

Tempo 2020 Sprocket Repair

Ted Bruce, KX4OM March 2009

Sometimes Tempo 2020 preselector and bandswitch drive train cracked sprockets can be repaired. Some, in fact can be used as-is by rotating the cracked section of the gear, so that end-to-end turning of the preselector or bandswitch knob (as applicable) does not place the crack on the chain. However, the sprocket may crack more at some time in the future. Eventually the sprocket may fall apart, completely off the brass insert. This is especially true of the bandswitch sprockets, which place more torque on sprockets. Incidentally, the best place for a possibly weak sprocket is the idler sprocket on the bandswitch gear train...very little torque on that one.

A simple way to limit further cracking of a sprocket is to use a loop of mechanics' wire (approximately #22 steel wire.) I bought some at Harbor Freight for 99 cents. Twisting the wire ends after one turn is applied may squeeze the crack (more) closed, if it is not too wide. I expect that the wire will help keep the sprocket from cracking further for some time. However, I decided to use a more permanent method, as I have to repair many of these sprockets (all sprockets on several rigs are cracked.)

This repair method follows the same principle of the mechanics' wire by squeezing the hub and reducing the stress placed on the original component. It is good for sprockets that do not have very wide cracks. It will be handy to keep a section of the nylon tube listed below to determine if the new "collar" will fit over the sprocket hub. For sprockets that have completely broken off the brass insert, additional repair steps will be needed. ⁽¹⁾ The cracking is due to age-related degradation of the nylon. Nylon contains moisture when it is cast, and the nylon compounds used over 30 years ago are more susceptible to shrinkage as the nylon ages as the moisture is released. This shrinkage causes the stress cracking of the nylon sprockets. Newer nylon compounds are less susceptible to aging. Nylon 6/6 is used in this repair method.

Items needed:

1. Rigid nylon tube, 5/8" O.D., 9/16" I.D. (McMaster-Carr p/n 8628K57, 5ft. for \$3.86)
2. Variable-speed drill or drill press
3. Drill bit: 11/64" , BLU-MOL 135 degree split point (Home Depot, \$1.99)*
4. Nylon-compatible super glue (Surehold Plastic Surgery, Walgreen Drugs)
5. Hacksaw: (Buck Bros. Junior Hacksaw, 6" blade, Home Depot, \$3.97)
6. Workbench vise
7. 150 grit sandpaper (approximately)

* A new bit, having never been used to drill metal is highly recommended. The split point prevents the drill from slipping off the tough and slippery nylon.

Steps:

1. Clamp the nylon tube in workbench vise.
2. Using the hacksaw cut a section the length of the exposed sprocket hub (8.15mm, 0.32").
3. Mark a spot for the drill bit center on the cut section (3.77mm, 0.148") from one end. This distance is the measured distance from the edge of the sprocket gear to the center of the Allen screw hole.
4. Clamp the cut section of nylon tube in the vise, with cut ends clamped.

5. Center the drill bit exactly on the marked hole center, and begin drilling *slowly* to allow the bit to cut into the nylon. Note: all machining of nylon should be done at **slow speed**.
6. Compare the newly-made nylon collar with the sprocket to make sure that the set screw hole will be accessible after assembly. *See accompanying Photo 1 on the last page.*
7. Test-fit the collar onto the hub without glue, to make sure that the dimensions are correct.
8. Remove the collar, taking care not to damage the sprocket.
9. Cut a small piece of sandpaper and rough up the inside of the new nylon collar. Also, rough up the outside surface of the nylon sprocket hub. This greatly increases the shear strength of this cyanoacrylate-based glue.
10. This glue will set quickly when the two surfaces contact each other. Only one surface is necessary for glue application. Quickly, but very carefully spread the gel on the sprocket hub, taking care to avoid the area of the setscrew hole (leave a section clear of glue from the outer edge of the hub to the sprocket gear (we don't want the glue to be pushed into the setscrew hole.)
11. Quickly line up the collar with the hub and push it all the way on. *See accompanying Photo 2 and Photo 3.*
12. The glue quick-sets in a few seconds, but fully sets in 24 hours.

The sprocket is now repaired, and after the 24 hour wait time, it can be reinstalled on the shaft.

- (1) A broken sprocket with wide cracks is more difficult to repair. The two nylon pieces of a typical sprocket that is broken off the brass insert can be glued together with the type of superglue for plastics listed above. The outside diameter of the glued-together pieces will be about 9/16", which will fit perfectly into a newly-made nylon collar, as above. The problem is that the original nylon was cast onto the brass insert, and the brass has crosshatched machining, and it will no longer fit into the nylon hub after the two pieces are glued together. Either the machining marks on the inside surface of the nylon hub must be removed, the machining on the brass hub insert must be filed (or turned down on a lathe) down, or both.

Cyanoacrylate glues are not good gap-fillers, and Plastic Surgery is no exception. The shear strength is diminished with other than "perfect" mating surfaces. After considerable study of various types of industrial glues, I eliminated most of them including common epoxies, polyurethane glues, and methylacrylate-based (also called "acrylics) adhesives, and many more. Methacrylate-compounded adhesives, such as MA330 and other adhesives produced by ITW Plexus, along with Devcon Plastic Welder II, cannot be used on copper alloys such as brass. Devcon HP250 bonds nylon to galvanized steel but not to brass. Dynatex Super Glue advertises the ability to fill small gaps, and it bonds metals and some plastics, but not to each other. Most epoxies that are specified for hard-to-bond engineering plastics (including nylon) that also bond metal are for steel or aluminum, not brass.



Photo 1



Photo 2



Photo 3