LUMINEQ®
RUGGED DISPLAYS

The world's most reliable displays for extreme conditions

Display information that matters

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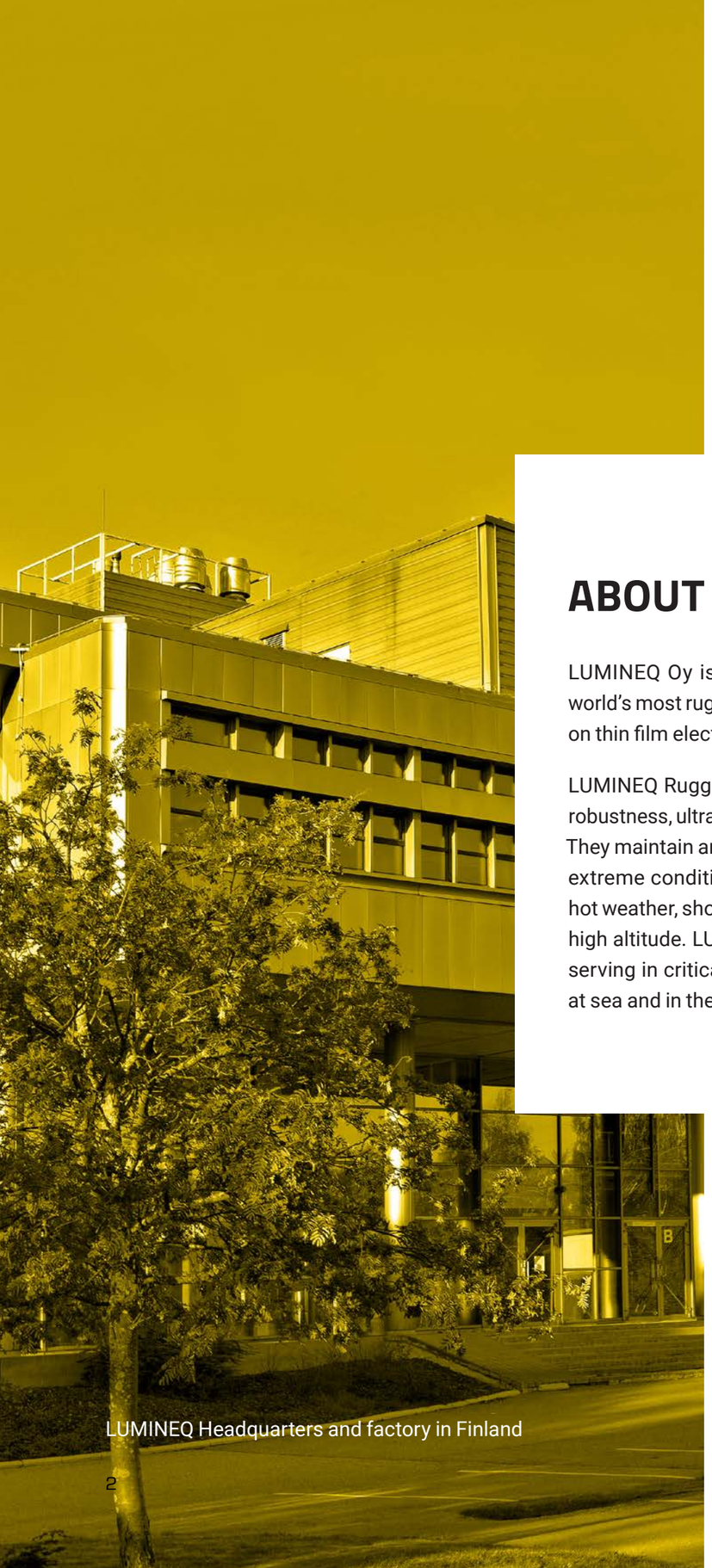

LUMINEQ Headquarters and factory in Finland

ABOUT LUMINEQ®

LUMINEQ Oy is a premium manufacturer of the world's most rugged and transparent displays based on thin film electroluminescent technology.

