

#004-895

GraverSmith™

OPERATION AND MAINTENANCE MANUAL



IMPORTANT

Read these instructions BEFORE operating the machine. There are a few things that must be done before connecting the machine to any power source.



NOTICE

This machine requires clean, dry oil-free air. We suggest using an oil free compressor. If your compressor is an oil type, you MUST have an oil removal filter (coalescing type) in the air supply line to this machine. If you are unsure of this requirement, please call 800-835-3519 or 620-343-1084 and ask for Technical Services.

OIL CONTAMINATION IS NOT COVERED BY WARRANTY.

INTRODUCTION

The **GraverSmith** fulfills the need for a cost-effective machine capable of allowing rapid cutting and carving of metal, stone, wood, ivory and many other materials. The easily controllable features of the **GraverSmith** also makes it an ideal tool for stone setting, stippling, matte finishing on jewelry, stipple engraving on crystals and more.

The **GraverSmith** acts on the principle of an air-powered hammer capable of delivering controlled impacts at speeds of 400-8000 strokes per minute (handpiece dependant). A foot pedal controls the impact power in much the same way the gas pedal works on a car. The wide range of power and control allows the user to freely move from light to heavy cuts. To realize the full capability of the **GraverSmith** you need to become familiar with both the operation and routine maintenance of your machine. This manual is intended to help you master both the machine, handpiece and the proper preparation of the graver.

GraverSmith

- 1 Rugged plastic carrying handle
- 2 Press type ON/OFF switch
- 3 5 micron filter and water trap
*NOTE: Will not remove oil from air
- 4 Air regulator with gauge
- 5 Handpiece port
- 6 Strokes per minute control
- 7 Compressed air supply IN
- 8 Compressed air supply OUT
- 9 Air input port (from filter)
- 10 Foot throttle port

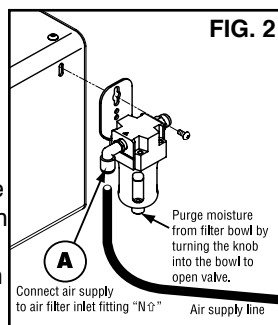


MACHINE SET-UP

CONNECT AIR SUPPLY

GraverSmith recommends 1.4 CFM (40 liters/min.) at a minimum 45 psi (3.1 bar). Maximum input is 125 psi (8.6 bar). We encourage reducing the air pressure from the compressor with a regulator to 45~60psi (3.1~4.1 bar) as this ensures a stable air pressure supply. The compressed air must be clean, dry, and oil-free. The filter supplied with each unit is a final filter and is not capable of removing large amounts of water, oil, or contaminants. If the air supply has excessive water, oil, or contaminants, an additional filter/water trap/coalescing filter should be installed ahead of the unit. Be sure to clean/purge all filters and water traps regularly. **IMPORTANT: Never add oil to the compressed air for the GraverSmith.** Oil can foul internal parts and cause erratic handpiece operation. If your compressor requires oil, YOU MUST use Coalescing Filter (#004-579) to ensure this oil does not contaminate your compressed air.

Decide where you want to locate the machine on your bench. **NOTE: The machine must be in vertical position - DO NOT lay on its side.** Next, decide where you would like the air filter located. Make its location readily accessible so it is easy to purge moisture from the bowl. You may attach the air filter to your machine, bench, or wherever you desire. Keep the location of the filter where you can see it and easily maintain it. Here we show it attached to the back right side of the machine (FIG. 2).



CONNECTING THE HOSES

If “push-to-connect” fittings are new to you, they are amazing. With the AIR PRESSURE SHUT OFF, simply insert the hose all the way into the fitting opening — it stays attached. To disconnect, press in on the orange ring while gently pulling the hose out.

Locate the air input fitting on the air filter. It is identified on the air filter with the marking “N¹”. Connect your 1/4" OD (6,35mm) air supply hose directly to the “push-to-connect” fitting simply by pushing the hose end inside the orange ring receiver (A). If your air supply hose is larger than 1/4" OD you have two options. Use a reducer, not supplied, and step the air hose size down to a 1/4" OD (6,35mm), or replace the “push-to-connect” fitting with the included barbed fitting and attach air supply hose.

Locate the 6' (1.82m) air hose (#044-069) and cut a 5 1/2" (139mm) piece from it. **NOTE: This is if you are going to locate the Air Filter as described above.** Connect this 5 1/2" hose to the air outlet (FIG. 3-B) on the air filter, opposite the air input. Connect the other end of that hose into the fitting on the back of the machine (FIG. 3-B) marked AIR INPUT on the label below it. Use these same connections no matter where you locate the filter.

CONNECT FOOT THROTTLE

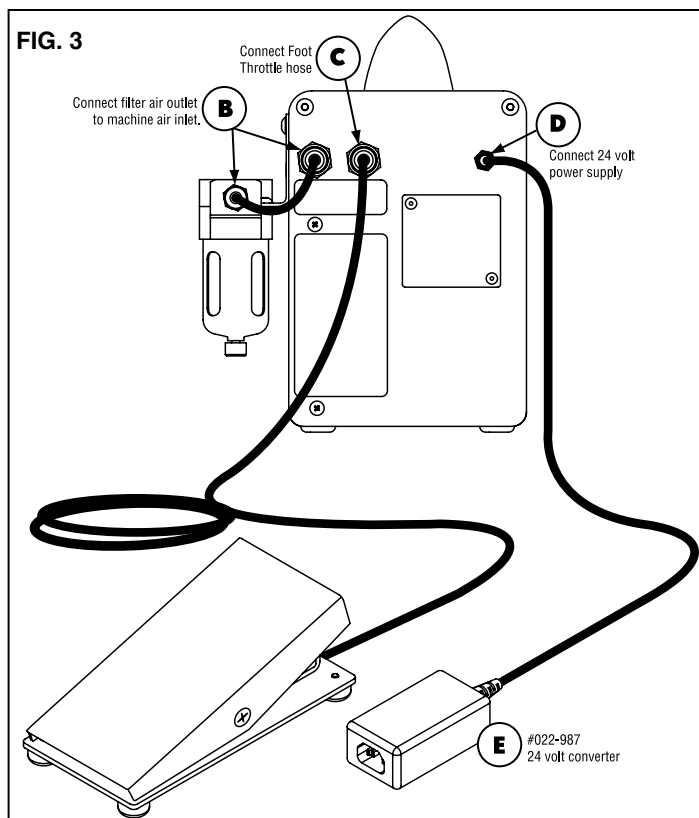
Place the foot throttle on the floor in a convenient position. Run the hose to the back of the machine. If you need to “snake” the hose through an opening on your bench, make sure the hose is not pinched or kinked. Connect the hose from the foot throttle to the “push-to-connect” fitting above the label marked THROTTLE CONNECTION (FIG. 3-C).

