

**Product Guide** 

# THE ULTIMATE GUIDE TO PCB HARDWARE

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MAKING IT EASIER

## HELP FOR CHOOSING THE RIGHT **PCB HARDWARE**

When designing data cabinets, home appliances, office equipment, cable junction boxes or anything that involves electronics, PCB hardware are integral components for your project. This guide will help you understand the different components that can enhance the performance of your printed circuit board design.

We strongly recommend that you try the printed circuit board hardware you need before you buy-request **free samples** so that you can ensure they're right for your application. You can also download **free CADs** to help with your design.

## WHAT YOU NEED TO KNOW

In the following sections we have provided information on the different types of PCB hardware, materials, and applications that you might need to consider.



## HARDWARE BY APPLICATION

A good starting point is to see what solutions are commonly used for certain applications.

- ݣֵ֫ Solutions	Consumer Electronics & Office Machinery	Consumer Appliances	Data Cabinets	Electrical Cabinets	Automotive
PCB supports	0	Ø	۷	ø	٢
PCB standoffs and spacers	ø	Q	Ŭ	۷	ø
Card guides, ejectors and pullers	ø		ø	٢	
PCB mounting block	ø	Q	Ŭ	۲	ø
PCB fan accessories	ø	Q	ø	٥	۷
PCB LED hardware	Ø	ø	ø	۲	ø
PCB grommets	٢		٢	ø	ø

## PCB HARDWARE COMPONENTS

Before choosing your hardware, you might find it helpful to read **How to ensure a smooth PCB assembly**. The information could help you decide which components you should use. Otherwise, here's a look now at the hardware you need.



# PCB SUPPORTS

PCB supports, also known as PCB support pillars and PCB support posts, do what the name says: they support the mounting of a PCB. They do this by joining your PCB board to the required surface. They also add an element of insulation and protection from electrical transmission, while providing a more secure, stable hold. For materials, you can choose between plastics and metal. Plastics make your PCB lighter, and you might prefer the ease of installation that most of these supports offer.

Mounting options vary, and include **adhesive**, **edge locking**, **reverse locking**, **screw locking** and **snap lock**. Here's a look at the primary categories:

## **MOUNTING TYPES**



## THREADED

**1. Standard:** Held in position with the use of a nut to give a very secure fixing that can be released and re-tightened.

**2. Undercut:** Provides a more secure connection by being fixed into the thread.

**3. Self-tapping:** No closing washers or nuts necessary due to self-tapping thread.

#### **SNAP LOCK**

Pushes into a panel or chassis hole, giving a secure but easily releasable fix.



#### SNAP FIT

Quickly pushes into a panel or chassis hole, giving a strong but efficient mounting that saves you time when undergoing installation.

DIFFERENT TYPES AVAILABLE:

Edge lock, bayonet and fir tree.

#### PRESS FIT/BLIND HOLE

Fins hold securely to a range of binding holes with a painted style that drives easily into applications with space restrictions.

#### **ADHESIVE BASE**

Adhesive tape eliminates the need for a mounting hole, providing time and space efficiencies.

## **EXAMPLES OF PCB SUPPORTS INCLUDE:**

Need: Fast and easy installation

## Solution: EDGE LOCKING SUPPORT -RIVET MOUNT

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## Why?

- Double-sided adhesive backed PCB support
- Release tab for quick installation
- Locks onto board, but is releasable with a pinch
- Nylon
- Rated UL94 V-2
- Operating temp range: -40°F to 185°F (-40°C to 85°C)

Need: Easy installation for more mechanical strength

## Solution: PCB SUPPORT PILLARS -LOCKING/TEARDROP/ THREADED MALE

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#### Why?

- Threaded male end mounts securely with a hex nut
- Top end has a small, low-profile, snap-lock teardrop nose that holds the PCB in place
- Nylon 6/6
- Rated UL94 V-2
- Operating temp range: -40°F to 185°F (-40°C to 85°C)

Need: Connect multiple boards or when back of the panel is not easily accessible

## Solution: PCB SUPPORT PILLARS -TWO-PRONG SNAP-LOCK/ TWO-PRONG SNAP-FIT

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- Mounted on both sides with a low profile two-prong fastener
- One side is locking and the other is a releasable snap-fit
- Available in a variety of styles
- Nylon 6/6
- Rated UL94 V-2; can also be produced as a custom part in UL94 V-0
- Operating temp range:
  -40°F to 185°F (-40°C to 85°C)



# PCB STANDOFFS AND SPACERS

PCB standoffs and spacers help maintain space and positioning of components within your PCB. Both can have the same shapes. You can get a hexagonal standoff or a hexagonal spacer. You can also choose a round standoff and round spacers.