LUMINEQ Rugged Displays are renowned for their robustness, ultra-reliability, and long product lifetime. They maintain an excellent performance even in the extreme conditions such as -50 °C cold or +95 °C hot weather, shock and vibration, high humidity, and high altitude. LUMINEQ rugged displays have been serving in critical applications since 1983, on land, at sea and in the air.

GLOBAL SALES NETWORK

We sell products directly to end customers as well as through local distributors and sales representatives in different countries.

Headquarters

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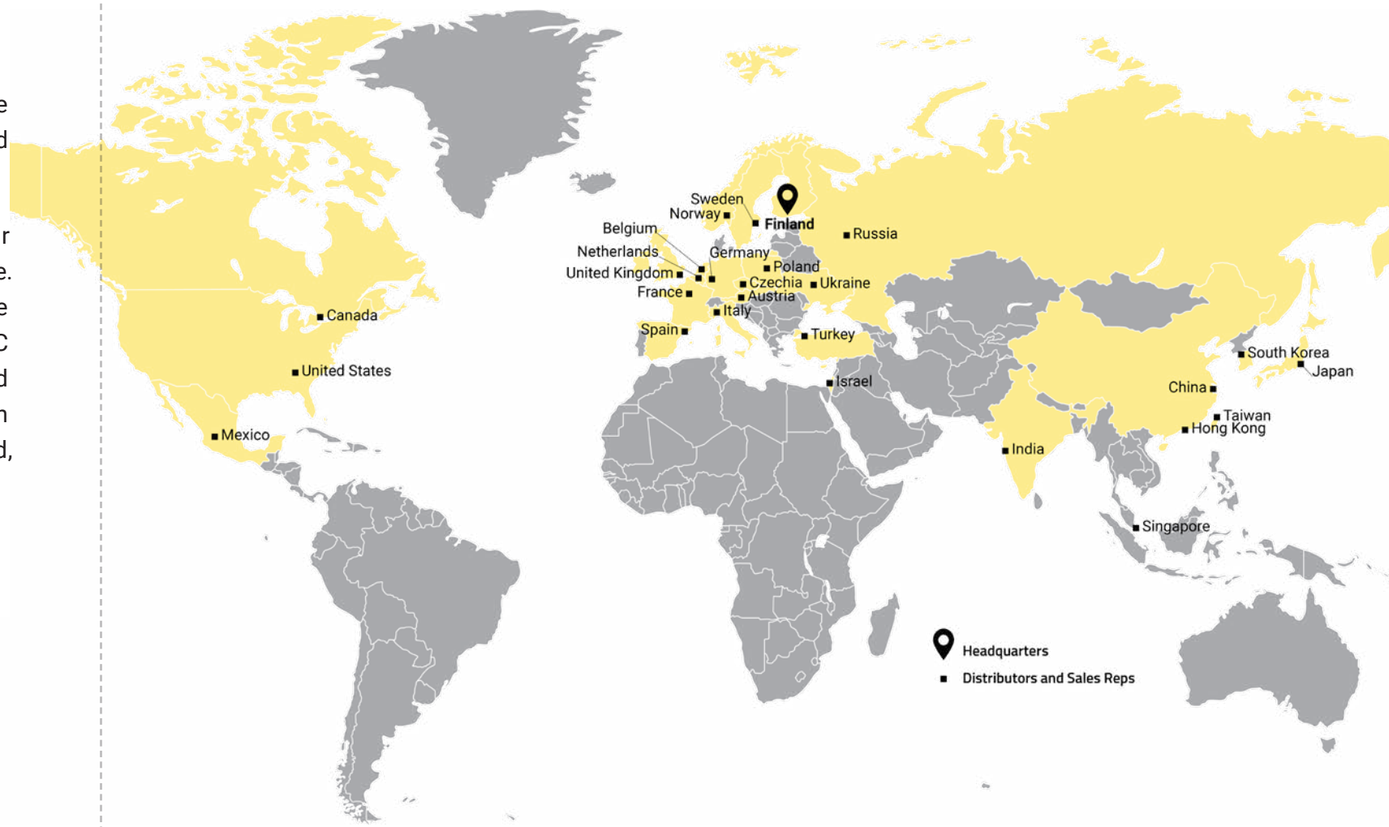
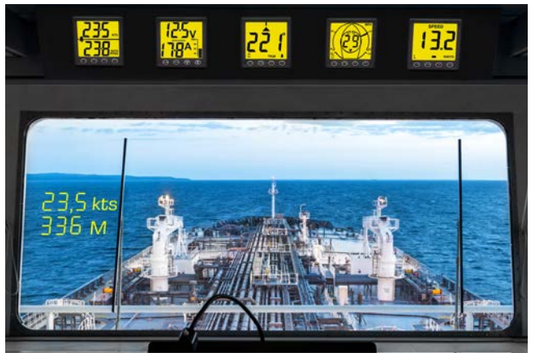