CONNECT ELECTRICAL POWER

IMPORTANT: The ROTARY VALVE is lubricated by air passing through it. DO NOT RUN THE MACHINE UNLESS AIR SYSTEM IS ON.

Connect the electrical power cord into the 24 Volt Converter Box (FIG. 3-E). Plug the converter cord into the jack on the back of the machine (FIG. 3-D). **IMPORTANT NOTE: DO NOT USE OTHER BRANDS OF 24 Volt Converters - DAMAGE WILL OCCUR to the machine.**

The power converter supplied with your machine will accept 120 Volt or 230 Volt. All that is necessary to convert power supply is to use the 230 Volt adapter supplied in the accessory box. You are ready to tune the handpiece.



OPERATION

STROKES PER MINUTE (SPM)

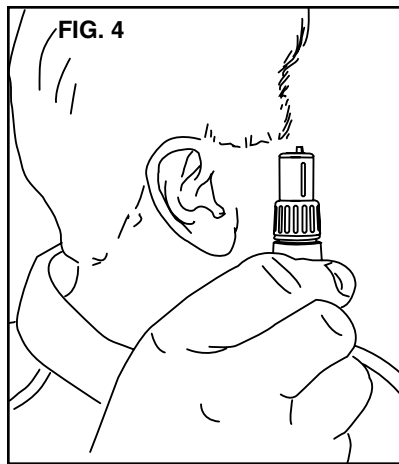
Stroke speed setting is a matter of personal preference and experience. Generally speaking, lower speed settings are preferred for some stippling, matting or staking functions. Try mid-range settings for tasks requiring maximum power. Higher speeds work best for fine, delicate cuts and to obtain the best finish.

The **GraverSmith** shows a range of 400 to 8,000 strokes per minute. The calibrations on the dial are only approximate. Each model of handpiece has a normal range of strokes per minute. Operating outside this range can produce erratic operation at times.

HOW TO TUNE THE GRAVERSMITH

By “tuning” your machine, we mean adjusting the strokes per minute and air pressure for optimum performance. **TUNING YOUR MACHINE PROPERLY IS THE SINGLE MOST IMPORTANT OPERATION YOU SHOULD LEARN.**

1. Turn ON your air compressor and allow the tank to fill. Wait for the compressor to cycle off and stop running.
2. Turn the GraverSmith on and set the stroke per minute dial at 2300 and using the regulator knob on the front of the machine, back the air pressure down to 2 to 5 PSI (0.1 to 0.4 bar).
3. Hold the handpiece you have selected to use with the tool holder end up (vertically) next to your ear FIG. 4).



4. WITHOUT depressing the foot control, SLOWLY increase the air pressure until the handpiece begins to buzz. While continuing to increase the air pressure, the handpiece will vibrate, more air pressure will make it knock. Slowly add air pressure and when the knocking barely stops and add 2 psi (.13 bar), this is considered the perfect air pressure operating range for any of the handpieces listed in the chart at the bottom of the page.

Another method of tuning (although not as precise) is to use the initial setting shown in the chart below. Set the Strokes Per Minute dial to the Recommended Initial Setting. Set the air regulator knob to the middle of the Normal Air Pressure Range for the handpiece you are using. The goal is to use the least air pressure possible that will properly operate the handpiece.

Remember, if the handpiece vibrates without depressing the foot control, the air pressure is probably too low. If the handpiece fades out at full throttle, the air pressure is probably too low, or the strokes per minute is too high for that handpiece. The handpiece should start to operate within 3/8" (9,525mm) of depression of the foot control, if it doesn't the air pressure is probably too high. Always make small adjustments in air pressure or strokes per minute, not large ones, until you are familiar with your machine.

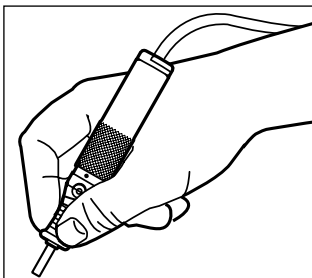
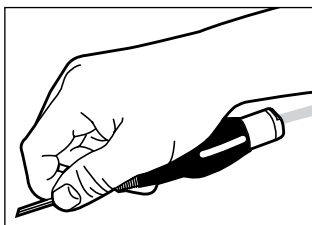
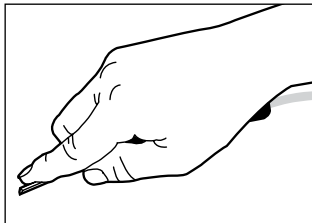
If you have “tuned” your machine properly, the handpiece will operate smoothly and predictably. New operators often use too much air pressure or the incorrect strokes per minute range. This can make your machine difficult to control for fine work. The **GraverSmith** has excellent control for the smallest stone setting and the finest engraving. But, you must learn to “tune” the machine correctly to achieve this fine control! After a while, you can experiment with variations in air pressure and stroke speed to suit your work preference.

