

Anti-FOG Series

▶ Anti-fog film?

- Anti-fog film is coated special *hydrophilic* polymer that has scratch resistance property.
- **Application** : Commercial freezer door, Automotive window films, Bathroom mirror, sports & military visor, architectural glazing

▶ Features

- Energy Saving for freezer
- Anti-fog property
- Scratch resistance property
- Excellent chemical resistance for Acetone, MEK, Alcohol, Toluene)

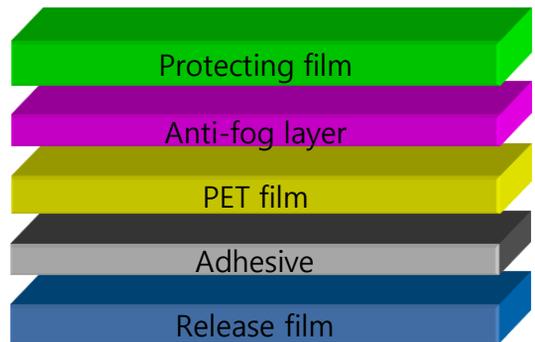
▶ Maintenance & Care

- Detergent : Top Job[®] or Formula 409[®]

▶ Specifications



▶ Cross sectional Structure



Product Name	Film Thickness(㎜)	Coating Thickness(㎜)	Film width(mm)	Adhesion	Hardness	VLT(%)	Anti-fog property ^a	Scratch durability ^b (% Δ Haze)
Anti-FOG	50	10	1524	100/10 0	2H	90	Pass	7.6

Anti-fogging test^a : The test surface is immersed in distilled water for 1hr and allowed to dry for at least 1hour. It is then placed face down over a container of warm water(122°F/50°C) so as to completely cover the opening. AF layer may exhibit a ring of condensation as the coating hydrates, but remain clear indefinitely therefore. The test is complete when sufficient moisture has condensed to form large water drops.

Scratch durability^b : Taber abrasion test, measurement of the ΔHaze(CS10F wheel, 500g load) after 100cycle.

Anti-FOG Series

▶ Saving energy

● Application : Showcase



▶ Test condition: -20℃ to + 20℃, 50% humidity

How much money can you save by turning off showcase heater?

※ In case of 6 Door Showcase(610 W)

Reduction of energy consumption depending on Heater ON/OFF : 0.32kWh/hr

(0.32kWh × 24hr/day = 7.68kWh/day)

(7.68kWh/day × 30days = 230.4kWh/month)

(230.4kWh / month × 12months = 2,764.8kWh/year)

Save : ₩150/kWh × 2,764.8kWh/year = ₩ 414,720/year

Anti-FOG Series

► Saving energy

● Application

Without film

Anti-fog film

► Test condition: 20°C, 70% humidity



First day Initial



1hour



2hour



Second day Initial



1hour



2hour



3hour



6hour



9hour

Anti-FOG Series

► Technical Memo

- Clarity:** Anti-fog film is exceptionally clear. While the specification limit is 1% haze, actual values are usually less than 0.5%. Often the coating will fill in fine scratches and actually improve the clarity of molded parts.
- Scratch Resistance:** Rubbing lightly with #0000 steel wool will leave only a few light scratches on the Anti-fog surface. Occasionally, fine scratches will appear but will heal when warmed slightly or when moistened, or after simply standing at room temperature for 15 min. to 30 min.
- The following data were obtained using a Taber abraser with a CS10F wheel and 500g load, according to ASTM D1044:

	<u>100 cycles</u>	<u>500 cycles</u>
Uncoated PET film	28% (approx.) D haze	86% (approx.) D haze
Anti-FOG film	5.6% D haze	25.5% D haze

- Falling sand abrasion was performed according to ASTM D968 using 3kg standard Ottawa sand:

Uncoated PET film	35% (approx.) D haze
Anti-FOG film	1.72% D haze
- Anti-FOG film is superior to all other formable hard coats in Taber abrasion tests and comparable to most non-formable hard coats on flexible substrates. In the falling sand test, Anti-fog film outperforms all other hard coats tested. Bayer abrasion tests yield ratios ranging from 2.5 at 6µ coating thickness to over 10 at 15µ thickness.

•Anti-Fog:

- Anti-Fog Test #1 - The test surface is immersed in distilled or deionized water for 1 hr. and allowed to dry for at least 1 hour. It is then placed face down over a container of warm water (122°F/50°C) so as to completely cover the opening. Anti-FOG film may exhibit a ring of condensation as the coating hydrates, but will remain clear indefinitely thereafter. The test is complete when sufficient moisture has condensed to form large water drops.
- Anti-Fog Test #2 - The test surface is immersed in distilled or deionized water for 24 hours, removed and allowed to dry for at least 1 hr. The sample is then cooled in a refrigerator to approximately 40°F (4°C) and withdrawn to a test chamber containing ambient air at 70°F (21°C) and 70% to 80% relative humidity. Materials coated with Anti-FOG film will remain free of fog indefinitely.
- Untreated plastics or glass will fog within seconds. Inferior anti-fog coatings may fog immediately, or remain clear for a short time until they become saturated. Anti-FOG film passes ASTM and DIN tests for resistance to fogging.