MARKETS AND APPLICATIONS

LUMINEQ rugged displays are used in a wide array of demanding applications, such as radio, power supplies, instruments, and control platforms in extreme conditions. Since 1983, LUMINEQ displays have been serving in defense, industrial, marine, transportation, aviation, medical, oil & gas, and other outdoor instrumentation markets.

Defense



Marine

Transportation

Railway

Medical

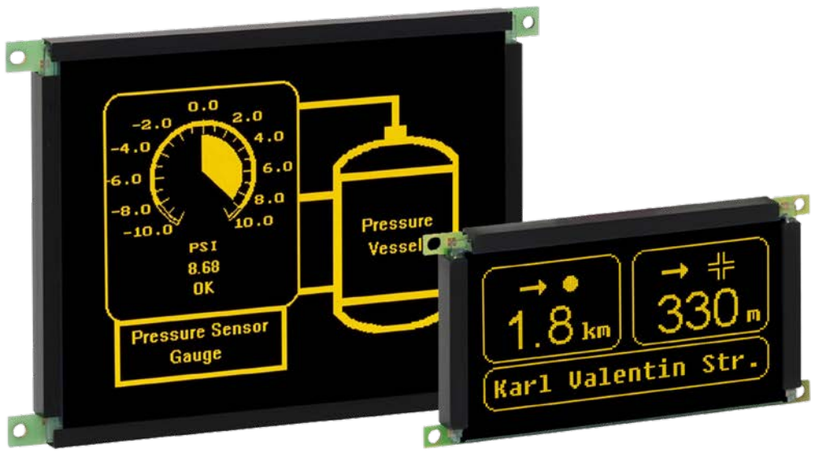
Outdoor instrumentation

Aviation

Oil & Gas

BENEFITS AND FEATURES

The **solid-state** design enables LUMINEQ Rugged Displays to tolerate extreme conditions such as cold, heat, pressure, shock, vibration, and humidity better than any other displays.



Wide temperature range

Operates reliably at extreme temperatures from -50 °C to 95 °C (-58 °F to 203 °F) with no need for heating or cooling

Shock and vibration tolerant

200G force shock durability for the glass and 100 g for the complete unit

Long lifetime

MTBF of over 250 000 hours. 85% of original brightness remains after 100 000 hours of usage regardless of environments

Instant on

<1 ms response time regardless of temperature

>179° viewing Angle

Wide viewing angle across the entire operating temperature range

Contrast

Delivers readability under sunlight and remains high contrast across the entire operating temperature range

Solar load

Unaffected by solar loading - glass performs at 105 °C (221 °F)

Long production lifetime

Long-term availability to avoid redesigns caused by component obsolescence

Solid-state

Proven track record of reliable operation in the harshest environments

Humidity tolerant

Tolerate high humidity – ideal for demanding marine applications

Altitude

Solid glass is virtually immune to absolute pressure and low air pressure (tested operation at 18 km)