HANDPIECE Tuning Chart

Handpiece Type	Normal Operating Range <i>Strokes Per Minute</i>	Normal Air Pressure Range <i>psi (bar)</i>	Recommended Initial Setting	
			<i>Strokes Per Minute</i>	<i>Air Pressure psi (bar)</i>
004-506 Large	800 - 2400	20 - 30 psi (1.4 - 2.1 bar)	1400	24 psi (1.6 bar)
004-508 Standard	1000 - 2800	18 - 23 psi (1.2 - 1.6 bar)	2000	20 psi (1.4 bar)
004-563 Bulino	1600 - 4000	19 - 23 psi (1.3 - 1.6 bar)	3000	20 psi (1.4 bar)
004-610 / 609 Hammer	1000 - 2700	20 - 25 psi (1.4 - 1.7 bar)	1800	22 psi (1.5 bar)
004-710 Hammer	1000 - 2700	20 - 25 psi (1.4 - 1.7 bar)	1800	22 psi (1.5 bar)
004-801 / 810	1800 - 4000	21 - 25 psi (1.5 - 1.7 bar)	3000	22 psi (1.5 bar)
004-720 Heavy-Duty	800 - 2400	20 - 30 psi (1.4 - 2.1 bar)	1400	24 psi (1.6 bar)
004-901 / 910	Standard Spring	1400 - 3400	2700	19 psi (1.3 bar)
	Fine Spring	1600 - 3600	3000	13 psi (0.9 bar)
004-921 Monarch	Standard Spring	2300 - 4000	3600	12 psi (0.8 bar)
	Fine Spring	2300 - 4000	3600	7 psi (0.4 bar)
004-940 Magnum	800 - 3400	20 - 23 psi (1.3 - 1.5 bar)	2400	21 psi (1.4 bar)

HOW TO HOLD YOUR HANDPIECE

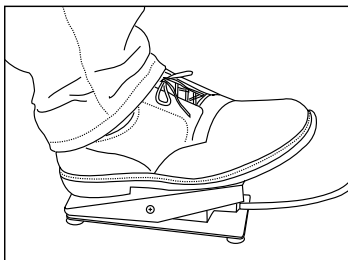
Normally, you should hold your handpiece like a table knife, not like a pencil. A few exceptions are hammering and stippling. Resist the urge to grip your handpiece tightly. Train yourself to hold the handpiece as softly as you can. When you grip it tightly or push hard with your hand, you lessen the impact power and create more work for yourself. So, relax and let the machine do the work while you concentrate on the design you are working on. When you are doing heavy work, try this: Partially release your grip on the handpiece as you add more power with the foot control. You will be amazed at how much more power you have. If you slip with the graver, you are not operating your handpiece properly, and probably pushing too hard with your hand.



Hammering is a special situation. When hammering you usually hold the handpiece like a pencil. If you are hammer setting, be sure to press the hammer tip down firmly on the work BEFORE using the foot control to start hammering. Also, do NOT operate the hammer by holding the tip slightly above the work as with many flexible-shaft hammers. Do NOT allow the hammer tip to “bounce” against the work. Use just enough downward pressure to keep the hammer from jumping off the work. GRS handpieces have tremendous power. Use just enough power to do the work ... take it easy at first!

HOW TO USE THE FOOT THROTTLE

The **GraverSmith** foot throttle is operated like an automobile accelerator and NOT like a flexible-shaft foot control. You should put the tool in position BEFORE depressing the foot control. Never depress the foot throttle and then try to bring a stroking handpiece to the work! If you need more power when cutting deeper, push more on the foot throttle to increase the handpiece power. You will soon learn to coordinate your foot action with the need for more power as you work. A beginner will push the foot control down a set amount and try to do the rest by pushing the handpiece harder, while never changing foot position. This is incorrect and not a safe way to use a handpiece. At the start of the cut, increase power in a smooth fashion. If you need more power, press more with your foot. As the cut tapers to the end, reduce the foot pressure gradually as your hand tilts the graver up and out. With a little practice, this hand/foot coordination will become as natural as driving a car.

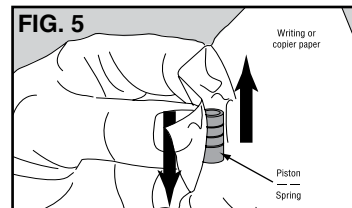


MAINTENANCE

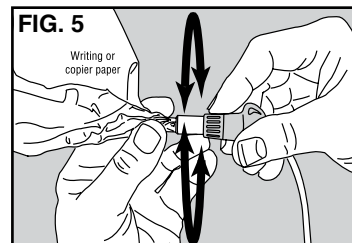
IMPACT HANDPIECE CLEANING

DO NOT USE SOLVENT! The impact handpiece must be kept clean for proper operation. If operation becomes sluggish, erratic, or fails, follow these cleaning instructions.

Remove piston and spring from the handpiece. One at a time, place in a sheet of writing or copier paper. DO NOT USE paper towel, tissue, or newsprint. Holding it between your fingers (FIG. 5) “buff and polish” off any dirt or residue. Folding the paper, use the edge to clean between the piston grooves and the spaces between the spring.



To clean the handpiece inside, take the writing or copier paper and twist it to a point (FIG. 6). Insert the paper point into the handpiece and rotate paper and handpiece against each other. This will “buff and polish” the inside clean.



IMPORTANT NOTE: DO NOT LUBRICATE PISTON, SPRING OR BORE. Oiling: Occasionally place a drop of synthetic oil or light grease on the handpiece chuck threads / jaws or Quick Change chuck. This will extend useful life, and improve operation.

THROTTLE

The throttle should require little maintenance. It should be cleaned periodically. Oiling: Periodically place a drop of oil on the throttle hinges. When cleaning the floor, place foot throttle on your bench or chair to prevent damage from debris.

AIR SYSTEM

If large amounts of water and contaminants are in the air supply to the unit, more frequent attention must be given to the units filter. The bowl must be drained frequently to prevent water from entering the rotary valve, hoses, handpiece, etc. In addition, the filter element must be cleaned and / or replaced frequently. If moisture is noted in the handpiece or throttle hoses, shut the unit down immediately and drain the filter bowl, and then follow these instructions:

1. Disassemble and clean impact handpiece(s) and reassemble.
2. Reduce pressure setting to 10 psi and turn unit ON to purge moisture from valves, hoses, etc. - with handpiece not attached.

ROTARY VALVE

The Rotary Valve is lubricated by air passing through it. Additional lubrication is not required or recommended.



