

Lumitex® Illumination Technology

Lumitex and Poly-Optical fiber optic products make backlighting easier than ever.

We Engineer Light: We provide light to sensitive applications, without heat, electricity or electromagnetic interference at the lit surface.

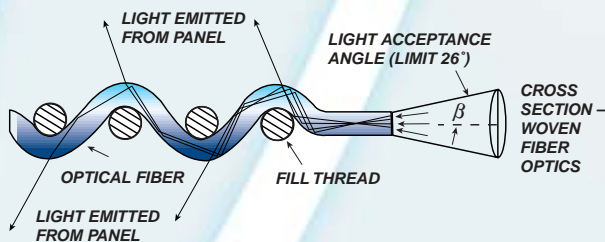
Light In Any Form: We provide light in forms that fit our customers' applications, applying several proprietary technologies, including Woven Fiber Optics™, UniGlo®, SolidState™ and MicroLens®, among others.

User-Friendly Light: We provide light without the customary problems of heat or electricity at the lit surface, delivering inert light that doesn't interfere with sensitive electronics, medical or other demanding environments. We focus responsive applications engineering on solving customer problems.

Our technologies are covered by over 75 patents, U.S. and foreign, describing light delivery systems.

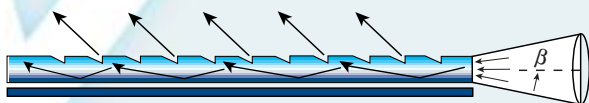
Woven Fiber Optic Lighting

Light enters the panel through each highly polished fiber end from a light emitting diode (LED), as shown below. Unlike other fiber optic technologies, however, Lumitex's patented weaving process creates computer-controlled "micro-bends" that cause the transmitted light to be emitted from the sides of the fibers through the cladding. All light is emitted uniformly along the entire surface of the panel.



Abraided Backlighting

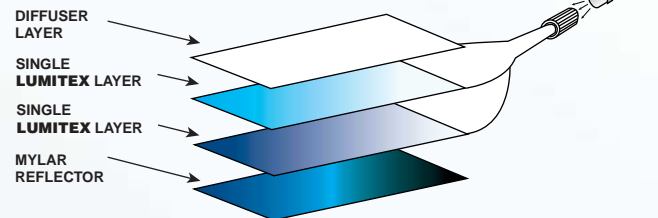
Here, acrylic optical fibers are abraided with a computer-controlled proprietary process known as UniGlo®. The micro abrasions disrupt the cladding to let the light out. By controlling the depth of the abrasions, the light is made uniform across the panel. The fibers are laminated directly onto a back reflector.



Fiber Optic Panel Construction

Lumitex® fiber optic panels are constructed of one to eight layers that are assembled together with double-sided adhesive. Each additional layer increases brightness. A polyester reflector is laminated to the back, and a clear

Typical fiber optic panel construction



vinyl top layer is added for extra durability. For some applications, such as LCD backlighting, a semi-transparent diffusion layer is placed between the top weave layer and the clear vinyl layer.

The optical fibers extend from the panel in cable form and are bundled into a brass ferrule and highly polished. These ferrules are then connected to a remote light source. Sources vary from single LEDs to low-current incandescent lamps to high-wattage halogen lamps, with a variety of power ratings. Most sources are DC and have lamp lives ranging from 10,000 hours to 100,000 hours.

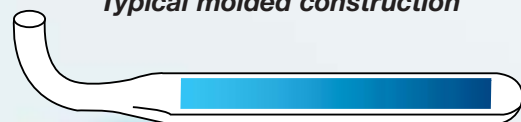
Lumitex's unique manufacturing process allows for an easily customizable product.

Molded Construction

In medical applications, Lumitex applies patented SolidState™ and MicroLens® technology, delivering cool light in the surgical site, through custom molded plastic devices that attach to our customers' instruments. We optically engineer the emission of light through surface treatments and finely-engineered micro-lenses that direct light where it's needed and illuminate hard-to-reach areas.

We also provide efficient and low-cost molded rods for light guide applications.

Typical molded construction



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Technologies

Fiber optic backlighting from Lumitex and Poly-Optical provides a combination of benefits that no other backlighting technology can match.

High Brightness – You get the brightness of electroluminescence (EL) – 30 Ft-L and more in many applications – without the degradation in brightness commonly associated with EL.

Longer Life – Durable fiber optic panel never needs replacement. Remote light source offers 10,000 to 100,000 hours of useful life, and replacement is simple and easy.