•Chemical Resistance: Anti-FOG films are unaffected by brief exposure to:

- The coating also protects sensitive plastics from solvent attack, but it may be permeated by solvent vapors over time. Acetone, MEK, glycol esters and toluene will damage Anti-FOG film if exposure time is extended.

•Weathering: The Anti-FOG coating does not crack, peel or discolor from exposure to sunlight. The coating does not, however absorb enough UV light to protect sensitive plastics from yellowing.

•Maintenance and Care: Anti-FOG coatings will usually outlast the coated item. Resistance to cleaning solvents and detergents is excellent. While grease and oils will contaminate the surface and impair anti-fog effectiveness, these can be removed with a strong grease cutting detergent such as Top Job® or Formula 409®. Consult the Material Safety Data Sheet for further handling precautions.

- Top Job® is a registered trademark of the Proctor and Gamble Company
- Fantastik® is a registered trademark of Morton Norwich Products Inc.
- Formula 409® is a registered trademark of the Clorox Corporation
- Scotch Brite® is a registered trademark of the 3M Corporation

Anti-FOG Series

► Technical Memo

Cleaning Caution

Resistance to oil based stains is excellent. Water-soluble stains may penetrate the coating if left in contact with it for an extended period of time. Grease and oils will contaminate the surface and impair anti-fog effectiveness. These can be removed with a strong grease cutting detergent such as Top Job[®], Fantastik[®] or Formula 409[®]. Coated articles should be cleaned regularly to prevent accumulation of oily deposits. Avoid using abrasive cleaners or pads.

It is normal for the coating to pass through a tacky phase as it dries. To clean, wipe with a wet cloth or paper towel and allow to dry. **DO NOT TRY TO RUB TO DRYNESS.** This will leave smudges and will necessitate cleaning again.

Usually only soap and water is required. Be careful to use only pure detergent and not detergent solution which contains hand cream or other oils. If film must be cleaned at very low temperature, soap and water solution may be diluted up to 30% with IPA to prevent freezing. Using 100% IPA may affect anti-fog performance. IPA 100% will also soften the Anti-fog coating, making it vulnerable to scratches. Normal hardness will return when the coating dries.

It is best to avoid cleaning products which contain abrasive agents. Most of these (Comet, Ajax) do not scratch Anti-fog layer but scratches may result if excessive force is used. Also, avoid strong solvents such as acetone and toluene. Any pure solvent other than simple alcohols must be tested in an inconspicuous area before use.

Many commercial products are sold for cleaning glass freezer doors. We are told these give acceptable results, but we have not tested every product that is available. For that reason, we recommend only water plus simple detergent.

To remove film, slide razor blade beneath one corner and lift slowly. Peeling too fast will cause adhesive to remain on the glass surface. If traces of adhesive do remain, remove with hydrocarbon solvents(hexane, heptane, mineral spirits) or glycol ethers (Dowanol PM). Rubbing alcohol(50-70% isopropyl alcohol)can also be used. Plastics should be tested first for solvent sensitivity.

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Installation instructions for Anti-FOG films

A representative installation of this material may be had using a dilute soap solution as noted below. However, please note that the adhesive is designed to be used DRY with a pressure roll laminating machine.

Film should be cut to shape prior to installation. Do not try to laminate over bevels. Leave 1/8" (3mm) between film edge and frame.

Glass or plastic surface must be clean, smooth, and dust free. A razor blade will remove encrusted foreign matter. Use squeegee and water to remove lint in final cleaning.

1. Spray glass or plastic surface with wetting agent (dilute soap solution). Be sure surface is wet when film is applied to glass.

2. Then separate and discard release liner (the thinner film)

To separate, it may be helpful to apply cellophane tape to both sides at a single corner and pull apart. Adhesive may appear cloudy when exposed. Clarity will return when installed.

To remove the release liner from a very large piece of film, place on a wetted surface, with anti-fog side down. This will allow you to strip the release liner without creasing the film. The assistance of a second person may be helpful.

3. Thoroughly wet exposed adhesive with wetting agent.

4. Apply film to wetted glass or plastic.

5. Before using squeegee, spray film surface with wetting agent. This will permit squeegee to slide easier and function better. Re-wet as necessary.

6. Use squeegee. Apply firm pressure from center of film outwards to edge. Be sure all water pockets are removed from beneath film.

Allow film to dry overnight or longer. If milky blotches are seen, film is not dry. Allow to dry further. Do not try to trim film until thoroughly dry. Then use new, sharp razor blade.

Film surface may be cleaned with glass cleaner and wet paper towel whenever necessary. Never use abrasive window cleansers or pads.

For bathroom mirror installations – every three months or so clean with strong kitchen degreaser (Mr. Clean, Fantastik, Formula 409) to remove build-up of household oils that settle on film surface.

To remove film, slide a razor blade under one corner and peel slowly. If traces of adhesive remain, remove with warm water or rubbing alcohol.