DO NOT RUN ELECTRICAL SYSTEM UNLESS AIR SYSTEM IS ON.

TOOL INFORMATION

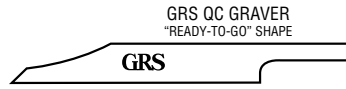
The ability to exercise precise control under all operating conditions is the most important feature of the **GraverSmith**. Coordination of the throttle and handpiece is very similar to steering your car while depressing the gas pedal.

Place the cutting point of the tool in position before depressing the throttle. Stop the stroking action before repositioning the tool, or at the end of a cut.

Use sufficient impact force to perform the cutting with a minimum of hand pressure. If your hand or arm becomes tired quickly, you are pushing the tool. Use only enough hand pressure to maintain complete control over the cutting action. If the tool point slips out of position and gouges your work, you are using too much hand pressure, or the point is improperly sharpened.

INSTALLING TOOLS INTO THE HANDPIECE

GRS offers a full line of graver, points, and tools. GRS QC Gravers are preshaped and ready to be sharpened and used.

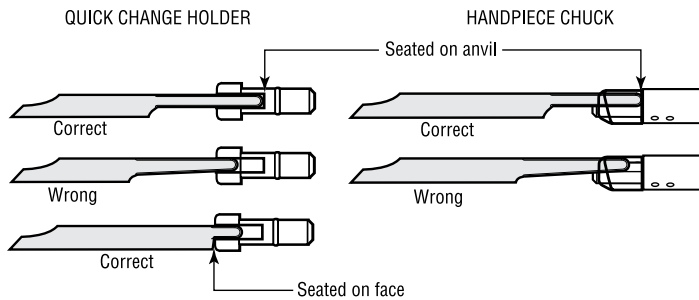


Standard gravers normally used with wood handles (point, knife, liners, etc.) may be used in all handpieces. The tang (or shank) end must be modified by grinding to fit the chuck properly.

When inserting the desired tool into the chuck, it is not necessary that it be aligned perfectly; however, it must be firmly seated inside the chuck, on the face of the chuck, or on the ledge provided in the chuck jaws.

The following sketch shows how the graver should be modified.

Do not use tool bits with a taper larger than the chuck will easily accept. If the tool bit shank is so large that it will not "bottom out," the impact during use will wedge the tool into the chuck so tight that it may damage it.

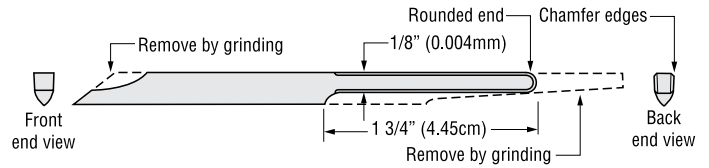


MORE ABOUT MODIFYING TOOLS

Removing the top/front of the engraver tip will allow a better view of the area being cut and will permit faster sharpening as there is less surface to be sharpened.

NOTE: When grinding a tool on a bench grinder wheel, do not let the tool tip get too hot and burn. Burning means the tool metal will turn blue, which takes the temper or hardness out of the tool and it will not hold a cutting edge. To avoid burning the tool, do not press too hard against the wheel; take your time. Have a container of water that you frequently dip the tool into before it gets warm in your hand.

Always be sure that the tool point is sharp. Refer to the TIPS section for sharpening technique.



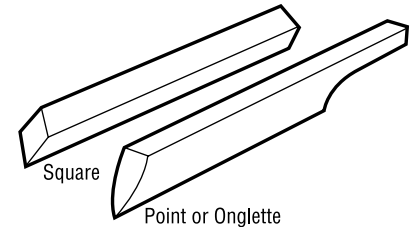
TOOL SHARPENING TECHNIQUES

While the **GraverSmith** is a tremendous aid in solving the most difficult task in engraving or carving, it does not help in another important area — the task of tool sharpening. In fact, it perhaps even emphasizes that problem. You will be cutting faster and deeper, and the need for proper point geometry and condition will soon become apparent. Be prepared to go through a learning period in tool sharpening. A few minutes spent with someone who knows how to sharpen tools properly can save hours of frustrating experimentation.

If a session with someone versed in tool sharpening is not possible, read the following information and practice. In the end, you must learn an effective technique so that when you put the tool into the work, you know the result will be as you planned.

GRS Tools offers a Graver Sharpening Simplified Video (#011-484) and a DVD called; The Expert's Guide to Graver Sharpening by Sam Alfano, Master Engraver (#022-375).

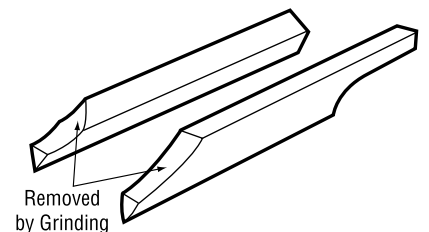
Various types of gravers are used for different types and styles of cutting, but the square and point (onglette) are the most important in metal cutting. Once you master the sharpening techniques for them, you should have little difficulty with others.



In his book, *The Art of Engraving* (#002-164), Mr. Meek's excellent illustration and discussion of the importance of proper tool sharpening technique and geometry is especially helpful. He relates to this subject in chapters 2, 4, and 7. This subject is of utmost importance, and this reference material is very helpful.

Gravers should be ground on the face first. An approximate 45-degree angle should be maintained. Keep the graver in the handpiece for free hand sharpening. First, this will save time. Second, the additional length provided is an aid in maintaining the proper angle on the stone. A considerable amount of care and practice is required to maintain the proper angle while sweeping the tool point across the stone.

A common error in sharpening is the tendency to increase the angle of the face gradually each time the graver is resharpened. To help prevent this and to reduce sharpening time, it is helpful to remove some of the excess material near the point with a bench grinder.