Lower Power – Requires less power than EL, CCFL, or LED Array – as low as 10-20 mA at 2 VDC – and no inverter. Lumitex® fiber optic backlighting is so effective in uniformly spreading out the light from a single LED that it can cover up to approx. 4 inches (100 mm) in width and 10 inches (250 mm) in length. A single LED is typically driven at 20-30 mA (and can be driven at as low as 10 mA) and 2 to 4 VDC.

Compact Size – Panels are thin, as low as .013 inches (0.33 mm), and remote light sources are smaller than many EL or CCFL inverters.

Heat/EMI Free – Fiber optic panel generates no heat or EMI.

Durable – Optical fibers are not affected by extremes in humidity (0% to 100%) or temperature (-40° to +85°C). Shock, vibration and hazardous environments do not pose a problem.

Thin, Low Profile – Typical construction is 0.068 inches thick (1.7 mm). Thinner constructions are available.

Range of Colors – Standard LED colors include green, white, blue, red, amber and yellow-green.



Very Low Startup Costs – Minimal engineering charge and usually no tooling. Low prototyping cost with no minimums. You can experiment and implement on a pilot scale without a large investment.

Design Flexibility – Fiber optic technology allows designers to solve unique problems. Simple in design, thin and inert, Lumitex® fiber optic backlights are flexible, with the potential design variations limited only by your imagination.



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Applications

LCD Backlighting

Membrane Switch, Keypad & Control Panel Backlighting

Lumitex® woven fiber optic panels and Poly-Optical® UniGlo® plastic optical fiber panels provide an unequalled combination of benefits for backlighting of all switch, panel and keypad overlay designs.

Longer Life – Durable fiber optic panels never need replacement. Remote light sources offer 10,000 to 100,000 hours life and easy replacement.

Lower Power – Remote light sources (typically LEDs) require less power than EL and no inverter. (Excellent for battery-powered applications.)

Compact Size – Panels are thin and pliable, and light sources are smaller than EL inverters.

Heat/EMI Free – Fiber optic panels add no heat or EMI to interfere with switch operation.

Superior Tactile Response – Flexible panels can be located over domes in switch and keypad applications, providing strong tactile feedback, while eliminating shadowing. Our panels have been independently tested to over 5 million actuations with no loss of light or degradation.

Design Flexibility – Die-cutting, color change, individual segment lighting, different shapes, quick and cost-effective prototyping.



Membrane Switch Backlighting

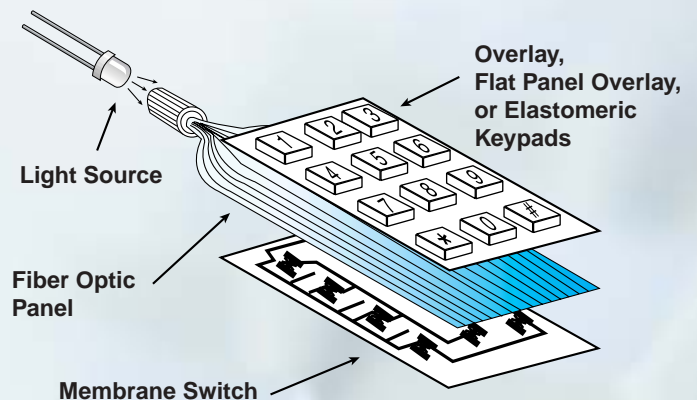
Applications include medical instrumentation, marine electronics, industrial process controls, communications equipment and military navigational applications. Lumitex® panels can be used in switches with tactile domes and flat membrane switches. (Fiber optic panels as thin as .013" can be used, adding less than 2 oz. of tactile pressure to the switch assembly.) White and a wide range of other colors are available. Die-cutting permits easy placement of displays of individual graphic segment backlighting. Backlighting panels can be designed to allow indicator lights to shine through die-cut holes in the reflector.

Rubber Keypad Backlighting

Applications include communications equipment, automotive controls, medical instruments, and hand-held control devices. Lumitex® panels are ideal for half-dome switch layers, where the panel is placed directly under the keypad. For specific key highlighting, panels can be die-cut to accommodate individual LEDs.

Control Panel Backlighting

Applications include communications controls, oil field equipment, and automotive, off-road and marine equipment controls. Multiple panel assemblies can be connected to a single light source to reduce power consumption and cost. Multiple sources can provide redundancy and color/NVG capability.



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Applications

Membrane Switch Backlighting

Machine Vision



Fiber optic panels from Lumitex provide high-brightness illumination for frontlighting and backlighting imaging systems used in machine vision applications such as sorting, counting, measurement and inspection.

