

# 3M™ Contrast Enhancement Film

## CEF05XX (8146-X) Series



### Product Description

3M™ Contrast Enhancement Films (CEF) are specialized optically clear adhesives offering excellent clarity and adhesion to various transparent display substrates. 3M™ CEF05XX is a bare ITO compatible and easy to convert adhesive with no UV curing required. It is recommended for glass cover lens to sensor or sensor to sensor bonding.

### Construction

| Product                | 3M CEF0501<br>film (8146-1)            | 3M CEF0502<br>film (8146-2)            | 3M CEF0503<br>film (8146-3)            | 3M CEF0504<br>film (8146-4)            | 3M CEF0505<br>film (8146-5)            |
|------------------------|--|--|--|--|--|
| Adhesive Type:         | Acrylic                                | Acrylic                                | Acrylic                                | Acrylic                                | Acrylic                                |
| Adhesive Carrier:      | None                                   | None                                   | None                                   | None                                   | None                                   |
| Approximate Thickness: |  |  |  |  |  |
| Release Liner:         | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester |
| Adhesive:              | 25 um<br>(1.0 mil)                     | 50 um<br>(2.0 mils)                    | 75 um<br>(3.0 mils)                    | 100 um<br>(4.0 mils)                   | 125 um<br>(5.0 mils)                   |
| Release Liner:         | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester |

| Product                | 3M CEF0506<br>film (8146-6)            | 3M CEF0507<br>film (8146-7)            | 3M CEF0508<br>film (8146-8)            | 3M CEF0510<br>film (8146-10)           | 3M CEF0512<br>film (8146-12)           |
|------------------------|--|--|--|--|--|
| Adhesive Type:         | Acrylic                                | Acrylic                                | Acrylic                                | Acrylic                                | Acrylic                                |
| Adhesive Carrier:      | None                                   | None                                   | None                                   | None                                   | None                                   |
| Approximate Thickness: |  |  |  |  |  |
| Release Liner:         | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester |
| Adhesive:              | 150 um<br>(6.0 mils)                   | 175 um<br>(7.0 mils)                   | 200 um<br>(8.0 mils)                   | 250 um<br>(10.0 mils)                  | 300 um<br>(12.0 mils)                  |
| Release Liner:         | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester | 75 um<br>(3.0 mils)<br>Clear Polyester |

## Typical Physical Properties and Performance Characteristics

**Note:** The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

### Durability Performance to Environmental Conditions:

The following environmental tests were conducted in the 3M laboratory under the conditions specified without any appreciable deterioration in visible appearance (no bubbles, delamination, etc.). No polarizer discoloration was observed for high temperature and thermal shock conditions. Sample construction is cover glass/3M CEF05XX film/polarizer on glass.

|                    | Condition  | Duration   |
|--------------------|--|------------|
| High Temperature   | +95°C  | 1000 hours |
| Low Temperature    | -40°C  | 1000 hours |
| High Temp/Humidity | +85°C/85%RH                                      | 1000 hours |
| Thermal Shock      | -40°C and +95°C (1 hour dwell, <1 min ramp time) | 200 cycles |

### Optical Performance to Environmental Conditions:

The following environmental tests were conducted in the 3M laboratory under the conditions specified without any appreciable deterioration in visible appearance (no bubbles, delamination, haze <1%, b\* <1). Sample construction is 3M CEF05XX on LCD glass.

|                  | Condition  | Duration   |
|------------------|--|------------|
| High Temperature | +105°C   | 1000 hours |
| UV               | .35 W/m <sup>2</sup> at 340nm, Boro-soda lime filter | 500 hours  |

**Peel Adhesion:**

ASTM D3330 modified, 180 degree peel from float glass, 1 cm wide peel strips, 12 in/min (305 mm/min), 2.0 mil polyester backing

| Peel Adhesion to Glass |                            |                            |
|------------------------|----------------------------|----------------------------|
| Dwell Time             | 20 min dwell at 25°C/50%RH | 3 days dwell at 25°C/50%RH |
| Units                  | N/cm                       | N/cm                       |
| 3M CEF0502 film        | 9.7                        | 10.3                       |
| 3M CEF0504 film        | 10.9                       | 11.4                       |
| 3M CEF0506 film        | 12.4                       | 13.2                       |
| 3M CEF0510 film        | 15.4                       | 16.0                       |