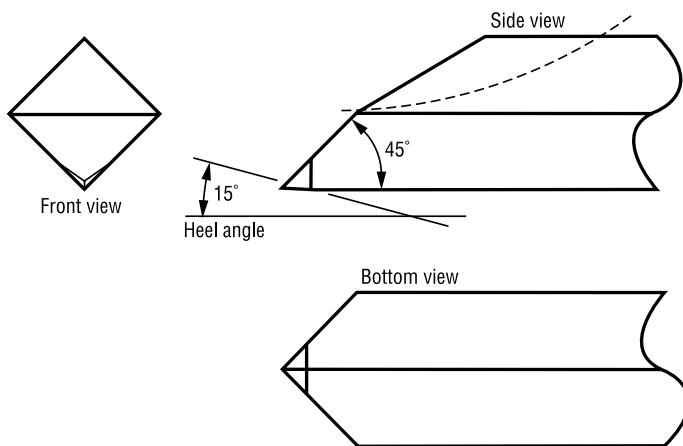


For the best results, the graver must be heeled, or set-up. This task takes some experimentation and practice to produce satisfactory results. The finish of the engraved cut is greatly affected by the finish of the graver heel. For a bright cut, finish the heel using polishing paper or a ceramic lap.

Here is what the heel accomplishes:

- A. It raises the working angle of the graver to a convenient height from the work surface.
- B. It provides depth control.
- C. It gives clearance when working on irregular surfaces and prevents the bottom surface of the graver from dragging on the edges of the cut when making curved cuts.
- D. It improves the quality and appearance of the cut.

Usually a heel angle of 15 degrees is used. Only a small amount of material needs to be removed. A few light strokes on a fine, hard stone is sufficient. Don't be confused by the tremendous number and variety of gravers available in the supply catalogs; virtually all work can be accomplished with a small variety of points.



**FOR A COMPLETE LINE OF GRAVERS VISIT
THE GRS TOOLS GRAVER WEBSITE:**

grstools.com/gravers-burs-and-more/

TIPS

The **GraverSmith** provides an effective, unique method for performing a variety of functions in many materials. You may not achieve effective results with the machine at first. In fact, your initial attempts may be disappointing or downright discouraging. Begin by expecting a learning period, whether you have had experience engraving by another method or are a novice. After the initial learning period, the results and the satisfaction derived from use of the machine are fantastic! It takes a little practice, some learning, and perhaps some re-learning. It may seem awkward and ineffective at first — like your first attempt to ride a bicycle, remember?

The easiest and most productive way to learn quickly is to work with someone accomplished in the use of the **GraverSmith**. If this is not possible, the information contained in these “TIPS” will be helpful. A most valuable and useful information source is James B. Meek's book, *The Art of Engraving* (#002-164) ... we recommend it highly.

Most of the information in this section is directed toward the task of metal engraving. Even if your purpose for using the machine differs, this information is relevant and helpful. The engraving of metal, especially steel, is most difficult, and demanding. When the principles of metal engraving are understood, then other uses will be less demanding. We have never known a person who could effectively carve a deep relief scene that could not easily set a stone, florentine or engrave a ring, matte finish a piece of jewelry, or carve wood.

Here are some reasons why you may not achieve effective results:

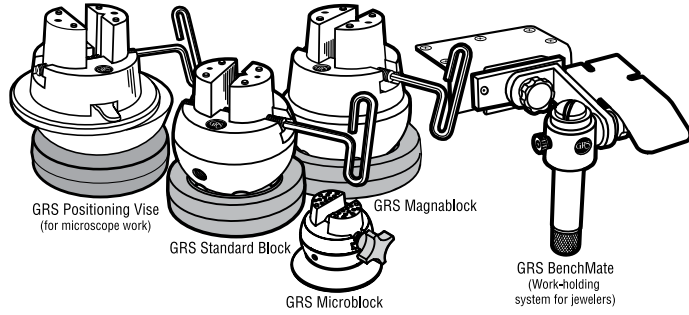
- The concept of variable power applied to the handpiece seems strange at first.
- Coordination of power and tool cutting action with the foot throttle might feel awkward, but after a small amount of practice it will become natural.
- It seems strange and different at first - but extremely effective when mastered. Again, remember how easy it was to ride a bicycle after you learned how. Successful cutting requires just the right amount of forward pressure on the handpiece, and proper manipulation of the throttle.

TECHNIQUES TO TRY

- Turn the machine ON, hold the handpiece in your hand, and work the foot throttle to get the feel of the power variation from light, short strokes to heavy, long strokes. You will begin to anticipate the foot throttle position for the various power settings desired.
- When cutting or engraving, hold the handpiece as you would a table knife, not a pencil. Place your index finger on the graver or chisel as you would on a knife blade to exert slight downward pressure. Hold it like a pencil only when stippling, background matting, chipping, etc.
- Place the tool cutting point on the work piece BEFORE applying power with the throttle. Attempting to enter the cut with the power ON and the handpiece stroking will quickly dull or damage the tool point.
- Apply power with the throttle only AFTER positioning the tool on the work. Use slight forward pressure to keep the tool point moving forward into the cut. Both tool angle and downward pressure control the depth of cut. Avoid using too much downward pressure; it's tiring and often indicates the need for better tool sharpening or a more relaxed technique.
- Vary the power input with the throttle to control the speed and depth of cut. Do not let the cutting action get ahead of your ability to guide the tool. Stop the throttle action to reposition

the work. Leave the tool point in the cut.

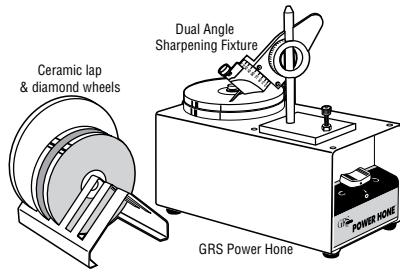
- Overcome the tendency to let the handpiece continue to stroke when not actually cutting (by failing to take your foot off the throttle.) With practice, control of the throttle becomes an automatic response.
- Use a stable vise or heavy engraver's block to hold the work. If the work is not held solidly, vibration will decrease effectiveness of the tool's power and will quickly dull or chip the point. A GRS engraving block is a most effective work-holding device.
- Don't push hard! If your hand become tired or cramped, you aren't using the power of the machine to do the work, or you may not have the tool properly sharpened or heeled.
- Keep the tool sharp and properly heeled. Sharpen frequently - before you lose the point entirely. With practice you will begin to "feel" when the point is beginning to dull. At this time, only a slight amount of sharpening is necessary to bring it back to the desired sharpness. Hardness of the material you are cutting will greatly affect tool life.
- There should be no noticeable vibration of the tool point in the cut. If the point is allowed to vibrate in the cut, the point will dull quickly.



