



LUMINEO

POWERED BY  BENEQ

**DISPLAYS FOR
EXTREME CONDITIONS**

CONTINUING TO MAKE LEGENDS IN DISPLAY

#1 in ALD thin film technology

Proudly presenting our new name of Lumineq, the team behind the development and evolution of the world's leading thin film electro-luminescent (TFEL) displays is now growing strong. We're number one in TFEL. We're the largest and longest established factory of our kind. And we're the leader in our chosen market of creating displays for extreme conditions – after 30 continuous years of operations.

What's new is that Beneq, a company which primarily concentrates on thin film equipment manufacturing and coating services, has acquired the Finnish-based electroluminescence business from US Planar Systems, Inc, which brought TFEL displays to unmatched levels of performance. As of the end of 2012, Beneq will work closely on the industrial production and development of TFEL display products, now all sold under the name Lumineq.

Committed to continued growth

The combination of Lumineq displays and Beneq is now stronger than ever, thanks to the synergies in strategies and offerings. Our joint goal is to expand our portfolio of world-leading ALD technology and related products.

Lumineq is committed to continuity in TFEL. Our mission is both to provide existing displays to our current customers and to develop new displays for existing and new customers. We are building a strong display product brand, Lumineq, with enhanced customer support, technical supremacy and quality. We will now be able to focus on developing new offerings based on our production-scale coating and other customization services. We aim to enter new areas of applications as deemed commercially viable. And Lumineq intends to grow into a strong brand under the Beneq corporate umbrella, which will offer strong continuity and growth.

Specialized expertise under the same roof

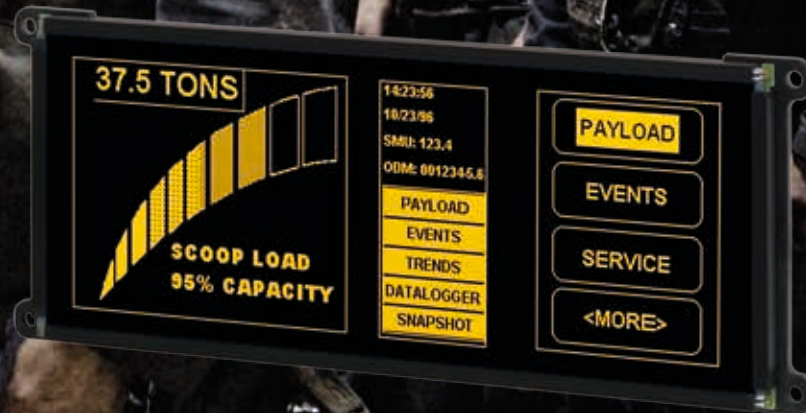
With an impressive 30-year history in this chosen business and originally a part of a Finnish pioneering company in electronics, Lumineq now offers specialized in-house know-how to tackle any thin film challenge that can be solved with ALD technology.

Lumineq employs 80 specialists with careers averaging over 10 years in this specific TFEL field. Our quality certified facilities offer 24/7 capability, industrial-scale capacity and all the knowledge of ALD technology: substrates, chemicals, coatings, finishing and assemblies. With this, Lumineq has an unsurpassed level of know-how in ALD, thin film coating and industrial production.

ENDURING DIRT, BLASTS AND GUSHING WATER

EL 640.200-SK series Diagonal size: 8.9"

Features: ICEBrite™, wide dimming range, locking connector,
extended temperature range, broad input voltage range, buffered



RELIABLE. ROBUST. RELENTLESS

Why thin film electroluminescent (TFEL)?

A Lumineq TFEL display is made to withstand the types of extreme conditions that easily destroy standard displays.

Embedded displays for extreme conditions

The unique performance and visual properties of a Lumineq TFEL display make it ideal for the most challenging and demanding embedded applications where other technologies simply cannot endure. TFEL displays are reliable, robust and proven in the harshest places on earth and in space. Plus, they last much longer than conventional displays.

Along with superior brightness and contrast, Lumineq's embedded TFEL displays offer enhanced shock and vibration resistance and an extended operating temperature range.

Application areas:

- Mining
- Marine
- Public safety
- Medical devices
- Industry
- Military/avionics
- Many more...

