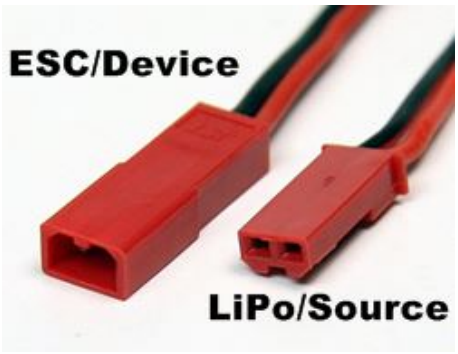
Battery Connectors

A simple guide to Battery Connectors

Types and Specifications



JST RCY Connectors are a small plug that is rated for 5 Amps of continuous load. They can be pushed up to 10 Amps for short bursts without issue.

They are used on smaller battery packs (usually under 1500 mAh) for powering small park fliers and small electric helis & quadrotors, or for powering on board electronics (receiver, servos, gyros, governors, etc.) in larger models with dedicated RX packs or higher current BEC's.

They are easy to plug & unplug and are very robust. They come both as crimp only versions or with wires already installed.

Deans Mini Connectors (Mini T Plug) are a solid little connector rated at about 10Amps. again, they can be pushed to 15Amps for sort bursts without issue.

They are easy to solder the wires to, but you need to be careful of overheating the pin. Heat shrink is used insulate the exposed solder joint afterward. You have to be very mindful of which pin is powered on the voltage source side. You don't want the exposed pin to be the "+" on the source side because it will create a shorting hazard. Deans Mini's are easy to plug & unplug for the most part and are "non sex specific" so you only need the same plug to work as both male and female.

Servo plugs or Futaba plugs which use Mini-PV terminals, are not generally associated with LiPo battery connectors, however they are most certainly used for RC powering methods; namely the on-board electronics (receiver and/or flybarless system, servos). This could be either from a dedicated RX battery (NiMh, NiCad, LiPo, or LiFe), or the BEC (stand alone or built into the ESC).

When used as a power plug, the three-pin servo connector only uses the middle "+" pin and the outer ground "-" pin; the other outer signal pin is not used. You will therefore often see servo connectors with only two wires going to them (generally red & black) when used as a power plug.

Servo plugs are rated for a sustained 3 Amp load, but you can easily drive them to 6 Amps for short duration. This is why you still see these plugs powering fairly hungry digital servos; but no question, in larger models with large or many, power hungry digital servos, powering the entire works off a single 3 Amp servo plug is not the best practice.

Most folks are either feeding the servos direct power in these "large/many power-hungry cases", or with another power feed going to the RX or FBL system, using higher current rated plugs, or two or more servo plugs to power the servo bus/on-board electronics.

Making your own servo connector leads is well worth the effort to learn in this hobby as it can save you a tonne of money over the years allowing you to make customized length leads, or build your own Y type servo cables/splitters.

Amass XT30 Connectors

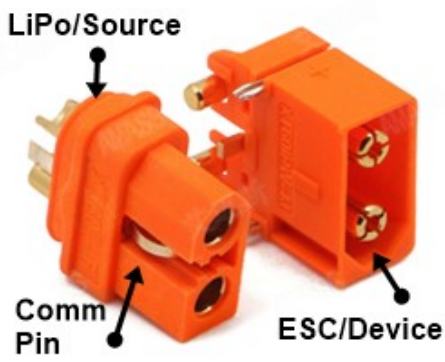
It's hard to determine where the "XT" line of connectors got their beginnings, but Amass Electronics CO. seems to be the originator.

There are lots of copies of these connectors on the market, most not as good as the original Amass so be cautious of "too good to be true" pricing (genuine Amass connectors have the name embossed right onto the connector body). That said, genuine Amass XT connectors are usually competitively priced.

The XT line in the 30, 60, and 90 sizes are currently **the best** in these Amperage ranges.

The XT30 RC LiPo battery connector shown above is their smallest rated at 30 Amps sustained, 40 Amp burst. Like all XT style connectors, wires are soldered to small external hollow pins on the back of the connector that need to be insulated with heat shrink/similar afterward. This also makes them easy to unsolder and replace/reuse. The connector housing material used (nylon) is very heat resistant so XT style connectors are more forgiving to overheating and pin loosening while soldering.

One warning with all XT plug types even though they are polarity protected, they can be forced together backwards.