WORKHOLDING

The workpiece must be held as firmly as possible. If it is not, much of the power and cutting capability of the tool is lost. Use either an engraver's ball vise or a vise which can be rotated with your free hand to position the work as the cut progresses. GRS offers a selection of vises to fit different tasks.

GRS sharpening equipment is a most valuable aid in tool sharpening. It is especially helpful for beginners in the art of engraving, and has been readily accepted by accomplished engravers who have found that it is faster and produces more consistent results.



The combination of the GRS Power Hone® and the Sharpening Fixture provides the ideal sharpening system. The Sharpening Fixture is designed specifically for use with the Power Hone. With this combination, you can sharpen repeatedly with consistent results time after time. It is easy to learn — you merely follow the instructions.

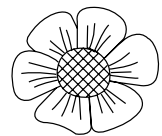
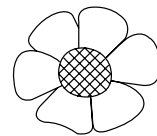
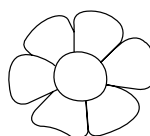
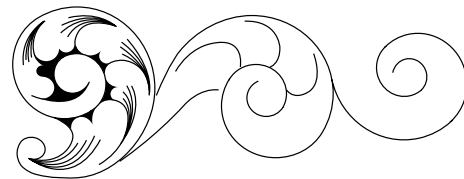
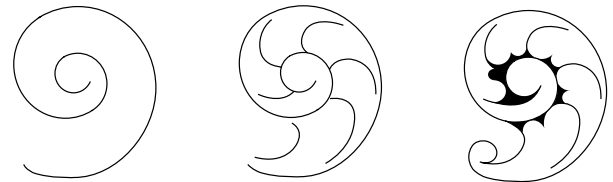
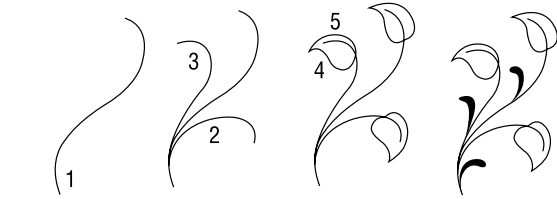
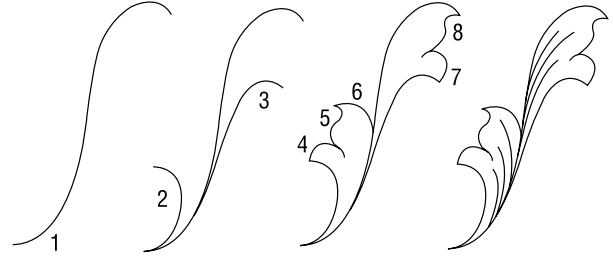
Tips For Practice Sessions

Start with simple cuts. Using a square or point (onglette) graver, begin by cutting straight lines then simple curves. Practice depth control, cutting both fine shallow lines and deep cuts. It is good practice to master the technique of varying the depth of cuts to produce a pleasing shaded effect. These practice sessions will help you acquire the necessary skills in both tool control and tool

sharpening techniques.

After you have mastered the basic skills, you can concentrate on learning the more difficult and intricate designs. With confidence in your ability to control the tool, you will be able to execute progressively more difficult patterns with varying depth of cut and subtle shading, and finally on curved or irregular surfaces.

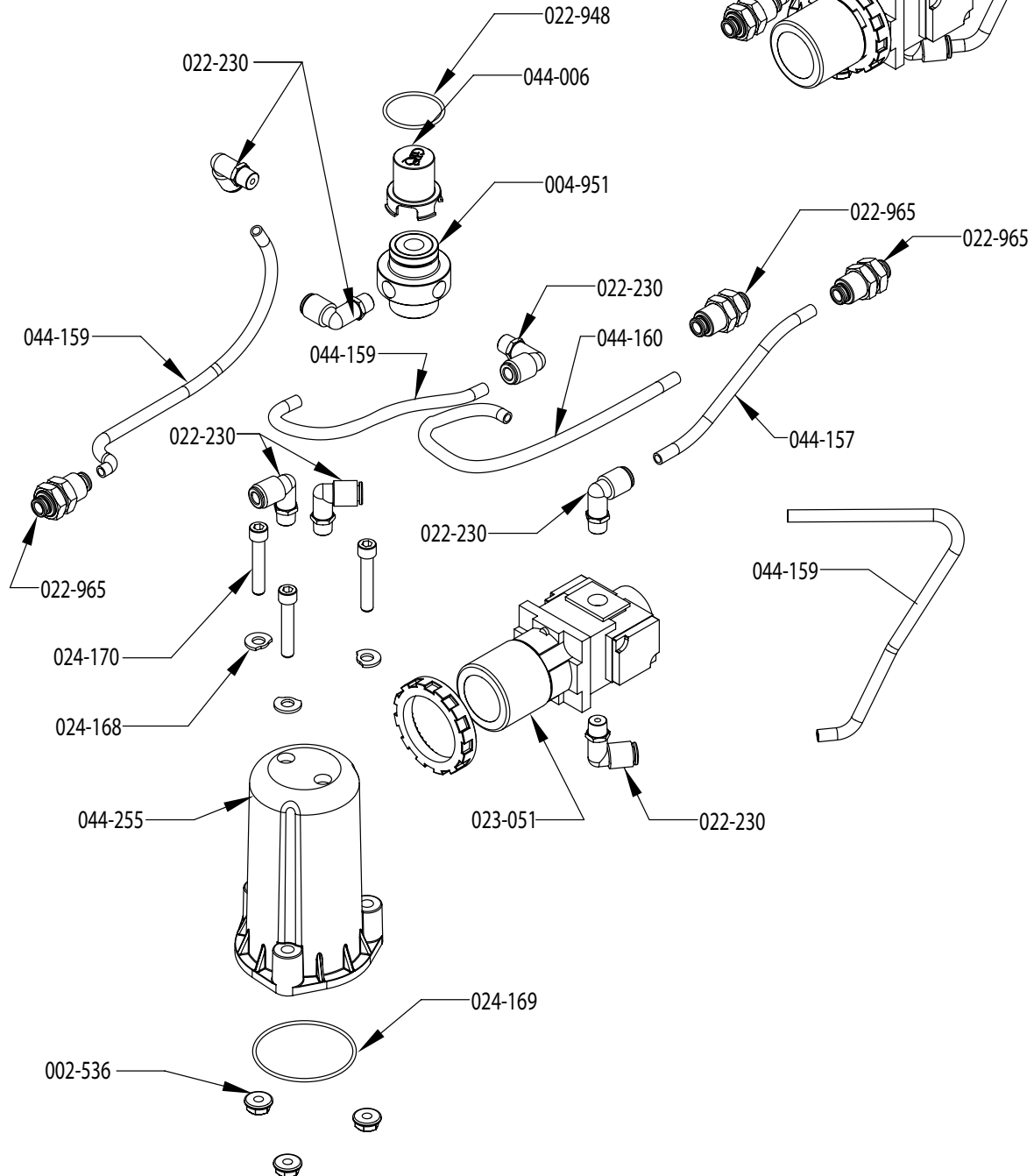
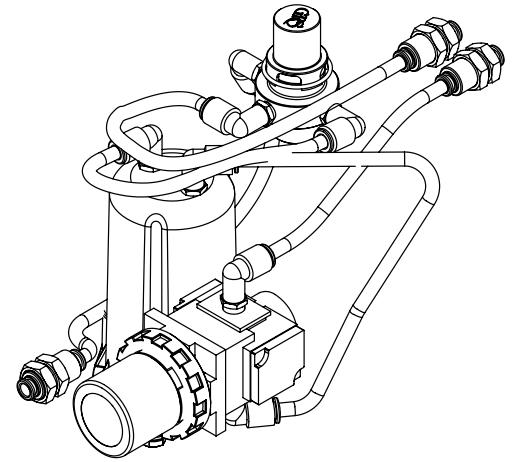
Simple exercises like those sketched below are good beginning practice designs as they are relatively simple. It is easy to determine the progression of the cuts to generate the design, and they do not require a large amount of rotation or manipulation of the work piece. This type of design is also good practice for the beginning woodcarver.



