



## PROPER USE OF POWER DRIVERS FOR CABLE AND CONDUIT FITTING INSTALLATIONS

Over the last 25 years or so, the average electrical system installer's use of cordless screw drivers has proliferated. Smaller and lighter, with lots of power, these power drivers help installers save time (and their wrists) repetitively tightening all kinds of screw-type fasteners during the installation of electrical equipment. However, there are also increasing issues with electrical component damage and performance due to misuse of these tools.

There are three primary styles of power screwdrivers on the market today:

**Power Screwdriver** – Small, lightweight, and most similar to manual screw driving. Does not generate a tremendous amount of torque. Slow maximum speed. (Up to 150 in-lbs)



Image Courtesy of Milwaukee Tool®

**Power Drill/Driver** – Extremely versatile and powerful. Most are variable speed, and with today's more powerful Li-Ion batteries, can develop significant amounts of torque and speed. (Up to 800 in-lbs)



Image Courtesy of Porter Cable®

**Power Impact Driver** – With the addition of rapid impact vibrations and Li-Ion power, these drivers can develop SIGNIFICANTLY higher torques than their non-impact counterparts. (Up to 1600 in-lbs)



Image Courtesy of DeWALT®



The one common feature to most of these tools is that they all have a “Clutch”. The exception is most of the Impact Power Drivers on the market today DO NOT have a clutch. This is a manually adjusted feature which helps to limit the amount of torque generated. ALL users of these tools should be familiar with the clutch, and properly set it for the job. **One setting does not fit all applications.**

With regards to cable and conduit fittings, screw-type fasteners are used on setscrews, clamps, and covers. These screws are typically produced in sizes starting at #6-32 up to ¼”-20. The screw heads typically have one of three drive types – Straight, Phillips, and Robertson. These three drive types have very different performance characteristics.

**Slotted Drive Bit** – The original type of screw drive. Difficult to align and keep aligned. Prone to stripping screw heads, or damaging surrounding surfaces due to misalignment or slipping of drive bit and slotted head. Does not allow for a significant amount of torque to be developed.



**Phillips Drive Bit** – Used primarily in most screw fastener applications. It was designed to easily align with screw head and to automatically ‘cam-out’ to limit torque. However, it requires significant downforce to maintain engagement, and to generate significant torque. Prone to stripping screw heads.

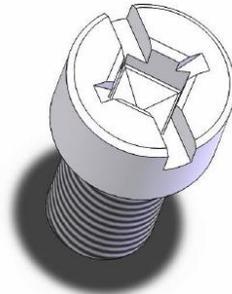


**Robertson® Square Drive Bit** – Will not cam-out like the Phillips Drive and does not require significant down force to achieve significant torque. Also, very easy to align and keep aligned. Extremely possible to over-torque screw causing fastener failure and/or product damage.





In late 2004, Bridgeport Fittings became the first major conduit and cable fittings manufacturer to offer a “Tri-Drive” design screw head on most of its setscrew style EMT fittings. This Tri-Drive screw head incorporates the three common types of drive styles – Slotted, Phillips, and Square drive styles into *one* screw head. This provides the installer a greater choice to use a drive type best suited for them. Today, the Tri-Drive style is used on many cable fitting clamps and covers, as well as other styles of fittings (i.e. squeeze-type). As such, the Square-drive bit is the most popular due to its ease of use with hand screwdrivers.



**“TRI-DRIVE” SCREW**

The problems start when installers use a Square-drive bit in their power drill/driver or impact driver tool. IF the tool’s clutch is not set properly to LIMIT the amount of torque generated, there is a high likelihood of product damage. The damage may be (and not limited to) stripped screw threads, broken screw heads, cracked or bent fittings, reduced ID of EMT or setscrew perforation, excessively compressed cable armor, conductor insulation damage, and/or electrical shorts.

UL514B is the primary specification to which ALL electrical fittings are evaluated and Listed. The specification requires (among other things) a torque evaluation of all threaded fasteners (i.e. locknuts, screws, gland nuts, bolts, etc.). The specified maximum torques on fasteners are based on the fastener/thread size, and drive type. Correctly applying these torques will ensure that the fitting will consistently meet the other electrical and mechanical requirements outlined in UL514B.

Below are examples of fastener torque limits for different fitting products:

Product Example	Fastener Size	UL514B Max Torque (in-lbs)*
1/2" thru 1" EMT Set Screw Connectors & Couplings	#10 & 1/4-20 Screw	35
1/2" thru 1" Squeeze Type FMC Connectors	#10 & 1/4-20 Screw	35
1/2" thru 1" NM Cable Connectors	#8 Screw	20
1/2" thru 1" MC/AC Cable Connectors with straps	#8 Screw	20

\*Please note that the units are INCH-POUNDS, not FOOT-POUNDS.



As illustrated in the table above, the maximum fastener torques are well below the typical torque ratings of power drivers at their maximum settings. **As such, it is imperative that the installer properly set the power driver's clutch to prevent product damage by over-torquing. In addition, many product labels will indicate the proper fastener torque required.**

With many power drivers with 15 to 20 clutch selections, clutch settings between 1 and 4 should not significantly over-torque most fasteners under 1/4"-20. Of course, every power tool is different, and the installer should know and understand the torque settings, and how appropriate they are for the application. **When in doubt, first torque the fitting fastener by hand to verify.**



**IMPORTANT NOTE:**

**A Power Impact Driver should NEVER be used for ANY cable or conduit fitting assembly due to the inability of minimum torque settings being reduced to a recommended level – no matter which drive style is used.**

If there are any questions about proper installation and torquing of cable and conduit fittings, please contact the Engineering Department at Bridgeport Fittings.

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