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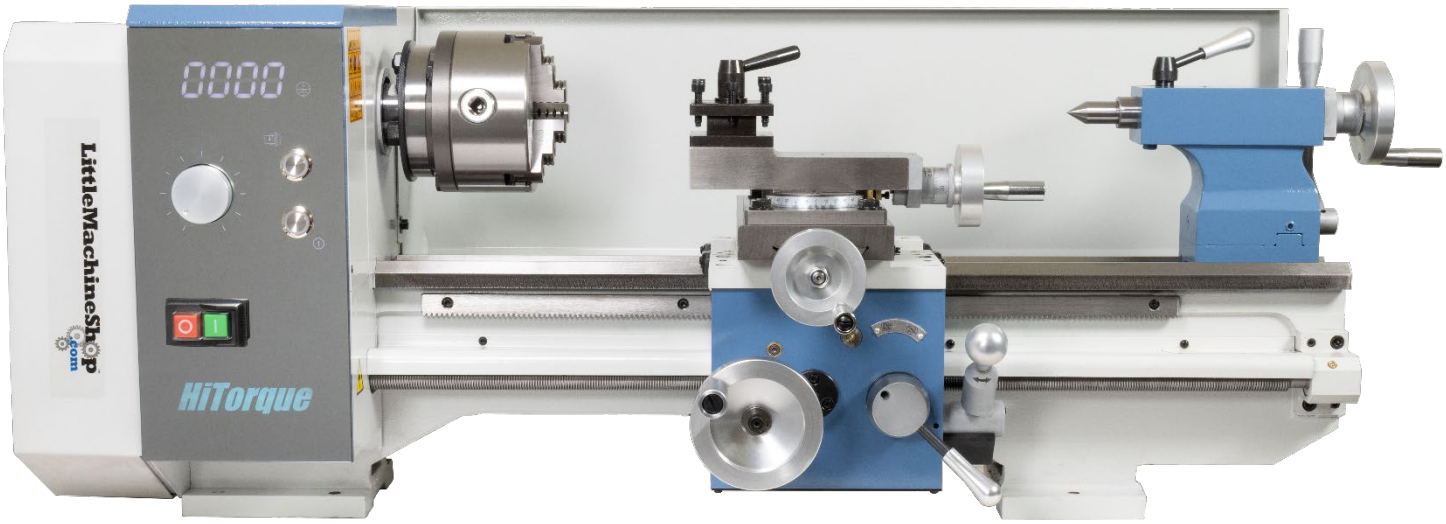

HiTorque® 9×20 Bench Lathe User's Guide

Model 7600

from LittleMachineShop.com®

There may be detail differences between your specific machine and the information given here (with little or no impact on functionality). Please email us at info@littlemachineshop.com if you have questions about any aspect of the manual or your machine (or see our website LittleMachineShop.com for more information). Your feedback is welcomed!

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Written by LittleMachineShop.com®

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Contents

Introduction

This user's guide covers the care and operation of the LittleMachineShop.com ***HiTorque®*** 7600 9×20 Bench Lathe. This lathe is a version of the SIEG SC50 built to LittleMachineShop.com specifications. Be sure to read and understand the safety guidelines presented in this book before using your lathe.

The ***HiTorque®*** 9×20 Bench Lathe is available in two models:

- Model 7600 is the standard version.
- Model 7650 is the deluxe version. It includes all the features of Model 7600 and adds:
    - Digital position readouts (DRO) scales on the carriage and cross slide, and handwheel DROs on the compound rest and tailstock
    - Quick change tool post (QCTP) set with five tool holders
    - Compound rest modified to better accommodate the QCTP

Chris' Tip: You can upgrade your Model 7600 lathe with the following items available from LittleMachineShop.com:

Part number 6387: Digital position readout (carriage and cross slide)

Part number 5880: Digital position readout (tailstock)

Part number 2280: Quick change tool post set, AXA

Part number 4914: Quick Change Tool Post Conversion Kit, AXA for 9x20 Bench Lathe

Installation of these components creates a machine that functions like a Model 7650 deluxe lathe, excluding having a compound rest DRO. Note: there may be some cosmetic differences.

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Safety Considerations

Always use common sense when using a power tool. Review the following safety instructions. Besides the general safety rules for any power tool, the following include specific considerations for the bench lathe.

General Safety

- Use common sense. Think through the results of your actions before you act.
- Understand the operation of the machine. Do not operate the machine if you do not know what is going to happen.
- Learn, don't experiment. Study, understand, and do things where you have a clear expectation of the outcome. Don't "see what will happen."
- You are responsible for your own actions. We can't be held responsible for your actions when you use the machine.

