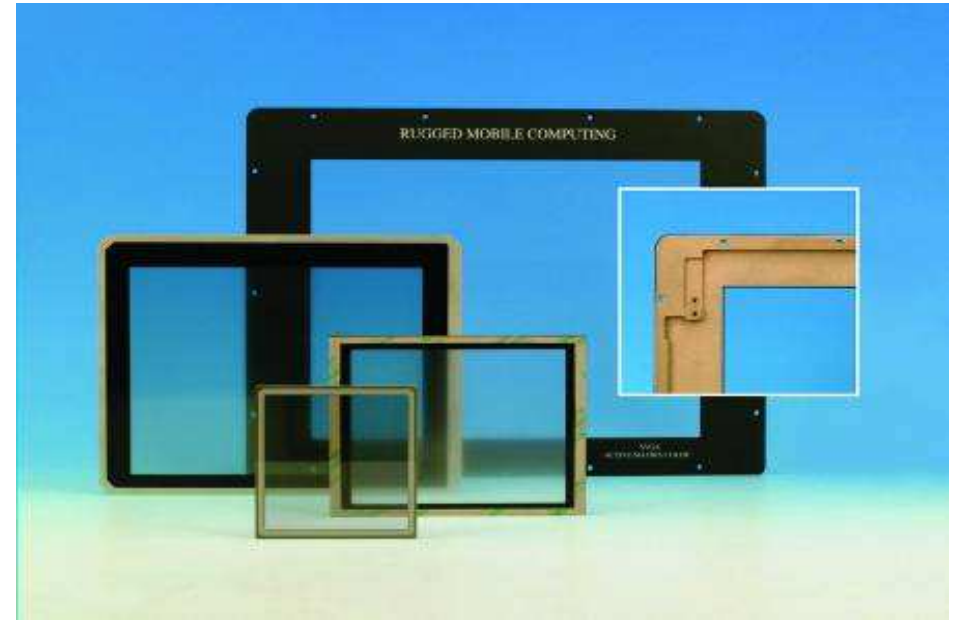
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Duralan P: Non Shielded Display Filters

Display filters are designed to protect and enhance the effectiveness of a display product.



Product Features include:

- High Volume Applications 10k +
- Anti-Glare
- Anti-Reflection
- Complex Fabrication
- Directional Viewing
- Hardcoating
- Costs effective for commercial applications
- Polycarbonate Material
- Embedded Graphics
- Monolithic or Laminate Structure
- Multiple Colours

Win-Shield ITO: Conductive Coated Display Filters

- Conductive Coatings are ITO
- Available in Glass, Polycarbonate and Acrylic
- Thickness of coating increases the shielding effectiveness but reduces light transmission.
- Typically 8 to 14 ohms per square
- Supplied with or without Busbar Termination



Features & Benefits:

- Coating is very stable
- Will not oxidize
- Is not light sensitive
- Chemically resistant
- Highly adherent
- High light transmission
- Many competitors offer glass only – we offer ITO on 3 substrates



Shielding medium is provided with a conductive coating onto Glass, Acrylic or Polycarbonate:



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Win-Shield F: Coated Clear Optical Quality Polyester Films

- ITO Film's low-profile design allows it to be a solution where mechanical modifications of the application cannot be achieved.
- ITO Film is an ideal solution where high light transmission and moderate shielding is required.

Product Features include:

- Light Transmission: 70 - 80%
- Thickness: 0.13mm
- Shielding Effectiveness:
 - 100KHz - 20dB
 - 10MHz - 90dB
 - 1GHz - 30dB
- Available with coatings: 8 Ohms to 20 Ohms/Sq
- 12 - 15 Ohms/sq would be considered standard.

