

Vacuum Chucking on your Omega Stubby Lathe

Adding vacuum chucking to your lathe adds a useful dimension to your turning, allowing the earth's atmospheric pressure to hold workpieces in place while you finish them.

Your Stubby lathe has a built-in port for this purpose located at the upper rear of its headstock. Basically, what you will need to get going is a vacuum chuck threaded to the lathe spindle and some fittings and air hose to connect the vacuum port on the lathe to a vacuum pump.

The purpose of this presentation is to outline the bits and pieces you can use to create a simple, economical and easily assembled network of fittings between your lathe and a vacuum pump of your choice so you can add vacuum chucking to your lathes features. However, I think a brief description of the whole system may help to explain the use of vacuum as a holding force for turners new to this ability and feature.

Simply put, the vacuum chuck consists of a rigid surface that conforms to the surface shape of your workpiece, with a small hole in the center surrounded by a female thread to mate with your lathe's spindle thread. The surface which is to be in contact with your workpiece is coated with a closed cell, compliant sealing material. In practice, your workpiece is centered and held up against the compliant membrane which is supported by the chuck body; with the vacuum pump running, vacuum is gradually applied creating a negative atmosphere between the workpiece and the chuck allowing the positive earth's atmosphere surrounding the workpiece to hold the piece against the chuck. A simple vacuum control valve and air inlet allows you to control how much vacuum is created so you can install and release the workpiece and regulate the amount of pressure applied by allowing greater or lesser outside air into the system to equalize the atmosphere you create behind the workpiece.

Vacuum chucks are commercially available in a variety of shapes and sizes or you can make your own from a lathe faceplate and common materials available at building and/or plumbing supply retailers. For more information on this consult your Stubby Owners Group or search the "web" re: vacuum+chucks.

The Theory behind this vacuum setup

This setup provides for creating vacuum between your chuck and your pump via one of two routes; a) through the "stock" route through the rear of the headstock or, b) through an aftermarket "through-the-handwheel" network of fittings available separately.

Newer versions of Stubby lathes may use the stock route as the lathe is now built for use with the higher pressures produced by vacuum pumps.

In earlier models of Stubby lathes designed for use with an HVLP vacuum source such as a shop vac, the "through-the-handwheel" setup will be necessary if you're going to use an HPLV vacuum pump as the seals in the headstock will not hold vacuum for this application.

Explanations of how to easily build this setup for a "through-the-handwheel" routing will be explained logically as you proceed with the assembly and indicated with an *.

Regardless of whether you choose to use the lathes integrally designed vacuum capability through the headstock or an aftermarket “through-the-handwheel” vacuum assembly, the vacuum gauge and fittings are conveniently secured in the same location at the rear of the lathe headstock in plain sight and easy reach of the turner. In either case, vacuum will be routed through the lower barb fitting, witnessed on the gauge, regulated by the vacuum valve with intake air entering through the sintered bronze intake fitting.

Lets get going and you'll see what I mean...

Omega Stubby Lathe vacuum fitting setup

Preface: the vacuum port at the rear of your Stubby lathe is threaded BPT which is not standard here in North America. Our standard NPT thread is so close as to be an almost perfect mate, therefore we suggest the use of a 1/4" NPT fitting for this union.

Fittings required:

- 1/4" NPT brass nipple (2)
- 1/4" NPT female forged brass tee (1)
- 1/4" NPT male to 3/8" barb fitting (2)
- 1/4" NPT female forged brass cross (1)
- 1/4" NPT vacuum valve (1)
- 1/4" NPT sintered bronze intake (1)
- vacuum gauge (1)
- Teflon thread sealing tape (1 roll),
- a small tube of silicon sealant

Assembly instructions:

NOTE: when tightening threaded fittings, use only moderate pressure to firmly seat the fittings. Do not use excessive pressure or you will be in danger of stripping the soft brass threads.

- 1) while looking at the end of each male thread, in a clockwise rotation (“with” the thread), apply 3-4 full wraps of Teflon thread sealing tape fully covering the threaded portion of each fitting.
- 2) Begin assembly by threading the two “1/4” brass nipples” into the “ 1/4” female forged brass tee”; one into the side inlet and the other into one of the two ends, advancing each until they are snugly seated using finger pressure.

