Protection, Light Control and Display Enhancement

3M™ DISPLAY PROTECTION FILMS

Extend the shelf life of displays with 3M display protection films that protect and enhance displays while maintaining their own look longer.

- Less frequent screen cleaning
- Glossy surface for crystal clear image
- Durable, long last protection
- Fades normal fingerprints over time
- Patented technology

3M™ Glossy Fingerprint Fading (GLS1230)
- Chemical and disinfectant resistant
- Masks fingerprints
- Anti-glare matte to reduce mirror-like reflections
- Helps prevent damage, scratches and scuffs
- Scotchgard™ easy-to-clean surface
- Color-neutral anti-reflection technology
- Helps prevent damage, scratches and scuffs

3M™ Glossy Low Reflection Protection Film (GLR320)
- Chemical and disinfectant resistant

3M™ Anti-Reflection Matte Protection Film (ARMR220)
- Chemical and disinfectant resistant

3M™ Advanced Light Control Film Polycarbonate (ALCF-P)
- Create ideal visibility for the inside of vehicles
- Complete glass viewing angle perpendicular to the lenses
- Available with or without matte finish
- Compatible with most touch systems

3M™ Brightness Enhancement Film (BEF)
- Manages the incident output of light to improve brightness
- Adaptive technology compresses brightness output for on axis viewers
- Can cross axis sheets at 60 degrees
- Variety of configurations for specific needs

3M™ Uniformity Tape (UT)
- Maximizes the recycling efficiency of LCD backlights
- Provides more than 98% reflectance across the entire spectrum
- Backlight reflector for LCDs
- Thin, 100% polymer reflector film

3M™ Enhanced Specular Reflection (ESR)
- Varieties of configurations for specific needs
- Light normally absorbed and lost by the backlight is “re-polarized”
- Polarizes a backlight’s output to allow more light to pass through the LCD
- Increases brightness and amount of available light across the entire LCD
- Multilayer, reflective polarizer

3M™ Dual Brightness Enhancement Film (DBEF)
- Variety of configurations for specific needs
- Can cross two sheets at 90 degrees
- Refraction technology compresses backlight output to on-axis view
- Prismatic film that manages the angular output of light to increase brightness
- ±24 degree viewing angle perpendicular to the louvers
- Create visual security or contrast improvement on the outside of LCDs

3M™ Light Control Film (LCF)
- ALCF-A2+ features a reflective polarizer (DBEF)
- ±30 degree viewing angle perpendicular to the louvers
- Create visual security on the outside of LCDs
- Low birefringent polycarbonate film
- Prevent nighttime reflections from glass surfaces of automobiles

3M™ Advanced Light Control Film A2 and A2+ (ALCF-A2/ALCF-A2+)
- Provides efficient recycling of light into the display
- Increase brightness in the display, or translate them into power savings or thermal management.
- Recycling, light management films increase the brightness of LCD backlights.
- Use them to increase brightness in the display, or translate them into power savings or thermal management.
- Could serve as a cause of driver distraction. Managing this light allows automotive designers to be more open. ALCF-A2+ has the added advantage of brightness enhancement with the inclusion of ESR® in its construction.

3M™ Advanced Light Control Film E2 (ALCF-E2)
- Provides a film that manages the incident output of light to improve brightness
- Adaptive technology compresses brightness output for on axis viewers
- Can cross axis sheets at 60 degrees
- Variety of configurations for specific needs

3M™ Advanced Light Control Film A2 and A2+ (ALCF-A2/ALCF-A2+)
- Provides efficient recycling of light into the display
- Increase brightness in the display, or translate them into power savings or thermal management.
- Recycling, light management films increase the brightness of LCD backlights.
- Use them to increase brightness in the display, or translate them into power savings or thermal management.
- Could serve as a cause of driver distraction. Managing this light allows automotive designers to be more open. ALCF-A2+ has the added advantage of brightness enhancement with the inclusion of ESR® in its construction.

BRIGHTNESS ENHANCEMENT FILMS

3M™ Enhanced Uniformity Film (UNF)
- Patent technology
- Fades or removes fingerprints in the field
- Scratches, heat or cold damage
- Rough surface or crystal clear image
- Less frequent screen cleaning

3M™ Display Enhancement and Protection Films

- Center console displays
- Instrument cluster displays
- Rear-view mirror displays
- Lighting elements

Offering benefits critical to the automotive industry

3M offers a small line of enhancement films that can be used to increase the design freedom for automotive interiors. They microreplicate a polymer surface to manage reflections, manipulate light distribution and increase display brightness. Benefits can include improved driver/passenger viewability, increased thermal management and more open interior designs.

Advanced solutions for protection, light control and display enhancement.