GraverSmith™ Pneumatic Parts List

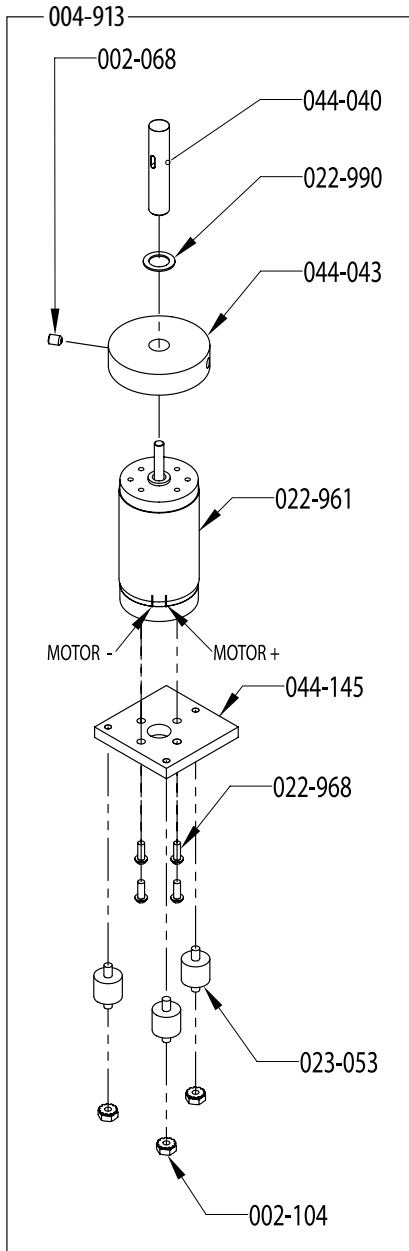
002-536 NUT, 1/4"-20 FLNG LOCK Z/P
 004-951 VALVE BODY, ROTARY

022-230 FITTING, PTC 0.25" 90° M1/8" NPT
 022-948 O-RING, 1.078" O.D. 0.938" I.D.
 022-965 FITTING, PTC 0.25" BULKHEAD
 023-051 ARG REGULATOR GAUGE IN KNOB
 024-167 MOLDED AIR TANK (TWO HOLE VERSION) - 1
 024-168 SPECIAL WASHER - 3
 024-169 O-RING - 1
 024-170 SOCKET HEAD CAP SCREW - 3
 044-006 VALVE SHROUD, ROTARY
 044-157 6.0" LENGTH OF 050-029
 044-159 8.6" LENGTH OF 050-002
 044-160 12.60" LENGTH OF 050-002