**Color:**

Ultra Scan Pro (Hunter Lab)  
ASTM E308, D65/10°

| 3M CEF0502 film (8146-2) | 3M CEF0504 film (8146-4) | 3M CEF0506 film (8146-6) | 3M CEF0510 film (8146-10) |
|--------------------------|--------------------------|--------------------------|---------------------------|
| L* = 96.9                | L* = 96.9                | L* = 96.9                | L* = 96.9                 |
| a* = -0.01               | a* = -0.03               | a* = -0.03               | a* = -0.02                |
| b* = 0.16                | b* = 0.16                | b* = 0.17                | b* = 0.18                 |

**Refractive Index:**

3M CEF05XX film  
(+ 0.0005 Metricon measurements)

| 3M CEF05XX film (8146-X) |        |        |
|--------------------------|--------|--------|
| 405 nm                   | 532 nm | 633 nm |
| 1.4981                   | 1.4860 | 1.4809 |

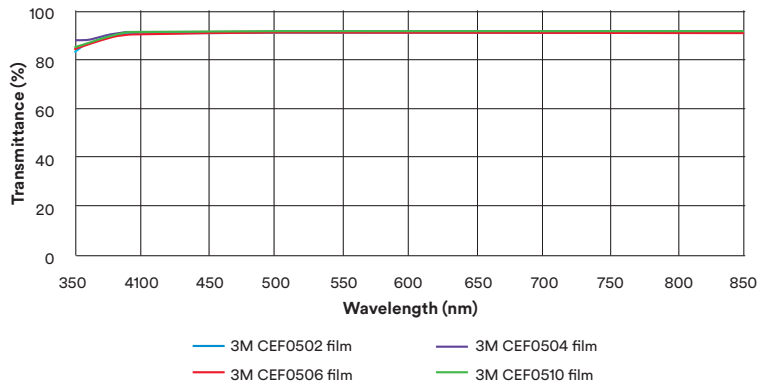
**Haze:**

Haze is measured according to ASTM D1003-92

| 3M CEF0502 film (8146-2) | 3M CEF0504 film (8146-4) | 3M CEF0506 film (8146-6) | 3M CEF0510 film (8146-10) |
|--------------------------|--------------------------|--------------------------|---------------------------|
| 0.1%                     | 0.1%                     | 0.2%                     | 0.2%                      |

**Transmission Curve:**

Uncorrected Transmission vs. Wavelength for 3M™ CEF05XX on Glass



## Typical Electrical Properties at Room Temperature

ASTM-D150-92, 3M CEF05XX film

### Dielectric Constant:

| 3M CEF05XX film (8146-X) |                     |
|--------------------------|---------------------|
| Frequency (kHz)          | Dielectric Constant |
| 100                      | 4.11                |
| 500                      | 3.72                |

## Suggested Lamination Process

Step 1: Remove secondary liner, and then laminate 3M CEF05XX film to first adherent substrate by roller at room temperature

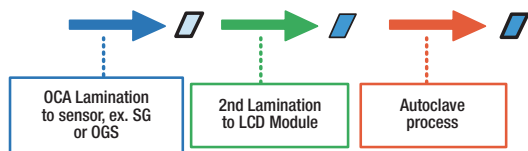
Recommendation: roller pressure 0.1 – 0.2 MPa, roller speed 0.5 – 1 m/min

Step 2: Remove primary liner, and then laminate 3M CEF05XX film/first adherent to second adherent by vacuum lamination

Recommendation: Vacuum condition < 50 Pa, pressure around 0.1 – 0.2 MPa

Step 3: Autoclave process

Recommendation: 30-60C/3-5kgf/cm<sup>2</sup>/20-30min



## Storage

- Store in original packaging or plastic bag.
- Avoid applying pressure or resting objects on the product to prevent marking, denting, or deforming the surface.
- Wear gloves to prevent fingerprints or nail marks when handling.



### 3M Display Materials & Systems Division

3M Center, Building 235-1E-54  
St. Paul, MN 55144-1000 U.S.A.

Phone 1-800-3M HELPS  
Web 3M.com/displayfilms

- Product needs to be unpacked and handled in a clean-room facility.
- CEF should be properly stored at room temperature conditions of 22 ± 8° C and 50 ± 20% relative humidity

## Regulatory

For regulatory information about this product, please contact your 3M representative.

## Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes reliable, but the accuracy or completeness of such information is not guaranteed.

## Product Use

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