Benefits:

- Use for retro fits
- Low to moderate shielding



Trade Name & Part Numbers

Win-Shield : EMI Shielded Windows

<u>Optical Product Description</u>	<u>Designation</u>	<u>Part Number Prefix</u>
Laminated Polycarbonate EMI	Win-Shield P	1000
Laminated Glass EMI	Win-Shield G	2000
Laminated Acrylic EMI	Win-Shield A	3000
Cast Monomer EMI	Win-Shield C	4000
ITO Coated EMI Windows	Win-Shield ITO	5000
ITO Coated Polyester Films	Win-Shield F	6000

Duralan : Non Shielded Windows

<u>Optical Product Description</u>	<u>Designation</u>	<u>Part Number Prefix</u>
Polycarbonate	Duralan P	7000
Glass with Anti-Reflective	Duralan G	8000
Acrylic	Duralan A	9000

Part Number System: 09-XXXX-MXXXX
Example: 09-2000-M01920 (custom laminated glass product)



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European Optical Product Guide

Examples of Application



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Optical Solution on Bio Detection Unit

Existing Solution:

- Hard coated screen printed acrylic window.
- Has stepped edge, & busbar termination.

Customer Unmet Needs:

- Chemical resistance of substrate
- Scratch resistance of substrate
- Unique keyhole shape design with highly engineered tolerances.
- High volume capable processing.
- High quality demands on printed image.
- Solution needs to meet stringent quality & processing requirements.

Parker Chomerics Solution:

- Cast Monomer substrate.
- Highly resistant to aggressive substances & chemicals.
- Scratch & abrasion resistance x20 times of acrylic.
- Dimensional tolerances +/- 0.1mm.
- Repeatable, hi-volume processes to meet precision & economic requirements.
- Custom mesh screen for optimised image resolution.

Quantifiable Customer Benefits:

- Chemical integrity without hard coatings.
- Meet scratch requirements, lightweight solution compared to glass.
- Increased durability for field use.
- 100% backlit optical checks.
- Price comparable to acrylic, & offers enhanced properties.
- Meets customer quality requirements (wash, bake, out-gassing) in high volume.



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Night Vision Window on Military Vehicle Inter-Comms Unit

Green Tinted Polycarbonate with specific Light Transmission within defined wavelength range.

Existing Solution:

- Original version of this unit did not have a display.

Customer Unmet Needs:

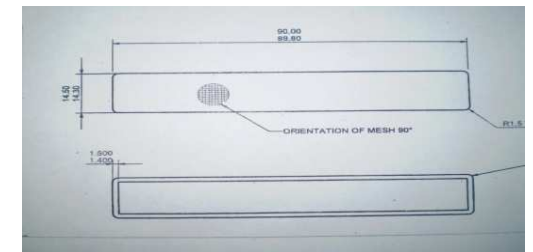
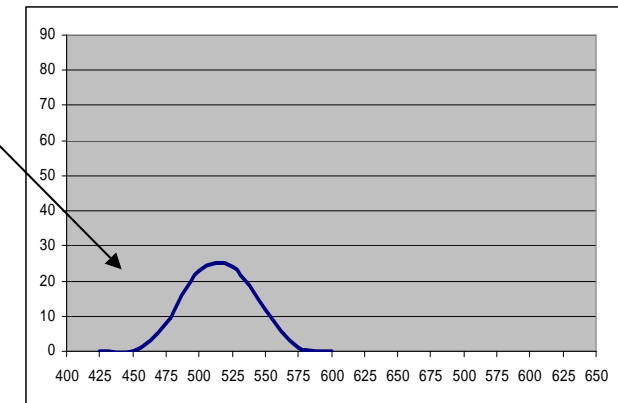
- Shielded Display Window
- Readable with Night Vision Equipment
- Light Transmission within 450 to 575 nm wavelength
- High Impact / Scratch Resistance
- Good Chemical Resistance
- Conductive Gasket on Busbar for extra IP
- Volume production capabilities 50k plus

Parker Chomerics Solution:

- Cast Monomer substrate.
- Highly resistant to aggressive substances & chemicals.
- Scratch & abrasion resistance x20 times of acrylic.
- Dimensional tolerances +/- 0.1mm.
- Repeatable, hi-volume processes to meet precision & economic requirements.
- Custom mesh screen for optimised image resolution.

