

Touch screens under harsh environment



Executive Summary

Have you ever considered the environmental abuse taken by touch screens? Touch screens are contemporary input/output devices that enable simple and intuitive operation of equipment and machinery. You may know your smartphone touchscreen best, yet consider public-use examples like vending machines, credit-card point-of-sale terminals, check-in kiosks at airports and hotels, and operator interface screens on medical equipment and factory equipment. They are used in every aspect of our lives and are subjected to challenging environments: wide temperature ranges, water/humidity, and UV rays.

Touch screens are often used in harsh environments. Consider touch screens mounted on snow guns and snow-packed vehicles used in ski resorts. We would not subject operators to continuous exposure to extremely cold temperatures of -20°C or less; but we do expect the equipment to serve its operator at a moment's notice. In EV chargers and payment machines in outdoor parking lots, the surface temperatures are elevated when sunlight hits the touch screen during the daylight hours. The touch screen and LCD may be discolored or damaged in a short period of time due to the impact of UV. (Figure 1)

Figure 1. LCD with touch screen irradiated by UV rays in UV irradiation test
(Equivalent to 1 year)



Consider other environmental challenges like water. Traditional capacitive touch screens, may malfunction if exposed to water. Equipment requires special protection when used outdoors in the rain or in an environment with water around it, such as kitchen equipment and water jet processing machines.

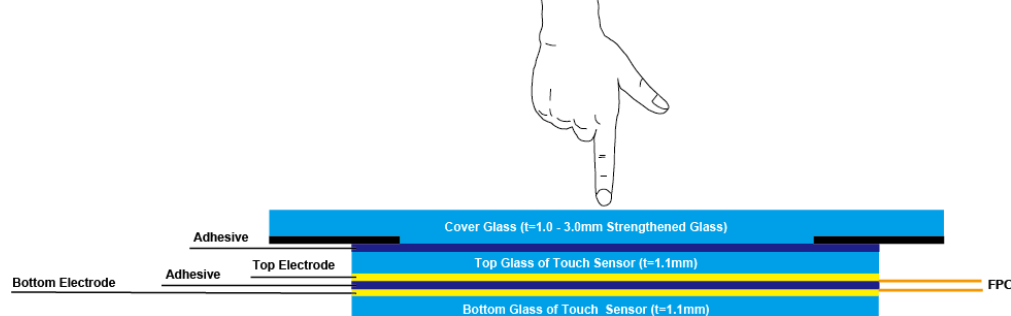
Equipment designs typically incorporate touch screens in mountings on the outermost surface of the device, for ease of access. Touch screens are directly affected by these external environmental influences. Therefore, it is necessary to select an appropriate touch screen and design the interface depending on the characteristics of usage and environment.

Frustrated by the inability of traditional touch screens to meet your harsh location requirements? DMC has introduced new technology for glass structure projected capacitive touch screens. DMC's design is suitable for wide operating temperature ranges, mitigating ultraviolet rays, and preventing water intrusion and malfunction.

Industrial grade glass structure projected capacitive touch screen

DMC's "DUS-A series" utilizes a unique structure in which two pieces of 1.1 mm thick glass are bonded together with a sensing electrode in the middle. Tempered glass with a thickness of 1 to 3 mm is typically used as a cover glass on the touch screen.

Figure 2. Structure of the DUS-A touch panel with a cover glass

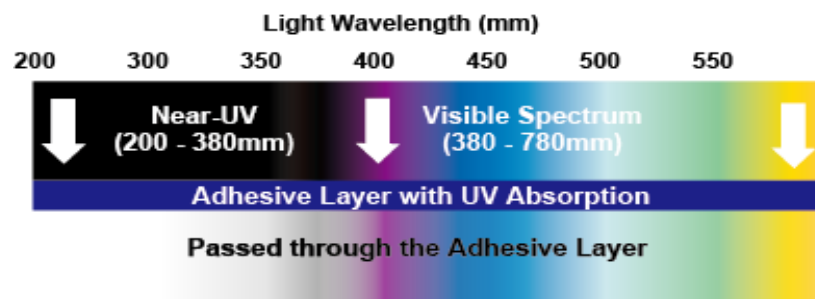


The DUS-A series uses laminated glass to create a highly robust structure. For lighter weight applications, DMC also developed the DFS series with a two-panel sensor structure and uses 0.55 mm thickness glass for the upper / lower glass(15" or more).

