


Gentex is the world leader in
electrochromic (auto dimming) technology.

From our headquarters in Zeeland, Michigan, we design
and manufacture over 36 million electrochromic products
annually. We are the leading supplier of electronically
dimnable windows (EDWs) for the aerospace industry,
having launched the first major EDW program with the
introduction of the Boeing 787 Dreamliner.



Gentex electronically dimmable windows (EDWs)
present aircraft operators, designers, passengers
and crew members with a window of opportunity
to experience air travel in a new and innovative
way—an experience at their fingertips.

GENTEX
CORPORATION

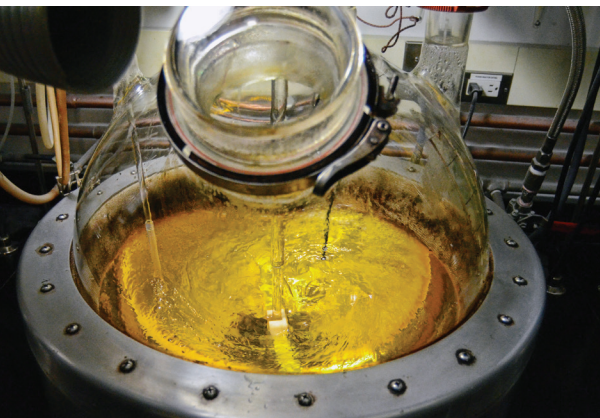
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Aerospace
Electronically Dimmable Windows

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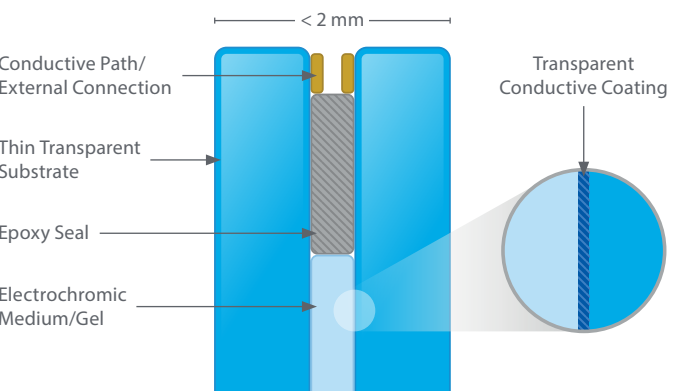


The Technology

Gentex pioneered electrochromic (EC) technology in automatically dimming rearview mirrors for automobiles in 1987. Since this time, Gentex has fielded hundreds of millions of EC devices in the automotive industry while continuously improving and adapting the technology. In 2008, Gentex made a technological breakthrough by engineering the first dimmable aircraft windows. To date, we've shipped more than 50,000 EDWs for the aerospace market.

Our windows darken on demand with infinite variability to cut sunlight and glare while still providing an exterior view. Our aerospace products add innovation and increased passenger comfort to the in-flight experience, improve aircraft design flexibility, and enable airlines to give customers and crew more control over the view out of their windows, while eliminating a large source of maintenance and reliability issues.

Gentex EDWs employ a proprietary EC gel layer, which is laminated between two transparent substrates. The interior surfaces of these substrates are coated with a transparent conductive material, and an electric current is passed across this EC gel creating an electrochemical reaction. Applying this small electrical DC voltage across the gel causes it to darken, while removing the voltage allows the gel to return to its natural, transparent state. The voltage can be precisely controlled and continuously adjusted to allow for infinite levels of light transmission between fully clear and very dark states. The Gentex EC technology has the greatest opacity range from clear to dark, the highest optical clarity, and allows for the most durable EC devices in the marketplace.



Benefits

- Infinitely variable states of darkening
- Cuts sunlight glare
- Still affords an outside view
- Improves passenger comfort
- Provides greater aircraft design flexibility
- Less maintenance than standard window shades