Design freedom through reflection control

ALCF-A2/A2+ manage reflections created by stray light entering automotive displays and instrumentation. These reflections, on the instrumentation or side glass, cause a source of driver distraction. Managing this light allows automotive designers to be more open. ALCF-A2+ has the added advantage of brightness enhancement with the inclusion of ESR® in its construction.

3M™ Glossy Protection Film (GLS100)
- Films that protect and enhance displays while maintaining their own look longer.
- Extend the life of your displays with 3M’s durable, precision designed protection films.

3M™ Eyewear Protection Film (EPF)
- Helps prevent damage, scratches and scuffs
- Helps reduce glare and reflection
- Enhanced clarity while maintaining glare from the sun
- Scratch-resistant surface
- Chemical and drip resistant

3M™ Anti-Reflection Polymeric Film (ARP)
- Helps prevent damage, scratches and scuffs
- Helps reduce glare and reflection
- Enhanced clarity while maintaining glare from the sun
- Scratch-resistant surface
- Chemical and drip resistant

3M™ Anti-Reflection Matt Protection Film (ARMR)
- Helps prevent damage, scratches and scuffs
- Helps reduce glare and reflection
- Enhanced clarity while maintaining glare from the sun
- Scratch-resistant surface
- Chemical and drip resistant

3M™ Anti-Reflection Textured Film (ATF)
- Helps prevent damage, scratches and scuffs
- Helps reduce glare and reflection
- Enhanced clarity while maintaining glare from the sun
- Scratch-resistant surface
- Chemical and drip resistant

3M™ Anti-Reflection Paintable Film (APF)
- Helps prevent damage, scratches and scuffs
- Helps reduce glare and reflection
- Enhanced clarity while maintaining glare from the sun
- Scratch-resistant surface
- Chemical and drip resistant

3M™ Advanced Light Control Film A2 and A2+ (ALCF-A2/ALCF-A2+)
- Provides efficient recycling of light into the display
- Increase brightness in the display, or translate them into power savings or thermal management.
- Recycling, light management films increase the brightness of LCD backlights.
- Use them to increase brightness in the display, or translate them into power savings or thermal management.
Protection, Light Control and Display Enhancement

3M™ DISPLAY PROTECTION FILMS

- 3M™ Glossy Protection Film (GLS100)
  - Provides protection and enhances displays while maintaining their own look longer.

- 3M™ DISPLAY PROTECTION FILMS
  - Less frequent screen cleaning
  - Glossy surface for crystal clear image
  - Durable, long lasting protection
  - Fades normal fingerprints over time
  - Patented technology

- 3M™ Glossy Fingerprint Fading (GLS1230)
  - Chemical and disinfectant resistant
  - Minimal impact on display image
  - Masks fingerprints
  - Anti-glare matte to reduce mirror-like reflections
  - Helps prevent damage, scratches and scuffs

- 3M™ Anti-Reflection Matte Protection Film (ARMR220)
  - Chemical and disinfectant resistant

- 3M™ Glossy Low Reflection Protection Film (GLR320)
  - Chemical and disinfectant resistant

3M™ Advanced Light Control Film Polycarbonate (ALCF-P)

- Create ideal acuity in the vision of LEDs
- ±30 degree viewing angle perpendicular to the louvers
- Available with or without matte finish
- Compatible with most touch systems
- ±30 degree viewing angle parallel to the louvers
- ALCF-A Film with a reflective polarizer (DBEF)
- Helps prevent damage, scratches and scuffs
- Matte finish to display image
- Chemical and disinfectant resistant

3M™ Advanced Light Control Film A2 and A2+ (ALCF-A2/ALCF-A2+)

- Brightness enhancement films increase the brightness of LED backlighting.
- Use them to increase brightness in the display, or translate them into power savings or thermal management.
- 3M™ Brightness Enhancement Film (BEF)
  - 3M™ Enhanced Specular Reflection (ESR)
    - Light normally absorbed and lost by the backlight is "re-polarized"
    - Increases brightness and amount of available light over entire LCD
    - Multilayer, reflective polarizer

- 3M™ Dual Brightness Enhancement Film (DBEF)
  - Variety of configurations for specific needs
  - Can cross two sheets at 90 degrees
  - Refraction technology compresses backlight output to on-axis viewer

- 3M™ Uniformity Tape (UT)
  - Maximizes the recycling efficiency of LCD backlights
  - Provides more than 98% reflectance across the entire visible spectrum
  - Optical Systems Division
  - Rear-view mirror displays
  - Instrument cluster displays
  - Rear-view mirror displays
  - Lighting elements

BRIGHTNESS ENHANCEMENT FILMS

3M™ Automotive Grade Films

- 3M™ Automotive Grade Films
  - St. Paul, MN 55144-1000
  - 3M Center, 235-1E-54
  - Optical Systems Division
  - 3M Optical Systems Division

