Making Double Six Ferrules

Text and photos by Harald Langer, Translation by Tim Anderson

harald@fishing-rods.at www.fishing-rods.at

Langer & Langer AUSTRIA

Before I go into the production of our Double-Six ferrules, I would like to mention the tools and machines used.

Producing the ferrules requires a lathe, a tool-bit grinder (see photo), a screw press, various drills and reamers, a triangular needle file, a hardened precision hole-punch, and a 40 mm diameter brass rod.

For my example, I assume that we are producing a ferrule for a rod which needs a ferrule measuring 4.93 mm in diameter from flat to flat. That means 5.70 mm from apex to apex of the hexagon. I'll explain later why this dimension is important.

Preparation of the Female Section of the Ferrule

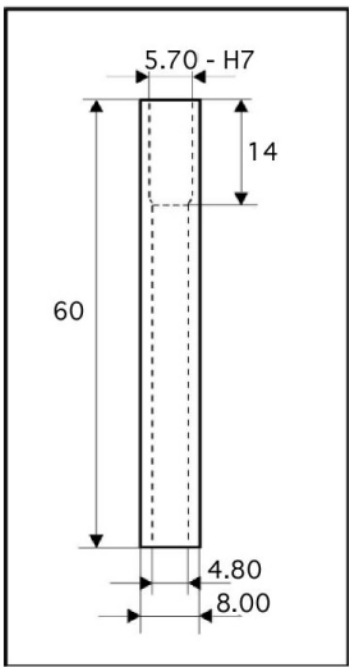

Figure 1

I'll begin with making the female part of the ferrule. The completed piece will have a length of 45 mm, so I need a solid piece of nickel silver 60 mm long and 8.00 mm in diameter (Figure 1).

After producing these dimensions on the lathe, I drill a precisely centered starting hole in preparation for the subsequent drilling required for making the internal hexagon.

Since the hexagon is to measure 4.93 mm from flat to flat, I drill the somewhat smaller (4.80 mm) central hole slowly and with little pressure. Too much pressure and the drill wanders and the hole is not centered. My lathe has a precision chuck and I drill the hole from both ends which reduces the risk of the drill wandering.

I enlarge this hole from one end to a diameter of 5.5 mm and to a depth of 14 mm and then ream the enlarged hole with a 5.7 mm diameter reamer (the exact diameter from apex to apex of the internal hexagon).

Preparation of the Male Section of the Ferrule

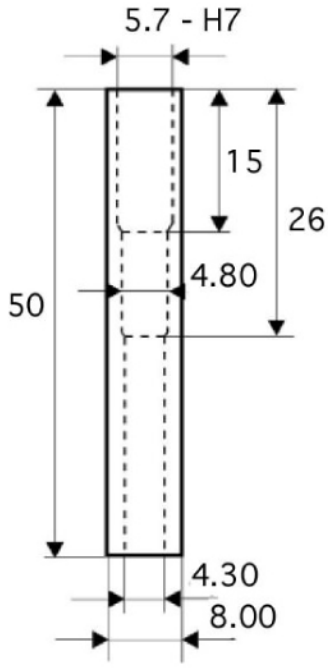

Figure 2

A solid piece of nickel silver 50 mm long and 8.00 mm in diameter is needed because the completed male ferrule section will be 34 mm long (Figure 2).

Centered as described above, I drill a through-going hole 4.30 mm in diameter. This is drilled out on one end to a diameter of 4.8 mm and a depth of 26 mm. The same end is further drilled out to a diameter of

(Continued on page 41)

5.5mm and depth of 15 mm and this section is then reamed out to a diameter of 5.70 mm.

Ferrule Holder

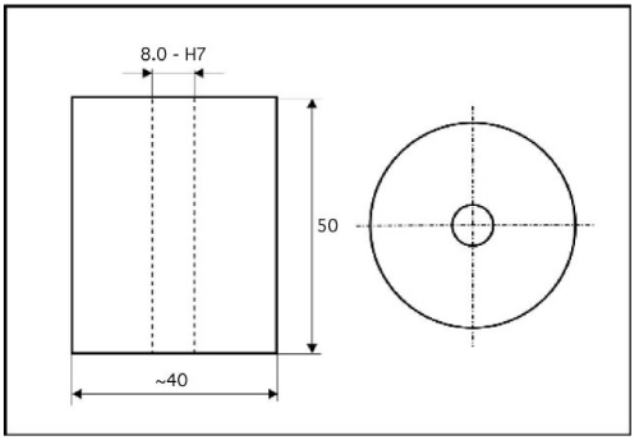

Figure 3

A holder for the above-prepared cylinders is needed for upcoming work and to prevent stretching of the material when forming the hexagonal shape. The lathe is used to cut a cylinder 50 mm high from the brass rod (see Figure 3). I drill a centered 5.8 mm hole along the cylinder's axis and ream it out to a diameter of 8 mm. The side which was drilled from is then marked with a graver. The cylinder which will hold the ferrule sections is finished.