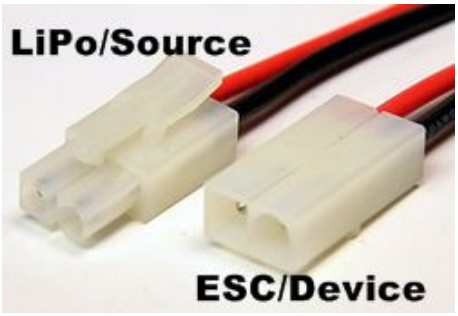
Another "flavour" of the XT60, is the **XT60i**. These connectors are fully compatible with XT60's, but they have a 3rd contact pin (comm pin indicated in this photo).

This communication pin is used with the BattGo Smart Battery System as the communication port to send information from the battery to the ECS or charger or vice versa.

EC2 connectors are rated up to 20 Amp sustained loads, with up to 30 Amp bursts.

They use 2mm bullets and are basically a smaller version of the vastly popular mid-size EC3, and large EC5.

Like both the EC3 & EC5, wiring is first soldered into the pins which are then snapped into the case when cooled down and require no heat shrink insulation as the solder connection is hidden withing the connector housing. This makes replacement/reuse more difficult.



Regular size Tamiya connectors rated at 15 Amps maximum were once very popular, especially with the electric RC car, truck, and boat crowd; but since high Amperage LiPo's have entered the scene, Tamiya plugs are used less and less these days.

They are quite large for the small amount of current they can handle. You will however still find them powering smaller models and some types of nitro starting systems. Most 7.2V (6 cell) C size NiCad packs to this day come standard with the Tamiya connector installed.

Tamiya connectors are easy to plug/unplug and have a sprung locking tab which not only keeps the connectors from pulling apart once engaged, but also gives added "paw grip" when pulling the plugs apart as the tab is disengaged.

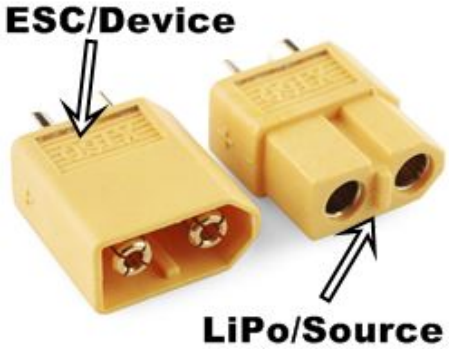
They required crimping the wire to the pins but you can also get them with the wires already crimped allowing you to just solder the wires to your device or battery.

EC3 Connectors use 3mm long bullet pins and are rated for up to 60 Amps of continuous load, 75 Amp burst.

Horizon Hobby uses the EC style connectors pretty much exclusively, and have made them very popular in their eFlite & Blade line of airplanes and helicopters.

These are therefore the very first LiPo battery connector many are introduced to, myself included. One of the biggest complaints with EC3's by others is they can be very difficult to plug/unplug, at least compared to the other connectors in this current range, not to mention they are fairly pricey.

Wires are soldered into the hollow end of the pins and then the pins are snapped into the connector so no worries of melting the plastic housing. Another advantage is the ECs don't require heat shrink insulation as the wire insulation runs into the connector housing which is nice. The drawback is it can be difficult to remove the pins from the housing for replacement or reuse. I find a small drift punch while supporting the housing on the edges so the pins can be tapped out the back side will work most times (but not always).



XT60's as already stated are one of the best RC LiPo battery connector/s in this current range and be used on even on fairly large models without issue. They are rated for 60 Amps sustained and 90 Amps for short bursts.

They are fairly easy to plug/unplug and that is why I like them better than Deans or EC3's.

As mentioned in the XT30 description, the genuine Amass ones are constructed out of high temperature nylon so they don't melt/pins loosen if you get a little carried away.

External soldering "cradle style" pins on the back require heat shrink insulation, but make them easy to remove/replace/reuse.

As the name suggests, Traxxas battery connectors (TRX connectors) are used exclusively on electric Traxxas RC vehicles/boats but can be fitted to any current application up to about 60 Amps.

These are a very nice connector that many say are one of the nicest to plug and unplug. They use a flat contact tab like Deans over a bullet style connector pin.

Like the EC3 connector, the Traxxas connectors don't require heat shrink for insulation as the wires are soldered onto the ends of the contact tabs and inserted deep enough into the connector housing afterward that the wire insulation offers full protection, also prevents melting the connector housing. Similar to the EC style connectors, pin removal can be very difficult without a special pin release tool/key.

