

Well-Made Electrical Enclosures Go the Distance for Harsh Environments



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Introduction

Although enclosures are often approached as a less important aspect of your electrical and electronic system, these critical components can mean the difference between long life and early failure if not selected properly—and this is especially true in harsh environments.



All of your important electrical/electronics are contained inside your enclosure, including (but not limited to) fiber optic devices, routers, switches and power supplies; all your interface wiring and connectors; and anything else that might be part of your system. It quickly becomes apparent that enclosures play a critical role in protecting your devices and components against the elements, including high or low temperatures, moisture and humidity.

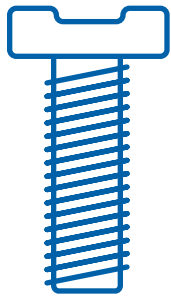
Engineers fully understand that overheating and moisture are two of the greatest threats to the life expectancy of equipment that needs protection. The wrong enclosure can lead to everything from electrical shock to users to long-term damage to components and complete system failures. This white paper will explore and discuss some of the important aspects to selecting the best enclosure for your applications—particularly outside and harsh environment applications.



Materials Can Make a Difference

Outdoor enclosures particularly are subject to harsh weather conditions and must be built from high-quality materials—in an innovative design—to ensure long-lasting enclosure life. High-quality polycarbonate has proven itself as an optimal material to protect against most environmental influences, including UV and highly varied weather conditions; such as rain and snow (moisture and humidity); and heat and cold (from -35°C to 80°C). Even when installed around corrosive environments such as aggressive atmospheres, oils or greases, polycarbonate enclosures are often a good choice.

Polycarbonate is a very durable material which also provides resistance against a list of mechanical stresses, including high-impact resistance (to IK 09 standards), low-scratch resistance and shatterproof safety, particularly geared toward user safety. Polycarbonate enclosures offer users a lightweight material that delivers on a wide variety of fronts as mentioned. Although designed for outdoor use, it excels when used in harsh indoor applications as well.



Mounting Your Enclosures

Enclosure mounting has always been an issue over the years because enclosure selection was typically something done near the end of the design cycle, placing limits on where and how it is to be attached. Enclosures should be available to be either wall mounted or pole mounted. When wall mounting, be sure that the hole mounts are outside the lid seal area so that you do not compromise the integrity of the enclosure to moisture or harsh atmospheric conditions of the area, which may introduce challenges to your equipment operation. An example might be Altech's mounting channels in the corners of the enclosure, or its optional external mounting features. For pole mounting, accessory kits are available for poles of 2.4 in. to 8.3 in. in diameter.

Mounting options inside the enclosure are such an important aspect of your enclosure selection that engineers should be sure that accessories that fit the needs of their application be available. These include standard DIN rails, mounting plates, front panels and dividers that can be installed, such as Altech's tool-less mounting system available for its GEOS enclosure system (Fig. 1).