5 unique advantages of TFEL

No other technology comes close to these figures:

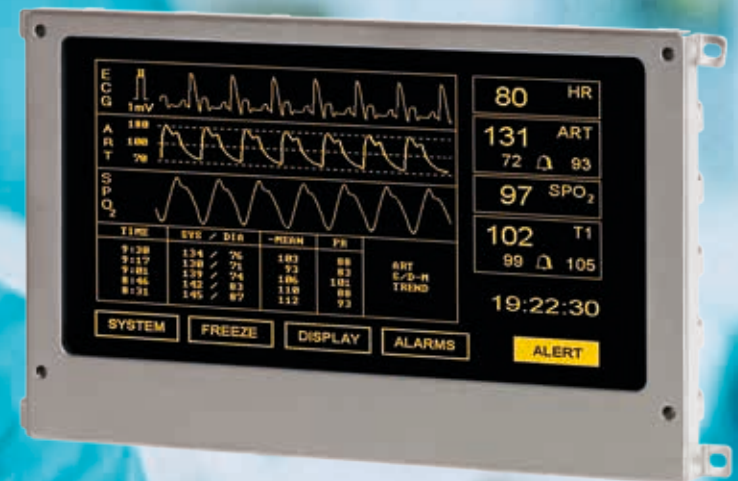
- 200 g-force shock survival
- 250,000 hour mean time between failures (MTBF)
- From -60 to +105 °C (-76 to +221 °F) with instant pixel response and no motion blur
- 100,000 hours measured brightness with more than 85% of original luminance
- 179° vertical and horizontal viewing angles for multi-person viewing

In addition, a Lumineq TFEL ensures a wide dimming range and emissive pixel technology for more legible small texts.

TFEL Glass – design and use your own electronics

Lumineq can provide you with TFEL glass alone when you want to design your own electronics. If needed, we can also support you with our experienced engineering team to design custom electronics.

WHEN RELIABILITY MUST BE TAKEN FOR GRANTED



EL 480.240-PR3

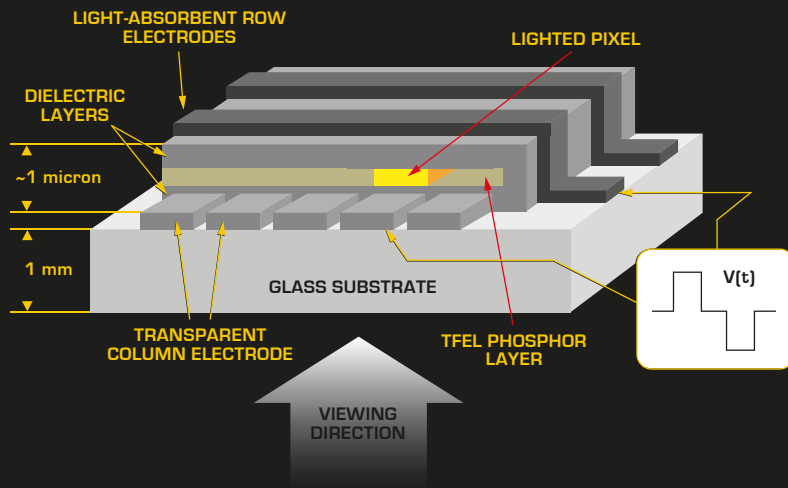
Diagonal size: **6.4"** Features: **ICEBrite™**

WHAT MAKES TFEL SO UNIQUE?

The technology behind TFEL

A Lumineq TFEL display comprises a solid-state glass panel, an electronic control circuit and a power supply.

The TFEL glass panel, the heart of the assembly, consists of a luminescent phosphor layer sandwiched between dielectric layers and a matrix of row and column electrodes. The circuit board, which contains the drive and control electronics, is connected directly to the back of the glass panel. A pixel on the display is lit by applying voltage to the row and column electrodes, causing the intersection area to emit light.

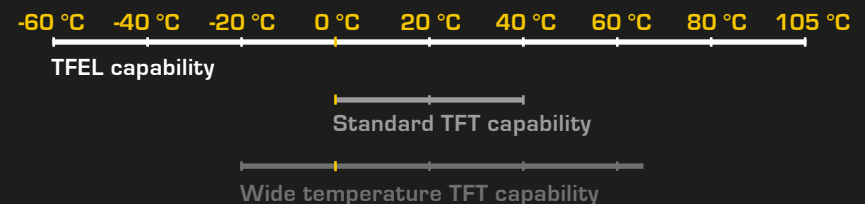


Unique image quality

TFEL display technology is unrivaled for embedded display solutions. The combined performance and visual characteristics of TFEL displays make them superior to all other technologies in demanding applications. Equipment and system designers have turned to TFEL displays to better respond to the increasing demands of their customers for image quality, product lifetime and reliability. TFEL technology has proven to excel in applications ranging from monitor and control instrumentation in deep-sea vessels to operational systems in orbital spacecraft.

