COTS Military Grade Ultra Rugged LCDs

DiamondVue Xtreme Series

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VarTech’s COTS Military Grade DiamondVue Xtreme Series of LCD displays excels in the harshest environments and most demanding applications. These LCDs are optically bonded and have chemically strengthened front glass with optional EMI coating. Electromagnetic Environmental Interference protection, enhanced shock and vibration safeguards, extended operational temperatures, and anti-reflective protective faceplates make these LCDs ideal for rough terrain vehicles, harsh weather field operations, and any other application which requires an ultra rugged flat panel solution.

DiamondVue Xtreme Military LCDs are compliant with these IEC Specifications and MIL-STDs:

- EN61000-4-2 - Electromagnetic Immunity
- FCC Part 15 – Class B - Electromagnetic Emissions and Evaluation
- High Temperature – Operating and Storage
- Low Temperature – Operating and Storage
- Humidity – MIL-STD-810F, Method 507.4-1
- Salt / Fog – MIL-STD-810F, Method 509.4
- Fungus – MIL-STD-810F, Method 508.4
- General Truck Vibration (Non Operating, in package)
- Tactical Transportation Vibration (Non Operation, un-damped equipment)
- Tactical Transportation Vibration (Non Operation, damped equipment)
- Transit drop – MIL-STD-810F, Method 516.5, Procedure IV
- Bench Handling – MIL-STD-810F, Method 516.5, Procedure VI

EMI
- FCC Part 15 – Class B
- Optional MIL-STD-461D/E

Shock
- Designed to meet MIL-STD-901D

Vibration
- Designed to meet MIL-STD-167
COTS Military Grade Ultra Rugged LCDs

Available in 6.4” - 23.1” Sizes

XTREME SERIES FEATURES and OPTIONS

1. Mechanically engineered for extreme harsh environmental conditions.
2. Conformal Coating of all internal circuit boards for added protection against humidity, salt, etc.
3. Conformal Coating to all exterior metalwork for added protection against humidity, salt, etc.
4. High-end power supply engineered with high-grade components which are designed and tested for lower leakage current and higher dielectric strength. This power supply provides low earth leakage and low emissions while providing stringent isolation.
5. Optically bonded laminated anti-reflective front protective glass (optional bonded touch screen).
7. Integrated heaters at the rear of the LCD panel for extended CCFL operational temperature capabilities down to -20°C (optional bonded thermal ITO conductive coating thin film & bus bar for -40°C operation).
8. Full-Range Linear Dimming to black (optional automatic dimming sensor or push button digital controls).
9. Strengthened humidity resistant bonding adhesive on all connectors and screws/nuts for added shock & vibration protection.
10. Optional CCFL enhanced high brightness backlighting.
11. Optional Low Power LED enhanced high luminance 1000+ nits (cd/m2)
12. NVIS - A proprietary NIR [near infrared] rejection filter, when placed over displays, it removes the NIR component of the display emission but maintains sunlight readability.
Military Grade Ultra Rugged LCDs

COTS Military Grade Ultra Rugged LCDs
Available in 6.4” - 23.1” Sizes

MOUNTING OPTIONS

<table>
<thead>
<tr>
<th></th>
<th>NEMA 4 Panel</th>
<th>NEMA 4X Panel</th>
<th>VESA</th>
<th>RETMA Rack</th>
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<tbody>
<tr>
<td>6.4”</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Dual</td>
</tr>
<tr>
<td>8.4”</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>10.4”</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>12.1”</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>15.0”</td>
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<td>•</td>
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<tr>
<td>17.0”</td>
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<tr>
<td>19.0”</td>
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<td>•</td>
</tr>
<tr>
<td>20.1”</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>21.3”</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>23.1”</td>
<td>•</td>
<td>•</td>
<td>•</td>
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</table>

