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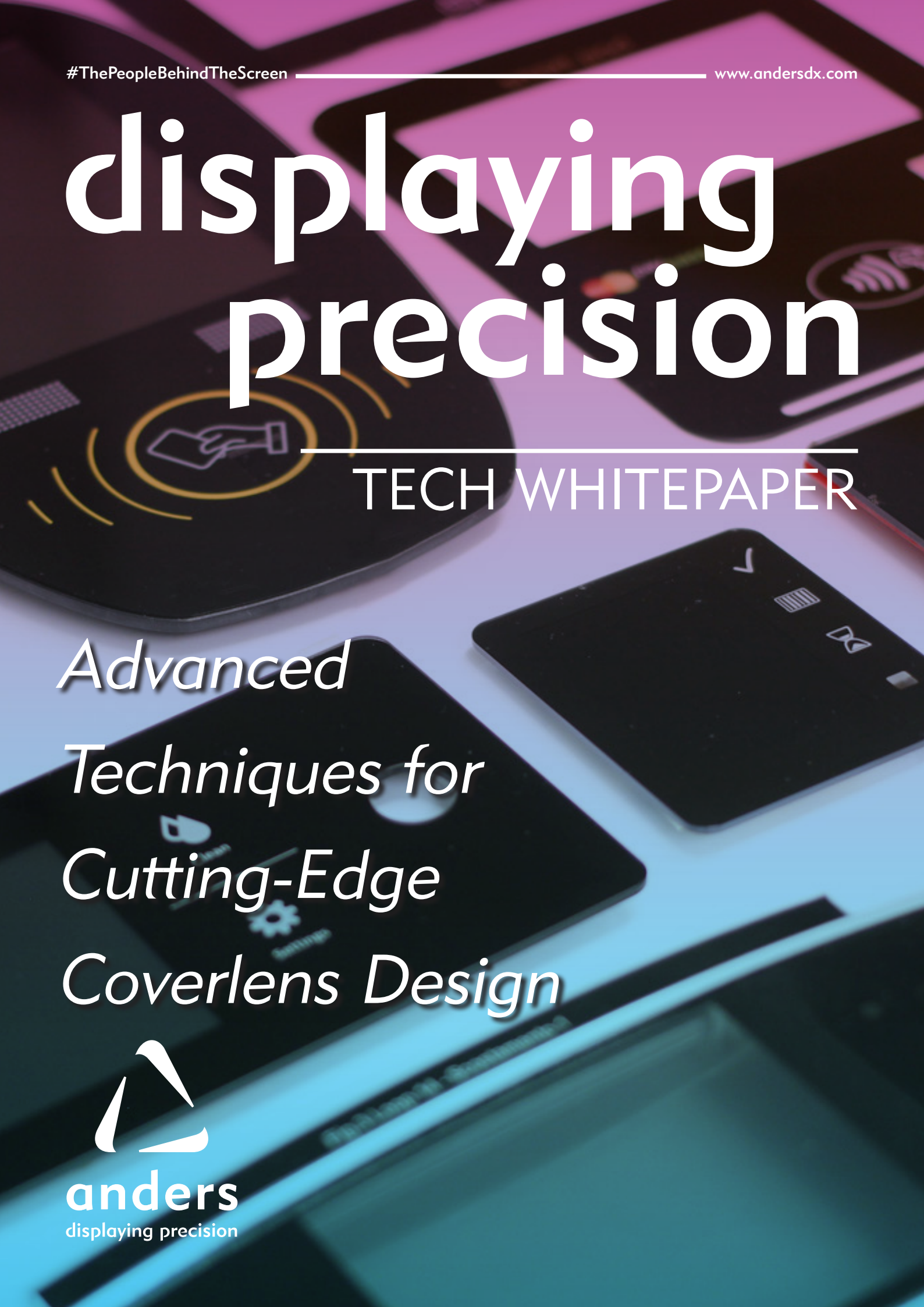
TECH WHITEPAPER



Advanced Techniques for Cutting-Edge Coverlens Design

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INTRODUCTION

Most LCDs need a coverlens, and the design of this vital component presents a wealth of opportunities to enhance the style and performance of your product.

Thinking creatively about your display's coverlens can be an affordable way to make your HMI stand out from the rest. Spot facing and touch bumps are two new processes which provide even more differentiation for designers.

