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Author: Tory Royce

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Valve Body Reaming

When it comes to reaming valve bodies, there are always questions about how to approach things the “right” way. It pays to keep in mind that reaming a valve body bore, to allow installation of an oversized valve or sleeve is a precision operation and must be viewed with the mindset of a machinist. Properly maintained equipment, correct setup, and the right cutting fluids are all critical in achieving success. Here are a few suggestions we have compiled over the years, in response to common inquiries.

A primary factor in successful reaming is how effectively the reamer is piloted. Though often overlooked, it is critical that the reamer follow the centerline that was established by the original machining process. There are currently three ways to establish and maintain proper reamer alignment.

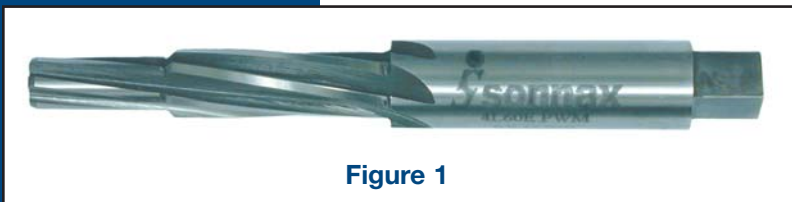


Figure 1

The first method is a self piloting reamer (*see Figure 1*). This type of reamer will have a properly sized “nose” that will help guide and center the reamer in the bore. Though simple, they are nonetheless effective in certain applications. Unfortunately there are limitations with this type of reamer depending on the bore design and depth. The most obvious limitation: this reamer cannot ream to the bottom of the bore.

The second method accomplishes the centering function by using a reamer jig, inserted in the bore to provide a path and support for the reamer (*see Figure 2*). The jig ensures the reamer will start its cutting operation straight and true. Again, limitations exist with this design. Excessive wear and factory machining processes can cause concentricity issues.

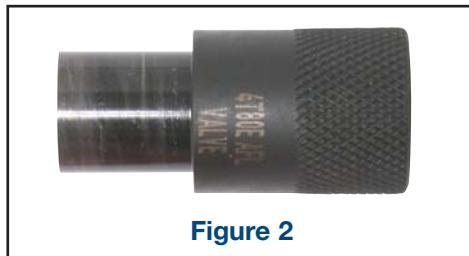


Figure 2

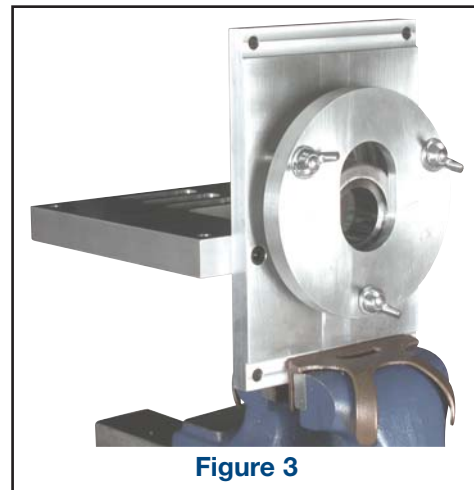


Figure 3

Finally, some situations require a fixture for proper alignment (*see Figure 3*). The fixture allows the piloting operation to be performed externally, by using a guide pin and an adjustable collar to establish centerline, and a reamer guide to hold the reamer in alignment.

Once you have valve body and piloting method set up, it helps to take an inventory of the tools that are needed. Some tool kits require multiple reamers, so keep this in mind and pay close attention to the instructions for the proper sequence. The reamer(s) can be driven by hand with a speed handle, or by using a high torque, low speed power drill. An electric drill can be used, but the speed is more easily maintained with an air drill and adjustable regulator. A wobble drive adapter should be used between the drive tool and reamer socket, to prevent side loading (*see Figure 4*). It's important to maintain a constant speed of no more than 200 rpm or the surface finish and bore size can be negatively affected. Always clean the valve body thoroughly before beginning, to ensure the best finish possible.

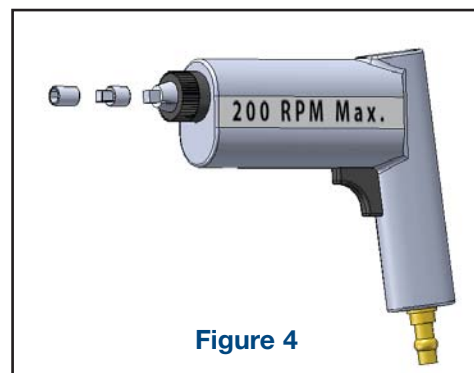


Figure 4

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Automatic Drive P.O. Box 440
Bellows Falls, VT 05101-0440 USA
800-843-2600 • fax: 802-463-4059
email: info@sonnax.com •
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A cutting fluid designed for aluminum is critical for the best results. Products such as ATF or rust penetrants should never be used for this purpose. Reamer damage, a poor surface finish, and/or an incorrect bore size, can result. Water soluble cutting fluids such as MobilMet S122 or Lubeguard Biotap work best, but old favorites such as Tap Magic also work well.

For volume cutting operations and for best results with power reaming, a reaming station with constant lube has proven to be the most efficient set up (see Figure 5).