General Machine Safety

- Read the manual. Know the operation of every control before you attempt any operation of the machine.
- Make sure the machine is on a flat, level surface that can support the weight of the machine plus fixtures and work piece.
- Maintain your machines. Ensure that it is well-adjusted and in a safe state.
- Check for damage and abnormal wear before operating the machine.
- Maintain a clean and uncluttered work area.
- Ensure that your machines are well lit. Ensure that your shop is well lit and have additional task lighting where appropriate.
- Make sure that all guards are in place and functioning before operating the machine.
- Always wear safety glasses (side shields are recommended) that are ANSI Z87.1-2003 compliant.
- Wear hearing protection (ear plugs or earmuffs) when operating loud machines.
- Wear appropriate clothing, no rings, gloves, neckties, jewelry, or loose-fitting garments. Bind long hair or wear a hat.
- Keep bystanders, children, and visitors a safe distance away while operating any power tool.
- Don't operate machinery while under the influence of drugs or alcohol.
- Avoid pinch points.
- Clamp work securely. Cutting forces are significant and work pieces that are not secured can turn into projectiles.
- Do not attempt to work pieces that are too large or too heavy for the machine.
- Use appropriate cutting tools with appropriate feeds and speed.
- Do not force or overload machinery.
- Never leave a running machine unattended.
- Cutting tools get hot during use and can cause burns if handled inappropriately.

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- Clear chips with a brush or other tool, never with your hands.
- Do not use compressed air for cleaning machines. A shop vacuum works well and is much safer.
- Be aware that chips and dust from some materials (magnesium, for example) are flammable. Understand the materials you are using.

Lathe Safety

- Your bench lathe is a small lathe. Don't attempt jobs that are beyond its capacity.
- Check the work piece after you place it in the chuck or other work holding device. Be sure it is secure before turning on the lathe.
- Don't wear loose clothing or jewelry when operating the lathe.
- Stop the spindle and make sure the machine is in a safe condition before:
    - Opening or removing safety shields
    - Reaching into work area
    - Changing or adjusting tools
    - Changing or adjusting work pieces
    - Changing speed ranges
    - Clearing chips or coolant
- Inspect cutting tools for sharpness, chips, and cracks before each use. Replace dull, chipped, or cracked cutting tools immediately.
- Handle cutting tools with care. Cutting edges are very sharp and can cause lacerations.
- Do not use unbalanced work pieces or fixtures in the spindle.
- Remove all tools (wrenches, chuck keys, locking pins, and so on) from the spindle immediately after using them. Never leave the key in the chuck.

Electrical Safety

- Plug the machine into a grounded receptacle.
- Ensure that all components are properly grounded. The easiest way to ensure this is to plug your machines and devices into grounded outlets that you have tested.
- Use caution when using liquids and electricity. Ensure that coolants and lubricants are kept away from high voltage electrical components.
- Disconnect all components from the power receptacle before servicing.
- In the event of a power outage, turn off all components to ensure that the machine does not restart unexpectedly.

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Specifications

HiTorque® 7600 (SIEG SC50*)	
Swing over bed	9" (230 mm)
Swing over Cross Slide	4.3" (110 mm)
Distance between centers	18.1" (460 mm)
Cross slide travel	4.7" (120 mm)
Compound rest travel	2.8" (70 mm)
Spindle through hole	1.1" (28 mm)
Spindle taper	#4 Morse taper
Tailstock taper	#2 Morse taper
Spindle speed	Low Range Pulleys: 50–1350 High Range Pulleys: 100-2500 RPM
Range of threads	6-80 TPI, (0.25-4.0 mm)
Longitudinal power feed rates	0.0018" (0.045 mm)/revolution 0.0049" (0.126 mm)/revolution
Cross slide power feed rates	0.0007" (0.019 mm)/revolution 0.0019" (0.048 mm)/revolution
Power requirements	120 V 60 Hz 12 Amps
Spindle motor output	1.34 hp (1000 Watts)
Machine weight	254 lbs (115 kg)
Overall dimensions	36" x 25" x 18" (910 mm x 630 mm x 450 mm)

* HiTorque® machines begin with a SIEG model class and are then upgraded to specifications negotiated with LittleMachineShop.com®. These include, but are not limited to, brushless motors, NSK bearings and more!