- Advanced Automotive Grade Films
  - Offers a full line of enhancement films that can be used to increase the brightness of LED backlights.
  - 3M™ Enhanced Brightness Film (BEF)
    - 3M™ Advanced Light Control Films (ALCF-A2/ALCF-A2+)
      - ±30 degree viewing angle perpendicular to the louvers
      - Low birefringent polycarbonate film
      - Prevent nighttime reflections from glass surfaces of automobiles
      - Suitable for the complete line of film products and the designers, engineers and brands that implement them.
### Environmental Performance and Specifications

<table>
<thead>
<tr>
<th>Products</th>
<th>Transmission Haze</th>
<th>Clarity</th>
<th>Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pencil Hardness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Applied Thickness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cold Dry Heat</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heat &amp; Humidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thermal Shock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Film Applications

**Mobile Enterprise**
- Field Services
- Inventory
- Warehouse
- Delivery

**Government**
- Public Safety
- Military
- Law Enforcement
- Rugged
- Aeronautics

**Financial**
- Mobile Banking
- ATMs

**Healthcare**
- Medical Records
- All-in-One Monitors
- Tablets
- Patient Check-In
- Remote Monitoring
- EHRs

**Entertainment**
- In-Flight
- Gaming Stations
- Slot Machines

**Transportation**
- Off-Road/Heavy Equipment Vehicles
- Locomotives
- Information Displays

**Retail**
- Hospitality
- Retail POS
- Information Kiosks
- Digital Signage

**Automotive**
- Center Console
- Instrument Cluster
- Rear View Mirrors
- Entertainement Displays

### Film Applications

<table>
<thead>
<tr>
<th>Products</th>
<th>Cold Dry Heat</th>
<th>Heat &amp; Humidity</th>
<th>Thermal Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40°C/1,000h</td>
<td>85°C/1,000h</td>
<td>60°C/90% R.H./1,000h **</td>
</tr>
<tr>
<td></td>
<td>65°C/95% R.H./1,000h</td>
<td>65°C/90% R.H./1,000h **</td>
<td></td>
</tr>
<tr>
<td></td>
<td>85°C/1,000h</td>
<td>40°C/1,000h</td>
<td>85°C/1,000h</td>
</tr>
<tr>
<td></td>
<td>60°C/90% R.H./1,000h **</td>
<td>65°C/95% R.H./1,000h</td>
<td>40°C/1,000h</td>
</tr>
</tbody>
</table>

**Not 3M Products**
- DBEF-Q with OCA
- Polarizer*
## Environmental Performance and Specifications

### PRODUCTS

<table>
<thead>
<tr>
<th>Product</th>
<th>Transmission</th>
<th>Reflectance</th>
<th>Polarity</th>
<th>Applied Thickness</th>
<th>ESR</th>
<th>Heat &amp; Humidity</th>
<th>Thermal Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLS 1230</td>
<td>84%</td>
<td>2%</td>
<td>99.9%</td>
<td>2H (500g)</td>
<td>100%</td>
<td>0.15mm</td>
<td></td>
</tr>
<tr>
<td>AGF 6200</td>
<td>96%</td>
<td>2%</td>
<td>80%</td>
<td>3H (500g)</td>
<td>1.6%</td>
<td>0.155mm</td>
<td></td>
</tr>
<tr>
<td>GLS 100</td>
<td>94%</td>
<td>0.3%</td>
<td>99.9%</td>
<td>2H (500g)</td>
<td>100%</td>
<td>0.15mm</td>
<td></td>
</tr>
<tr>
<td>GLR 320</td>
<td>84%</td>
<td>0.3%</td>
<td>99.9%</td>
<td>2H (500g)</td>
<td>100%</td>
<td>0.15mm</td>
<td></td>
</tr>
<tr>
<td>ARMR220</td>
<td>84%</td>
<td>2%</td>
<td>80%</td>
<td>3H (500g)</td>
<td>1.6%</td>
<td>0.155mm</td>
<td></td>
</tr>
<tr>
<td>ALCF-P</td>
<td>84%</td>
<td>0.3%</td>
<td>99.9%</td>
<td>2H (500g)</td>
<td>100%</td>
<td>0.15mm</td>
<td></td>
</tr>
<tr>
<td>GLASS TOUCH SCREEN</td>
<td>84%</td>
<td>0.3%</td>
<td>99.9%</td>
<td>2H (500g)</td>
<td>100%</td>
<td>0.15mm</td>
<td></td>
</tr>
<tr>
<td>IR FILM</td>
<td>84%</td>
<td>0.3%</td>
<td>99.9%</td>
<td>2H (500g)</td>
<td>100%</td>
<td>0.15mm</td>
<td></td>
</tr>
<tr>
<td>DBEF-Q with OCA</td>
<td>84%</td>
<td>0.3%</td>
<td>99.9%</td>
<td>2H (500g)</td>
<td>100%</td>
<td>0.15mm</td>
<td></td>
</tr>
</tbody>
</table>