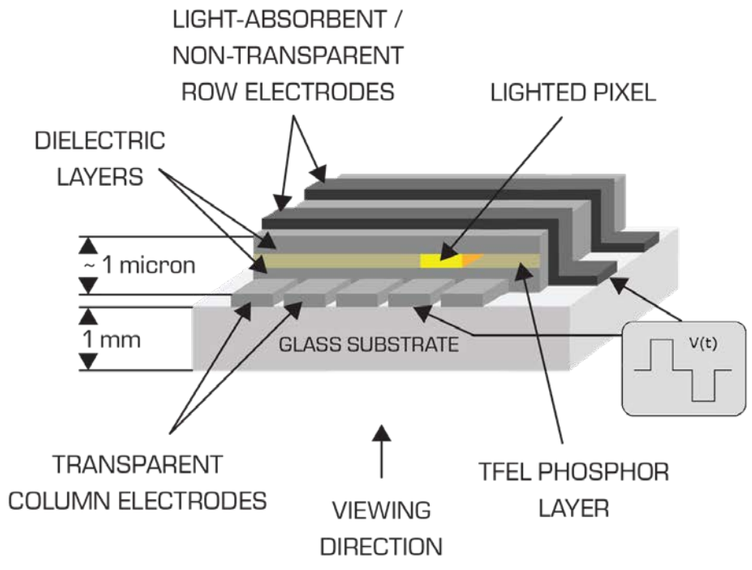
LUMINEQ VS. OLED VS LCD

Compared to AMLCD and OLED displays, LUMINEQ solid-state displays are naturally much more rugged and reliable especially in harsh environments and extreme conditions.

Below is a comparison of these three industrial displays in terms of their lifetime and performance in various environments, such as operating temperatures, low and high altitude, high humidity, shock and vibration, and solar load.

	LUMINEQ Displays	AMLCD (TFT)	OLED
Operating at **95 °C (203 °F)**	Operating survival.	Not available	Not available
Operating at **85 °C (185 °F)**	Operating with long lifetime. Unaffected by solar loading.	Liquid crystal materials may get damaged permanently. Sensitive to solar load.	Extremely short lifetime.
Operating at **-50 °C (-58 °F)**	Operating. Instant "ON".	Slow start-up. Heater is needed.	Not available
Shock & vibration	Inorganic solid-state structure, designed for rugged applications.	An extra protection is required.	An extra protection is required.
High altitude	Solid glass is virtually immune to low air pressure. Tested operation at 18 km.	An extra protection is required.	Not specified. Not tested.
Low altitude	Solid glass is virtually immune to absolute pressure.	Pressurized enclosure against absolute pressure changes is required	Extremely sensitive to moisture and oxygen.
Solar load	Unaffected by solar loading. Glass performs to +95 °C (203 °F)	Effective thermal management is required.	Extremely short life time.
High humidity	The display glass is immune to humidity.	The display panel polarizer adhesives can fail.	High humidity can cause permanent damage.
Production lifetime	Typically over 20 years.	Up to 15 years.	A few years.
Product lifetime	Typically over 20 years. Low lifetime cost.	Up to 10 years if with a good LED backlight.	Short lifetime, especially at high operating temperature.

TECHNOLOGY



LUMINEQ Thin Film Electroluminescent (TFEL) displays comprise 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 phosphorous layer sandwiched between transparent dielectric layers and non-transparent row 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, thus causing the area of intersection to emit light.

The result of this compact and solid-state design is a flat, reliable and inherently rugged display with exceptionally fast response time of less than 1 ms, regardless of temperature.