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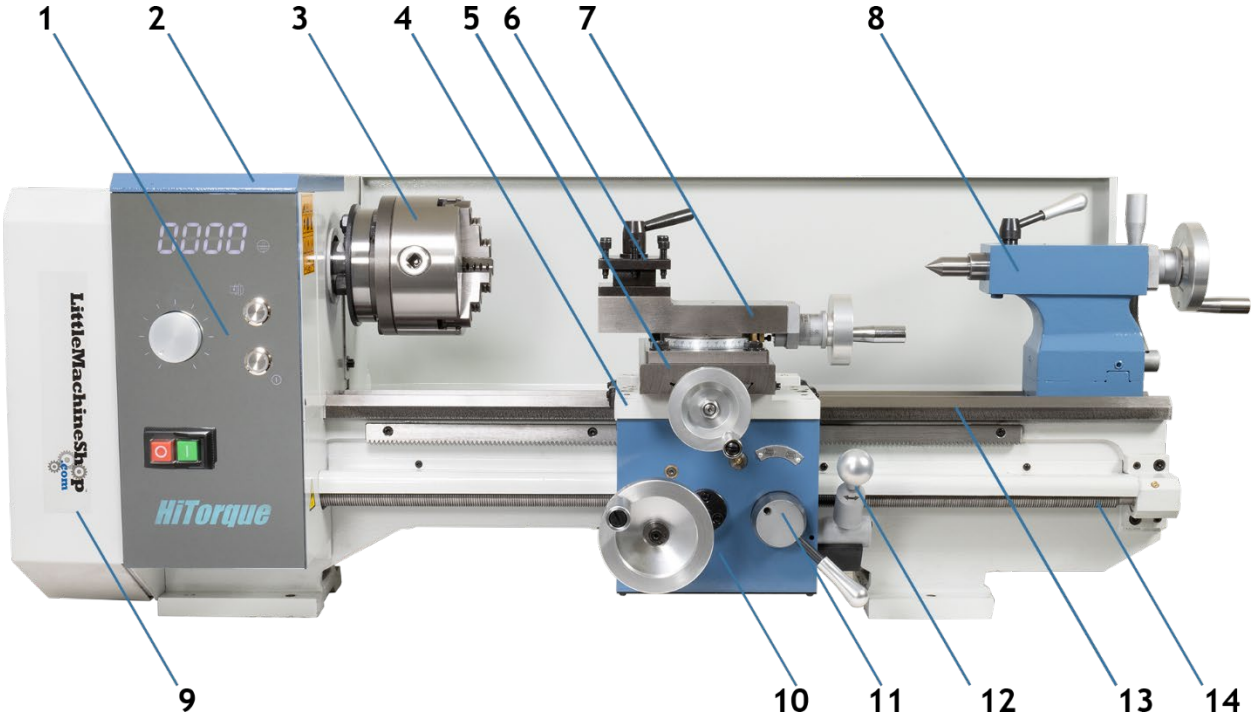
Features

Front View



1. Motor controls
2. Headstock
3. Chuck
4. Carriage
5. Cross slide
6. Tool post
7. Compound rest
8. Tailstock
9. Change gear cover
10. Apron
11. Half nut lever
12. Power feed lever
13. Bed ways
14. Lead screw (under cover)

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Basic Accessories

The following accessories come with the ***HiTorque***® Bench Lathe.

- #2 Morse taper dead center
- #4 Morse taper dead center
- Change gears (for details, see "Threading")
- Outside jaws for the 3-jaw chuck (for details, see “Changing Chuck Jaws” on page 21)
- Chuck key for the 3-jaw chuck
- Open end wrenches: 8 x 10 mm, 14 x 17 mm, and 17 x 19 mm
- Hex wrenches: 2.5, 3, 4, 5, and 6 mm
- Mounting bolts and washers

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Lathe Setup

Your lathe was fully aligned, adjusted, and inspected in the factory. Some minor movement may have occurred during shipping; therefore, it is always a good idea to inspect the machine.

Assembly

The only required assembly is to install the handles on the handwheels. The handles should turn freely when installed. A small drop of Loctite on the handle threads will prevent it from loosening.

Cleaning

Your lathe will arrive coated with grease to protect it from corrosion during shipment. Follow this procedure to remove the grease:

1. Wipe most of the grease off with rags or paper towels.
2. Clean the surfaces with mineral spirits (paint thinner).
3. Lightly re-coat the surfaces with fresh oil or rust preventative lubricant.

See “Lubrication” on page 47 for specific recommendations for lubricants.

Installation

- Handling the lathe is at least a two-person job. Lifting gear (sling, hoist, or forklift) must be rated for at least 1,000 lb. Ensure the sling strap is not contacting any wires, levers, lead screw, or other sensitive parts.
- Power requirement is 120V, 60Hz, 14A minimum. *Extension cord not recommended.*
- Before connecting power for the first time, be sure that:
    1. The machine is on a firm footing, adequately secured to bench or stand, and leveled.
    2. Cutting tools and turning stock are installed and tightened.
    3. There are no clamps or locks on moving parts.
    4. The speed control knob is set for the lowest speed.

