



GUIDE TO

FASTENER SELECTION FOR ELECTRIFICATION

EVERYONE NEEDS AN ELECTRIFICATION STRATEGY



The 'electrification of everything' is at the heart of efforts to transform from brown to green energies. The electrification movement, including initiatives such as low-carbon cities and electric vehicles, is hurtling forward with the help of large and small manufacturers. Global influential companies such as Tesla and Cummins are on the frontlines of the transformation with investments in technologies that accelerate the electric future.

Many established brands are championing the use of electric vehicles. Harley Davidson, for example, unveiled a stunning new electric bicycle that went on sale (preorder) in early 2021. And the motorcycle manufacturer is also spinning out its e-bike division as a separate company called Serial 1 Cycle.

Collaboration is also happening between established companies and startups. As part of its pledge to meet the goals of the [Paris Agreement](#) 10 years early, Amazon announced that it was purchasing 100,000 electric trucks from Michigan-based electric vehicle startup Rivian Automotive Inc. This represents the largest purchase of light-duty EVs in history. Currently, Amazon has a delivery hub using electric delivery vans in the UK and has announced plans to add more than 1,800 electric vehicles from Mercedes-Benz Vans to its European Union delivery fleet, in 2021, including more than 500 in the United Kingdom.

Global manufacturers will likely continue to partner with startups and more agile companies to accelerate their electric initiatives.



LEVC's VN5 ELECTRIC VAN

A collaborative design and build with Optimas.

What Sectors Are Leading Electrification?

There are **three main sectors** where electrification is being prioritized:

1. Industry

Agriculture, construction, mining - users of heavy equipment such as excavators

2. Transportation

Components such as batteries, as well as vehicles in municipal fleets, electric cars, personal electric vehicles (PEVs) such as scooters

3. Buildings

Residential water heating, residential & commercial space heating

The goals for each industry differ. For example, the industrial sector needs electrified equipment that can maintain the power and stamina needed to run for many hours of difficult work. Meanwhile, the building sector is looking for better efficiency ratings and performance for things like heating and cooling equipment.

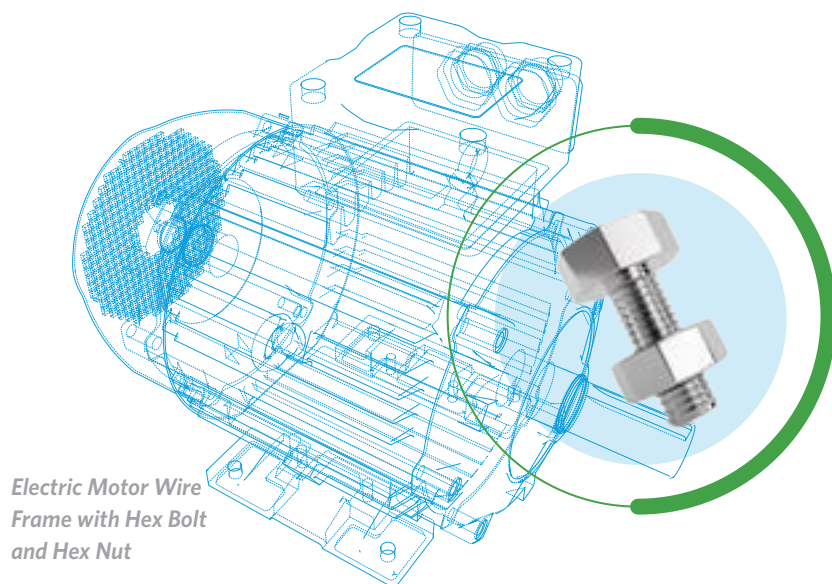
The sector that has seen (and will likely continue to see) the most growth opportunity is the transportation sector. Here, it's all about vehicle distance and range. In other words: how far can a vehicle travel on a single charge?

Who will design, engineer, and build the municipal fleets, PEVs, stoves, furnaces, boilers, and other mechanical products of the future? Companies like yours. Manufacturers will lead us into the electrified future through innovation and strategic partnerships.



Fasteners: A Small But Important Part Of Your Electrification Strategy

Every area of the manufacturing process needs to be evaluated for efficiencies. And every part used to manufacture a product, even the smallest parts, such as fasteners, needs to be optimized for better results.



