

ELECTRONIC PRODUCTS



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Selecting portable/ handheld enclosures

Materials, construction, and a host of customized features are available to accommodate your design

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The ongoing miniaturization of electronic components, including mobile phones, PDAs, pagers, instruments, and remote controls, has resulted in an increased demand for handheld enclosures. Between off-the-shelf and customized handheld enclosures, many choices of style, material, color, finish, and size are available.

ENCLOSURE MATERIALS

Property	ABS Plastic	Polycarbonate Plastic	Aluminum Alloy A380
Impact resistance	Good	Excellent	Excellent
Service temperature (°C)	-20 to 65	-35 to 120	450 max
UL flammability rating (UL 94)	HB	V-2	Nonflammable
Dielectric strength (Volts/Mil)	400	430	Not applicable
Resistance to:			
Acid	Good	Good	Poor
Alkali	Good	Poor	Fair
Organic solvents	Poor	Poor	Excellent
Gasoline	Poor	Poor	Excellent
UV resistance	Poor	Good	Excellent
Transparent material	Not available	Available	Not available
Cost	Less	More	High

Note: Property values may vary for different brands of proprietary materials. Consult manufacturer for exact values.

Materials

The most common materials used for handheld enclosures are plastic and aluminum (see table). ABS and polycarbonate plastic are used for most applications for economy. Die-cast aluminum is used for applications requiring higher strength, rigidity, and high EMI/RFI protection.

joined together by screws, which are generally inserted from the bottom or occasionally from the top.

Construction

Most handheld enclosures are constructed in two basic styles: traditional and clamshell. Traditional two-piece designs consist of top and bottom shells

Clamshell designs consist of four pieces: top and bottom shells, as well as front and rear panels. The front and rear panels are captivated between the top and bottom shells, which are joined together with screws. Both top and bottom shells could have molded-in guides and mounting bosses for components and circuit boards.



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The traditional design is comparatively less expensive and easier to seal with a gasket. The clamshell design provides more flexibility in locating and accessing components. Clamshell designs also allow front panels to be made of a different material, color, or transparency, but they are more difficult to seal environmentally.

Handheld enclosures are available in a variety of shapes, including rectangular, T shape, round, and cylindrical. The actual shape depends on the individual application.

Shielding/environmental sealing

Many designs also have gaskets that provide environmental sealing to meet NEMA and UL specifications. Gaskets are typically constructed of EPDM, neoprene, or polyurethane materials, depending on the application.

For low-volume applications, extruded gaskets offer the most economical solution. They are cut and assembled into the molded grooves on the enclosure's mating edges.

Many manufacturers have begun using form-in-place gaskets. Most form-in-place gaskets use a two-component polyurethane resin, although a one-piece-molded unit that fits the shape of the box may be the most economical method for larger quantities.

For EMI/RFI shielding, diecast aluminum enclosures offer the best protection. However, less-stringent applications can use plastic enclosures coated with conductive paint. The paint usually contains nickel, copper, or silver powder, depending on the desired conductivity level. Nickel is most common, least expensive, and least conductive, while silver is reserved for high-end applications, most expensive, and most conductive.

For EMI/RFI applications, the gasket material needs to be conductive, too. Many gasket suppliers provide conductive gaskets impregnated with carbon or silver particles. Gaskets having a wire-mesh jacket can also be used with metal enclosures.

Features

Manufacturers offer many versions of handheld enclosures with built-in features such as guides for circuit boards, mounting bosses, compartments for a variety of batteries, insert-molded areas on the exterior face for labels and decals, and cutouts for displays. Some manufacturers, such as Bud Industries, offer a secondary CNC machining service for adding custom holes, cutouts, silk screening, pad printing, and EMI/RFI shielding.

The industry's most common colors are black, gray, and off-white. If the design requires custom colors, it is best to choose a Pantone or RAL color number. While most plastic materials can use customized colors, such colors may require minimum buys and longer lead times.

Exterior surfaces of most plastic enclosures have fine texture finishes that prevent and hide scratch marks and other minor imperfections. The interior surfaces are normally smooth.

Die-cast aluminum enclosures normally have smooth surface finishes that can be further treated with chemical conversion coatings such as iridite or alodine. These treatments are generally applied to enhance corrosion resistance and adhesion of paint or powder coating.

When selecting a handheld enclosure, it is wise to select a manufacturer who has a variety of styles and optional features available in their standard line so that prototypes can be quickly made with add-on custom features to meet your exact need before production quantities are ordered. Manufacturers who can also provide the custom modification should be preferred for dimensional accuracy and one-stop shopping.



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