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What's new for display coverlenses

Thinking creatively about your display's coverlens can be an affordable way to make your HMI stand out from the rest. Spot facing and touch bumps are two new processes which provide even more differentiation for designers.

Most LCDs need a **coverlens**, and the design of this vital component presents a wealth of opportunities to enhance the style and performance of your product.

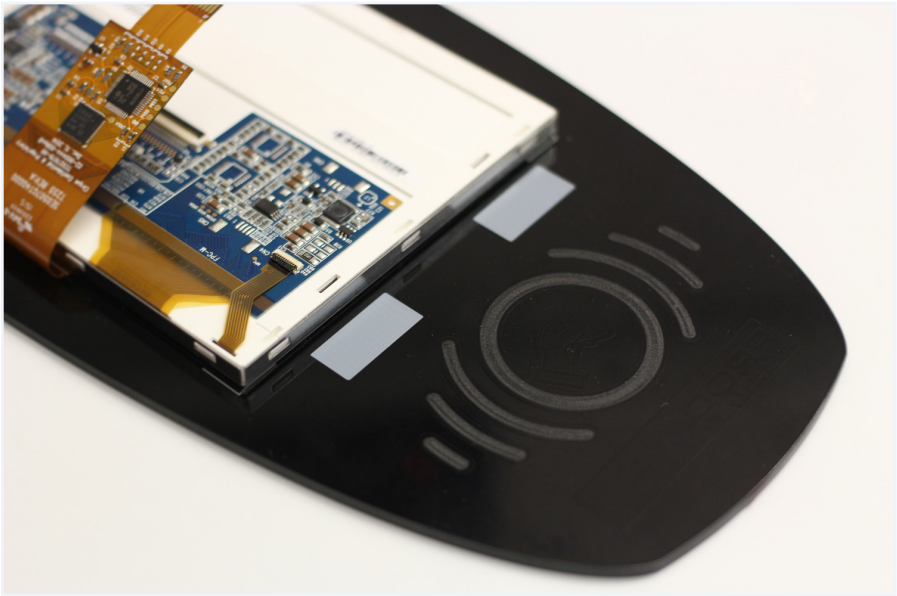
You can choose the **dimensions** to match the display exactly or, by over-sizing, achieve more creative effects: you can use it to bring separate features such as **buttons**, **touch sensors**, or **indictor lights** into a unified, harmonious user interface, or achieve a "high-end" feel by giving the impression of a larger, more expensive display. You can print or backlight your logo and use colour to enhance visual impact. You can create **icons** that are permanently visible or hidden until lit for that extra wow factor.

Other choices include **polycarbonate or toughened or chemically strengthened glass** at a thickness needed to achieve your desired mechanical properties.

The options don't stop there. Surface treatments such as **spot facing** or **touch-bumps** now introduce new ways to style and functionalise your user interface.

Moreover, **optical bonding**, not only enhances the viewing characteristics of displays used outdoors or in bright ambient light, but also helps reduce power consumption and achieve the impact-resistance ratings demanded in sectors such as industrial and automotive.

Coverlens dimension can be over-sized to bring different features



Coverlens customisation options include:

- Glass or PPMA materials up to 10mm thickness
- Chemically strengthened or toughened glass
- Oversized for additional touch or iconography
- Custom shapes including curves and cut-outs
- Logo and graphic printing
- Hidden til lit feature
- 3D feel touch surface
- Optical bonding for better viewing and durability

Adding interest with new surface treatments

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Introducing texture, features, or topology to the coverlens can assist **usability** and **add interest** to the appearance of the device.

You may be creating a product for the **visually impaired**, who can benefit from the ability to differentiate between different touch-sensor functions. Other major opportunities lie in automotive applications, such as **tactile control panels** that help motorists keep their eyes on the road. In this sense, a novel 3D touch surface can enhance safety as well as offering a cool new feature to attract buyers.

One technique that can be used to create such features is **spot facing**; a chemical process for **engraving glass to a specific depth** without penetrating the lower face.

When applied to a touch panel, it is possible to create engraved areas that correspond to touchable controls such as buttons, dials, or sliders. This enables adding a tactile dimension to the user experience and can also be employed to engrave a logo or brand name in the coverlens.Unlike mechanical engraving, spot facing leaves a **smooth edge**, free from burrs, and hence requires no further machining or polishing to be safe for the user to touch.