So what exactly is the difference? Spacers are unthreaded, with a through hole. Standoffs are threaded on both ends and come in both male and female designs. Sometimes you'll see the description "threaded round spacer". This is a standoff, because it's threaded. The bottom line is, they have the same purpose. The difference is in whether or not they're threaded.

## MATERIALS: PLASTIC, METAL OR CERAMIC?

Materials vary. Use ceramic spacers for extremely high-temperature applications. PCB plastic spacers, such as a Nylon PCB standoff, offer good corrosion resistance and are cost-effective for mass production, while still having good mechanical properties. They're also the preferred choice over metal if you need a lightweight alternative.

## EXAMPLES OF PCB STANDOFES AND SPACERS INCLUDE:

Sturdy, insulated spacing for Need: high-power electronic applications

## Solution: PCB STANDOFFS - ROUND/ METRIC THREADED/INSULATOR/ **NYLON & BRASS**

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## Why?

- Female to female threaded round standoffs
- No assembly equipment required apply by hand
- High mechanical strength
- Metric Nylon standoffs with brass inserts
- Nylon 6/6
- Rated UL94 V-2
- Operating temp range: -40°F to 185°F (-40°C to 85°C)

Need: Good isolation for the fastenina screw

## Solution: PCB SPACER - NON-THREADED/ **ROUND/THROUGH**

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### Why?

- Non threaded spacer
- Round spacers available in: - Nylon 6/6, operating temp range: -40°F to 185°F (-40°C to 85°C), UL94 V-2
  - Heat Stabilised Nylon, black, UL94 V-2, operating temp range: -40°F to 257°F (-40°C to 125°C)
  - Impact Modified Nylon, UL94 V-2, operating temperature range: -40°F to 149°F (-40°C to 65°C)
- Acetal, UL94 HB, max operating temp: Up to 203°F (85°C)
- PVC, UL94 V-0, operating
- temp range: 32°F to 122°F (0°C to 50°C)
- Polystyrene, UL94 HB,
- max operating temp range Up to 167°F (75°C)

Need: Sturdy, insulated spacing for high-power electronic applications

Solution: PCB STANDOFFS - ROUND View online ☑

### Why?

- Male round standoff spacers
- Installed by hand: no assembly equipment required
- Ideal when high mechanical strength is needed
- Round Nylon standoffs with brass inserts
- Available as male/female hexagonal standoff insulator
- Rated UL94 V-2
- Operating temperature range: -40°F to 185°F (-40°C to 85°C)



#### Need: Easy installation

## Solution: PCB STANDOFFS - HEXAGONAL/ THREADED/SELF-TAPPING

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## Why?

- Hexagonal female, with through hole
- Self-tapping standoff-screw threads the plastic for strong hold
- Nylon 6/6
- Rated UL94 V-2
- Operating temperature range: -40°F to 185°F (-40°C to 85°C)

YOU CAN LEARN MORE ON HOW TO CHOOSE YOUR PCB SPACER FROM OUR **GUIDE, THREE TOP TIPS FOR SELECTING** PCB SPACERS.

YOU CAN ALSO LEARN MORE FROM OUR VIDEO HERE.



# CARD GUIDES

PCB card guides are used to mount circuit boards in tight spaces. One example of this is a PCB rack. Use a PCB vertical card guide or a horizontal one depending on the mounting direction of PCBs in your application. Card guides are often used to save space and prevent boards from bending. They're easy to install and some come with adhesive backs while others give you a locking action. Both give your PCB more stability. In addition, some options help when your PCB needs protection against shock and vibration.

## **EXAMPLES INCLUDE:**

Need: Stand up to shock and high vibration

## Solution: PCB CARD GUIDES - HORIZONTAL/ SNAP-IN/DEEP CHANNEL

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## Why?