Patented Lumitex technology enables these woven fiber optic panels to efficiently and economically emit uniform, diffuse and shadow-free light over large surface areas. The panels can be

driven by LEDs (for long life at very low power) or by more powerful (up to 150W) halogen sources for maximum brightness.

Lumitex offers custom sizes and configurations. Panels can be provided with die-cut holes in the center to allow for a camera or microscope lens. For special applications and unique problems,

Lumitex engineers work with customers to customize the company's machine vision lighting products to their individual specifications.

Off-the-shelf panels are available with lit areas of 2"x2", 3"x3", 4"x4", 4"x6" and 7"x8", with the fiber optics illuminated by Lumitex's 150W quartz halogen light source.

This light source, the MV-150, provides constant color temperature during dimming, thermal shut-off protection, quiet operation, and the ability to quickly change background color via interchangeable external filters.



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└ Applications

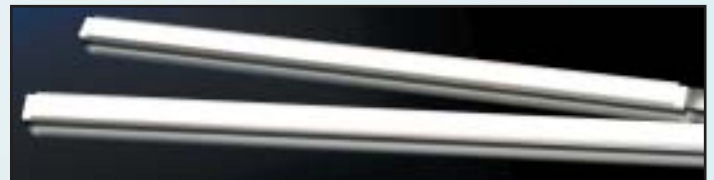
└ **Machine Vision
Lighting**

Specialty Lighting Applications

Lumitex's proprietary fiber lighting technologies and experienced engineering staff have enabled us to help designers solve difficult problems in many unique applications. And, Lumitex offers low design and prototyping charges and quick manufacturing turnaround. Here are just a few of the many examples of special illumination projects that Lumitex has helped make happen.



- Lines of Light are excellent for splash lighting and task lighting of small, inaccessible areas as well as backlighting of bezels used in consumer electronics and automotive HVAC and radio controls. Lumitex can also provide multiple lines of light going into one ferrule. This is ideal for putting a very bright line of light into a small area (e.g., machine vision applications), and can help save power and space and eliminate heat.
- Lumitex manufactures a range of extruded, molded and machined plastic rods for illuminating emergency exit lighting, accent lighting, TV control panels, and a variety of other special applications.



- These thin, flat fiber optic panels (18" L x 1.25" W) provide non-ferrous, heat- and noise-free interior lighting for MRI systems, with two of these strips mounted inside each MRI bore tube to maximize patient ease and relaxation inside the enclosed chamber.
- A custom line of light can be directed in specialized ways to allow for very sophisticated measuring and detection. A similar, but much smaller, device is used for measuring coin diameters.



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└ Applications

└ **Fiber Optic Devices**

Medical Lighting

Lumitex® designs and applies unique lighting technologies for surgical, diagnostic and phototherapy applications. Our products provide cool light in a user-friendly form without heat, UV or EMI.



LightMat™

The Lumitex LightMat™ Surgical Illuminator is a cool, universal panel, designed to improve visualization in deep cavity surgery. Flexible and malleable, it attaches easily to most retractors, bringing bright, cool, shadowless area lighting where the surgeon is working – inside the surgical cavity. It is designed to be used with most medical instruments in deep-cavity surgery or in small openings, under flaps and in lateral margins. In deep-cavity surgery, surgeons frequently find it saves time and can help improve outcomes through better visualization.

MRI/NMR

Lumitex has a unique solution for patient comfort lighting in closed-loop MRI or NMR machines, where sensitive electronics make lighting very difficult. Lumitex's lighting technology is inert, and does not interfere with magnetics or electronics.



Phototherapy

The BiliBlanket™ provides light directly to babies for treating jaundice. Its unique design delivers high-level dosages in a user-friendly form that allows the mother to hold her baby and the nurses to have better access

to the baby. Lumitex markets its award-winning BiliBlanket globally through Ohmeda, a major distributor of neonatal equipment.

Surgical Illumination

Lumitex applies its SolidState™ and fiber optic technologies to custom designed surgical instruments, bringing cool area lighting into body cavities where surgeons are working. Unlike overhead lights or headlamps, Lumitex technology allows surgeons to brighten the operative view from inside the surgical field, overcoming the limitations of overhead lights and headlamps.



Benefits:

- Provides directional or diffuse lighting
- Illuminates hard-to-reach areas
- Integral to instruments
- Delivers intense light, even through 3-dimensional contours

Our lighting systems are designed with 3-D optical ray-tracing, 3-D CAD and solid modeling systems for rapid prototype design and turnaround. Our engineering team works with designers from customer companies to optimize lighting and minimize the physical profile. Our CNC center enables rapid prototyping for clinical evaluation.



www.lumitexmd.com

www.lightmat.com



Optical Fiber

Whether you require optical fiber or devices designed and built to your specifications, Lumitex® and Poly-Optical® products can meet your needs.