* NOTE: *only* if you are going to use the “through-the-handwheel” routing, the “brass nipple” you thread into the end of the “tee” must lightly sanded internally then be fully blocked with silicone sealant as this fitting will merely be an anchoring fitting for the network. Do this prior to assembly, allowing the silicone to cure fully before assembling.

- 3) Into the remaining end of the “1/4” forged female brass tee” thread one of the “1/4” NPT male to 3/8” barb fittings”
- 4) Thread the opposing end of the “tee” which you fitted with a “brass nipple” into the vacuum port on the rear corner of your lathes headstock. Seat the “brass nipple” firmly using a small

wrench so that the side inlet on the “tee” is horizontal and the remaining “brass nipple” pointed toward the handwheel side of the headstock.

- 5) Thread the “forged brass cross” onto the “brass nipple” exiting the side of the “tee” so that the cross is firmly seated in a vertical orientation.
- 6) Thread the remaining “ ¼” NPT male to 3/8” brass barb fitting” firmly into the female thread on the bottom of the “forged brass cross”
- 7) Thread the “vacuum gauge” firmly into the female thread on the top of the “forged brass cross” so that it seats facing forward, toward the front of the lathe headstock.
- 8) Thread the “ ¼” NPT sintered bronze intake” firmly into the female threaded end of the “ ¼” NPT vacuum valve”.
- 9) Thread the male thread of the “ ¼”vacuum valve” firmly into the remaining, horizontal, female thread in the “forged brass cross” so that it seats with the red shut-off handle facing forward.

Connection to the vacuum pump:

This assumes that the inlet and exhaust ports on the chosen vacuum pump accept ¼” threaded fittings. If this is not the case on your pump, adaptation will be required.

Fittings required:

- 3/8”i.d. braided tubing (10ft. roll)
- ¼” NPT to 3/8” brass barb fitting (1)
- high flow vacuum pump filter (1)
- ¼” NPT brass pipe, 2” length (1)
- ¼” NPT forged brass street elbow (1)
- exhaust muffler (1)

Assembly instructions:

- 1) as above, apply 3-4 full wraps of Teflon sealing tape to a male threads in a clockwise rotation.

NOTE: you are aiming to achieve a horizontal airflow through the filter with the filter oriented vertically, the glass dome down

- 2) Depending on the orientation of the inlet port on your pump, thread either the “¼” NPT forged brass street elbow” or the 2” long “¼” NPT” brass pipe” firmly into the inlet port of your vacuum pump. If you used the elbow here, now firmly thread the 2” long, “¼” brass pipe” into the female thread of the elbow.
- 3) Paying attention to the direction of airflow as indicated by the arrow on top of the filter, firmly thread the output side of the “vacuum pump filter” onto the “¼” brass pipe” so that it’s seated perfectly vertically with the glass dome down.
- 4) Firmly thread the “¼”NPT to 3/8” brass barb fitting” into the inlet side of the “vacuum pump filter”
- 5) Slide one end of the “3/8” braided tubing” onto the “brass barb fitting”, the other end onto the “brass barb fitting” beneath the “vacuum gauge” at the bottom of the “forged brass cross” fitted at your lathe.
- 6) Firmly thread the “exhaust muffler” into the outlet port of the pump.

Decision time

If you have built this network of fittings to use the Stubby's "stock" vacuum setup, routing vacuum through the headstock, cut a small length of 3/8" braided hose, say 2 1/2" long and plug/seal one end permanently by filling it to a depth of 1" with silicone sealant. After the sealant has cured thoroughly, install the open end of the hose onto the 3/8" barb fitting exiting the rear of the "brass tee" at the lathe to block this fitting.

In the event you may want to switch to using a "through-the-handwheel" routing at a later date, you merely have to remove this short plugged hose, run a suitable length of 3/8" braided hose from this brass barb fitting to the handwheel assembly, where you will have already removed the plug from the center of the handwheel, then plug the "1/4" brass nipple" as described in step 2) at the beginning of assembly.