- Horizontal card guides Nylon 6/6
- Allows for maximum PCB retention
- Accepts PCB thicknesses: 1/16", 3/32" and 1/8"
- Rated UL94 V-0
- Operating temperature range: -40°F to 149°F (-40°C to 65°C)

Need: Added stability

## Solution: PCB CARD GUIDES -VERTICAL/SNAP-IN/LOCKING

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## Why?

- Vertical mount PCB card guide
- Snap-in locking tabs hold board in place more securely
- Tension guides with double channel enable side-by-side mounting
- Nylon 6/6
- Rated UL94 V-2
- Operating temperature range: -40°F to 185°F (-40°C to 85°C)

Need: Added stability for parallel mounting

## Solution: HORIZONTAL CARD GUIDES -ADHESIVE/NO MOUNT, SLIDE-IN, DUAL-SIDED

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## Why?

- Adhesive backed
- Plastic PCB card guides-PVC
- Horizontal mount for boards of any length or width
- Rated UL94 V-0
- Operating temperature range: 32°F to 122°F (0°C to 50°C)

# CARD EJECTORS AND PULLERS

A card ejector, also known as a puller, inserter and extractor, is fitted to relieve stress to the PCB and its circuitry by helping to remove the card from restricted spaces. It's mounted onto the board itself, providing a handle, so that a technician can pull out the board, avoiding the circuitry. In essence, a card ejector performs as a lever. It uses mechanical force against a guide rack or chassis.

A circuit card puller attaches to a PCB to help pull it out and push it back into position. These are used when you're facing difficult insertion and extraction problems, which means you're probably dealing with having to remove large PCBs and tight-gripping multi-pin edge connectors.

## EXAMPLES OF CARD EJECTORS AND PULLERS INCLUDE:

Need: Ease of pulling out board and pushing back in

### Solution: PCB CARD PULLERS

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### Why?

- Attaches to circuit board
- Curved tab for fingertip grip
- Nylon 6/6
- Rated UL94 V-2
- Operating temperature range: -40°F to 185°F (-40°C to 85°C)



Need: Aid in removing PCB from restricted space

## Solution: PCB CARD INSERTERS & EXTRACTORS

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## Why?

- Mounted directly onto board
- Handle allows board removal without touching circuitry

### Available in:

- Nylon 6/6, UL94 V-2, operating temperature range: -40°F to 194°F (-40°C to 90°C)
- Glass-Filled Nylon 6/6, UL94 V-0,
- operating temperature range: -22°F to 284°F (-30°C to 140°C

Need: Easy card insertion and extraction

## Solution: CIRCUIT BOARD EJECTOR

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- Optimum leverage to assist in extraction
- Includes roll pin for mounting
- Nylon 6/6
- Rated UL94 V-2
- Operating temperature range: -40°F to 185°F (-40°C to 85°C)

# PCB MOUNTING BLOCK

PCB mounting blocks are used for interconnecting solderless connectors to a PCB. The mounting block provides electrical as well as mechanical connection between the chassis and the board. They're especially useful for mounting printed circuit boards and small panels at right angles within your application. PCB mounting blocks are popular in a variety of industries, including automotive, telecommunications and consumer electronics.

## EXAMPLE OF A PCB MOUNTING BLOCK INCLUDES:

Need: Electrical connection between chassis and board

## Solution: PCB MOUNTING BLOCK

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### Why?

- Nylon PCB mount screw terminal block connector
- Mounts into a #4 or M3 Self-Tapping
- Screw hole on chassis or other PC board
- Rated UL94 V-2
- Operating temperature range: -40°F to 185°F (-40°C to 85°C)



## **DOWNLOAD FREE CADS** AND TRY BEFORE YOU BUY

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Request your free samples or download free CADs now.



# FUSE COVERS

A fuse cover encases electrical fuses, providing insulation and protection from A fuse cover encases electrical fuses, providing insulation and protection from contamination and liquids.

## **EXAMPLES OF FUSE COVERS INCLUDE:**

Need: Snug fit for fuse clips and blocks mounted to PCB printed circuit board

## Solution: FUSE COVERS - QUICK FIT, FLEXIBLE, TRANSPARENT

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### Why?