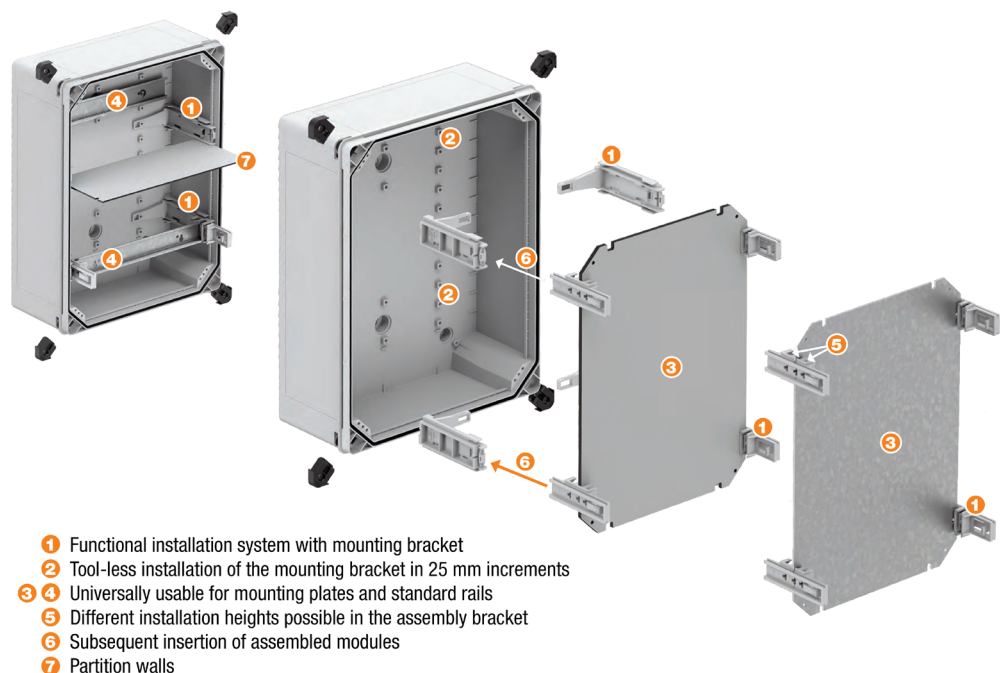


Fig. 1 Modular component mounting features.



Accessories for the system can be attached to mounting brackets at 25 mm location points and varying installation heights, then slid into the enclosure easily for preassembly. Ultimately, a flexible enclosure will be modular and provide a variety of installation possibilities to fit a wide variety of applications.

Certifications and Ratings are Important

It is always important to make sure your enclosure choice has the technical ratings you need, but also the required certifications and ratings that are required by your application or location. This means considering where your equipment might be sold into. Different countries require different certifications, so if you expect your system to be purchased and installed out of the country, be sure your enclosure (along with other components) have the proper certifications.

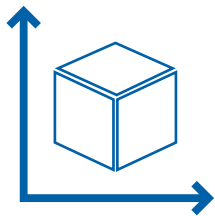
Certifications you might need include VDE, UL 50, IEC 62208, IEC 61439 and CSA 22.2. IP ratings are also required for outdoor enclosures particularly. IP ratings are comprised of two numbers: the first number ranges from 0 to 6 and is used to measure the degree of protection of the device against solid object such as dust, dirt, sand and other debris. A 0 rating means that the device is not protected from solid debris, while a 6 rating indicates that the device is highly secured from solid objects (even those as small as powder and dust). The second number, ranging from 0 to 9, indicates the amount the device is protected from liquids.

Again, a 0 means there is no protection from liquids and a 9 shows that the device can withstand high pressure jets at high temperature. The IP67 rating—as well as IEC 62208 and IEC 61439 international compliance—of Altech's GEOS series enclosures means they are dust-tight and short-term immersible in water.

A key feature of the GEOS includes a unique “Drain Protect” design with a sealing system that is engineered to prevent the ingress of a wide variety of harmful contaminants, including everything from moisture to dust in hot and cold temperatures to oils and greases that can be found in so many industrial applications. This unique design diverts moisture to the back side of the enclosure by using an overlapping cover with a built-in drainage channel along the top edge of the enclosure.

Drain Protect helps to keep the housing tight and dry in accordance with UL Type 4X and 12K standards by discharging water from around the lid before moisture can reach the enclosure’s elastomer seal. These enclosures are also available with drainage holes on all the sides of the box base. Such models allow for the drainage holes to be opened if necessary, before or after installation.

UL has developed testing standards for electrical enclosures to assure safety, compatibility and proper function of electrical products. GEOS enclosures have been UL approved for use in the U.S., Canada and Europe, and carry UL Type 4X and 12K ratings.



Features and Benefits to Watch For

When selecting an enclosure for outside use, be sure that it is available in a size that allows for growth, whether you select a modular system or a system that comes in a variety of sizes that you can grow into. We recommend choosing an enclosure that might allow for a variety of internal heights and widths and comes with an assortment of accessories to provide a certain amount of flexibility through customization.

Along these lines, users may notice condensation problems when using sealed enclosures in environments with varying temperature and humidity. This is because air can hold only a certain amount of water vapor at a certain temperature and a certain pressure. The higher the temperature and the higher the air pressure, the greater the maximum possible water content.