Now, you will also plug the hole in the bolt in the center of your lathes handwheel to block air from entering the vacuum route there. This can be accomplished by exchanging the center-bored M16 x 30mm bolt securing your handwheel with an un-bored hex bolt of the same dimensions or firmly press-fit a turned, tapered plug into the existing bolt. Don't use silicone here as you'll need the hole again to permit use of your knockout bar for other turning operations.

* If you are going to employ a "through-the handwheel" routing now, having plugged the initial "brass nipple" in step 2 of this assembly, all you do now is install one end of a suitable length of 3/8" braided hose onto the "3/8" barb fitting" exiting the rear of the "brass tee" at the lathe and the other end of this hose to the barb fitting at the handwheel vacuum assembly. (Some modification here may be necessary if the fitting on your handwheel assembly isn't terminated in a 3/8" barb fitting).

To Test your vacuum system:

- 1) Plug or cap the no. 2 Morse taper of your lathes headstock spindle to seal it fully.
- 2) Open the "vacuum valve" fully, so air can be drawn in through the "sintered bronze intake" fitting.
- 3) Turn your vacuum pump "on" and with it running, slowly close the "vacuum valve", restricting air from entering through the "bronze intake" at the lathe until the pump begins drawing pressure as indicated by your "vacuum gauge".
- 4) Allow the pump to draw an indicated -20hg of pressure then fully close the "vacuum control valve" and shut "off" your pump.

Your vacuum system is now sealed at both the ends and should hold the indicated pressure for a reasonable time (several minutes) without change. If so, you've done a good job of assembling your vacuum system and you're ready to open the vacuum control valve, releasing the pressure, replace the plug or cap you used to seal the spindle with a vacuum chuck and enjoy your new lathe holding method.

If the pressure drops according to your vacuum gauge, you have a leak somewhere in the system caused by one or more elements not fully seated/sealed. Begin by checking the plug/cap at the lathe spindle and (optional) the method you used to seal the hole in the center of the handwheel. If those

aren't the culprit expand your search by checking all your threaded connections one by one. A dab of silicone sealant wiped around the shoulder of the offending joint should solve the issue. If you resort to this, keep the pump running to draw the sealant into the joint then turn the pump off and let the system rest, uncharged, until the sealant has set fully, usually 12 hrs.

Revision to Omega Stubby Lathe vacuum fitting setup

November 2nd, 2008

At the suggestion of Bill Rubenstein who feels that over time, the vacuum seals in all Stubby lathes, designed for vacuum chucking via a fitting port on the rear of the headstock, are destined to fail, I offer the following revised assembly of fittings.

All of the components in my original setup remain the same except for two:

- In lieu of the 1/4" npt brass elbow, there is a 1/4" npt female forged brass "tee". One end of this is threaded onto the 1/4" npt brass nipple that is threaded into the lathe headstock and seated so the side female thread is horizontal and facing toward the hand-wheel end of the lathe.
- Into the rear of the "tee", thread a 1/4" npt to 3/8" barb fitting.

Now continue assembling the setup as I originally described , threading the remainder of the components into the remaining horizontal female thread on the side of the 1/4" npt "tee".

By doing this, regardless of whether the turner chooses to use the lathes integrally designed vacuum capability through the rear of the headstock or an aftermarket "through-the-hand-wheel" vacuum assembly, the vacuum gauge and fittings are secured conveniently at the rear of the headstock and in sight and easy reach of the turner.

In the event the turner chooses to use the Omega integral system, he/she would plug the knockout bar hole in the centre of the lathes hand-wheel as well as the 1/4" npt to 3/8" barb fitting coming off the rear of the 1/4" npt brass "tee". The hand-wheel could be plugged by tapping in turned tapered plug or by replacing the bored bolt with a solid bolt of the same length and value. The brass barb fitting could be plugged by adding a 2" length of 3/8" braided hose, and filling the hose with silicon or threading in a 1" long 3/8" bolt into the end of the hose and binding it with a hose clamp.