- Can be used with screws, pin plugs
- and receptacles
- Flexible PVC
- Rated UL94 V-0
- Maximum operating temperature: 221°F (105°C)

Need: Hold and cover fuse

Solution: FUSE COVERS -HOLDER & COVER

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#### Why?

- Can be used with screws, pin plugs and receptacles
- Window in holder enables visual inspection
- Glass-Filled Nylon 6/6
- Rated UL94 V-0
- Operating temperature range: -40°F to 266°F (-40°C to 130°C)

Need: Protect fuse when maintenance is performed on surrounding components

#### Solution: FUSE COVERS - RIGID, SOLID

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- Snaps into fuse and fuse holder
- Window in holder enables visual inspection
- Nylon 6/6
- Rated UL94 V-0
- Operating temperature range: -40°F to 230°F (-40°C to 110°C)



# PCB FAN ACCESSORIES

Fans are your best option for your PCB's heat management. To enhance your fan's safety and efficiency, you'll need the right parts.

## **FAN GASKETS**

One of those parts is a fan gasket, which can provide the noise and vibration insulation you need while preventing air leaks. By sealing the small gap between the fan and the housing, efficiency is improved, feedback airflow is minimized, and with it, losses in air pressure.

## **FAN GUARDS**

Fan guards protect your PCB by preventing dust and water ingress. Materials vary when it comes to fan parts, and that goes for fan guards. For instance, both metal and plastic fan guards are available. Your choice will probably depend on the look and strength you're after, and which option fits your budget. A **metal fan guard** is installed with a screw-mount application. Plastic is a bit more versatile. For example, you can get a **plastic fan guard with a screw-mount application** or one that snaps in.



## MOUNTS

Mounts help position and secure your fan. Anti-vibration rubber fan mounts reduce noise produced by the fan. These type of **fan mounts** are usually made out of an elastomer, such as silicone rubber or Acrylonitrile-Butadiene-Styrene (ABS).

## **FAN RIVETS**

When mounting your fan, you can simplify the process and save time and money by eliminating the need for screws and nuts with **fan rivets. Fan snap rivets** have prongs that expand to hold securely as the pin is driven in.

Another option: **push fan rivets**, which are also easy to install and expand when pushed in for a tight fit. To remove, simply pull the head.



# PCB FAN ACCESSORIES

## **FILTERS**

Filters are another example. Fan filters remove any dust or small particles from the fan's airflow to prevent any internal damage. You can get a metal fan filter – stainless steel and aluminum is one example – or a felt fan filter. Aluminum and stainless-steel filters allow more free air flow, with more dust as well. They're easier to clean than felt, and have a sleeker design. Felt is harder to clean, but keeps the dust out. Also, the felt fan's design takes up more space.

For your convenience, you can also get **fan filter sets**, which provide you with a finger guard, filter cover, mesh filter and felt filter.

## **EXAMPLES INCLUDE:**

Need: Prevent obstruction and debris from falling into fan blades

## Solution: FAN GUARDS, PLASTIC AND SNAP-IN

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### Why?

- Plastic fan guard ABS
- Easy to install with snap-in application
- Fan guard also protects user from bodily harm
- Rated UL94 HB
- Operating temperature range: 32°F to 140°F (0°C to 60°C)



Need: Protection from shock and vibration

## Solution: FAN MOUNTS - RIGID

### View online 🗹

### Why?

- Anti-vibration fan mount-ABS
- Prevents dust ingress
- Easy to install
- Protects user from bodily harm
- Operating temperature range: -40°F to 203°F (-40°C to 95°C)

Need: Protective seal while isolating noise and vibration

### Solution: FAN GASKETS

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### Why?

- Silicone rubber material provides tight seal while reducing transmission of noise and vibration
- Prevents air leaks
- Operating temperature range: -94°F to 302°F (-70°C to 150°C)

## Need: Remove particles suspended in air

## Solution: FAN FILTERS, MESH

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- Stainless steel fan filter mesh
- Operating temperature range: -328°F to 1598°F (-200°C to 870°C)



# LED MOUNTING HARDWARE

LED components, such as LED spacer mounts, position and restrict movement of your LED lights. LED spacers raise the LED from the board surface and provide more stability, rigidity and height conformity. This rigidity and stability make the manufacturing process easier. It's also vital when the board is serviced, or when the PCB or other parts need repairs.