SCREEN PERFORMANCE

<table>
<thead>
<tr>
<th></th>
<th>Resolution</th>
<th>Brightness</th>
<th>Optional High Luminance</th>
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<tbody>
<tr>
<td>6.4”</td>
<td>VGA 640 x 480</td>
<td>400 nits</td>
<td>700 nits</td>
</tr>
<tr>
<td>8.4”</td>
<td>VGA / SVGA</td>
<td>400 nits</td>
<td>1400 nits</td>
</tr>
<tr>
<td>10.4”</td>
<td>VGA / SVGA / XGA</td>
<td>380 nits</td>
<td>850, 1200 nits</td>
</tr>
<tr>
<td>12.1”</td>
<td>XGA 1024 x 768</td>
<td>300 nits</td>
<td>1000 nits</td>
</tr>
<tr>
<td>15.0”</td>
<td>XGA 1024 x 768</td>
<td>450 nits</td>
<td>1500 nits</td>
</tr>
<tr>
<td>17.0”</td>
<td>SXGA 1280 x 1024</td>
<td>250 nits</td>
<td>1200 nits</td>
</tr>
<tr>
<td>19.0”</td>
<td>SXGA 1280 x 1024</td>
<td>250 nits</td>
<td>850 nits</td>
</tr>
<tr>
<td>20.1”</td>
<td>UXGA 1600 x 1200</td>
<td>250 nits</td>
<td>780 nits</td>
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<tr>
<td>21.3”</td>
<td>UXGA 1600 x 1200</td>
<td>250 nits</td>
<td>750 nits</td>
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<tr>
<td>23.1”</td>
<td>UXGA 1600 x 1200</td>
<td>250 nits</td>
<td>N/A</td>
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EMI-ITO Glass Shielding with Conductive Coating

VarTech's EMI-ITO is a range of EMI shielded windows with a conductive coating for use in EMI/RFI shielding applications. The combination of high visible light transmission, near neutral color and low electrical resistance make an ideal EMI/RFI shield for electronic displays requiring moderate shielding effectiveness and high quality optical properties.

**Product Format:** EMI-ITO windows are either un-laminated or fully laminated glass filters with an ITO coating of 12 ohms/sq. Windows are available to order as finished windows. Laminated versions offer greater strength and options for front surface treatment and edge profiles.

**Coating Properties:** The soda lime float glass is coated with a primary secondary layer of Indium Tin Oxide (ITO).

- Surface resistance: 12 ohms/sq
- Coating thickness: 150nm
- Heat Resistance: 140°C
- Humidity (60°C/90%RH): No effect
- Adhesion to glass: MIL M-13508 4.4.6
- Abrasion resistance: MIL C-675-A 4.6.11
- MIL E-12397-B
- Transmittance @550nm: 89%
- Color: Clear
- Reflection: <4%

**Termination Method:** Direct contact can be made to the conductive surface by a suitable conductive fabric over foam gasket, silver loaded silicone gasket, copper tape or silver epoxy painted busbar. Do not use gaskets containing metal wire which can damage the coating or place the window directly against a hard plastic or metal surface.

**Design Options:**
- Contrast Enhancement & privacy filters
- Colors and Neutral density tints
- NIR blocking filters

**Shielding Effectiveness:** The soda lime float glass is coated with a primary secondary layer of Indium Tin Oxide (ITO).

<table>
<thead>
<tr>
<th>Window diagonal (mm)</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>450</th>
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<tbody>
<tr>
<td>30</td>
<td>52</td>
<td>48</td>
<td>39</td>
<td>36</td>
<td>33</td>
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<td>75</td>
<td>43</td>
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<td>34</td>
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<td>150</td>
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<td>32</td>
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<td>200</td>
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<td>500</td>
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<td>1000</td>
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<td>24</td>
<td>24</td>
<td>24</td>
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<td>24</td>
</tr>
</tbody>
</table>

Coatings of 12 ohms/sq has been chosen to provide a good balance between shielding and optical performance. Coatings greater than 20 ohms/sq lack shielding effectiveness and lower ohm/sq coatings have reduced light transmission and increased light reflection.

**Product Range:**
- **Size:** parts up to 400 x 500mm
- **Thickness:** 1.1mm un-laminated
  2.5 to 4.3mm laminated
- **Front finish:** Plain glass
- Anti-Reflective (MLAR) coating
- Non-Glare (etch85)
EMI Mesh

Woven meshes for shielded windows, apertures and displays where an electronic enclosure requires shielding from electromagnetic interference (EMI) or is emitting electromagnetic energy which may cause interference with another system but requires a high level of visible light transmission or image clarity.