### COLD DRY HEAT HEAT & HUMIDITY THERMAL SHOCK

-40°C / 500 hours
85°C / 500 hours
60°C / 90% R.H. / 500 hours
85°C / 500 hours
65°C / 95% R.H. / 1,000 hours
65°C / 90% R.H. / 1,000 hours

- One hour at -40°C followed by one hour at +95°C
- One hour at -40°C followed by one hour at +85°C

### TRANSMISSION HAZE CLARITY PENCIL HARDNESS REFLECTION APPLIED THICKNESS COLD DRY HEAT HEAT & HUMIDITY THERMAL SHOCK

- 65°C / 95% R.H. / 1,000 hours
- 65°C / 90% R.H. / 1,000 hours

- **Noncondensing**
### Environmental Performance and Specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GLR 320</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>150mm</td>
</tr>
<tr>
<td>ARMR220</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GLS 1230</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>AGF6200</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GLS 100</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GLR 320</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>ARMR220</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*Not 3M products

### Film Applications

- **Mobile Enterprise**
  - Field Services
  - Inventory Management
  - Warehouse
  - Delivery

- **Government**
  - Public Safety
  - Military
  - Law Enforcement
  - Rugged
  - AWS

- **Financial**
  - Mobile Banking
    - ATMs

- **Healthcare**
  - Medical Records
    - All-in-One Systems
    - Tablets
    - Patient Check-In
    - Imaging Systems
    - EMRs

- **Entertainment**
  - In-Flight
    - Gaming systems
    - Slot Machines

- **Transportation**
  - Off-Road
    - Heavy Equipment Vehicles
    - LOCOMOTIVES
  - Information Displays

- **Retail**
  - Hospitality
    - Retail POS
  - Information Kiosks
    - Digital Signage

- **Automotive**
  - Center Consoles
  - Instrument Clusters
  - Rear View Mirrors
  - Entertainment Displays

- **abileceği**
  - 3M™ Display Films offer advanced solutions for display enhancement above and below the display surface.
Protection, Light Control and Display Enhancement

3M™ DISPLAY PROTECTION FILMS

- 3M™ Glossy Protection Film (GLS100)
  - Protects and enhances displays while maintaining their own look longer.
  - Extends the life of your displays with 3M’s durable, precision designed protection.
- 3M™ Glossy Fingerprint Fading (GLS1230)
  - Chemical and disinfectant resistant.
  - Minimal impact on display image.
  - Masks fingerprints.
  - Anti-glare matte to reduce mirror-like reflections.
  - Helps prevent damage, scratches and scuffs.
- 3M™ Scotchgard™ Easy-to-Clean Surface (GLS320)
  - Scotchgard™ easy-to-clean surface.
  - Enhances display clarity while maintaining glossy finish.
  - Reduces annoying reflections.
- 3M™ Anti-Glare Protection Film (AGF6200)
  - Chemical and disinfectant resistant.
- 3M™ Anti-Reflection Matte Protection Film (ARMR220)
  - Chemical and disinfectant resistant.
- 3M™ Glossy Low Reflection Protection Film (GLR320)
  - Chemical and disinfectant resistant.

BRIGHTNESS ENHANCEMENT FILMS

- 3M™ Advanced Light Control Film - Polycarbonate (ALCF-P)
  - Brightness enhancement films increase the brightness of LCD backlights.
- 3M™ Uniformity Tape (UT)
  - Maximizes the recycling efficiency of LCD backlights.
- 3M™ Enhanced Specular Reflection (ESR)
  - Variety of configurations for specific needs.
- 3M™ Light Control Film (LCF)
  - ±30 degree viewing angle perpendicular to the louvers.
  - Create visual security on the outside of LCDs.
- 3M™ ALCF-A2+
  - ±30 degree viewing angle perpendicular to the louvers.
  - Low birefringent polycarbonate film.
- 3M™ ALCF-A2 and A2+
  - ±30 degree viewing angle perpendicular to the louvers.
  - Polarizes a backlight’s output to allow more light to pass through the LCD.
  - Increases brightness and amount of available light over entire LCD.
- 3M™ ALCF-A2+ A2 Film
  - ±24 degree viewing angle perpendicular to the louvers.
  - Prismatic film that manages the angular output of light to increase brightness.
- 3M™ Light Control Film Polycarbonate (ALCF-P)
  - ±30 degree viewing angle perpendicular to the louvers.
- 3M™ Enhanced Light Control Film Polycarbonate (ALCF-P)
  - ±30 degree viewing angle perpendicular to the louvers.

3M™ Automotive Grade Films

Advanced solutions for protection, light control and display enhancement.