For example, at a temperature of 55°C the air can hold only 20% of the water at a temperature of 20°C. It is easy to imagine that a lot of devices and wiring, during operation, can easily become higher than 55°C. This warmer air in the enclosure gradually absorbs the water vapor contained in the ambient air. If the outside temperature falls, then the outer walls of the enclosure cool down. Once the dew point temperature is reached, the water vapor contained in the air condenses on the inside of the enclosure as condensate and collects in the box—which can adversely affect the electrical ratings of the enclosure.

Another concern is the electrical environment your enclosure will be exposed to. Be sure that you double-check the enclosure specifications while considering any adjustments that you anticipate in the future. Enclosures such as the GEOS line provide the ability to operate in electrical networks with a rated voltage of up to 1,000 VAC/1,500 VDC, where a prospective short circuit current (Icp) does not exceed 10 kA—for higher Icp consider a current-limiting protection device.



Fig 2. The GEOS enclosure cabinet is available with a hinged door for fast access while maintaining safety to employees. Doors can be solid or transparent so that alarms can be seen without opening the enclosure.



While most enclosures offer easy-to-remove face plates, companies like Altech have designs where the cover can incorporate a hinged door (Fig. 2) while maintaining many of the features of their standard line of enclosures. The hinged door is attached to the frame in a horizontal or vertical layout depending the requirements of the application, and open at an angle of up to 180 deg. For locking the enclosures, hinged GEOS Cabinets use a cam lock system.

Units offer transparent and gray doors in three base sizes and up to two enclosure heights. This feature allows the enclosure to be opened quickly and easily, and closed safely when not needed. The hinged door does not restrict the assembly of any internal fittings whatsoever and are easily removed or reversed. Accessories available include front plates, internal swing doors, contact protection modules, door stops and more.

Always Consider Your Specific Application

We've mentioned this repeatedly because it's important: You must maintain a clear focus on the specific needs of your application, both now and for future potential. Enclosures made for electrical installations in harsh environments and outdoor use can provide protection for notable applications such as those found in the solar and wind power industry; for large plant or building heating and air conditioning controls; and industrial applications such as the food and beverage industry, where washdowns are a standard operation.

A consideration for users of outdoor enclosures is often brand related. When making a purchase, be certain that the enclosure company offers options for applying branding elements such as hot embossing, screen, pad, digital printing or laser marking, as well as milling options for cable entries and connectors.

Summary

In summary, while an enclosure may be considered one of the simplest of electrical components to specify, it is extremely important that it's designed properly. Although engineers can find extensive choices available in the market, the challenge is in knowing which electrical enclosure is right for their given application. Every application is subject to its own operational nuances, which means that you might want to be able to customize your enclosures under certain conditions.

If you choose to work with a company that offers customization opportunities, you'll save a lot of time and effort. Perhaps you'll want to consider those companies that can customize the enclosures they sell by offering milling and printing services.

But it's not just the outside of the enclosure that typically needs to be specialized: Some applications lend themselves to external mounting, while others will need to be mounted from the inside. You may also want free choice between screw and quick-release closures, and between screw-on panels and hinged doors. Finally, look for a company that provides a wide variety of enclosure sizes, with different heights, base sizes, and opaque or transparent cover options.

Optional Patented Ventilation System

An optional, patented air ventilation element can be incorporated into GEOS enclosures to prevent condensate water while maintaining a high IP65 level of protection. Although this option can de-rate the enclosure once you put vents in it (rated UL Type 3R), it may be a necessary addition to make sure your electronics are safe from damage. Through the use of a continuous and high rate of air exchange, condensation is kept out of the enclosure. The continuous and high rate of air exchange allows the interior air to mix constantly with the environmental air and transports the moisture outwards. This air exchange takes place even in environments with almost constant air humidity and temperature changes.

The interior of the enclosure heats up from component use and, due to the permanent pressure equalization, all enclosure parts (including the seal) are permanently relieved of pressure. The system also provides 100% protection against foreign bodies entering the enclosure for maintenance-free operation.