Quantifiable Customer Benefits:

- Night Vision Shielded Window and Gasket meeting all requirements supplied from a single source.
- Manufacturing process that meets volume demand
- Manufacturing and QA procedures to ensure critical specifications on light transmission and tolerances are repeatable and maintained.



Ruggedised (Military) Laptop

Existing Solution:

- Polycarbonate Laminated Window

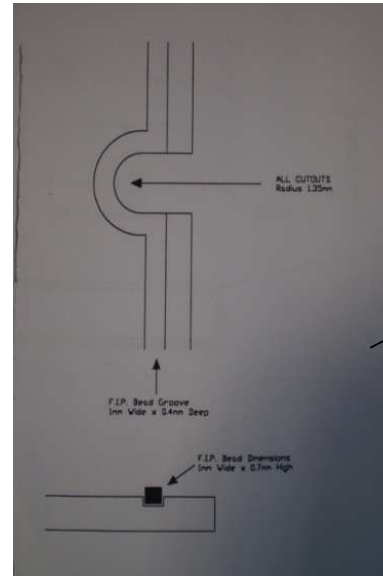
Customer Unmet Needs:

- Very Thin Shielded Window with multiple fixing holes and accurate dimensional tolerances.
- Anti-Glare Solution
- Good Scratch / Impact Resistance
- Good Chemical Resistance
- 17" Display but needs to be light weight
- Gasket around display for High IP Rating.

Parker Chomerics Solution:

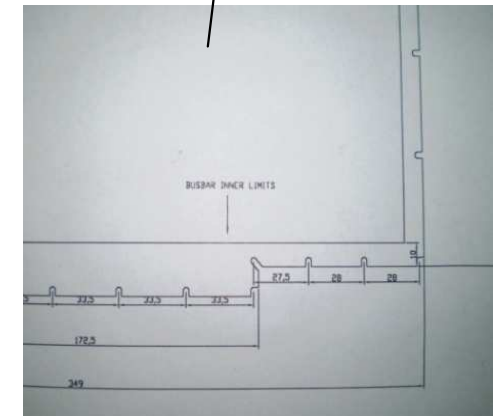
- Cast Monomer Shielded Window 1.5mm Thickness
- 100OPI Silver Plated Blk SS Mesh
- Cast in Non-Glare finish
- Substrate has excellent Chemical Resistance properties without the need for additional coatings
- Silver Busbar Termination
- Groove Machined into window itself and FIP Gasket applied to create environmental & EMC Seal.

Machined Groove around entire perimeter and fixing holes with FIP Gasket applied.



Quantifiable Customer Benefits:

- Light weight, highly chemical / scratch resistant shielded window without any additional coatings, only 1.5mm thick.
- Supplied with mounting holes and gasket machined and dispensed directly onto the window removing the need for additional grooves and separate O-Ring on the laptop casing itself.



Multiple fixing holes machined around entire perimeter of the window.

High Capacity Data Radio Display Assembly

Existing Solution:

Customer Unmet Needs:

- Ruggedized Military Display assembly supplied complete to mount directly onto the radio chassis.
- Hi-impact resistance (Anti-Reflective Coating).
- Display assembly requires both EMC and High IP rating.
- Each radio requires full environmental & EMC test - Quality critical component.

Parker Chomerics Solution:

- Chemically Toughened Glass with Multi-Layer Anti-Reflective Coating, laminated and water cut to form Shielded Window with 50 OPI Mesh and Busbar Termination.
- Two stage Sealing and bonding process of the window into custom bezel. Inner edge of window Silicone sealed and bonded into place. Remaining cavity back filled with Conductive RTV to connect window to bezel.