Hole Punch

I use a hardened, hexagonal punch to produce the inner hexagon (Figure 4). Because they cannot be purchased, I have to grind them out of round punches. I buy hardened punches with a diameter of 5.70 mm (working end) and 80 mm long.

I clamp the punch in the holder of the tool-bit grinder, turn it 90º to the wheel and cut away the head of the punch. I then return the grinder to a straight position, and clamp the punch at its head end so that about 65 mm of the punch extends out of the holder.

Now I bring the grinding disk into contact with the punch and grind the first of the six sides, regularly measuring the size of the cut. Then I turn the holder 60º and grind the next side, repeating the process until all six sides are cut and the flat-to-flat diameter measures 4.93 mm. I try to keep my tolerances within + 0 mm to -0.02 mm.

Internal Hexagon of the Female Section of the Ferrule

Now finished are all the parts necessary for making the internal hexagon of the female ferrule section.

I set the ferrule holder on its marked face so that the hole faces upwards and slide the prepared ferrule section into the hole with the 5.70 mm hole in the ferrule section facing upwards. The punch is pressed in until it stops. It is now snugly in place in the ferrule section. The fit must be snug in order to guarantee that the punch can be pressed straight and centered into the ferrule.

After the three pieces are assembled together,

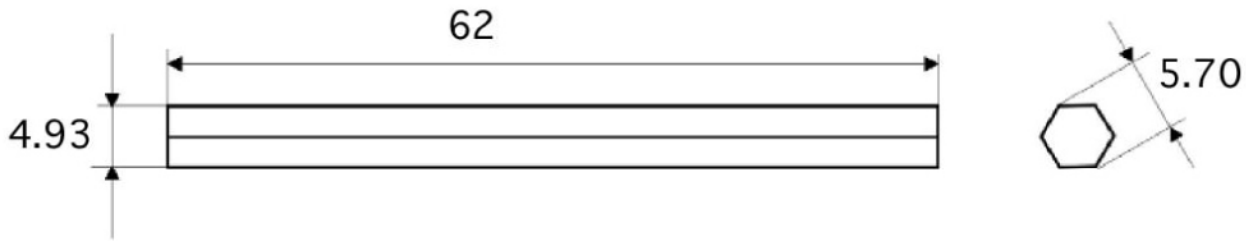

Figure 4

(Continued on page 42)

the punch is driven with the press 2-3 mm into the ferrule section. During this process, one should always have the impression that the punch is entering the ferrule section freely. If too much material is swaged out, there is the possibility that the punch abrades, runs crooked, or even bends. All of these would make a precise result impossible.

After this step, I carefully drive the punch out from the back side. Before doing so, I make registration marks on the punch and the ferrule section so that I know how the punch was in the ferrule.

Photo 1

The triangular file is now used to remove the inner burr carefully. Then the punch is replaced in the ferrule with the marks aligned and is again, pressed 2-3 mm further in. This procedure is repeated until the internal hexagon is fully formed (Figure 5).

Then I put the ferrule section in the lathe and trim it to a length of 45 mm.

Subsequently, I check the inner surface and, if necessary, smooth it carefully with the needle file. I precisely lap it using the punch and fine abrasive paste. When this is completed, the punch should slide effortlessly but without play through the ferrule section.

External Hexagon of the Female Section of the Ferrule

The female section is now placed in the holder of the tool-bit grinder (photo 1) with 35 mm exposed. Then I re-insert the punch in the ferrule section, loosen the clamp slightly, and lay one flat of the punch on the working face of the grinding wheel. This orients the ferrule section correctly and I can reclamp it.

The punch is removed and the six outer faces are ground to a wall thickness of 0.50 mm along a length of 30 mm. After producing a parallel hexagonal ferrule section over the 30 mm length, I turn the ferrule section around and clamp it, on the faces, in the holder. Then I adjust the grinding head of the grinder to an angle of about 1° and grind a taper on the other end of the ferrule section. A precise angle is not essential, but the tapered section should be a little shorter than one-half of the ferrule and the wall thickness should not be less than 0.20 mm at the end of the ferrule section.