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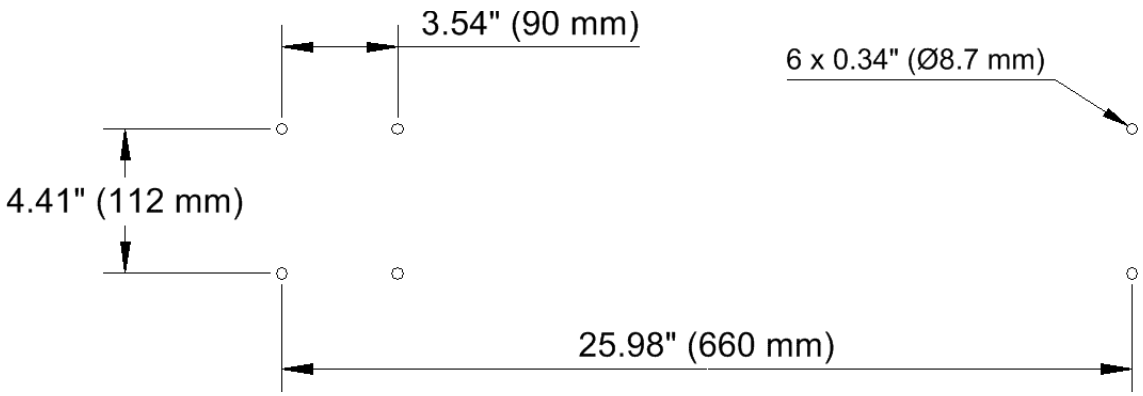
Mounting Your Lathe

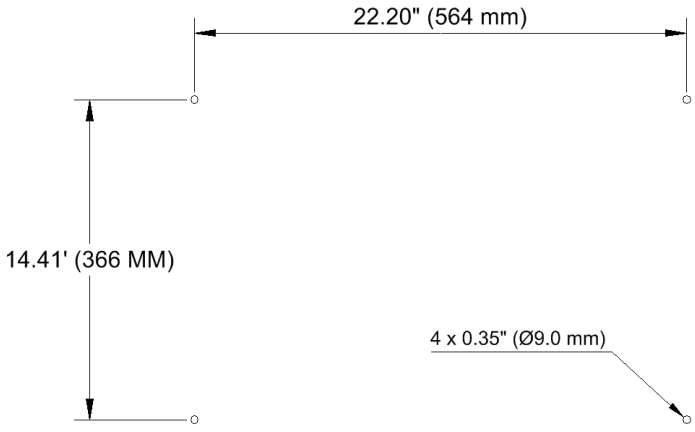
Many people purchase a stand or chip tray for the ***HiTorque®*** Bench Lathe. The machine bolts right to these with the cap screws that are furnished.

You can also bolt your lathe to your workbench. The following diagram shows the holes required.



Mount the lathe to the workbench with M8 (or 5/16") bolts. Use fender washers on the underside of wooden benches to prevent the bolt heads from pulling through.

If you have the chip tray, its mounting dimensions are shown below.



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Lathe Controls

Become familiar with the controls used to operate the lathe before you use the lathe.

Motor Controls

1. Main Power switch
2. Emergency stop (E-stop) switch
3. Start/stop button
4. Spindle direction button
5. Speed control knob
6. Spindle speed display

Main Power Switch and Emergency Stop (E-stop) Switch

The green main power switch enables power to the lathe and the start/stop button. The spindle speed display will illuminate. The red E-stop switch disconnects the main power.

Turn the main power switch off when you are not using the lathe.

Start/Stop Button

The Start/Stop button starts the spindle when pressed while the main power is on. It will illuminate and the spindle will run at the last set speed. Press the button again to stop the spindle. Use this button for normal starting and stopping operation of the lathe.

Spindle Direction Button

The spindle direction button controls the direction the spindle turns. After turning on the main power and pressing Start, the spindle turns in the default forward direction—the direction used for normal turning. Press the button to toggle between forward and reverse directions. The button illuminates to indicate reverse direction.

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You can change the motor direction at any time and at any speed that safety allows. The motor will make a controlled change of direction by slowing to a stop and then reversing direction.

Speed Control Knob

The speed control knob adjusts the spindle speed from maximum to stopped. To prevent unintentional spindle movement, be sure to push start/stop button to stop the spindle before making any workpiece or tooling changes.

Spindle Speed Display

The spindle speed readout shows the speed of the spindle in revolutions per minute (RPM). It also indicates the direction of turning, forward or reverse.

Using the Motor Controls

To power up the lathe:

- Press the green button of the main power switch. The spindle speed display illuminates.

To start the lathe:

1. Press the start/stop button. The button illuminates and the spindle turns.
2. If you want the spindle to turn in the other direction, press the spindle direction button.
3. Use the speed control knob to adjust the spindle speed.

To stop the lathe:

- Press the start/stop button. The lathe retains the speed and direction settings so that the next time you push the start/stop button, it resumes at the same speed and direction.

End of day:

- Press the red E-stop button to power off machine.

To stop the lathe in an emergency:

- Press the red E-stop button.