Complete Window Assembly, supplied with Conductive Adhesive back filled to the rear edge of both bezel and window – flatness across the back of the glass, Adhesive and the bottom of the bezel is a critical parameter.



Complete Window Assembly supplied with Silicone Seal for inner edge of window

Quantifiable Customer Benefits:

- Complete Window and Bezel assembly with four fixing points for minimal manufacturing time and reduced complexity.
- Chemically Toughened Glass for Impact / scratch and Chemical Resistance.
- Ruggedized Assembly that will meet stringent 100% testing.

LAN & Tactical Access Unit Display

Existing Solution:

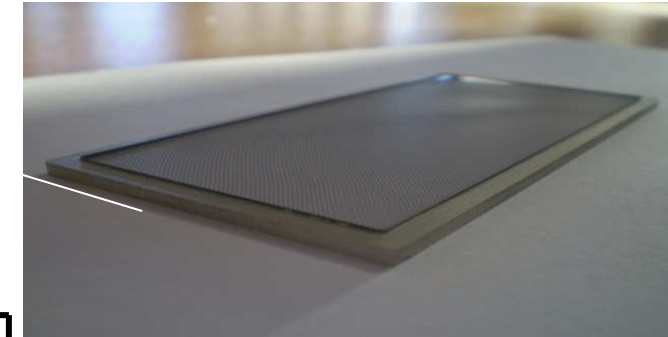
- Hard Coated Acrylic Lamination

Customer Unmet Needs:

- Stepped Window with radius corners to be fitted and bonded to application.
- Good Light Transmission and shielding demands not particularly high.
- Impact and scratch resistant properties

Parker Chomerics Solution:

- Cast Monomer Shielded Window
- 50 OPI Blackened Copper Mesh
- CNC machined with step and radius corners
- Supplied with Silver Busbar Termination



Quantifiable Customer Benefits:

- Light Weight cast shielded window with 80% Light Transmission.
- Excellent Chemical & Scratch Resistance without need for additional coatings.
- Window CNC Machined providing step, radius and +/-0.1 Dimensional Tolerances

Tempest Display Screens

Existing Solution:

- Cast Acrylic Shielded Window



Customer Unmet Needs:

- High Quality Shielded Display Window
- Maximum Thickness 1.5mm
- Impact & Scratch Resistance
- Resistance to commercial cleaning solvents.
- Accurate dimensional tolerances for securing window to display casing.



Parker Chomerics Solution:

- Polycarbonate Non-Glare Hard Coated substrate
- 100 OPI Blk Copper Mesh @ 45° orientation
- Overall Lamination Thickness 1.5mm
- Dimensional Tolerances +/-0.1mm
- Highly Conductive Silver Busbar Termination



Quantifiable Customer Benefits:

- Single Solution, same Shielded Window Construction and Specification can be manufactured to fit all display sizes
- Consistent and repeatable manufacture, all displays 100% tested for emissions, conductivity and EMC performance of the window critical to the application.



Tempest is not an acronym, it is a codeword associated to the phenomenon of being able to remotely and or covertly gather either spatially radiated or line conducted electronic signals and reconstitute them into meaningful intelligence.

Tempest qualified display screens for Dutch Government Departments, 15" / 17" / 19" and 24" Standard Sizes

Remote Bomb Disposal UGV

Existing Solution:

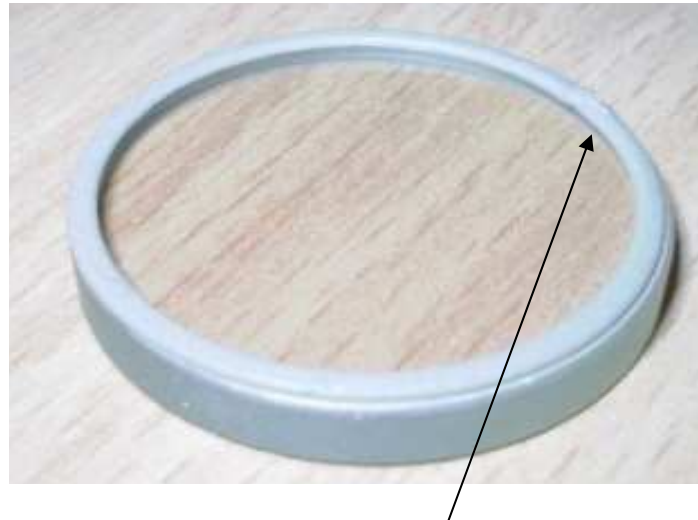
- Non-EMI Toughened Glass Window
- Separate die-cut gaskets.

