Picking neck bushing and expander mandrel

What we must discuss here first is some fundamentals of how much interference fit you want to end up with and how much material you want to be moving.

Everything below is based on annealing your brass every single time you reload it. I cannot stress this fact enough. Brass MUST be annealed every time in order to have consistent results. Your results may vary depending on the brass you use. All brass manufacturers are different and their brass has different characteristics, metallurgy, it's malleability, and brass lot numbers from one lot to another can make a difference That is why I ONLY use Lapua brass and it is the most consistent and best brass I have found.

For these reasons, I can not be absolutely positive as to how your brass is going to react. This is why testing this procedure is critical. Adjustments my be needed. Read my "final thoughts" at the end of this document.

I have learned an important rule that you want to move "a lot" of material as opposed to making small or minor movements. For the reason behind this, when you "squeeze" your brass with the neck bushing, it pushes the imperfections to the "inside of the neck, or inner diameter of the neck". Then when you pull the expander mandrel out it then forces the imperfections to the "outside of the neck, or outer diameter". Therefore if you are making just small or minor adjustments, this will have little if "no" effect on this process. I go for .002 of neck interference because I am shooting from a bench with a bolt action rifle. Now if I were shooting in the field, hunting, or from a semi-automatic rifle, I would want to increase that to at least .004 to .005 neck interference with all the jarring and vibrations from
semi-automatic and bumps and drops in the field. But here we are talking precision reloading.

One of the first dimensions you must know is your neck wall thickness. We will use this process below to find that out:

Finding your neck interference

1. First thing you want to do is find your case neck wall thickness. The simplest way is to measure the diameter around your case neck with a bullet seated in the case using a good set of calipers.

2. Then you must take a measurement of your bullet diameter using a caliper around the outside of the bullet.
3. When these two measurements are known you can now figure your neck interference size.
4. This example below is only for reference to make it simple

Example for finding case "neck wall thickness" using measurement with bullet seated:

A. First you must seat a bullet you are going to use in the brass you are going to use
B. Now measure the diameter around your case neck with a bullet seated in the case using a good set of calipers = .2685 (my case yours will vary)
C. Now take a measurement of your bullet diameter using a caliper around the outside of the bullet = .2425 (my bullet yours will vary)
D. Now Subtract C from B = .0260 neck wall thickness
E. Then divide this by 2 because there are two sides to the neck. .0260 divided by 2 = .013
F. This gives you .013 case neck wall thickness

Figuring your Expander mandrel size

1. With the known bullet diameter of .2425 and using the examples that above and we want .002 of neck interference, we would first subtract the .002 neck interference we want from bullet size of .2425 we get .2405. That gives us our .002 neck interference.
2. **But we are not done yet**. We must take into account the "spring back", closing up effect of .001. Therefore, if it "springs back" .001, we should add .001 to our .2405 giving us a total dimension of .2415 for our expander mandrel.
3. Now as I have said, all brass manufacturers are different and their brass is different characteristics, metallurgy, it's malleability, and brass lot numbers from one lot to another can make a difference

Figuring your neck bushing size

Your neck bushing should be at least .005” to .008” smaller than the final neck interference you want. You must also account for “spring back”, which is a natural occurrence and the brass will “spring back” at least .001” after each operation.
So let’s say you want to end up with .002” neck interference”

1. First you must know your neck wall thickness with bullet seated (example .2685)
2. Now you would want to subtract at least .005 to have good pull through effect when expanding neck with expander. Therefore, .2685 minus .005 gives us .2635
3. **But we are not done yet**. We must take into account the “spring back”, opening up effect of .001. Therefore, if it “springs back” .001, we should subtract another .001 from our .2635 giving us a total measurement of .2625 for our neck bushing.
4. And again, all brass manufacturers are different and their brass is different characteristics, metallurgy, it’s malleability, and brass lot numbers from one lot to another can make a difference

Final Thoughts

1. Although the math and numbers can seem daunting you will see it is really just simple math. The one thing I stress again is “all brass manufacturers are different and their brass is different characteristics, metallurgy, it’s malleability, and brass lot numbers from one lot to another can make a difference”
2. Therefore, the only way to be sure you are getting the neck thickness you desire, is to use a pin gauge after these operations and actually measure the ID (inner diameter) of the case neck.
3. Pin gauges are not too expensive, but you don’t need to go out and get a complete 100 piece set let’s say. If you are wanting a final ID (inner diameter) of the case neck to be say “.240”, you can buy individual pin gauges like I do ranging in ½ thousandths increments from say “2390 through .2420. That’s about 7 pin gauges. They can be found at:

https://www.mcmaster.com/products/pin-gauges/class-z-go-plug-gauges/