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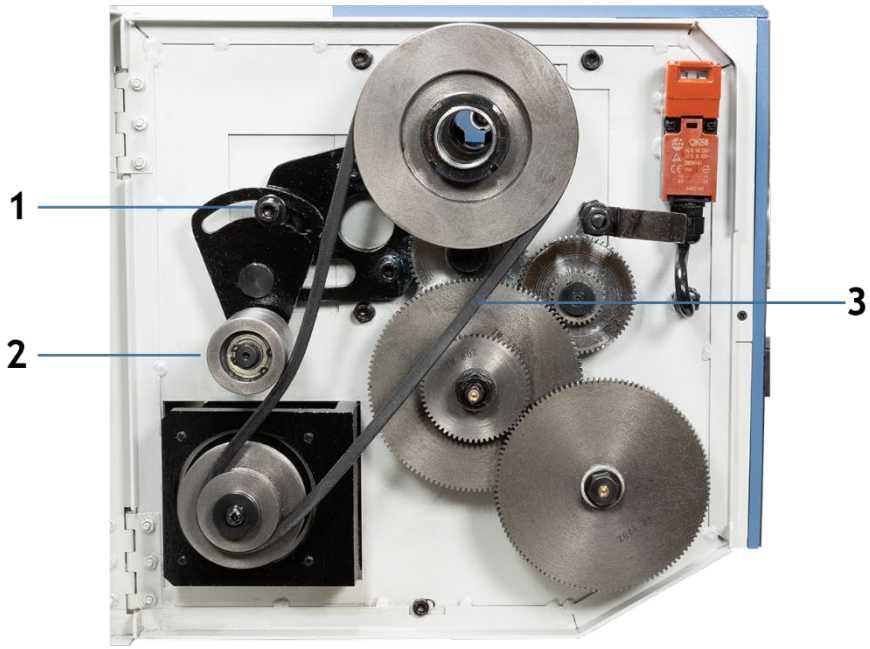
Speed Ranges

The ***HiTorque***® 7600 and 7650 Bench Lathes incorporate a two-speed belt drive system that provides an extended speed range as well as very quiet operation. The speed range is changed by moving a V-belt between two sets of pulleys. When the belt is on the large motor pulley and the smaller spindle pulley, it is set for high-speed operation. When the belt is on the small motor pulley and the large spindle pulley, it is set for low-speed operation. The low-speed setting is recommended for the vast majority of lathe operations.

To change the speed range:

1. Turn the Main power off by pushing the Red E-stop button.
2. Open the change gear cover.

   Note: there is a safety interlock switch that will prevent operation of the lathe when this cover is open.
3. Loosen the 14 mm hex bolt that secures the idler roller tensioner arm location and rotate arm to remove tension from the belt.
4. Move belt to desired speed range.
5. Rotate idler tensioner to press on belt to take up slack in belt and re-tighten 14mm securing bolt. The tension on the belt should be firm but not tight.
6. Close change gear cover and restart lathe. If the lathe main power button does not stay on, check that change gear cover is securely latched so that safety interlock switch is activated.



1. Tensioner securing bolt – 14mm
2. Belt tensioner
3. Belt

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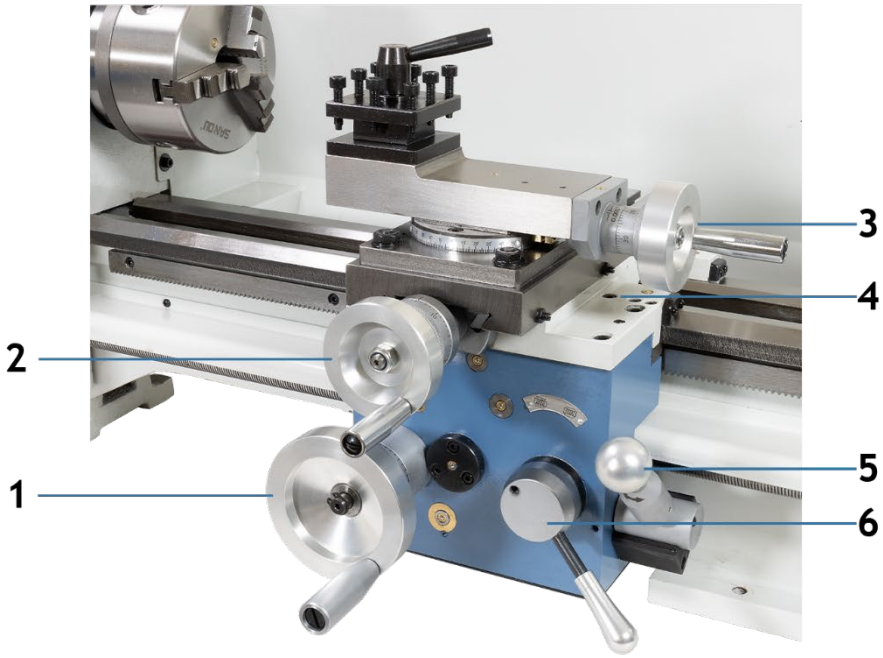
Carriage and Cross Feed Controls

The carriage and cross slide controls are the centerpiece of lathe operations. With these controls you can manually move the carriage along the ways, engage the power feed, move the cross slide toward or away from your workpiece and move the compound rest for fine tool control.