Customer Unmet Needs:

- High performing optical solution for attack cameras and lamps
- High Impact Resistance
- Excellent Light Transmittance
- EMI Shielding and Conductive Gasket.
- Additional environmental IP gasket.
- Single source solution

Parker Chomerics Solution:

- Chemically Toughened Glass
- ITO Coating 14 Ohm/Sq with Silver Busbar one side applied directly to the glass substrate
- Conductive FIP gasket applied to Busbar one side.
- Environmental non-conductive silicone FIP gasket applied directly to glass on opposite side to ITO.



Form In Place Gasket applied directly to window

Quantifiable Customer Benefits:

- Ruggedized Optical solution
- All requirements met within a single solution, EMI, impact protection, high optical performance and environmental sealing.
- Tolerance control on both the glass and the FIP gaskets combined with the single item solution provides customer with much reduced assembly times and components requirements on BOM's



Advanced Chemical Agent Detector

Existing Solution:

- Hard coated screen printed acrylic window that has stepped edge, & busbar termination.

Customer Unmet Needs:

- Chemical resistance of substrate
- Scratch resistance of substrate
- 4mm Thick Window with Radius Corners and tight dimensional tolerances to fit enclosure apertures.
- High quality demands on printed image.
- Solution needs to meet stringent quality & processing requirements

Parker Chomerics Solution:

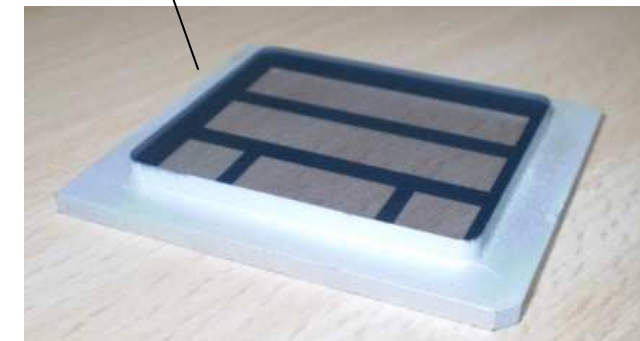
- Cast Monomer substrate.
- Highly resistant to aggressive substances & chemicals.
- Scratch & abrasion resistance x20 times of acrylic.
- Dimensional tolerances +/- 0.1mm.
- Repeatable, hi-volume processes to meet precision & economic requirements.



Window Silver Busbar Terminated, provided with Silk Screening and bonded to housing with Cho Bond 1038

Quantifiable Customer Benefits:

- Chemical integrity without hard coatings.
- Meet scratch requirements, lightweight solution compared to glass.
- Increased durability for field use.
- 100% backlit optical checks.
- Meets customer quality requirements (wash, bake, out-gassing) in high volume.



Fuel Quantity Test Set

Existing Solution:



Customer Unmet Needs:

- Optical Solution to provide:
- Good Impact / Scratch & Chemical Resistance properties
- High Level of Shielding Performance
- Bezel assembly complete with optical shielding solution and EMI gasket for mounting into application enclosure.