When reaming by hand, it is recommended to soak the reamer and bore thoroughly before starting, with occasional reapplications thereafter. Always turn the reamer clockwise, never backwards. Try to maintain a fluid, continuous motion, with little to no forward pressure. The reamer should pull itself through the bore, so avoid pushing it harder. This will only hurt the finish and possibly cause it to “corkscrew”, which can result in an undersized bore.

It is advisable to clean chip buildup periodically during the process to keep the finish intact. Chip buildup can also cause the reamer to bottom prematurely, resulting in sleeve fitment issues and sticking valves, so pay close attention to this. When using a fixture, never breakdown your setup until you are completely

finished reaming. This can cause the reamer to cut off center and induce sticking and hydraulic leaks due to the loss of your original centerline.

Now that we have the basics out of the way, what happens when you have fitment issues when you're done? If the sleeve and/or valve(s) are too tight after reaming, here are a few suggestions:

Chuck the reamer in a power drill and run it in and out of the bore at 500 rpm. This will burnish the bore and remove any surface imperfections. Alternatively, use a piece of coat hanger wire bent over a small piece of scotch-brite pad chucked in a drill, to remove flashing material. Be very cautious not to remove too much material and cause a leak.

Check the reamer for aluminum buildup. It's not always visible at first, but under a magnifying glass this will be evident. It may be necessary to periodically clean the edge of the reamer flutes with a product such as an EZE-LAP paddle or a sharp cutting tool bit (see Figure 6). Drag the tool along the inside edge of the flute, towards the tip, to remove the buildup.

If a sleeve is too loose, here are a few tips to avoid or help correct a problem:

As stated earlier, always use a wobble drive adapter between the reamer socket and drive tool. This prevents side-loading and oblong bores. If you are using a speed handle, keep

hand motions as fluid and circular as possible. Avoid exaggerated movements which can force the reamer to wobble in the bore.

If a sleeve is too loose, a tubing cutter can be utilized to tighten things up (see Figure 7). Lightly scratching the sleeve in a couple of locations can help with this. This technique can also help with a leaking end plug, in some cases.



Figure 6

When setting your valve body up in a fixture, make sure the guide pin action is as smooth as possible when stroked in and out of the bore. There should be no steps felt when inserting the pin. Continued adjustment should be done until the action is completely smooth.

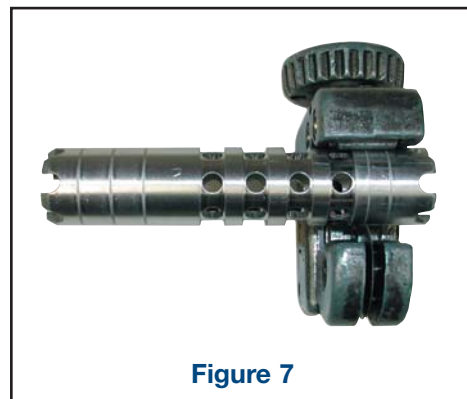


Figure 7

Hopefully this will help clarify the most common inquiries about reaming. It helps to remember that all of these suggestions were obtained through trial and error, so don't be afraid to contact Sonnax Tech Support, if you have any questions or concerns. With a little care and process development time, anyone can make a worn-out valve body perform as good as new.

Tory Royce is a Sonnax Technical Support Specialist and a member of the Sonnax TASC Force (Technical Automotive Specialties Committee), a group of recognized industry technical specialists, transmission rebuilders and Sonnax Industries Inc. technicians. E-mail Sonnax Tech Support at info@sonnax.com or call 800-843-2600.

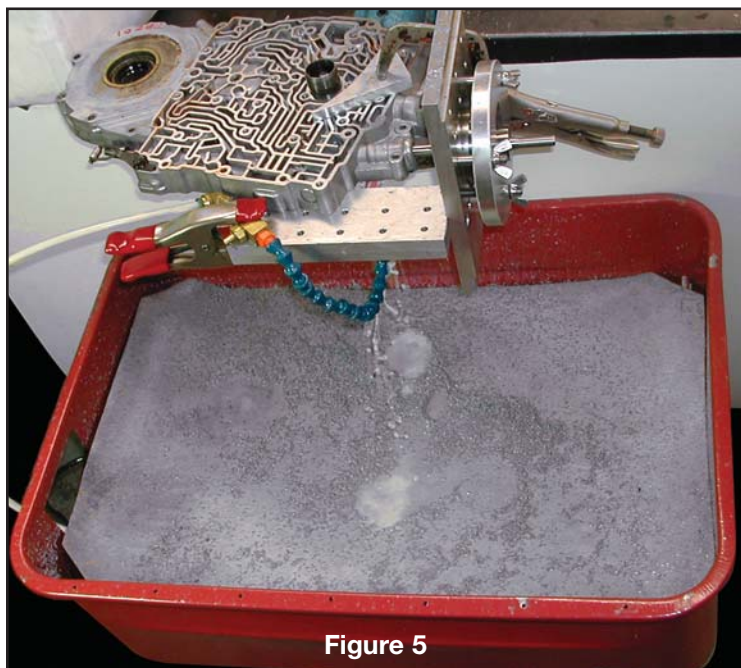


Figure 5