When operating temperature is vital

Lumineq TFEL displays exhibit the widest operating temperature range of any commercially available technology. TFEL glass itself can operate down to -100°C (-148°F); certain TFEL displays are rated as low as -60°C (-76°C), without any decrease in response time or clarity of view.



CRYSTAL CLEAR, NO MOTION BLUR, AT -60 °C



EL 320.240.36 series

Diagonal size: 5.7" Features: ICEBrite™



EL 160.120.39

Diagonal size: **3.1"**

Features: **ICEBrite™**, wide dimming range, locking connector, extended temperature range, broad input voltage range

Options: **conformal coating**



EL 160.80.50 series

Diagonal size: **3.5"**

Features: **Features: ICEBrite™**

Options: **wide dimming range, locking connector, conformal coating, industrial temperature range, extended temperature range**



EL 240.128.45 series

Diagonal size: **4.8"**

Features: **ICEBrite™**, wide dimming range, locking connector, built-in **RAiO RA8835A** controller

Options: **conformal coating**

EL 320.256-F series

Diagonal size: 4.8"

Features: **dimming, broad input voltage range**

Options: **ICEBrite™, non-ICEBrite™, wide dimming range, Hi brightness**



EL 320.240-FA3 series

Diagonal size: 4.9"

Features: **red/green/yellow multi-color, 16 colors, wide dimming range, locking connector, extended temperature range, broad input voltage range**

Options: **conformal coating**



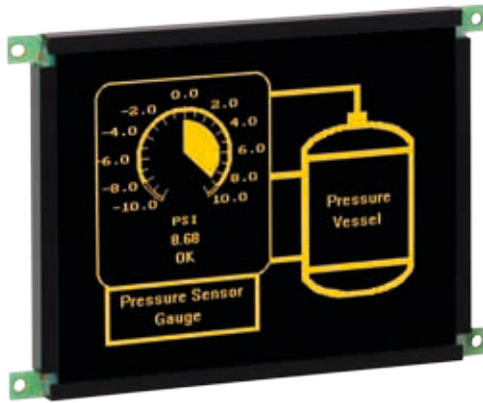
EL 320.240.36 series

Diagonal size: 5.7"

Features: **ICEBrite™**

Options: **wide dimming range, locking connector, conformal coating, industrial temperature range, extended temperature range, anti-glare**





EL 320.240.36-HB series

Diagonal size: 5.7"

Features: **ICEBrite™**, wide dimming range, locking connector, broad input voltage range, Hi brightness

Options: conformal coating



EL 480.240-PR3

Diagonal size: 6.4"

Features: **ICEBrite™**



EL 640.480-AF series

Diagonal size: 6.4"

Features: **ICEBrite™**, dual panel interface, dimming

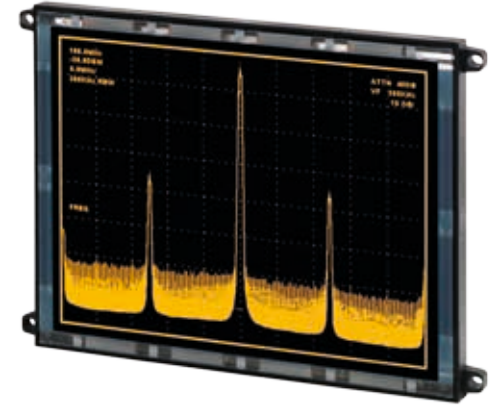
Options: wide dimming range, locking connector, extended temperature range, anti-glare

EL 640.480-AG series

Diagonal size: 8.1"

Features: **ICEBrite™**, dual panel interface, dimming

Options: wide dimming range, locking connector, conformal coating, extended temperature range, anti-glare



EL 512.256-H series

Diagonal size: 8.6"

Features: dimming, broad input voltage range

Options: aluminum frame, steel frame, wide dimming range, industrial temperature range, extended temperature range



EL 640.200-SK series

Diagonal size: 8.9"

Features: **ICEBrite™**, wide dimming range, locking connector, extended temperature range, broad input voltage range, buffered