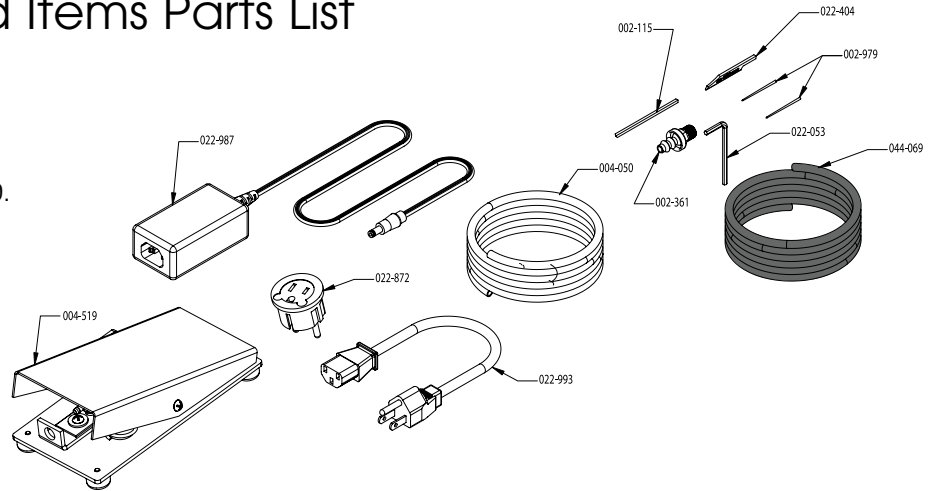
GraverSmith™ Electrical Parts List

- 002-068 Set screw #10-32 x 1/4" blk
- 002-104 Nut #8-32 HExKEP Z/P
- 004-812 Speed pot wire assembly
- 004-817 Red wire assembly motor to control
- 004-817 Red wire assembly switch to control
- 004-818 Black wire assembly switch to control
- 004-826 Power jack assy For GraverSmith
- 004-827 Red wire assembly switch
- 004-828 Black wire Switch
- 004-829 Ground wire assembly heatsink to board mount screw
- 022-961 4000 rpm motor
- 022-962 Controller board
- 022-968 6-32 x 0.375 round head machine screw
- 022-970 24VDC green illuminated switch
- 022-990 Nylon washer
- 023-053 Isolation mount
- 023-054 Control knob rogan PT-6-PS
- 044-040 Valve rotor
- 044-043 Flywheel for valve rotor
- 044-145 Motor mount mass plate



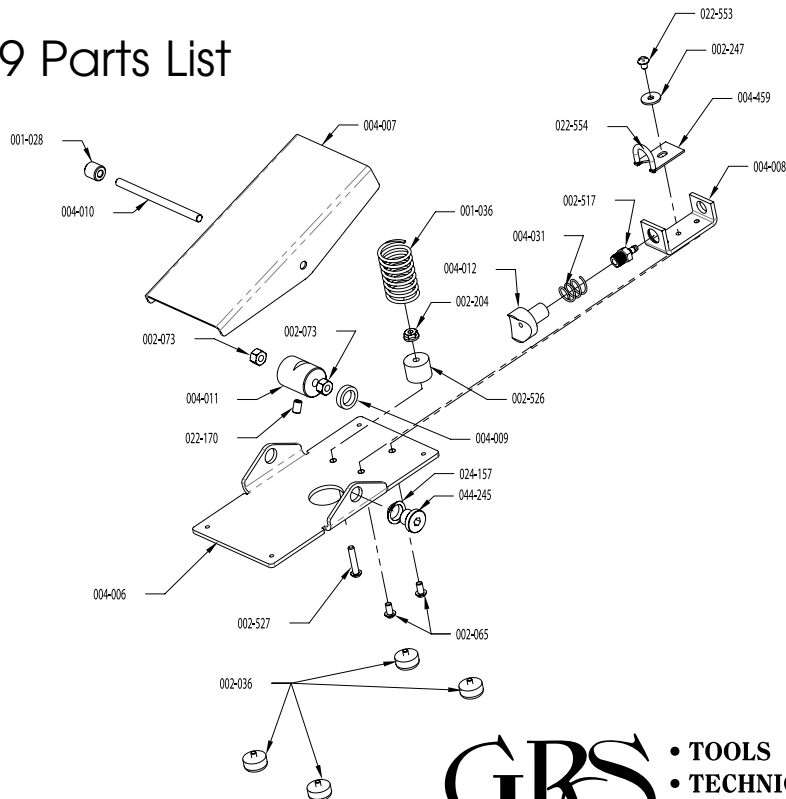
GraverSmith™ Boxed Items Parts List

PART NO.	DESCRIPTION
002-115	Square point graver
002-361	Barb fitting, 1/8 x 1/4
002-979	Steel point, small
004-050	#050-002 Tubing For Foot Control, 6 Ft., PU CLR 0.250" O.D., 0.170" I.D.
004-519	Throttle assembly
022-053	Hex wrench, 1/8" Hex Key
022-404	#4 QC HSS Onglette Graver
022-872	Schuko adaptor 110 to euro 230
022-987	Power supply
022-993	115 power cord assy
044-069	#050-029 Black Supply Tubing, 6 ft., 0.250" O.D., 0.130" I.D.



Foot Throttle #004-519 Parts List

PART NO.	QTY.	DESCRIPTION
001-028	2	Throttle Hinge Nut
001-036	1	Throttle Spring
002-065	2	10-32 x 3/8" RHMS
002-073	2	1/4-28 Nu
002-204	1	10-32 Hex Whiz Loc Nut
002-247	1	Washer
002-517	1	1/8" NPT x 0.170" Barb Fitting
002-526	1	Spring Retainer
002-527	1	10-32 x 3/4" RHMS
004-006	1	Throttle Base
004-007	1	Hinge Plate
004-008	1	Spring Retainer
004-009	2	Spacer
004-010	1	Pivot Shaft
004-011	1	Bleed Shaft
004-012	1	Outlet
004-031	1	Throttle Outlet Spring
004-459	1	Spring Retainer
011-210	4	Rubber Foot Assy. 8-32 x 3/8"
022-170	1	1/4-40 x 3/16" SHSS
022-553	1	10-32 x 1/4" RHMS



WARRANTY

Each GraverSmith, including handpieces and foot control, carries a full 2-year warranty covering parts and labor.

These products are designed for reliable operation using most sources of compressed air. However, some air supplies contain excessive water, oil, dirt, rust, or other contaminants. The unit's built-in filter is a final filter to protect against normal dirt and water. If your compressed air has excessive contaminants, you should install the necessary filter(s) and water trap(s) ahead of your unit.

Oil contamination can be gradual and subtle. If you notice an oil residue (usually a yellow to brown colored sticky or liquid residue) in the unit's filter bowl or handpiece / throttle hose, you probably have an oil problem in your compressed air. Older oil-lubricated and "silent" compressors that use internal oil are more likely to cause oil contamination. If this occurs, install a Coalescing Oil Filter (GRS #004-579 or equivalent).

NOTE: Damage caused by contaminated compressed air is not covered by the warranty.



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