UV absorption characteristics

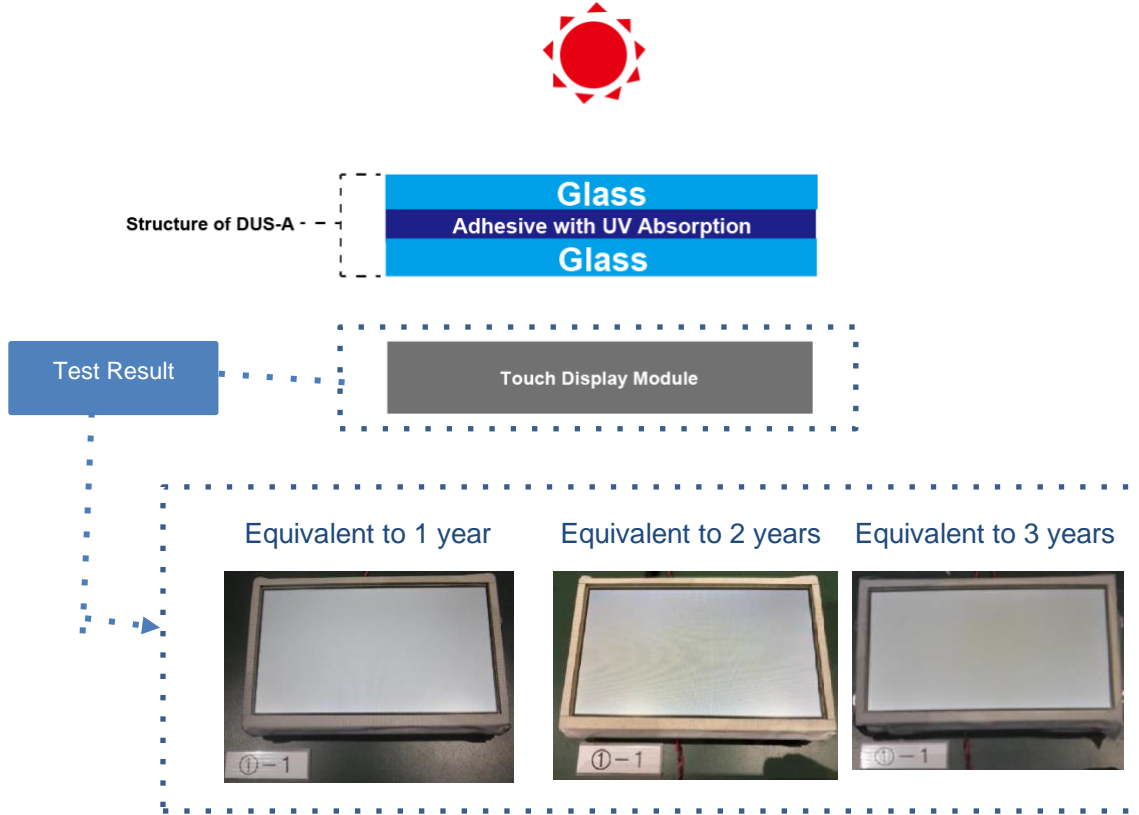
Traditional touchscreens degrade quickly when exposed to UV rays. DMC has designed glass structural materials with a unique ability to absorb UV rays. This structure is used for the adhesive layer between the glass layers of the projected capacitive touch screen, reducing the influence of UV rays on the LCD under the touch screen.

Figure 3. Light transmission image of the UV-absorbing adhesive layer



* The image does not guarantee the performance of the product.