PRODUCTS

	EL160.120.39	EL160.120.39 -SPI	EL160.80.50-ET
Matrix size	160 × 120	160 × 120	160 × 80
Display size	3.1"	3.1"	3.5"
Pixel pitch	0.39 mm	0.39 mm	0.50 mm
Brightness	70 cd/m^2	70 cd/m^2	107 cd/m^2
Typical power comsumption	3.0 W	3.0 W	4.4 W
Supply voltages	5, 8-18 VDC	5, 8-18 VDC	5, 12 VDC
Operating temperature	-50 °C to 85 °C	-50 °C to 85 °C	-50 °C to 70 °C
Storage temperature	-50 °C to 95 °C	-50 °C to 95 °C	-50 °C to 95 °C
Interface	4-bit	SPI	4-bit
Vibration	5 to 500 Hz, 0.5 g^2/Hz random	5 to 500 Hz, 0.5 g^2/Hz random	5 to 500 Hz, 0.10 g^2/Hz random
Altitude	18 km (59 ft)	18 km (59 ft)	18 km (59 ft)
Other features	Locking connector, Dimming, Broad input voltage range	Locking connector, Dimming, Broad input voltage range	Locking connector, Dimming

	EL240.128.45	EL320.240.36-ET	EL320.240.36-HB
Matrix size	240 x 128	320 × 240	320 × 240
Display size	4.8"	5.7"	5.7"
Pixel pitch	0.45 mm	0.36 mm	0.36 mm
Brightness	130 cd/m^2	50 cd/m^2	150 cd/m^2
Typical power comsumption	5.8 W	7.0 W	5.5 W
Supply voltages	5, 8-18 VDC	5, 12 VDC	5, 8-18 VDC
Operating temperature	-40 °C to 85 °C	-40 °C to 65 °C	-50 °C to 95 °C
Storage temperature	-50 °C to 105 °C	-40 °C to 85 °C	-50 °C to 105 °C
Interface	8-bit, µP	4-bit	4-bit
Vibration	5 to 500 Hz, 0.02 g^2/Hz random	5 to 500 Hz, 0.02 g^2/Hz random	5 to 500 Hz, 0.5 g^2/Hz random
Altitude	18 km (59 ft)	18 km (59 ft)	18 km (59 ft)
Other features	Locking connector, Dimming, Broad input voltage range, On-board display controller	Locking connector, Dimming	Sunlight readable, Locking connector, Dimming, Broad input voltage range

	EL160.80.50-ET -SPI
Matrix size	160 × 80
Display size	3.5"
Pixel pitch	0.50 mm
Brightness	107W cd/m^2
Typical power comsumption	4.4 W
Supply voltages	5, 12 VDC
Operating temperature	-50 °C to 70 °C
Storage temperature	-50 °C to 95 °C
Interface	SPI
Vibration	5 to 500 Hz, 0.10 g^2/Hz random
Altitude	18 km (59 ft)
Other features	Locking connector, Dimming