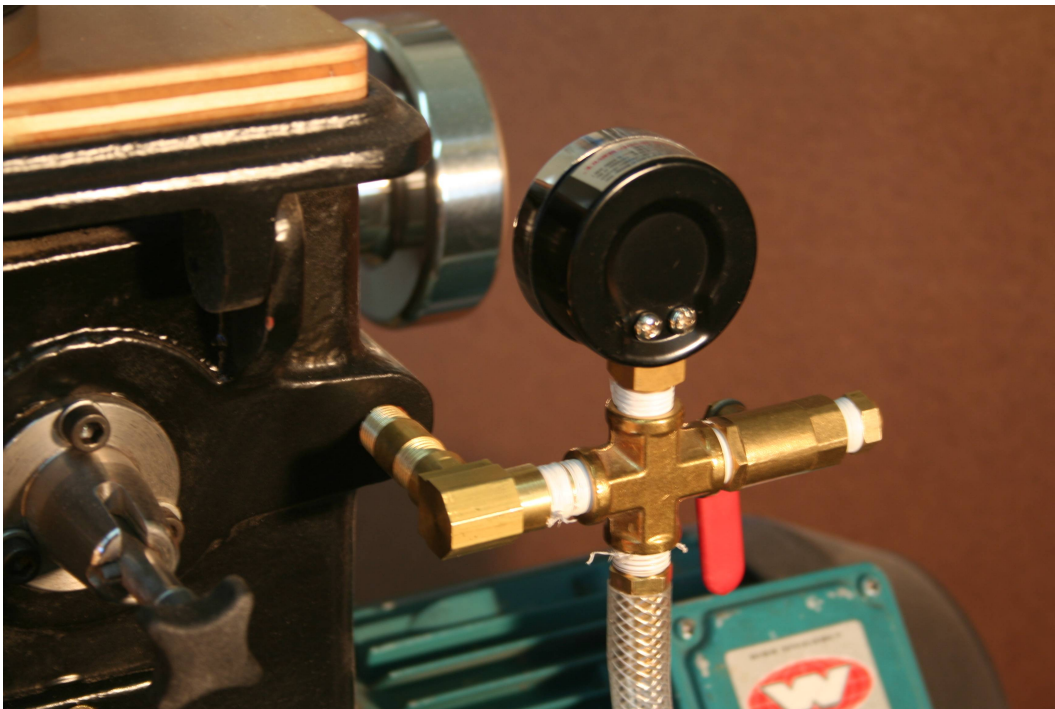
In the event the turner opted, at any time, for a "through-the-handwheel" vacuum setup, then he/she would plug the 1/4" npt nipple joining the 1/4" npt "tee" to the rear of the lathe by caulking it fully with silicon to prevent leakage. Once the silicone is fully cured (overnight), thread on the remaining fittings/gauge and join the 1/4" to 3/8" brass barb fitting on the end of the "tee" to the fitting in the center of the handwheel ass'y. via a suitable length of 3/8" braided hose.

In either case, vacuum would be routed through the lower barb fitting, witnessed on the gauge, regulated by the vacuum controller with inlet air entering through the sintered bronze intake.