Lumileen® is a trademark of Lumitex's Poly-Optical® division for its line of plastic optical fibers. A typical Lumileen® optical fiber consists of an inner acrylic plastic core coated with a thin cladding of fluorinated polymer. Since the refractive index of the outer cladding is lower than the core, light entering one end of a fiber reflects along the interior core material at the interface of the core and cladding. Light passes through the length of the fiber in a zig-zag path on its way to the other end. Lumileen® acrylic optical fibers are available in various grades and diameters, and are sold by the meter or by the spool. Most Lumileen® products can be promptly shipped from stock.



OptiBright® scintillating fibers consist of a polystyrene core with a Polymethyl Methacrylate (PMMA) cladding. These are fluorescent, light-collecting fibers that absorb UV and emit

visible light, creating a glowing effect. The core contains fluorescent dopants selected to produce the desired color. OptiBright® fibers are used for light transmission, illumination, radiation detection, and decoration.

LumiGlo® is a solid core, Teflon-clad, flexible optical light cable. Side-light optics and PE jacketed end-light optics are offered in a wide range of diameters. LumiGlo® large core optics are available in core diameters ranging from .120" to .710".



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About Us
Poly-Optical®



Ordering Information

To facilitate the ordering of the right Lumitex® or Poly-Optical® panel for your application, it is helpful to know what your requirements are before you contact us. These include:

Application: LCD Membrane Switch Machine Vision
 Medical Other _____

Panel Width: _____

Panel Length: _____

Cable Length: _____

Panel Thickness (max.): _____

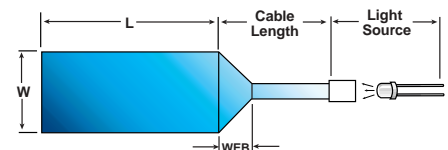
Are there bends in the cable?: _____

Color: _____

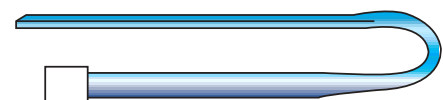
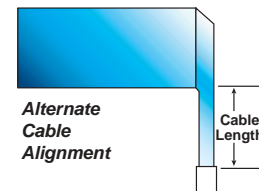
Available Power: _____

Brightness: _____

Annual Quantities: _____



WEB dimension usually 1/2 panel width.



Minimum bend radius of fiber is 0.062".
Actual cable bend radius may be greater.

Or, you can visit "Info Request" on our web site, or e-mail us at info@lumitex.com

About Lumitex



Strongsville, OH



Irvine, CA

Lumitex's facility in Cleveland, OH, and its Poly-Optical subsidiary in Irvine, CA, design and manufacture innovative light delivery systems for medical, electronics, industrial and other diverse applications. We specialize in engineering lighting solutions for sensitive applications where heat, electricity or EMI are prohibitive.

The company is built on its unique technology, adaptive applications engineering, and responsive customer service. Our technology includes over 132 patents describing ways of engineering light to deliver it more efficiently and uniformly. We invest significantly in R&D, engineering and rapid prototyping to meet our customers' needs. We work closely with our customers to solve design problems and quickly turn around prototypes.

Lumitex is headquartered in Strongsville, Ohio, USA, a suburb of Cleveland. Our west coast division, Poly-Optical Products, is located in Irvine, California, near Los Angeles.



Lumitex® Quality

Lumitex operates to the highest quality standards. We are ISO 13485 (Strongsville) and ISO 9001 (Irvine) certified. We operate to U.S. FDA Good Manufacturing Practices standards, and our OEM products meet the standards of UL, CSA, BSI, TUV and other international quality requirements.

Lumitex is committed to satisfying our customers 100% of the time by defining, designing and delivering a quality product on time at a competitive value. To achieve this, we pursue three basic concepts:

- **FIT:** Design the products, processes and packaging to meet or exceed customer requirements.
- **EFFICIENCY:** Operate in a clear business-like manner, from order-taking to product and process design to material specification, production and delivery.
- **CONTINUOUS IMPROVEMENT:** Look for opportunities to improve our products and processes, find ways to save costs every day, and maintain the flexibility to continuously innovate in providing illumination solutions for our customers.

www.lumitex.com

Your online source for immediate information on all Lumitex® and Poly-Optical® illumination solutions: Applications. Technologies. Specifications. Company News. Product News. FAQs. Links. The online illumination resource!

Lumitex. The Backlighting Engineers.



Poly-Optical® Products

Let there be light

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