TRX connectors are also one of the most difficult to solder properly because if you let even a small amount of solder wick down the connector tab, it will prevent the tab from clicking into the housing correctly. This is where good tinning skills and quality solder really come into play for a sort duration solder melt. Just enough heat to make a solid mechanical & electrical bond without enough heat migrating down the pin cause the solder to flow down as well.

EC5 Connectors are a larger/ longer version of the EC3 and because the bullet pins are longer (5mm) they have an even greater surface area for contact. EC5's are rated for up to 120 amps of continuous load, and bursts of upwards of 150A. Perfect for large 1/4 scale electric planes and 700-800 size electric helis.

Like the EC3's, the wires are soldered into the back of the pin and pushed into the housing far enough that heat shrink insulation is not required, but pin removal afterward is very difficult for replacement/reuse.

The XT90 is rated for a continuous 90 Amp load with bursts up to about 120-130 Amps.

Soldering connections on the back side of this plug are exposed so heat shrink must be used; however, there are now versions of this plug that have a plastic insulation cap that snaps on the back end of the plug if you don't want to use heat shrink.

Another AMASS XT-90 RC battery connector option is their "anti spark" version. If you look closely at the inside of the right contact tube in this photo, you can see the very first section of the tube is split and insulated from the rest of the contact tube.

This initial split section is wired to a resistor which allows the power capacitors in the ESC to slowly charge up before the rest of the pin makes contact as you insert it. This eliminates that big connector SPARK as the capacitors first charge up slowly before the main connection is made.

No question, not having that big current flow arc across the pins as you plug the connector in, will prevent carbon pitting on the tips of the pins and will extend the useful life of the connector.

The downside is these connectors are quite expensive and they are on the battery side, so you generally need a lot more of the expensive female plugs than the cheaper male plugs that are on the ESC side.

Amass AS150 Anti-Spark RC connectors are quickly becoming a "favourite" for high voltage & current RC powering applications.

They use 7mm bullets and as the name suggests, are rated at 150 Amps (190A burst).

One of the male bullets is special, it's the one circled in red.

If you look closely. It has an end cap that is insulated from the rest of the pin. This is the last plug you connect when you connect your battery to your ESC.

That insulated end cap is connected internally through a resistor to the main body of the pin to slowly charge the capacitors in your ESC as it first makes contact with the female bullet; preventing the big spark when connecting - it works surprising well. Unlike the XT-90, this more costly pin can be placed on the ESC side to keep costs down.

The female side of the bullet is actually the split connector (unlike most bullet pins), and uses a sprung clip around the edge to maintain proper contact pressure, even after hundreds of cycles.

These connectors are separate and therefore take up a little more space than a contained 2-pin connector type, but as they are used on large RC aircraft, room is rarely an issue. These connectors don't require heat shrink after soldering for insulation; the insulated end caps are simply threaded onto the bullet pin - nice design.

A little costly at close to £10 for a set (2-pairs), but considering they don't wear out from sparking, long term savings have to be taken into account.

Genuine Amass XT150 connectors are rated at (you guessed it), upwards of 150 Amps.

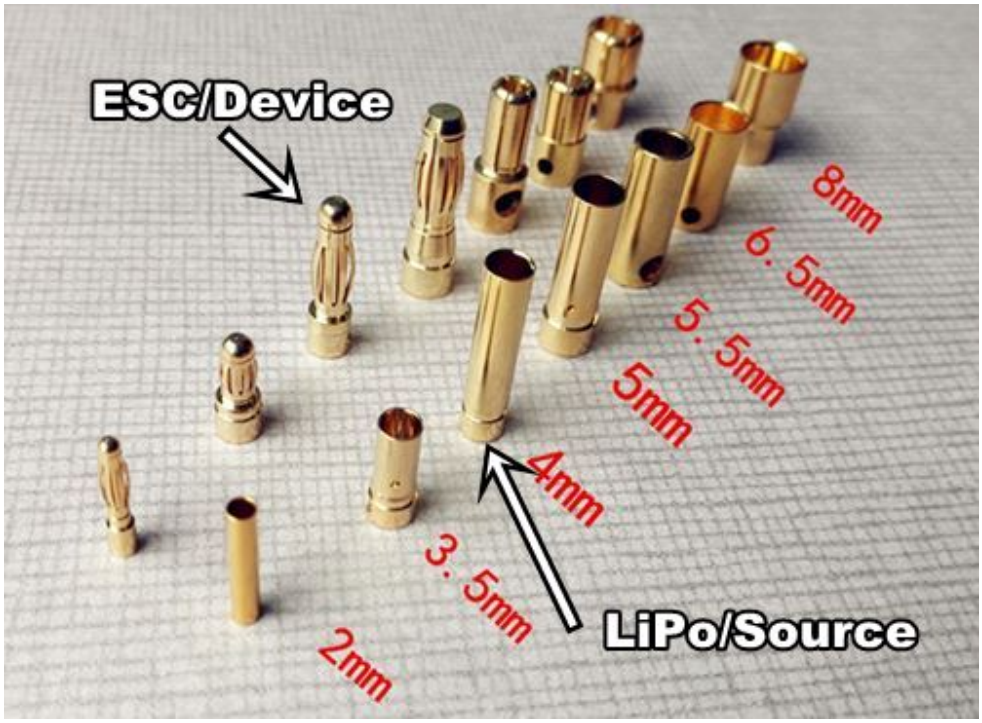
These are BIG connectors using a 6mm bullet so you need adequate room. One neat thing with them is the individual plugs can be slid together to make a one, two, or three pin connectors. This can make these big plugs a little easier to work with in tight areas where having two slid together would be too bulky.