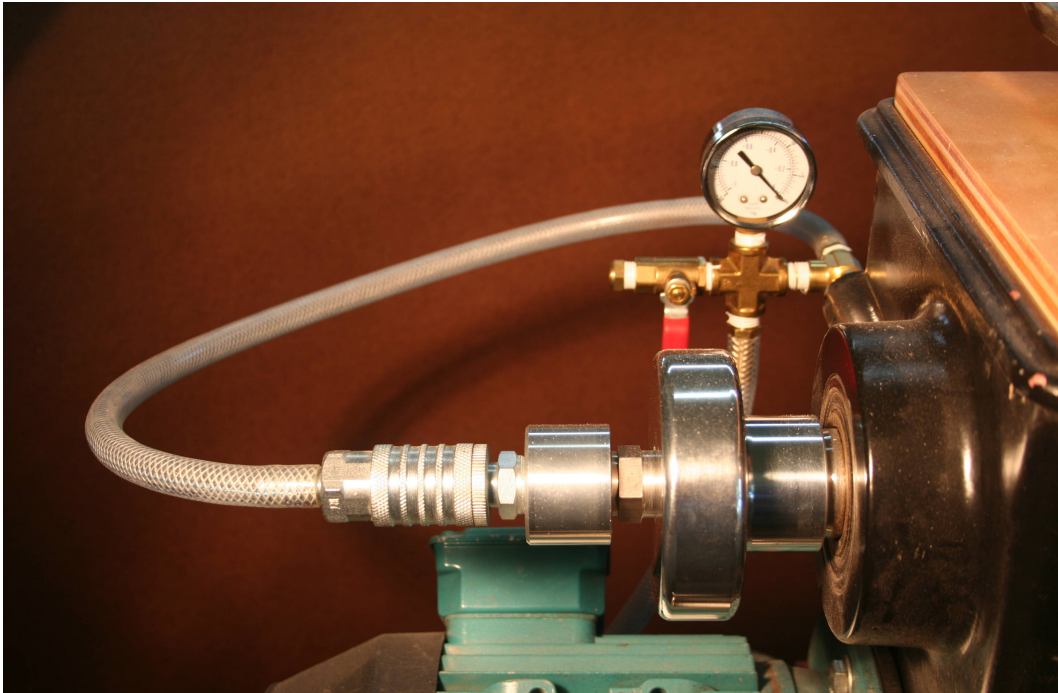
Photos – a Picture is Worth a Thousand Words



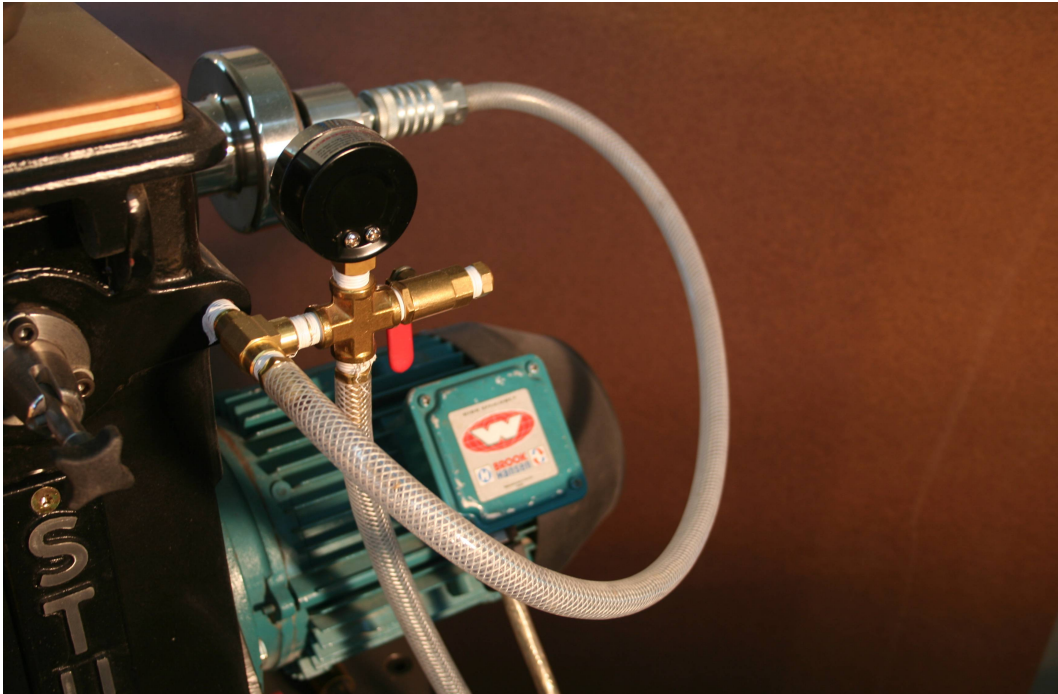
Factory Vacuum System -- Front View



Factory Vacuum System -- Rear View



Add-on Vacuum System -- Front View



Add-on Vacuum System – Rear View



Add-on Vacuum System -- Blocked Mounting Fitting