Other critical components include LED mounts and holders. Your LED light mount will have holes to pass the leads through before soldering the LED to the PCB. While through hole LED sizes vary, your LED spacer must have the right number of holes in order to take the leads attached.

For applications where the LED is not mounted directly on the PCB, you'll need an LED lens holder.

You might also need an LED light pipe, which transmits light from the LED mounted on a PCB. LED light pipe technology translates to excellent visual performance, providing uniform lighting. It also significantly reduces shadows and glare. Another big advantage: they're easy to install.

## EXAMPLES OF PCB LED HARDWARE INCLUDE:

Need: Ease in guiding the lead wires and preventing leads from shorting

## Solution: LED SPACERS - ROUND, IMPERIAL SPACERS, MOLDED, T-1 3/4

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### Why?

- Internal tapered dividers guide lead wires, preventing shorting
- Fits a standard T-1 3/4 LED
- Minimizes shifting and height variation
- Nylon
- Rated UL94 V-2
- Operating temperature range: -40°F to 185°F (-40°C to 85°C)



## Need: Mount LEDs at a 90° angle

## Solution: LED MOUNT - 90°ANGLE

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## Why?

- Panel mount LED applied easily by hand
- Available in two styles that accommodate both T-1 and T-1 3/4 LEDs
- Nylon 6/6
- Rated UL94 V-0
- Operating temperature range: -40°F to 248°F (-40°C to 120°C)



## Need: Auto insertion and pre-assembly

## Solution: LED SPACERS - ROUND, METRIC SPACERS

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#### Why?

- Self-retaining feature for auto insertion and pre-assembly
- Available in three different styles to accommodate both T-1 and T-1 3/4 LEDs
- Provides height control and lead wire retention and stability
- PVC
- Rated UL94 V-0
- Operating temperature range: 32°F to 122°F (0°C to 50°C)

#### Need: Transmits light at a 10° angle

## Solution: LED LENS HOLDER

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### Why?

- Holds a standard T-1 3/4 LED
- Available with or without a sealing O-ring
- Polycarbonate
- Rated UL94 V-0
- Operating temperature range: -40°F to 266°F (-40°C to 130°C)



Need: Make illumination crystal clear in desired location

## Solution: LED LIGHT PIPE

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- Available with either a flat or domed front shape
- Provides LED ESD protection (electrostatic discharge)
- Polycarbonate
- Rated UL94 V-0
- Operating temperature range: -40°F to 266°F (-40°C to 130°C)



# SCREW GROMMETS

While these can be used to secure panels, plastic screw grommets can also be used to securely fasten PCBs.

## EXAMPLES OF PCB SCREW GROMMETS INCLUDE:

Secure PCB through round hole Need:

Need: Secure PCB through square hole

## Solution: SCREW GROMMETS -NATURAL, FOLDING LEGS

## View online

## Why?

- Nylon screw grommet
- Tightened screw provides a secure lock
- (self-tapping screw needed) • Leas expand to secure heavy
- PCB components Rated LII 94 V-0
- Operating temperature range: -40°F to 185°F (-40°C to 85°C)



## Solution: SCREW GROMMETS -

NATURAL, SQUARE HOLE

## View online 🗹

## Why?

- As self-tapping the bottom leg eliminating nee
- Sauare hole pre
- Rated UL94 V-0
- Operating tem -40°F to 185°F (

screw is engaged, is are forced outwar ed for a nut	d,
events rotation D	
perature range: -40°C to 85°C)	Ţ

# TRANSISTOR **INSULATOR**

You'll also need transistor insulators. These transfer heat efficiently between your transistors and heatsinks. Another option is thermal grease, but this is laborious and extremely messy. Instead, place your transistor insulators between your transistors and heatsinks. Not only will the transistor be electrically insulated, but thermally conductive as well. Call it transistor heat sink insulation if you want. The result is, your heatsink heats up and dissipates the heat.