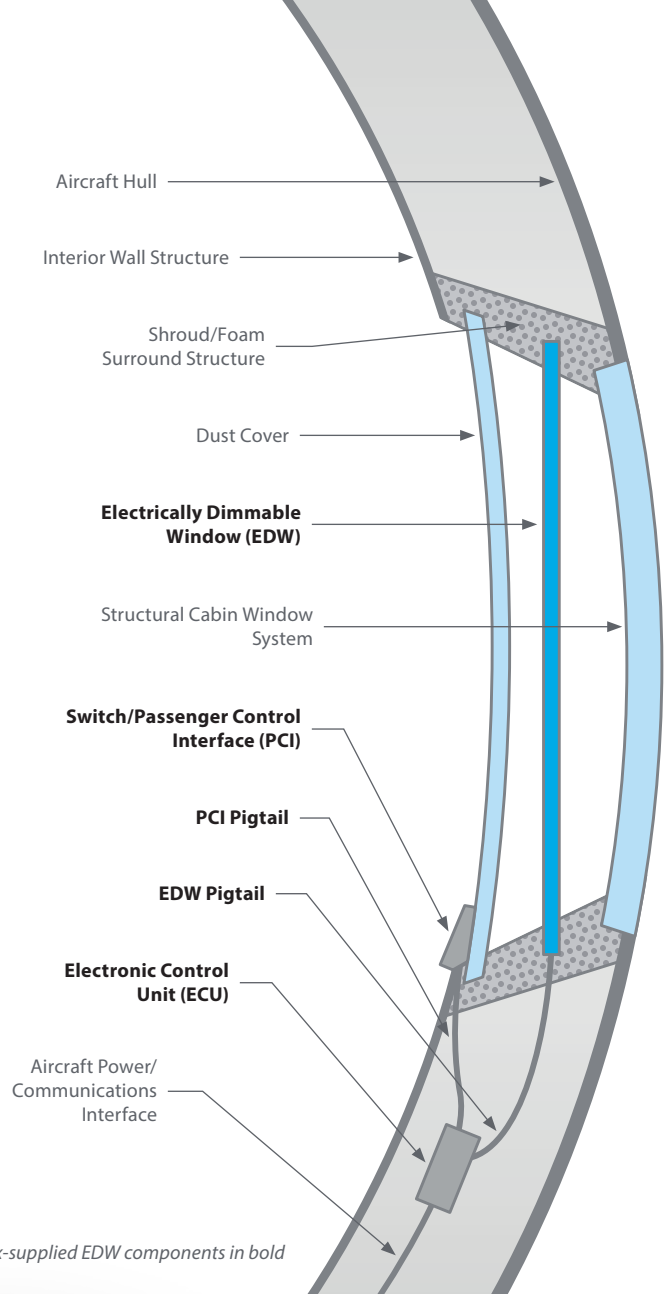
Integration / Control

Gentex's control hardware provides unprecedented reliability with operational protection from lightning strikes and overvoltage, while offering constant health-monitoring to ensure performance at each window. Windows can be controlled individually, or groups of windows can be controlled simultaneously, making control convenient and as simple as the touch of a finger. Crew override allows the system to be tuned to the desired in-flight environment for daytime and overnight segments.

Wireless control integration allows for a clean aesthetic and simple design, eliminating the need for packaging space to accommodate a switch and wired communication lines.

Designed to replace conventional pull-down shades, Gentex EDWs allow for integrated crew control and greater customization to cabin designers. Now offering both large-area and curved devices, Gentex brings flexibility in integration for a wider variety of cabin types, including aircraft with large window openings.

Additional Capabilities



Passenger Experience Improvements

Comfort and Convenience

Window-seat control allows the passenger to alter the amount of visible light entering the cabin. Unlike the binary function of a mechanical or electro-mechanical system, Gentex EDWs offer passengers the ability to reduce or eliminate glare from the window, all while maintaining a view of the passing scenery.

Wireless

For both business and commercial aviation customers, Gentex offers integrated wireless control, allowing seamless passenger control of the windows.

Acoustic Attenuation

Gentex EDWs further reduce acoustic transmission into the cabin through the sidewall window openings.

Mobile Application



OEM Benefits

Reliability

Our aircraft windows are lightweight and self-contained with no moving parts, making them highly durable and easy to maintain. This eliminates reliability issues, resulting in reduced aircraft on ground (AOG) time. System MTBF values are in the millions of flight hours and continue to climb!

Fail-safe

Unlike alternative technologies, our EDWs fail clear, making them FAA compliant for emergency exit integration.

Greatest Dynamic Range

Offers the industry's highest dynamic visible light transmission range with >99.999% light blocking efficiency and very low haze, even off-angle.

Cabin Heat Load

Sunlight transmission is greatly reduced, lowering the heat load inside the cabin and enhancing the operating efficiency of the aircraft's heating, ventilation and air conditioning systems.

Product Development

Gen 1 – Original Implementation

- Low-end transmittance <0.1%
- Currently flying on earlier Boeing 787s

Gen 2 – Shipping Since 2015

- Low-end transmittance <0.01% (10x darker than Gen 1)
- Currently flying on Boeing 787
- Faster transition time to fully darkened state
- Thinner glass substrates to significantly reduce weight

Gen 3 – In Development

- Low-end transmittance capability <0.001% (100x darker than Gen 1)
- Even faster transitioning speed from clear to fully darkened state and back to a fully clear state