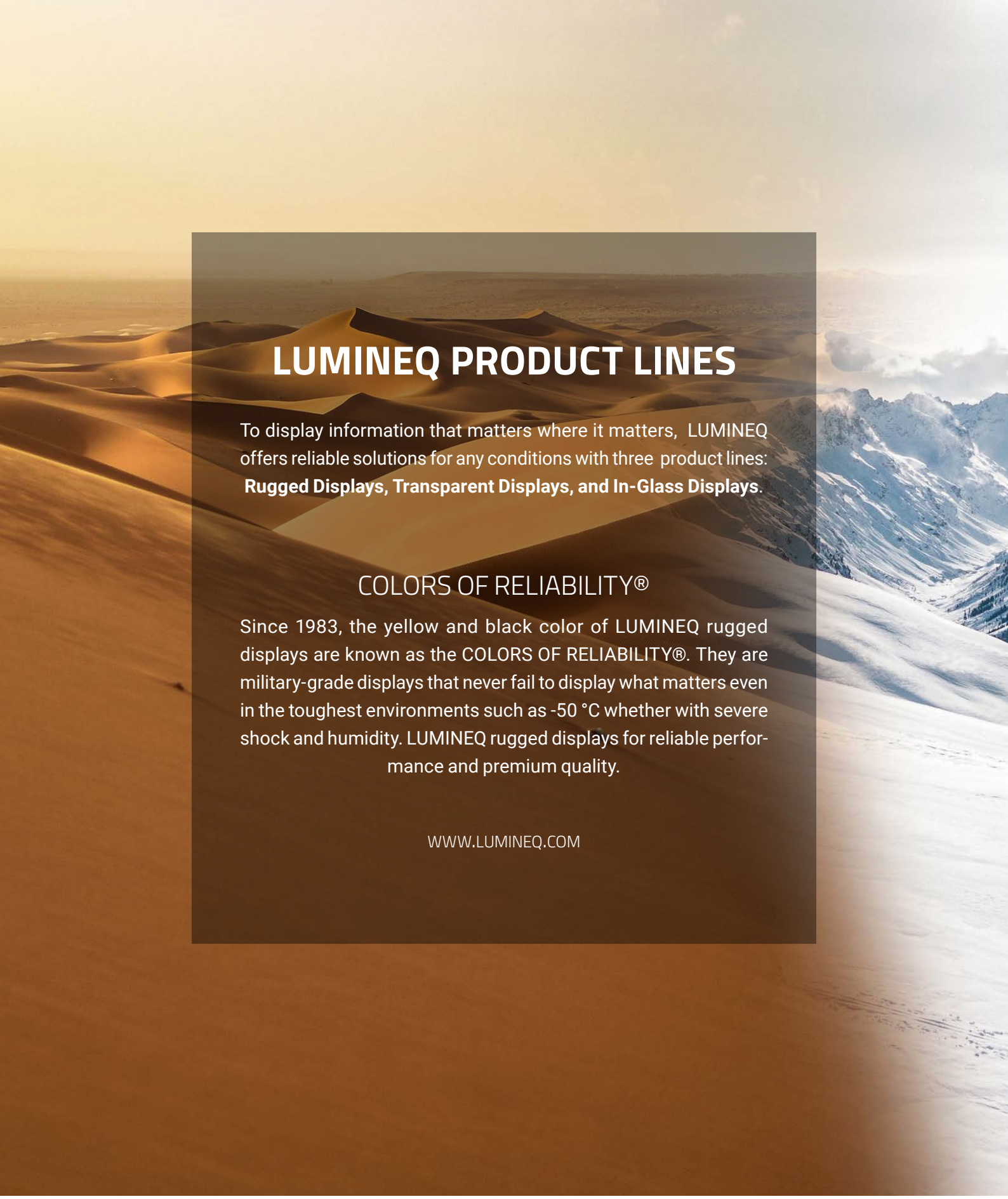
	EL320.240.36-HB -SPI
Matrix size	320 × 240
Display size	5.7"
Pixel pitch	0.36 mm
Brightness	150 cd/m^2
Typical power comsumption	5.5 W
Supply voltages	5, 8-18 VDC
Operating temperature	-50 °C to 95 °C
Storage temperature	-50 °C to 105 °C
Interface	SPI
Vibration	5 to 500 Hz, 0.5 g^2/Hz random
Altitude	18 km (59 ft)
Other features	Sunlight readable, Locking connector, Dimming, Broad input voltage range

Avaliable Options

- Conformal coating
- Anti-reflective coating
- Anti-glare film
- Tempered glass
- ITO glass: Conductive coated glass: 4 to 10 Ω/sq
- NVIS filter

Specifications for all displays

- Shock, IEC60068-2-27, 100G-force. 6 ms
- MTBF > 50 000 hours
- Relative Humidity, Operating 93% RH at 40 °C, IEC 60068-2-78
- Damp heat, Non-operating, 95% RH max. from 25 °C to 55 °C, IEC60068-2-30
- Altitude, 18 km (59 ft), IEC60068-2-13



LUMINEQ PRODUCT LINES

To display information that matters where it matters, LUMINEQ offers reliable solutions for any conditions with three product lines: **Rugged Displays, Transparent Displays, and In-Glass Displays**.

COLORS OF RELIABILITY®

Since 1983, the yellow and black color of LUMINEQ rugged displays are known as the COLORS OF RELIABILITY®. They are military-grade displays that never fail to display what matters even in the toughest environments such as -50 °C whether with severe shock and humidity. LUMINEQ rugged displays for reliable performance and premium quality.

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