Options: conformal coating



EL 640.400-C series

Diagonal size: **9.1"**

Features: **wide dimming range, broad input voltage range**

Options: **ICEBrite™, non-ICEBrite™, aluminum frame, industrial temperature range**



EL 640.400-CB series

Diagonal size: **9.1"**

Features: **wide dimming range**

Options: **ICEBrite™, non-ICEBrite™, aluminum frame, 24 VDC**



EL 640.480-AM series

Diagonal size: **10.4"**

Features: **ICEBrite™, dual panel interface, dimming**

Options: **wide dimming range, locking connector, conformal coating, industrial temperature range, extended temperature range, extreme low temperature capability (-60 °C, -76 °F), anti-glare**

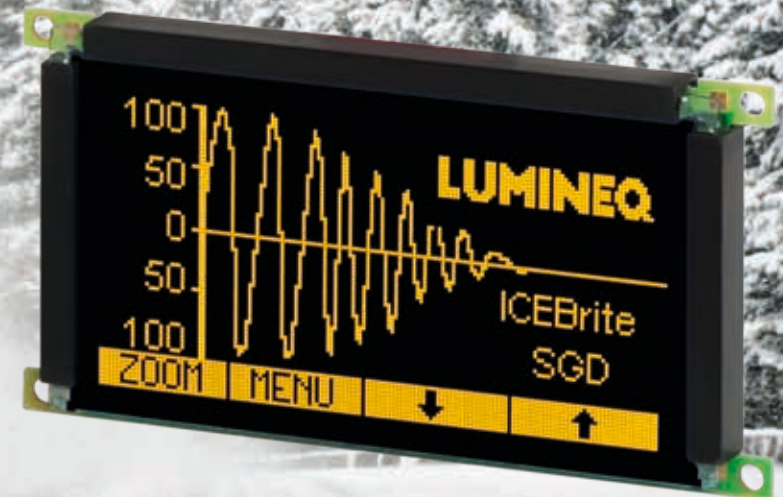
Compared with other display types on the market today, TFEL has many qualities that make it unique:

Environment	TFEL	OLED	AMLCD	PLCD	VFD	LED
Temperature range	Excellent	Very good	Good	Very good	Very good	Excellent
Humidity	Excellent	Poor	Good	Very good	Excellent	Very good
Shock and vibration	Excellent	Very good	Good	Very good	Very good	Excellent
EMI	Very good	Excellent	Very good	Excellent	Very good	Very good
Power consumption	Very good	Very good	Very good	Excellent	Good	Poor
Visual performance						
Brightness	Very good	Very good	Very good	Good	Very good	Excellent
Response time	Excellent	Excellent	Very good	Poor	Excellent	Excellent
Contrast	Excellent	Excellent	Very good	Good	Good	Good
Viewing angle	Excellent	Very good	Very good	Good	Very good	Poor
Color gamut	Poor	Excellent	Excellent	Good	Good	Very good
Gray scale	Good	Excellent	Excellent	Very good	Good	Very good
Sunlight readability	Very good	Very good	Very good	Excellent	Very good	Excellent
Graphic friendly	Excellent	Excellent	Excellent	Good	Very good	Poor
Cost of ownership						
MTBF	Excellent	Good	Good	Very good	Very good	Very good
Operating life	Excellent	Poor	Very good	Very good	Very good	Very good

Legend:

- Excellent
- Very good
- Good
- Poor

KEEPING IT RUNNING, COME RAIN OR SHINE



EL 160.80.50 series
Diagonal size: **3.5"** Features: **ICEBrite™**



CERTIFIED IN EVERY WAY

Lifecycle promise

Lumineq lifecycle programs make it easy for our customers to focus on their products. We can help you build a stellar product and keep it in production longer. Lumineq builds displays with the same components, eliminating any issues with varying components.

We have secured long-term commitments from component suppliers prior to design and production, and our close cooperation with suppliers ensures the long-term availability of products and components.

Warranty packages

Lumineq provides various levels of warranty. We can provide an extension on the standard warranty and provide basic support to protect you against costly unforeseen expenses of repairing an out-of-warranty display or display downtimes. A further warranty option guarantees uptime and return shipping.

ISO certification

Lumineq production facilities have obtained ISO 9001:2008 registration. Throughout our organization, there is a strong commitment to ongoing quality improvement.

For more information on our rugged embedded TFEL displays and glass, please visit:

www.lumineq.com

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