Moreover, the engraved surface remains **transparent** thereby allowing the user to see graphics or icons clearly when displayed behind the cover. Spot-faced features can be of **any shape**, and the strength of the glass is not compromised.

Touch bumps are an alternative technology.

In principle these are the exact inverse of spot facing, where the active area is indicated by a **raised bump**.

Spot facing and touch bumps are state-of-the-art user-interface design features that are currently being adopted by display makers including our own manufacturing partners.

We are ready to start working with customers to take advantage of these novel and effective techniques and prepare to make forthcoming new product designs really stand out. You can now create an effective and unique coverlens in glass, which is preferred for applications such as **medical equipment** and **control panels** for food or pharmaceutical production where hygiene is an important consideration.

Spot-faced glass process

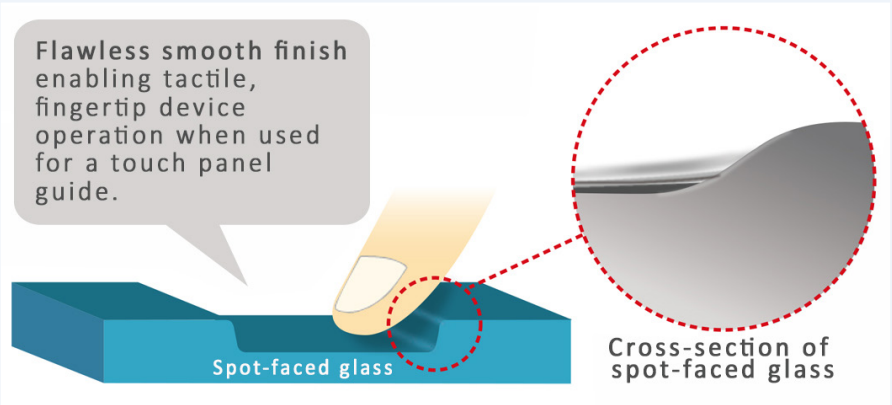


Figure 1. The chemical spot facing process can be used to engrave any shape onto the glass. Edges produced by this process are smoother and therefore safer than those produced mechanically.

Optical bonding for visual performance

Optical bonding reduces reflectance between the touchscreen's sensor and the front of the display resulting in improved display readability.

Bonding the coverlens to the display using clear optical adhesive **eliminates any air gap** between the two surfaces. Historically this process has been used to reduce reflections of ambient light between the display surface and coverlens and so **enhance the viewing experience**.

In a non-bonded panel, ambient light is reflected at both the front and rear surfaces of the coverlens and also from the front surface of the display immediately behind it.

As much as 13% of ambient light incident on the display surface can be reflected into the user's eye.

If the ambient light is particularly intense, such as bright electric lights or sunlight, the reflected light can overpower the backlight illumination and significantly impair readability.

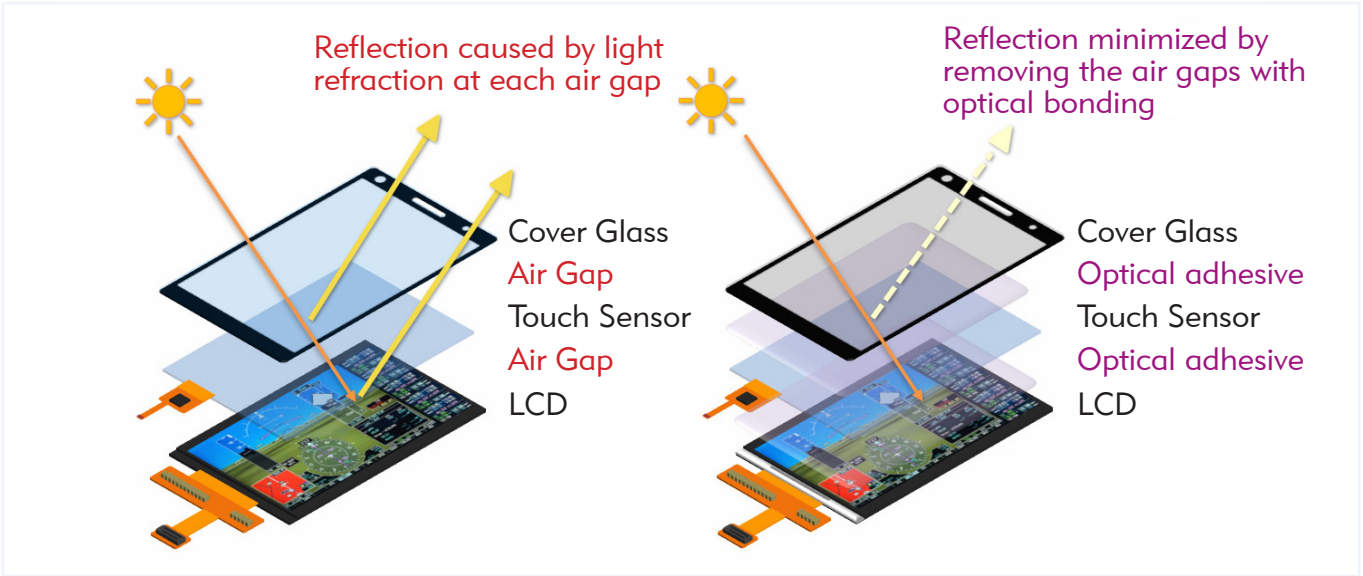
Typical approaches to improve readability include **increasing the backlight power** or **adding anti-reflective coating** to the front of the coverlens.