The ***HiTorque***® Bench Lathe power feed allows the lead screw to power the carriage for turning or the cross slide for turning, parting, and facing. The use of the power feed will produce a finer and more consistent surface than manual operation of the carriage and cross slide.



1. Carriage handwheel
2. Cross slide feed handwheel
3. Compound rest feed handwheel
4. Carriage lock screw
5. Power feed lever
6. Half nut lever

Carriage Handwheel

The carriage handwheel moves the carriage longitudinally toward or away from the headstock. You will use this handwheel for outside turning and boring, and to position the tooling for facing, knurling, and parting operations. On a lathe, left hand turning is cutting away from the headstock. Right hand turning is cutting toward the headstock.

Pull the handwheel towards you to disengage it when you are using power feed.

There are 40 divisions on the dial. Each turn of the handle advances the cross slide 0.080".

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Cross Slide Feed Handwheel

The cross slide feed handwheel moves the cross slide towards and away across the ways. Use this handle to advance the tool into work and for facing cuts, parting, and knurling operations.

The dial on this handwheel indicates the relative position of the cross slide. The graduated dial can be repositioned for convenience.

There are 50 divisions on the dial. Each complete turn of the handwheel advances the cross slide 0.050".

Compound Rest Feed Handwheel

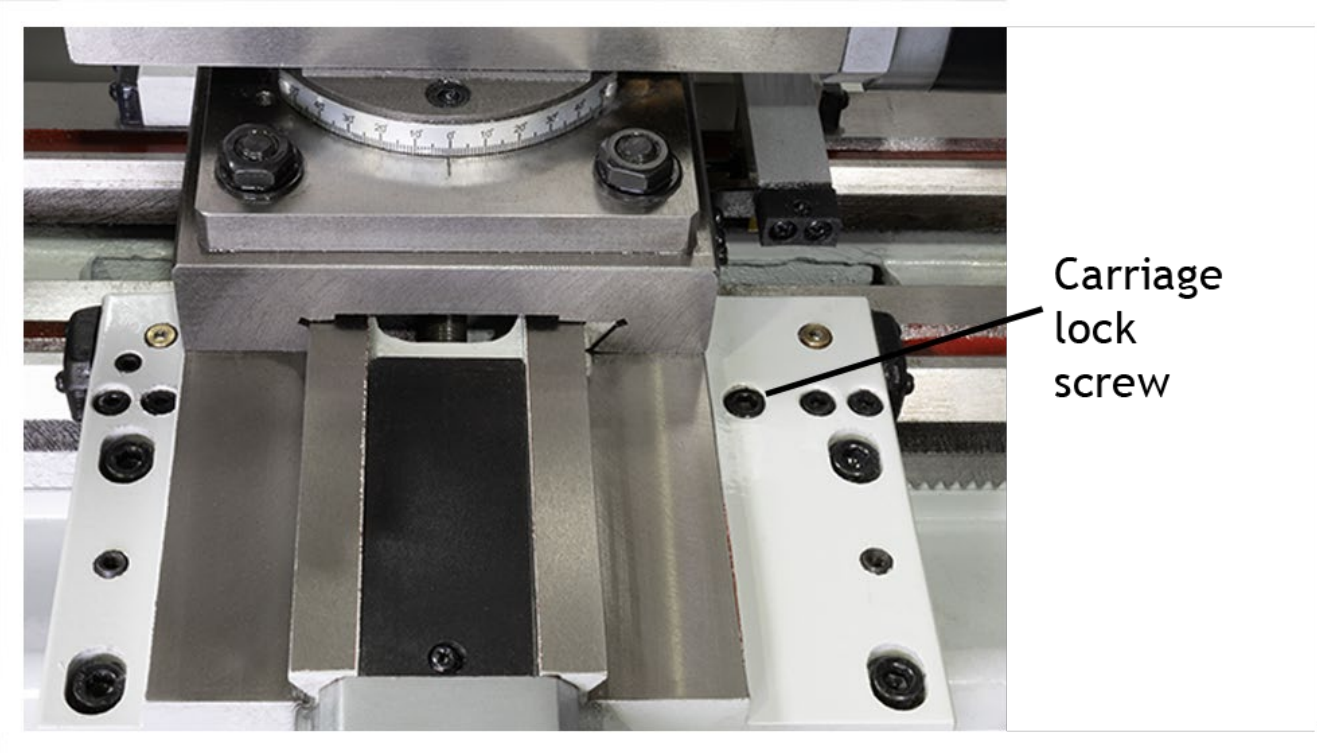
The compound rest feed handwheel advances or retracts the compound rest. Use this handwheel to advance the tool into the work for tapering and threading operations.

