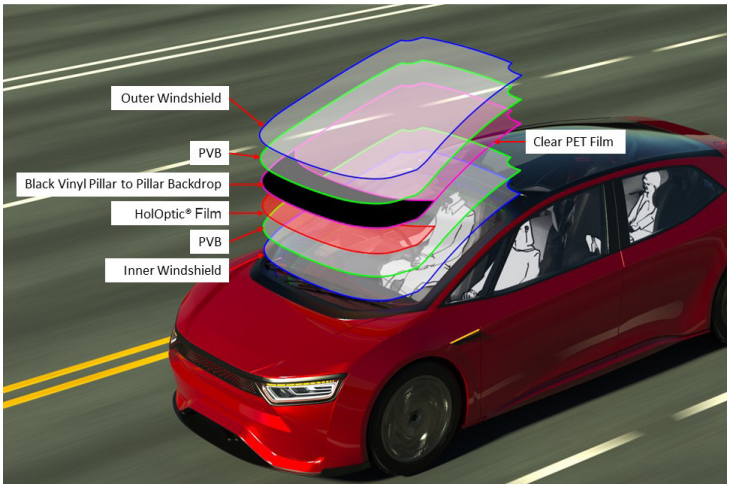
In-Plane Head-Up Display (IP-HUD)

Since 2010, Luminit has been manufacturing **Illumination Diffusers** for the auto industry, using its proprietary **Roll-to-Roll** holographic manufacturing line. Now, using a new low-cost transparent holographic film and copy method, the company has enabled the manufacture of transparent light reflective **Display Diffusers** for HUD windshield and passenger window applications. By using its substantial catalog of light directing precision diffusers to author from, custom optical prescriptions can include wide angle diffusion, light directing, lens power and mirror functions, all with low ambient reflections and haze. Once laminated into the windshield or cabin glass, transparency becomes more than 90% and image reflectivity over 80%, providing a stunning vehicle display and highly valued addition to the conventional vehicle. As you see in the picture on the right, auto designers are able to specify the ideal display for their interiors using up to five windshield projectors, providing a larger, brighter display size and wider field of view.

Using an LED, Laser or uLED panel based projector integrated in the vehicle cockpit, our holographic diffusers can transform any windshield or glass panel into an ultra-bright, full color HUD. Even in the brightest conditions, safety, operation, navigation and infotainment can all be user controlled. All this in a clear non-distractive auto standard display, providing delight to the customer.



Key Benefits

- Roll to Roll Holographic Diffuser Pioneers
- Low cost
- Ultra-High Brightness
- Wide Field of View (FOV)
- Virtual Image Distance (VID)
- Large eye-box

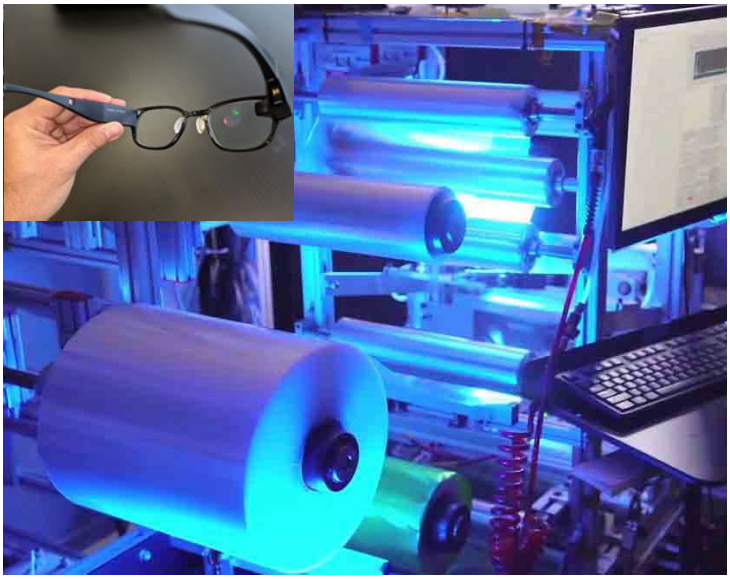
HUD Applications

- Automotive
- Aerospace
- Delivery vehicles
- Agricultural vehicles
- Construction vehicles
- Public Transport

Luminit®
Transformative Integrated Optics

Roll-to-Roll Scalable Manufacturing

Directing light beams without the need for conventional optics has been the goal of HUD designers for many years. This unique holographic technology works well with automotive windshield head-up displays. Recorded on thin (10-30 micron) holographic photopolymer film, the holograms have thick volume hologram properties that are wavelength and angle selective. Luminit has the experience and capacity to record almost any type of hologram—reflection and transmission, free-space, and substrate-guided with optical design, R&D, proof of concept, and manufacturing all under one roof. Luminit has unique and patented production capabilities that allow optical replication in a roll-to-roll system for high-volume, low-cost manufacturing and along with an experienced staff, make Luminit the One-Stop-Shop for automotive customers.



Luminit Technology, manufactured on roll-to-roll line above, was laminated between curved AR Glass lenses.

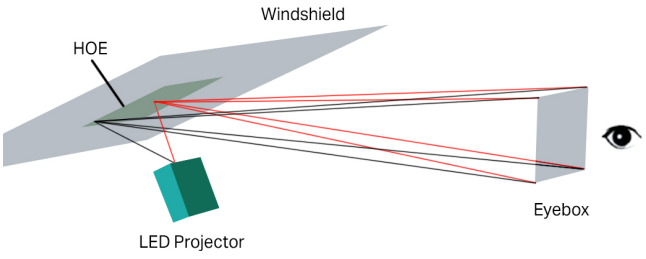
Light Shaping Diffusers® & Micro-Optics for HUDs

With **in-house direct laser-writing of masters,** the company can create and qualify refractive and diffractive optics with feature sizes as small as 1 micron, being fully compatible with Luminit's proprietary and patented Roll-to-Roll holographic manufacturing line where we can control the size and dimensional statistics of the pseudorandom patterns of the surface relief morphology.

Luminit diffusers for classical head-up displays
In current head-up displays, a virtual image of an intermediate image plane is projected onto the windshield. This intermediate image plane is formed upon a precise optical diffuser, to compliment the overall HUD design

Projectors for HUDs

While LEDs are a proven and recommended solution today, Solid State Micro LED panels offer even greater reduction in size for tomorrow. Micro laser sources also offer promising system-level benefits. These can offer higher F/#, improved contrast, lower cost optics and smaller package volume. In this combination, the systems offer significantly higher efficiency. Additionally, lasers emit polarized light that naturally eliminates the double image reflection and mitigates the need for a polarizer, which is necessary for LEDs.



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