

The Selection Process of an Enclosure



Apart from the style, image, price, service, quality and reputation of the organisation, this report shows what needs to be taken into consideration when selecting an enclosure. Design engineers should choose the enclosure first and then select the electronic and mechanical components to suit the enclosure.

The Material

The two main choices are between plastic (ABS, Polycarbonate, Polyester) enclosures and metal (aluminium, stainless steel) enclosures. Plastics are normally light weight, have flexibility in design, higher functionality, better insulation and radio frequency permeability. Metals have greater mechanical strengths, better resistance against ultraviolet (UV) radiation, a wide temperature range as well as EMC characteristics. Chemical resistance may also be required but this will depend on the type of material and coating used.

Plastics are used in electronic applications and metals are used in industrial applications.

Environmental Considerations

From airborne debris, temperature and UV rays, environmental elements can have a significant impact on how an enclosure will perform over many years of operation. For example, a fiberglass enclosure exposed to direct sunlight for several years will likely experience fiber-bloom and a mild steel enclosure will rust in wet or corrosive environments. Stainless steel may also rust if sprayed with salt. To prevent these problems, customers must take into consideration whether the enclosure will be located indoors or outdoors (a pressure compensation gland may be required for outdoor applications), the weather, UV and harsh chemical sprays. Customers should also evaluate if the enclosure will be located in a highly active environment, such as heavy industrial equipment or an electronic device where the enclosure is frequently used. Different materials offer varying degrees of impact resistance, and both plastic and metal enclosures are available with options to provide easy access to the enclosed components.

Electromagnetic Compatibility (EMC)

Electromagnetic compatibility (EMC) refers to a characteristic which is normally required. It aims to ensure that equipment items or systems will not interfere with each other as a result of undesirable electrical or electromagnetic influences. Plastic enclosures often have low EMC characteristics where as metal enclosures has high EMC characteristics.

This means that a metal enclosure should be used when electromagnetic compatibility is very important. Although enclosure manufacturers may offer processes to optimise the EMC characteristic of a plastic enclosure to the level of a metal enclosure.



The Ingress Protection (IP) Rating

Many applications require electrical and electronic equipment to work safely and reliably for many years under difficult environmental conditions. The ingress protection classification DIN EN 60529 supports protection against accidental contact and foreign bodies as well as protection against water. The IP categories specify the extent to which the surface of the enclosure is closed and is protected from dust and water. The letters IP (ingress protection) is followed by a two-digit number.

The first digit indicates the level of protection against accidental contact and foreign bodies:



FIRST DIGIT: Solids			SECOND DIGIT: Liquids		
Level	Object Size	Effective against	Level	Object size protected	Effective against
0	Not protected	No protection against contact and ingress of objects	0	Not protected	–
1	>50mm	Any large surface of the body, such as the back of the hand, but no protection against deliberate contact with a body part.	1	Dripping water	Dripping water (vertically falling drops) shall have no harmful effect.
2	>12.5mm	Fingers or similar objects.	2	Dripping water when tilted up to 15°	Vertically dripping water shall have no harmful effect when the enclosure is tilted at an angle up to 15° from its normal position.
3	>2.5mm	Tools, thick wires, etc.	3	Spraying water	Water falling as a spray at any angle up to 60° from the vertical shall have no harmful effect.
4	>1mm	Most wires, screws, etc.	4	Splashing water	Water splashing against the enclosure from any direction shall have no harmful effect.
5	Dust Protected	Ingress of dust is not entirely prevented, but it must not enter in sufficient quantity to interfere with the satisfactory operation of the equipment; complete protection against contact.	5	Water jets	Water projected by a nozzle (6.3mm) against enclosure from any direction shall have no harmful effects.
6	Dust Tight	No ingress of dust; complete protection against contact.	6	Powerful water jets	Water projected in powerful jets (12.5mm nozzle) against the enclosure from any direction shall have no harmful effects.
			7	Immersion up to 1m	Ingress of water in harmful quantity shall not be possible when the enclosure is immersed in water under defined conditions of pressure and time (up to 1 m of submersion).
			8	Immersion beyond 1m	The equipment is suitable for continuous immersion in water under conditions which shall be specified by the manufacturer. Normally, this will mean that the equipment is hermetically sealed. However, with certain types of equipment, it can mean that water can enter but only in such a manner that it produces no harmful effects.



The Impact Protection (IK) Rating

Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts in accordance with IEC 62262:2002 and IEC 60068-2-75:1997.

IK01	Protected against 0.14 joules impact. Equivalent to impact of 0.25 kg mass dropped from 56 mm above impacted surface.
IK02	Protected against 0.2 joules impact. Equivalent to impact of 0.25 kg mass dropped from 80 mm above impacted surface.
IK03	Protected against 0.35 joules impact. Equivalent to impact of 0.25 kg mass dropped from 140 mm above impacted surface.
IK04	Protected against 0.5 joules impact. Equivalent to impact of 0.25 kg mass dropped from 200 mm above impacted surface.
IK05	Protected against 0.7 joules impact. Equivalent to impact of 0.25 kg mass dropped from 280 mm above impacted surface.
IK06	Protected against 1 joules impact. Equivalent to impact of 0.25 kg mass dropped from 400 mm above impacted surface.
IK07	Protected against 2 joules impact. Equivalent to impact of 0.5 kg mass dropped from 400 mm above impacted surface.
IK08	Protected against 5 joules impact. Equivalent to impact of 1.7 kg mass dropped from 300 mm above impacted surface.
IK09	Protected against 10 joules impact. Equivalent to impact of 5 kg mass dropped from 200 mm above impacted surface.
IK10	Protected against 20 joules impact. Equivalent to impact of 5 kg mass dropped from 400 mm above impacted surface.

Dimensions

The internal and external dimension of an enclosure is extremely important when developing a new piece of equipment. In many cases the printed circuit board is chosen first and this makes it difficult for the design engineer to source the best enclosure solution.

Modification of Standard Enclosures

There are many ways of designing enclosures to meet customers' individual requirements. The enclosure manufacturer may support modification with added value services that include milling, drilling, cutting and sawing. They may also provide a service to fit membrane keypads, front membranes or displays on the enclosure as well as a complete solution. There are various enclosure accessories such as decor seals and decorative stripes that can also make a considerable difference to the design and look of a standard enclosure.

If the customer wants the enclosure to have colours of the company's corporate image, then a water transfer process can be applied or the enclosure can also be lacquered.

Ease of Assembly

An important point to consider when selecting an enclosure is how easy it will be to fit the components. A complicated design and construction may make it difficult to assemble electronic and mechanical components in the enclosure.

This problem can be avoided by using enclosures with a snap lock or quick-release fastening. Some enclosure manufacturers may also provide a fitting and assembly service and support the customer with a system solution including testing. The customer will provide the printed circuit board including components and the enclosure manufacture will produce the final product.