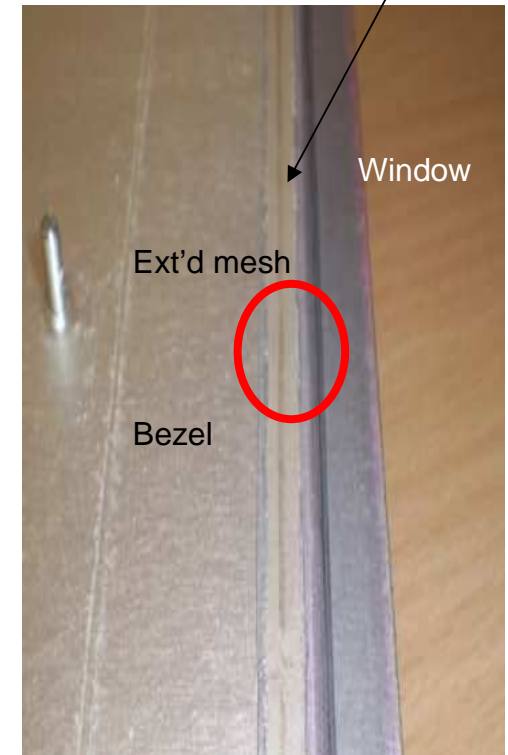
Parker Chomerics Solution:

- Polycarbonate Laminated Shielded Window
- Non-Glare Coating applied to front face.
- 100 OPI Blackened Stainless Steel Mesh
- Provided with 45° Mesh Orientation
- Window Silicone Bonded to free issue bezel to provide environmental seal.
- Mesh extended and conductively bonded directly to the bezel to provide maximum contact and shielding.

Quantifiable Customer Benefits:

- Complete EMI solution from a single source
- Receipt of a bezel assembly complete with shielded Display Filter and EMI Gasket.
- Reduced application manufacturing cost and complexity.

Window bonded into bezel
Extended mesh bonded to bezel with Cho Bond



LCD Fridge Freezer

Existing Solution:

- Original solution ITO Polyester Film
- This solution was too thin and flexible when fitted directly to LCD frame, therefore optical performance compromised and mechanical changes to LCD frame would be required.

Customer Unmet Needs:

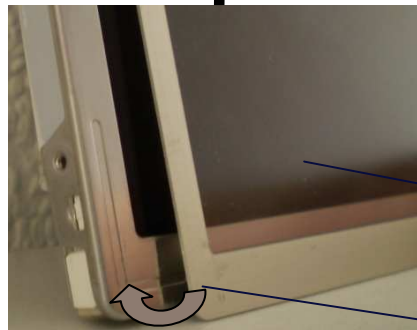
- Shielded display filter with very high optical performance for LCD TV.
- Solution to be very thin and must fit current frame design, this is a retro fit solution, no mechanical changes can be made to current applications design.
- Must provide EMC & excellent optical clarity from multiple viewing angles.

Parker Chomerics Solution:

- Thin Polycarbonate 1.0mm Thick precision machined with 0.5mm deep step and radii to fit LCD frame.
- Shielding provided by 14 Ohms/Sq ITO conductive coating terminated to a silver busbar on stepped edge.
- ITO coating index matched to provide high optical perf. with >86% light transmission
- Viewing side provided with non-glare coating to eliminate external glare/reflection and improve optical performance



Substrate machined to fit shallow step and radius of LCD frame, non-glare coating applied to viewing side of window.



14 Ohms Sq Index Matched ITO Conductive Coating with >86% Light Transmission for high image clarity and optical performance terminated to silver busbar.

Silver Busbar to contact directly with the LCD frame.

Quantifiable Customer Benefits:

- High performing shielded optical solution that provides full EMC compliance while maintaining an optimum image clarity from multiple viewing angles.
- Complete retro fit optical display window solution to minimise additional assembly time & processes with no mechanical changes to current design required.



European Optical Product Guide

Additional test data & contact information



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Additional Test Data

Data & Test methods for key properties:

- Optical properties.
- Physical & mechanical properties.
- Thermal expansion.
- Electrical properties.
- Abrasion
- 7 day immersion chemical resistance.



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