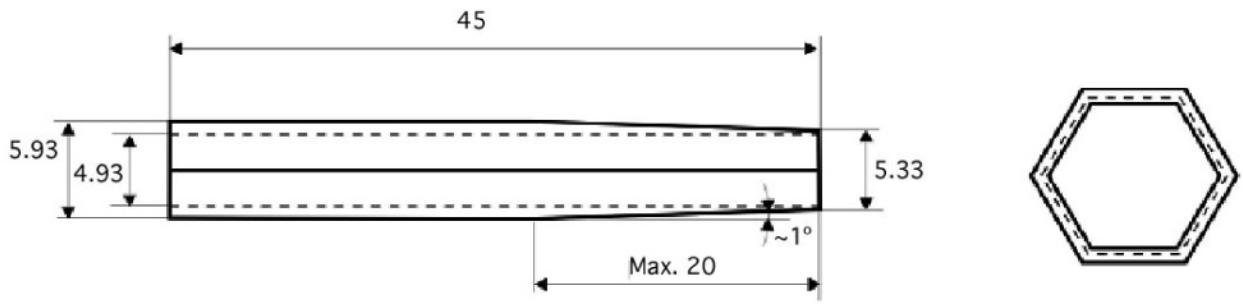

Figure 5

(Continued on page 43)

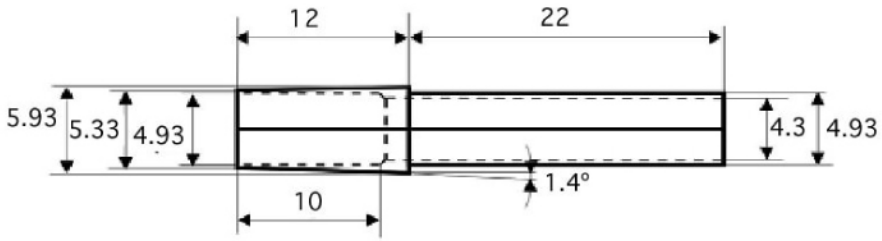

Figure 6

Internal Hexagon of the Male Section of the Ferrule

The prepared male ferrule section is placed in the holder and, as before, with the 5.70 mm hole upwards. I then place the punch to the bottom of the reamed hole, after having marked the punch 26 mm from its end. With three pieces assembled, I use the press to force the punch in to the mark which is the depth to the 4.30 mm hole. I then put registration marks on the punch and ferrule section and drive the punch out of the ferrule section. The section is then turned to final dimensions on the lathe. The swaged burr is removed with the triangular needle file and I re-insert the punch, aligning the registration marks (Figure 6).

External Hexagon of the Male Section of the Ferrule

I place the ferrule section in the grinder clamp with the punch toward the front and with about 20 mm of the ferrule section showing. I then loosen the clamp slightly and press one flat of the punch against the grinding wheel. The ferrule section is now aligned and can be clamped securely.

I remove the punch and grind one of the six outer flats to within 0.10 mm of its final dimension. I then turn the ferrule section around, align the newly cut flat with the wheel, and clamp it in place with about 30 mm sticking out of the clamp.

Photo 2

Now, over a length of 22 mm, the slide of the male section is ground to shape. Since the final dimension will be 4.93 mm, I grind the hexagon to 4.98 mm, that is, 0.05 mm over-dimensioned. It will later be fitted by hand to the female section.

After cutting the slide, the ferrule is again turned around and re-clamped with the previously cut flat aligned to the grinding wheel. I adjust the grinding head to an angle of about 1.4º and grind the outside so that the wall thickness at the end of the ferrule is not less than 0.20 mm.

The results should look like the picture (photo 2).

(Continued on page 44)

Fitting

Now the final fitting takes place. I put registration marks on both ferrule sections and polish equally, with fine sandpaper and a needle file, the flats of the male ferrule section.

After the sections begin to fit together, I mark the flats of the male section with a felt-tip marker and push the sections carefully together. I polish the resultant rubbed areas and repeat the process until the sections can be pushed entirely together.

Photo 3

Now I bring the outsides of the section to a high polish.

Caps

The caps for the ferrule sections are made last and the ferrule is ready for mounting.