Fasteners can account for **50%** of SKUs for manufacturing any electric product.

Electrification is moving fast. Manufacturers will have to look for fastener suppliers who can meet the changing demands for custom components under very short lead times. Not only that, but they'll need supplier partners who can assist with engineering support, including running tests within their onsite labs to demonstrate the technical performance of their parts.

WHY DOES FASTENER SELECTION MATTER?



Fasteners account for **1% of your project budget** but can make up nearly **50% of your product's parts**. They are literally 'the glue' that holds your product together.

Fasteners can be an afterthought for many manufacturers. While you don't need to become an expert in fasteners, you will need to at least understand what your options are, and how they affect the cost, timing and performance of your project.


Knowing more about the fasteners available can help you:

- Reduce cost and weight
- Increase your efficiency and stay on schedule
- Improve product performance through better engineering

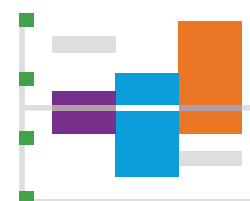


Hex Nuts and Hex Bolts

Considerations for Fastener Selection

The global fastener market continues to modernize and respond to technological advancements, including producing advanced lightweight products for automotive and other industrial applications, according to the [Global Industrial Fasteners Market in 2017](#). 

To see more data about Industrial Fasteners market size, share & trends analysis visit [Grand View Research](#).



[Visit site](#) 

There are hundreds of thousands of fasteners and thousands of fastener suppliers. It can be hard to know what fasteners are best for your electrification project. While these considerations below focus on vehicle development, in particular, they still apply to other types of electrification projects.

There are six areas of consideration when choosing fasteners for your electrification project:

1. Size
2. Insulation
3. Materials
4. Geometry
5. Non-Ferrous
6. Assortment & Availability



1. Size

Increased demand for electrification has created an opportunity to adopt a new fastener selection strategy that includes the option of smaller sized fasteners.

Smaller fasteners can provide opportunities for weight reduction. By decreasing the body diameter of fasteners, for example, an M8 fastener into an M6 fastener, the volume of material needed for production is reduced, which can lead to a weight savings of up to 30%.

Utilizing smaller fasteners can also mean a reduction of installation space - leading to smaller and lighter products overall. Smaller products also can help you realize cost-saving benefits through a reduction in raw materials used in the finished product.

An effective fastener partner can offset the reduction in size by helping you select fasteners that have the greater tensile strength to maintain the required clamp load in a joint.

Pro Tip: Decreasing weight by using smaller, higher tensile fasteners means increasing fixing points. Use angle tightening installation methods that allow installers to reach the required torque tension and clamping load with a smaller component (downsizing).



2. Insulation

With greater electrification, comes a greater need for insulation.

Your fastener partner should help you select insulating materials and finishes that help guard against the potential hazards that come with electrical components. Electrical insulation helps prevent breakdowns and short circuits which can mean controlling the free flow of voltage between 400 - 1500 volts.



Double Ended Stud Stud with Hex Collar with Black Xylan Insulation

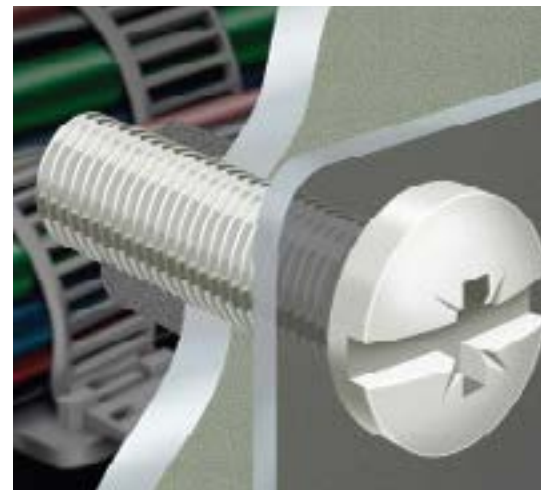
Thermal insulation should be considered part of the initial electrical design due to the enormous heat generation inside battery cells.

Pro Tip: Non-thermally insulated fasteners can unintentionally act as a thermal bridge drawing heat away from certain components and thus increasing the risk of condensation forming in critical areas carrying electrical current. Choosing insulated fasteners can help avoid this and ensure optimal battery operation.

