

HOW TO CHOOSE
THE BEST
RUGGED DISPLAY
SCREEN



How to Choose the Best Rugged Display Screen

Oil exploration and refining, mining, transportation, marine, military, and aerospace are a disparate group of industries. One thing they all have in common is that the environments in which they operate are often extreme, hostile, or otherwise challenging.

To work in these types of environments, you need equipment that is up to the task. Technology, notably computers and displays, are notoriously delicate objects; that is where rugged and ruggedized components come in, though there is an important distinction to make between the two.

Rugged vs. Ruggedized

You'll see all manner of products labeled as either "rugged" or "ruggedized," and it can sometimes be difficult to tell the difference between the two terms.

Strictly speaking, ruggedized technology refers to devices that have been upgraded from their original form to be made more resistant to certain external events and conditions. For example, a ruggedized laptop is likely to be exactly the same as a standard laptop, except for the addition of a more robust casing and perhaps a waterproof keyboard. Ruggedized devices are often marketed at "semi-rugged".

This level of ruggedization is a decent start but still remains limited. The laptop would be protected from small bumps and drops, but not from larger impacts or situations of high pressure; a spilled beverage won't damage it, but full submersion will destroy it. Ruggedization also fails to consider additional environmental factors such as vibration, temperature, and more damaging effects. This is where true rugged technology comes into play.

For a device to be considered properly rugged, it will have been designed from the ground up explicitly to maximize protection against water, sand and dust, extreme temperatures, drops, shocks, and vibrations. Fully-rugged or "ultra-rugged" devices are entirely unique from ruggedized and "semi-rugged" devices.

What Makes Rugged, Rugged

As of today, there is not yet a standardized definition of rugged or different levels of ruggedization. There are, however, two value sets commonly applied to rugged devices — the Ingress Protection (IP) Code and United States Military Standard (MIL-STD) 810.

The IP Code — officially ANSI/IEC 60529, Degrees of Protection provided by Enclosures — is a rating of enclosures of electrical devices. Specifically, they rate the protection against intrusion by body parts, water, dust, accidental contact, and other substances that is offered by an enclosure. IP Code ratings



are complex and multifaceted but, generally speaking, the higher the number the better the protection offered.

MIL-STD 810 — officially Environmental Engineering Considerations and Laboratory Tests — is the United States Military's guide for laboratory testing to which equipment must be subjected. The proscribed tests are designed and chosen to represent the most extreme environmental conditions to which a device could be exposed during its service life.

Because of the range of factors that MIL-STD 810 requires be tested, that assessment is considered to be the best gauge for judging rugged devices in lieu of ruggedization level standardization. In its latest revision, released in 2012, MIL-STD 810 lays out acceptable testing procedures and results for a wide range of environmental factors, including: altitude, temperature extremes and shocks, water and other liquids, sand and dust, acid, drop, shock, vibration, gunfire, humidity, acoustics, impacts, and many others.

Factors in Rugged Devices

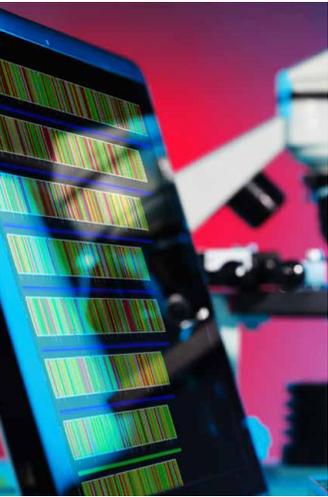
Rugged devices are not generally designed to fulfill every single MIL-STD 810 recommendation. Rather, they are designed based on their intended applications and the types of environmental factors a device is likely to encounter when used in those applications. Each application will present a unique set of circumstances and environmental considerations.

Though conditions vary on an application by application basis, there are several core environmental factors that come up regularly. Operating temperature, vibration resistance, drop and shock resistance, and pressure resistance are common considerations found across industries.

The following are some common industry applications and the environmental factors that must be considered for rugged devices used in them.

Transportation — Vibrations are always a concern in the transportation industry, especially for mission-critical components, such as the displays in the operational controls in the driver's compartment of a locomotive. Also of concern are the operational temperatures, as trains spend their lifetimes outdoors and exposed to the elements.

Aerospace — As with locomotives, vibrations and temperature are major concerns when designing rugged computers and displays for use in the aerospace industry. Device functionality at altitude must be considered for obvious reasons. Additionally, operating at high altitudes above cloud level and in thinner atmosphere, sunlight becomes a major consideration in avionics components — displays must be readable in high-glare scenarios.



Marine — Like other transportation sectors, vibration is a primary rugged computer and display design consideration. Because of its nautical nature, fluid contact, fluid immersion, humidity, mold, and fungus are all additional concerns.

Mining — In mining equipment, vibrations are an important concern even more so than in aerospace or transportation due to the increased severity of the vibrations encountered. Shock, generally a lower level consideration in transportation applications, is also important in mining applications due to the threat of falling rocks.

Petrochemical — Vibrations and shock are considerations in the petrochemical industry, including oil exploration, as well. Additional considerations include drops and, importantly, fluid immersion.

Military — Because military applications span so many different sectors, rugged devices designed for this use must consider a very wide range of environmental factors. Common considerations, such as vibration, drops, fluid contact and immersion, all remain. Because of the unique nature of work in the military, however, a number of additional considerations must be considered. These include weather factors such as rain, freezing rain, ice storms, and dust storms, as well as combat-related factors such as gunfire shock, ballistic shock, explosive shock, explosive atmospheres, and other conditions unique to warfare.

Comparing Your Options

Though the factors listed above cover a range of conditions, they merely scratch the surface of what must be considered when selecting or designing rugged computers and displays. Over the past 25 years, ICP America has worked closely with clients in a number of different industries designing rugged displays and building an expert knowledge base.

To learn more about our rugged displays and panel PCs, visit our [LCD Products](#) page. Alternatively, [contact us](#) today to discuss your project and learn if a custom rugged display is right for you.