Anderson Powerpole connectors are a long time proven industrial electronics connector that has filtered down into the world of RC. They are pretty much the most expensive connector listed on this page.

They are super easy to plug and unplug, but the connection is not that tight. Crimping is the preferred wire attachment method (with the correct crimping tool), but they can be soldered if you're careful. The pin is held into the connector after crimping or soldering and doesn't require heat shrink for insulation.

They are a fairly big and heavy connector compared to RC quality ones in similar Amp ratings, and don't offer fool proof polarity protection (can be plugged in backwards when not clipped/stacked together in the correct orientation). Powerpole's come in several sizes ranging from the small PP10 up to the massive PP350 which is rated at 350 Amps.

As you can see, Powerpole connectors are "stackable" and can be clipped together in many different configurations (they are the Lego of connectors).



Last up we have stand alone "Bullet Style" connectors, sometimes also called "Banana Plugs". Various sizes (measured in diameter) for various current ratings.

Listed below are some *approximate* continuous current values based on bullet size. There are of course variations dependent on bullet length (more length = more contact area) as well, but this list should get you in the ballpark for most of them.

- 2.0mm Bullet = 25 Amps
- 3.0mm Bullet = 50 Amps
- 4.0mm Bullet = 100 Amps
- 5.0mm Bullet = 120 Amps
- 5.5mm Bullet = 130 Amps
- 6.0mm Bullet = 140 Amps
- 6.5mm Bullet = 150 Amps
- 7.0mm Bullet = 160 Amps
- 7.5mm Bullet = 175 Amps
- 8.0mm Bullet = 200 Amps

Most of the RC LiPo Battery connectors I have listed above (other than the few that use flat tab contacts), all use bullet connectors within the housings. However, some folks just like to use standalone bullets as they are less expensive without the housing, weigh less, and take up less room.

There are essentially two styles of male bullet connectors, split & sprung. In the above photo, the male 2 to 5mm are the sprung design, the 5.5 to 8mm are the split type. The female side are all the same, basically a hollow tube that the male end fits into.

The sprung connectors have a sprung sleeved section that wraps around the inner pin and that is what makes contact with the inside of the female tube. The split style has the pin divided into two or more quadrants that are sprung outward, slightly wider than the internal diameter of the female end. As they are plugged in, the "quadrants" are squeezed and held tight again the inside of the tube under tension making good electrical contact.

Generally speaking, the split style are able to handle larger current loads than the spring style.

A male and female Dean's (T connector) set.

The Deans or T Connector were one of the first on the LiPo connector block, and remain to be a popular connector type with a very loyal following, which unfortunately had driven the price up; but has come back down, and compete favorably with the competition.

The Deans "Ultra" connectors are rated for 60 Amps of continuous load, up to 75 Amp & higher bursts.

One of their best attributes is they are small in size for the current rating. If you have very tight spacing in your RC model or other application, Deans connectors may be your best choice for fitment reasons alone.

Deans connectors use sprung flat tabs for the connector which is a departure from most other connectors that use "bullet" style pins. This makes the Deans one of the better plugs for consistent connectivity pressure as the sprung tabs don't seem to lose their contact pressure over time after many cycles like bullet connectors sometimes do.

Like almost every RC LiPo battery connector out there, there are a good deal of copied/clones of Deans T connectors on the market/

The plastic body on Deans plugs is fairly heat sensitive so you have to be careful while soldering to avoid softening the plastic which can loosens or miss-aligns the connector tabs. Some copies/clones actually have better heat immunity than the originals I have found.