Alternatively, optical bonding using a thin layer of optically clear adhesive reduces reflectance between the touchscreen's sensor and the front of the display. Hence the perceived strength of the backlight is increased, resulting in improved readability, without increasing power consumption.

Optically bonded displays can have **four times higher contrast ratio**, which also improves the viewing experience. Although the process typically adds a

Optical bonding and light reflection

Figure 2. When light from an external source passes through the panel and the gap, refraction causes some of it to be reflected back, creating glare on the screen. The increased light transmission of a screen with optical bonding significantly reduces glare from external light sources.



few percent to the cost of the panel, the premium can be offset by savings in the cost of anti-reflective coatings and the benefits of lower backlight power. Now, markets are recognising that optical bonding can offer many additional advantages besides simply enhancing visual performance.

Effect on Impact Resistance

More recently, the **mechanical advantages** of optical bonding – and particularly its effect on impact resistance – have come to the fore. As LCDs and graphics panels have become increasingly common in tools and equipment used every day throughout offices, factories, entertainment venues, commercial kitchens, and the home, their ability to withstand likely **accidental impacts**, or **vandalism**, has become relevant for a larger cross-section of users.

Impact resistance can be classified using the industry-standard scale of two-digit IK codes. A **higher IK rating implies resistance to impacts** of greater kinetic energy. The European standard EN 62262 specifies conditions under which a product must be tested to gain an IK rating.

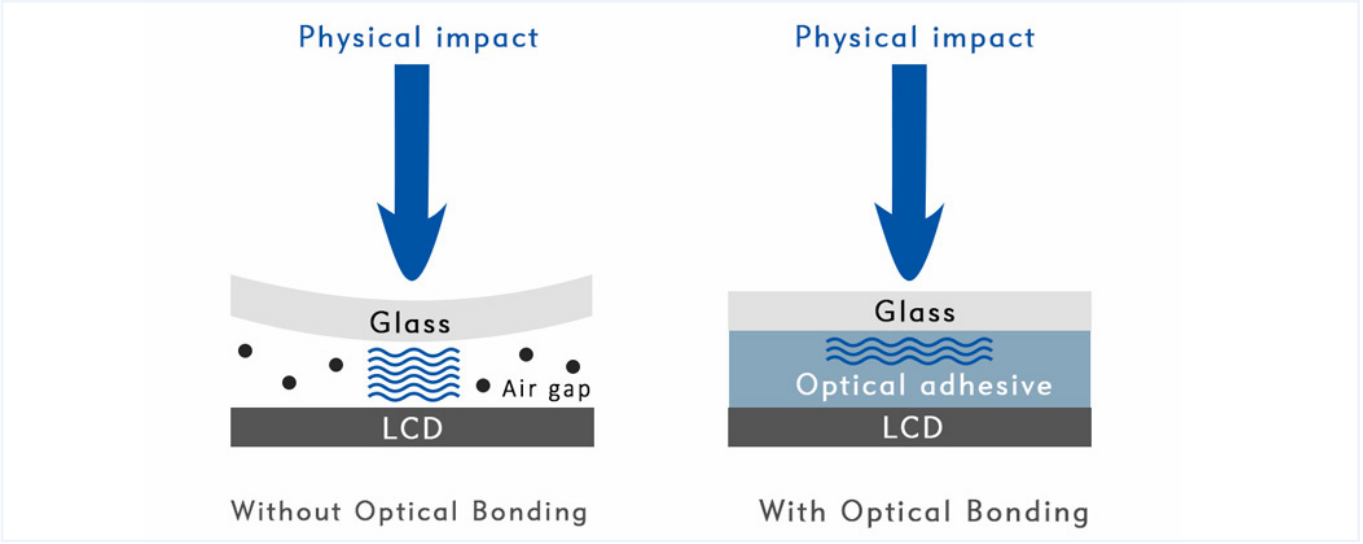
The Table 1 relates the IK ratings to impact energy and the associated EN 62262 specifications for the test hammer, freefall height, and spring- and pendulum-mounted tests. In addition, EN 62262 specifies the way test pieces should be mounted and standardises the prevailing atmospheric conditions. The test piece must withstand five evenly distributed blows to claim the associated rating.