Nylon fasteners are thermally and electrically insulated.



Nylon Machine Screw with Cheese Head



Cross Slot drive

3. Materials

One of the new key metrics by which electric vehicles are measured is distance. In other words: How far can it go off one charge?

Using materials like aluminum, magnesium and titanium within the fastener and fixings selection process, can help reduce weight and increase your distances. Understanding the material properties of fasteners and principles of joint design, allows engineers to troubleshoot potential pitfalls of changing the material of the fasteners, helping you to realize the benefits.

When replacing common materials (like steel) with weight-saving materials (like magnesium or titanium), you should take into consideration that there will be some re-engineering involved to address the potential changes in mechanical properties.

You can also decrease weight by reducing the volume of material used in the head of your fasteners. Simply changing the geometry of the fastener can reduce weight by as much as 35%. Removing material from the fastener can also save you money because you'll be using less raw material and reducing waste.

Pro Tip: Weight Saving vs. Tensile Performance: Getting the balance right. Selecting the right parts for an application will provide the tensile strength needed with the least amount of fixing points. This will ensure the most efficient use of weight vs. performance.

Fastener **materials** affect weight and weight impacts vehicle range and performance.



*Stainless Steel Bolts in Stayblack Coating.
Head styles are: Countersunk & Hex Flange*

4. Geometry

Geometry matters because a shallower head can enable manufacturers to **save weight** per fastener – leading to significant efficiency gains in aerospace, automotive and other high-end industries.

Examples of this are Mortorq Super Drive

Designed by the Phillips Screw Company, Optimas Manufacturing is licensed to manufacture MORTORQ Super® and External MORTORQ Super® drive systems (among others). These newer drive systems provide even greater torque delivery to fasteners than the traditional Phillips design. The unique, curved ‘wings’ provide full contact of the driver to the recessed walls which results in lower loading per mm² when torque is applied. Beyond offering higher torque transfer, the design also results in a shallower recess depth.

Other options include clinching, flow-drilling screws for metal and thread-forming screws for plastic. All have proven to be effective at joining dissimilar or thin materials and maintaining joint strength and integrity while reducing weight.

Pro Tip: Look for a supplier who will provide consultations and help your design team enhance product performance by using the latest innovations in fastener technologies.



Countersunk Machine Screw with Mortorq Super Drive Socket & Mortorq Super Drive Bit



Flange Bolt with External Mortorq Super Drive

5. Non-Ferrous

Electrified non-ferrous products, especially those with larger motors, require an uninterrupted flow of electric current. Introducing a ferrous steel bolt into an electric field can disrupt that field and impede the flow of current.

You can improve the efficiency of your electrified vehicle or machinery by incorporating non-ferrous, anti-magnetic fasteners that do not interrupt electric current.

Pro Tip: Consider in your fastener selection using non-ferrous materials such as aluminum, copper, nickel, titanium, and brass. In addition to enhancing flow, these materials also offer corrosion resistance.



Aluminium Hex Bolts and Nuts

6. Assortment and Availability

It can take up to 16-20 weeks to get a fastener from one end of the supply chain to the other – and that’s for commonly-sourced or standard fasteners.

Electrification projects that require specialty fasteners can be delayed for even longer if the engineering team has to wait for their parts supplier to source the right solution.

You can cut down lead times by sourcing from a partner with a robust portfolio of parts and the buying power to meet the many challenges of your project. Consider a supplier with a specialty focus on fasteners for electrification projects or one that can manufacture parts themselves.


Pro Tip: When choosing a supply chain partner for your fastener requirements, ensure that they will be able to meet all of your needs for availability, design, and logistics. This will ensure efficiency and savings throughout the life-cycle of your project.



FIND YOUR COMPETITIVE EDGE



Industrial fasteners are considered a vital part of many industries and play a key role in determining performance and efficiency.

Your competitive edge comes in [partnering with a supplier](#)  as a one-stop-shop throughout the part's journey from idea to production line installation. This approach can reduce fastener weight by as much as 50% while cutting costs and speeding your time to market.

More About Optimas

Optimas is the leading global industrial manufacturer, distributor, and service provider specializing in fastening and supply chain solutions for manufacturers seeking to improve efficiency and profitability. We take care of the details so you can focus on what you do best.



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