The dial on this handwheel indicates the relative position of the compound rest. The graduated dial can be repositioned for convenience.

There are 50 divisions on the dial. Each complete turn of the handwheel advances the cross slide 0.050".

Carriage Lock Screw

Use a 4-mm hex wrench to tighten the carriage lock screw when you want to prevent the carriage from moving.



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Compound Rest Rotation

The compound rest rotates on the cross slide and you can position it at any angle.

Position the compound rest at an angle and use the compound rest feed handle to make tapered cuts.

Position the compound rest at 29.5 degrees for cutting standard threads.

To change the angle of the compound rest:

1. Loosen the two socket head cap screws along the sides of the compound rest.
2. Turn the compound rest to the desired angle.

> Chris' Tip: You may need to remove one of the compound rest hold-down nuts to turn the compound past it.

3. Tighten the two socket head cap screws.

> Chris' Tip: For accurate work, use a protractor between the compound rest and the cross slide. Don't depend on the markings on the side of the compound rest.

Half Nut Lever

The half nut lever locks the half nuts around the lead screw, which engages the carriage drive for threading.

The half nuts are engaged when this lever is at the 6 o'clock position and disengaged when this lever is in the 4 o'clock position. NOTE: Since there is no threading dial, once you have engaged the half-nut lever for thread cutting, it must not be released until threading of the part is completed.

CAUTION: Do not engage the half nuts for turning or facing operations. Instead, use the power feed.

> Chris' Tip: Don't try to engage the half nuts when the power feed is engaged. There's an interlock, but you can break it if you try.
>
> You'll find it easier to engage or disengage the half nuts while the lathe is running. If you do attempt to change when the lathe is stopped, don't force it. Slightly rotate the carriage handwheel until half nuts and lead screw mesh.

Power Feed Lever

The power feed lever engages the carriage drive when it is down, and the cross slide drive when it is up. The power feed is disengaged in the middle (45 degree) position. The lever has a pull interlock that requires you to pull on the lever ball to make any changes to the lever's position. To change between the two modes, pull the lever ball out and rotate clockwise to choose between carriage power or cross slide power. The lever must be in the neutral position to change between carriage power feed and cross slide power feed.

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Carriage Power Feed Mode

When the ⇔ arrows are visible, the lever is operating the carriage power feed. Pull the ball and move the lever down to engage the carriage feed and back to neutral to disengage. To disengage, you do not need to pull on the ball, simply move the lever.

Cross Slide Power Feed Mode

When the ⇕ is visible, the power feed is operating the cross slide power feed. Pull the ball and move the lever up to engage the cross slide feed and back to neutral to disengage. To disengage, you do not need to pull on the ball, simply move the lever.

> Chris' Tip: Don't try to engage the power feed when the half nuts are engaged. There's an interlock, but you can break it if you try.
>
> You'll find it easier to engage or disengage the power feed while the lathe is running. If you do attempt to change when the lathe is stopped, don't force it. Slightly rotate the carriage handwheel or cross slide handwheel back and forth until gears and lead screw mesh.

Tailstock Controls

The tailstock is used with a dead or live center for securing work and for turning between centers. It is also used with a drill chuck for drilling and reaming operations. The taper in the tailstock quill is a standard length #2 Morse taper (2MT).

Tailstock Locking Lever

The tailstock is locked into position on the ways by the tailstock locking lever on the back of the tailstock. Pull the lever toward you to tighten the tailstock lock. Push the lever away to release the tailstock.

Tailstock Quill Handwheel

The tailstock quill handwheel moves the tailstock quill in and out. There are (mm) graduations on the top of the quill that show how far it is extended. There are 0.001" graduations on the handwheel dial.

To remove a tapered center or drill chuck arbor from the tailstock quill, retract the tailstock quill all the way and the tool will eject.

> Chris' Tip: Be sure to use a standard length 2MT and not the short 2MT from mini lathes. The short ones will not self-eject.

Tailstock Quill Locking Lever

The tailstock quill locking lever keeps the tailstock quill from moving. Use the tailstock quill locking lever to lock the tailstock quill in position when you are turning between centers and work holding. Turn the lever clockwise to lock the tailstock quill, and counterclockwise to unlock the tailstock quill.

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Lathe Work Holding

Mounting the Chuck

Standard on the 7600 is a 5″ (125 mm) 3-jaw chuck. The mounting system consists of a machined cast iron backplate with three mounting studs and nuts. It is not necessary to remove the nuts from the studs to mound and unmount the chuck. They will pass through the large holes in the spindle face. On the back side of the spindle face is a knurled steel locking plate about 3/16″ thick, that rotates through an arc of about 30 degrees.