Optical bonding has been found to **increase the impact resistance** of LCD panels by bringing the coverglass and display together in a single, unified, structure, effectively summing the thickness of each components and avoiding breakage by preventing either from deflecting excessively.

When applied in combination with a suitable mechanical mounting, optical bonding can considerably increase the overall impact resistance to help the end-product achieve a desired IK rating. In addition, when combined with toughened or strengthened glass, optical bonding can help increase the vandal resistance of products such as security panels and ATM machines.

Optical bonding and impact resistance

Figure 3. The additional resin layer in optical bonding provides increased physical durability to the display. Eliminating the gap between the LCD module and the panel increases the screen's resistance to scratches, dust, and fluids. This provides high durability for use in public access areas or other environments where the display is routinely used.



Summary of standard impact-resistance (IK) codes and EN 62262 test specifications

Table 1. The European standard EN 62262 specifies conditions under which a product must be tested to gain an IK rating. The table relates the IK ratings to impact energy and the associated EN 62262 specifications for the test hammer, freefall height, and spring- and pendulum-mounted tests.

IK code	IK0	IK01	IK02	IK03	IK04	IK05	IK06	IK07	IK08	IK09	IK10
Impact energy	Not tested	0.14J	0.2J	0.35J	0.5J	0.7J	1J	2J	5J	10J	20J
Hammer material		Polyamide						Steel			
Hammer mass		0.2kg					0.5kg	0.5kg	1.7kg	5kg	
Striking element radius		10mm						25mm		50mm	
Freefall test		Not tested						0.4m	0.3m	0.2m	0.4m
Pendulum test		Test applied									
Spring test		Test applied							Not tested		

Conclusions

An **imaginative approach** to coverlens design can make a tremendous difference to the market impact of any product, and ease compliance with industry-specific requirements such as food hygiene or mandatory automotive safety tests.

- **New techniques** are being developed empowering designers to create the most outstanding new products of their generation

- Considering your **target audience** when creating a Coverlens can help create outstanding user experiences

- **Optically bonding** a Coverlens to a display not only improve optical performance but also mechanical impact resistance

- **Spot facing**, **touch bumps**, and optical bonding are among the most exciting and influential techniques for creating beautiful and compelling user interfaces.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ABOUT ANDERS

Anders Electronics is a display and embedded display design specialist, dedicated to making electronic touchscreen technology safer, simpler and more enjoyable to use.

Anders has displayed precision since 1952, and continue to display engineering excellence by focussing our experienced energy into LCD and embedded display technology. As the market leaders, we design, develop, and deliver customised display solutions, for the non-consumer industry, and haven't stopped innovating! Anders features a history of reliability and innovation and lives to solve display engineering challenges.

We harness our expertise in display, embedded computing and touch control technology to help differentiate our customer's products through exceptional design and engineering.

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UK Head Office: Anders Electronics PLC, Kings Studios, 43-45 Kings Terrace, London, NW1 0JR
Call us on: +44 (0)207 388 7171 or email: info@andersdx.com

ANDERSDX.COM