Figure 4. UV irradiation test results via the structure of DUS-A



DMC recommends a glass-structured projected capacitive touch screen with UV absorption characteristics for the operation terminal of outdoor applications.

Wide temperature range

Concerned about the effects of thermal expansion or variable performance across temperature range? DMC's DUS-A series screen and compatible touch controller DUSx200 are made up of high-quality components and guarantee an operating temperature range of -40°C to 80°C . This technology can be used for operation terminals on equipment facing extreme cold or high temperatures, like agricultural and construction machinery subjected to long duration severe weather field exposures.

Preventing water malfunction

Traditional projected capacitive methods fail if the touch screen is wet as malfunctions such as input errors and misplaced touch location may occur. DMC's projected capacitive touch controller DUSx200 series detects water on the screen. It then takes action to address: an alarm is issued, coordinate output is stopped until the water is wiped off (or limits it to one point), and malfunction prevention functionality is implemented. DUSx200 series is a suitable solution for industrial applications in rainy environments such as mobile terminals used at construction sites. DMC does still recommend equipment using DUSx200 series incorporate a housing design to prevent water from getting inside the equipment and associated additional consequences.

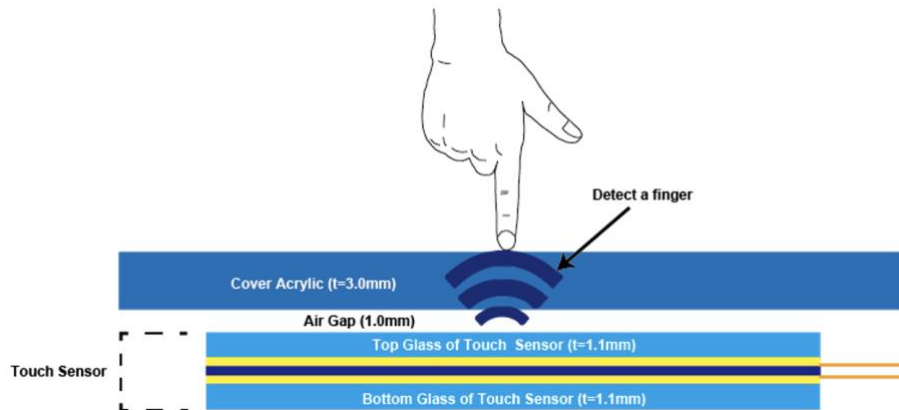
Impact resistant solution

Traditional projected capacitive methods struggle to balance impact resistant and touch sensitivity. DMC's projected capacitive touch controllers can detect touch through glass or acrylic covers by increasing sensitivity. This creates a unique design opportunity for a shock-resistant interface: simply install an acrylic cover that is harder to break than glass in front of the touch screen with a gap. Now the challenge: the thicker the cover, the higher the sensitivity is required. Since acrylic and air (gap) have a lower dielectric constant than glass, even higher sensitivity is required.

But if you increase the sensitivity too much, it will be more susceptible to ambient noise. DMC's touch controller will address the need, and provide the right sensitivity response and balance.

The DUSx200 touch controller has an ability of sensitivity adjustment with an air layer of 1 mm and an acrylic thickness of 3 mm as an impact resistant solution.

Figure 5 Impact resistant interface (1mm air layer + 3mm thick cover acrylic)



Conclusion

When developing a touch screen interface, one must implement design and evaluation tests that account for the variables of the usage environment. DMC has innovated touch screen technology for more than 30 years. If you are considering using the touch screen in a harsh environment, we recommend that you consider DMC's touch screen for best performance of your equipment when subjected to adverse temperatures, UV rays or water.

Reference

The robust projected capacitive touch screen link is [here](#)

Please feel free to contact [us](#) if you have any questions

Contact information

USCO America Inc.

sales@uscoamerica.com

<https://www.uscoamerica.com>

USCO America Inc.
Challenge Today for an Exciting Tomorrow