- Blackened 100opi copper is a rugged mesh that is recommend for standalone use.
- EmiClare is a proprietary mesh optimized for optical performance without sacrificing EMI performance. This is only supplied in finished window formats.
- MicroMesh is an etched copper grid matrix with higher light transmission and optical clarity. This is only supplied in fully laminated windows.
- Conventional stainless steel metal mesh and coated woven fabric are also available.
- Low ohms/sq EMI-ITO coated film that has no grid pattern.

<table>
<thead>
<tr>
<th>Material</th>
<th>Light T%</th>
<th>Surface Resistivity Ohms/sq</th>
<th>Format</th>
<th>SE Graph Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>EmiCare</td>
<td>80%</td>
<td>0.030</td>
<td>Only in final window form</td>
<td></td>
</tr>
<tr>
<td>MicroMesh</td>
<td>89%</td>
<td>0.050</td>
<td>Laminated window only</td>
<td></td>
</tr>
<tr>
<td>50opi .001” Blk Cu plated S/S</td>
<td>75%</td>
<td>0.025</td>
<td>Sheets 450 x 600mm</td>
<td>n/a</td>
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<tr>
<td>80opi .001” Blk Cu plated S/S</td>
<td>71%</td>
<td>0.020</td>
<td>Sheets 450 x 600mm</td>
<td>n/a</td>
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<tr>
<td>100opi .001” Blk Cu plated S/S</td>
<td>65%</td>
<td>0.020</td>
<td>Sheets 450 x 600mm</td>
<td></td>
</tr>
<tr>
<td>100opi .002” OFL Blk Copper</td>
<td>60%</td>
<td>0.010</td>
<td>Sheets upto 1200 x 2500mm</td>
<td></td>
</tr>
<tr>
<td>100opi .002” conventional Bk Cu</td>
<td>60%</td>
<td>2.0 +</td>
<td># Not supplied by OFL</td>
<td></td>
</tr>
<tr>
<td>100opi .002” unblk copper</td>
<td>60%</td>
<td>0.010</td>
<td>Rolls 1200m wide</td>
<td></td>
</tr>
<tr>
<td>Coated Woven Fabric</td>
<td>66%</td>
<td>0.140</td>
<td>Rolls 1200m wide</td>
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</tr>
<tr>
<td>EMI-lto film</td>
<td>82%</td>
<td>12-15</td>
<td>Rolls 1200m wide</td>
<td></td>
</tr>
</tbody>
</table>

**Shielding Effectiveness (SE) dB - Test Data to Mil-1285**

**Blackening:** To eliminate light reflections the mesh is blackened. VarTech’s blackening system is highly conductive and enhances shielding effectiveness at frequencies below 10GHz. The stainless steel meshes are copper plated before blackening.
Transparent Heaters

VarTech’s Transparent Heaters for the defrosting and maintaining LCD displays at optimum operating temperatures for screen response or the defrosting and maintaining windows from moisture. VarTech has developed a clear transparent heater circuit with a rugged busbar termination that can incorporated with our range of contrast enhancement and EMI shielded filters.

Specification: The VarTech Transparent Heaters are either un-laminated or fully laminated glass filters with an Indium Tin Oxide (ITO) coating of 12 ohms/sq. This is an optimum coating density to provide excellent heating performance with good optical clarity compared to the highly reflective thin resistive wires typically used to provide heat.

Extensive testing and military qualification has proved the VarTech transparent heater to maintain a LCD at 20°C with an outside temperature of -50°C and 3°C/minute temperature gradient.

Termination Method: Highly rugged proprietary insulated busbar and wire termination along two opposing edges.

Applications:

Transparent heaters are used in a board range of applications including: public information displays, material handling equipment, military ground based vehicles, naval flight deck equipment, control panels on heavy agricultural and earth moving equipment, periscopes and off-shore oil platforms.

Product Range:
Un-laminated glass transparent heater:
• Transmittance @ 550nm 89%
• Thickness 1.1mm only
• Plain float finish only
• Max size 400 x 500mm

Laminated glass transparent heater:
• The ITO surface is located within the lamination for ruggedization and additional layers incorporated for mechanical & impact resistance
• Thickness 2.5mm upwards
• Finish plain, etch non-glare and anti-reflective coating

Additional elements for Multi-function windows with transparent heater:
• EmiClare EMI shielding
• Contrast enhancement
• Etch non-glare and anti-reflective coated front surface finish
• Silk screen printing

Heated Window Performance