

DC Motor Maintenance - Undercutting



Technical Services get asked frequently about the necessity for the undercutting of armatures when rebuilding. Many have theories whether this is necessary or not.

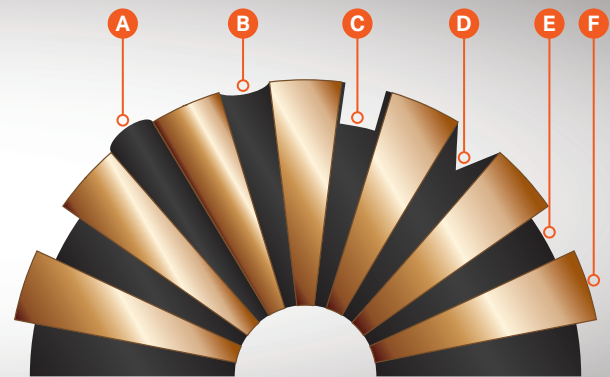
The undercutting of electrical DC motors is performed for many reasons, but most importantly for preventive maintenance. Typically the undercutting process is performed during the rebuilding process but some manufacturers will also perform this process on new items before they are installed.

The undercutting process is the removal of material found between the commutators segments. This insulation can be composed of resin, paper, molding, and other materials, but is typically made of mica. Mica is a mineral that is abundant, inexpensive, and has a very high dielectric stress of approximately 1180kV/cm but also has very good thermal conductive capabilities. This makes it very good for the making of armature commutators. The next closest material that has these same properties would be diamond.

Many factors contribute to the necessity for undercutting, but the most prevalent is the composition of the brush material being used. 12V brushes have a higher copper content and therefore are harder than their 24V counterparts. 12V brushes normally wear both the commutator and the mica at the same rate, but since the 24V brush is softer, as the brushes ride over the surface of the commutator, the softer brush material begins to wear, while the mica is not as easily removed and remains. This creates a raised "bump" between the commutator bars over time. This creates two undesirable conditions. First, the surface condition is no longer flat, which causes brush bounce on the commutator. This bouncing of the brush is translated into a higher ripple voltage being seen. Ripple represents wasted power that cannot be utilized by a circuit and causes excessive heating. Second, increased brush wear is seen by the mica removing a small amount of material every time the brush passes over the mica. This creates excessive brush dust and can eventually lead to unit failure over time. The undercutting process solves both the issues. Undercutting can be an important step in the proper maintenance of any DC motor but is mostly recommended for 24V systems. This would apply to DC generators as well as DC starter motors. It is also highly recommended that if undercutting is performed, that polishing follow to remove any burs created during the undercutting process.

The diagram on the right shows a few different conditions that may be seen in the commutator.

- A** Exposed mica "bump" due to wear of the surrounding commutator bars.
- B C D** Examples of improperly undercut mica.
- E** Correct undercut mica with a depth of 0.050" below the top of the commutator bar surface.
- F** Top of commutator bar.



Top view of commutator



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