To eliminate the chance of a short circuit or electric shock to your **transistor insulator**, use **transistor** covers to mount and protect transistors.

## EXAMPLE OF TRANSISTOR INSULATOR SOLUTIONS INCLUDES:

Need: Transfer heat efficiently between heatsinks and transistors

## Solution: TRANSISTOR INSULATORS - PAD

## View online 🗹

## Why?

- Silicone Rubber and Fiberglass specially formulated to act as thermally conductive insulator
- Non-toxic transistor insulator pads
- Rated UI 94 V-0
- Operating temperature range -76°F to 302°F (-60°C to 150°C)

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# MATERIALS **OVERVIEW**

Materials play an important role in PCBs and their components. Before designing your board, we recommend that you check out Your PCB substrate: a guide to materials.

Because PCB solutions come in a choice of materials, it's important for you to know each of those materials' properties. This knowledge will give you an idea of the performance you can expect from the solution. With that in mind, here's an overview of common materials for PCB hardware:



## NYLON

- Resists heat, corrosion and abrasions
- Stands up to most chemicals well, though dilute acids pose a threat
- Heat-Stabilized Nylon: shares the same mechanical properties as Nylon 6/6, but also has the advantage of heat stabilization. Stand up to 257°F (125°C) temperatures
- Impact-Modified Nylon: extremely high-impact strength at low temperatures and resistance to heat distortion, compared to Nylon 6/6
- Glass-Filled Nylon: gives materials tensile strengths of up to 32,000 psi, which is around 200% higher than the base resin. Also, heat deflection temperatures increase from 185°F to 266°F (75°C to 130°C)

## POLYVINYL CHLORIDE (PVC)

- Dense and resists impact deformation
- Very good tensile strength
- Resists chemicals and alkalis
- Poor heat stability, which is why additives are put in during manufacturing. This helps stabilize the material at higher temperatures
- Melt temperature of 212°F to 500°F (100°C 260°C), heat deflection temperature of 198°F (92°C) and tensile strength of 1,000 to 3,625 psi (Flexible PVC) / 4,930 to 9,000 psi (Rigid PVC)

## ACETAL

- Strong and rigid
- Low coefficient of friction against metals and other plastics good choice when your priority is dimensional stability
- Low water absorption and good electrical properties
- Resistance to fatigue and organic solvents
- Outstanding wear characteristics
- Insulator with a maximum service temperature of 170°F to 206°F (76.9°C to 96.9°C)
- Melting temperature of 320°F to 363°F (160°C to 184°C)

## POLYSTYRENE (PS)

- Very good electrical insulator
- Good chemical resistance to diluted acids and bases
- Poor oxygen and UV resistance
- Brittle and has poor impact strength due to the stiffness of the polymer backbone
- Low crystallinity results in low, upper temperature limit for continual use
- Some of its weaknesses can be offset by copolymerization with other monomers. For example, it can be copolymerized with ABS, giving it high stress and impact resistance and higher tensile strength

## POLYCARBONATE

- Strong, stiff and tough
- Can maintain rigidity up to 284°F (140°C) and toughness down to -4°F (-20°C)
- Amorphous-excellent mechanical properties and high dimensional stability
- Thermally resistant up to 275°F (135°C) and rated as slow burning
- Limited chemical and scratch resistance
- Tendency to yellow with long-term exposure to UV light

## ACRYLONITRILE-BUTADIENE-STYRENE (ABS)

- Excellent impact, chemical and abrasion resistance
- Excellent stiffness and strength
- Easily machined and thermoformed
- Good dimensional stability
- Excellent electrical properties
- Max service temperature 143°F to 170°F (61.9°C to 76.9°C)

## **STAINLESS STEEL**

- Corrosion resistant to salt spray and most oxidizing acids
- High ductility
- Excellent drawing, forming and spinning properties

## BRASS

- Generic term for a range of copper-zinc alloys with various properties, which include strength, machinability, wear-resistance, ductility, hardness, electrical and thermal conductivity, and corrosion resistance
- Adding zinc to copper improves strength and other properties
- Does not become brittle at low temperatures
- Excellent thermal conductivity
- Durable with aesthetic appeal

## **ESSENTRA** COMPONENTS

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