	1. Align the keyhole-shaped holes in the locking plate so the nuts pass through the large part of the keyhole but are too large to pass through the small part.
	2. The fit is very tight so gently tap face of chuck with a plastic dead-blow hammer and rotate to evenly seat chuck on spindle.

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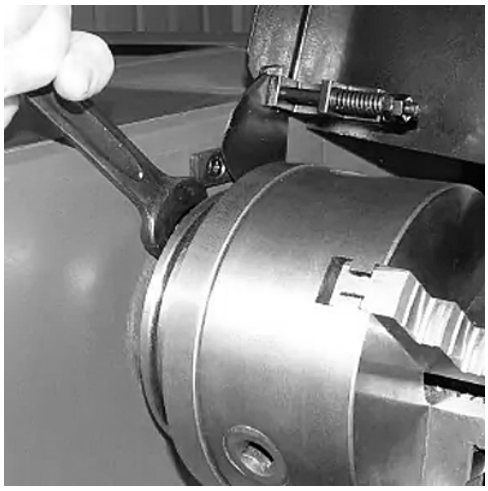
	3. Rotate the locking plate to prevent the chuck from falling forward.
	4. Tighten the nuts to lock the chuck in place.
	5. Removing the chuck is the opposite procedure. You will likely have to tap the chuck off with a plastic dead-blow hammer or mallet.

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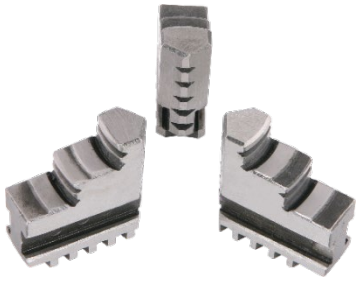
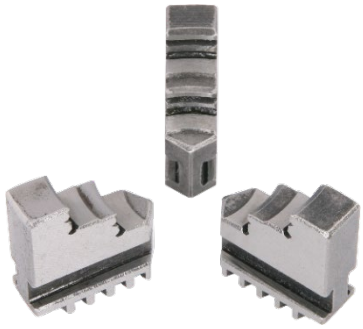
Changing Chuck Jaws

3-jaw lathe chucks come with two sets of jaws.

The “normal” set is called the inside jaws, because the stepped side is designed to fit inside of hollow work pieces and hold by an outward force. These jaws are used to clamp on the outside of smaller diameter work pieces using the long straight side.



The second set of jaws is called the outside jaws because the stepped side of these jaws is designed to clamp on the outside of larger objects. They are not used to hold small diameter work pieces.



Because of the construction of a 3-jaw scroll chuck, each of the three jaws in a set is different. You will find a number in the groove in the side of each jaw that identifies its position in the set.

To remove a set of chuck jaws:

1. Place a piece of wood on the ways to protect them in case you drop something.
2. Place one hand around the chuck jaws to prevent them from falling out.
3. With your other hand, turn the lathe chuck key counterclockwise to open the jaws.
4. The jaws will come loose from the chuck, one at a time, when about half the length is exposed beyond the diameter of the chuck.

To install a set of chuck jaws:

1. Place the three jaws in numeric order on the bench.
2. Slide jaw number 1 into the slot in the chuck that has the same number stamped in it.
3. Press the jaw into the slot with one hand, and with the other hand, turn the chuck key to open the chuck.
4. You will feel the jaw move out of the slot as you turn. Stop turning right after the jaw clicks inward in the slot.
5. Turn the chuck key to close the chuck about ¼ turn to engage jaw 1.
6. Slide jaw 2 into the next slot counterclockwise from jaw 1 when you are looking toward the headstock.
7. Slide jaw 3 into the open slot.
8. While pressing jaws 2 and 3 into the slots, turn the chuck key to close the chuck. Make sure all jaws close together. If one or more is not aligned, open jaws till disengaged and repeat process.

Mounting Work in a 3-Jaw Chuck

Three jaw lathe chucks are good for most lathe operations. All three jaws move together as you turn the chuck key. But because of the way they are made, 3-jaw chucks have limited accuracy. They will center work to within about 0.003" runout. If you need better concentricity, use an independent 4-jaw chuck or a collet.

If you chuck a work piece, create a part, and then part it off, the lack of concentricity will not cause a problem. The only time it is a problem is when you try to re-chuck a work piece.

Place your work piece between the jaws of the lathe chuck and turn the chuck key clockwise to close the jaws. Tighten firmly. To get the jaws as tight as possible, tighten all key locations with the chuck key.

Mounting Work in a 4-Jaw Chuck (optional accessory)

Four jaw lathe chucks are designed so that each jaw can move independently and allow for precise centering of round, square, and odd shaped workpieces.

1. Put the workpiece in the chuck and center it by eye. 4-jaw chucks have grooves in the face of the chuck body to make this easier.
2. Set a dial indicator against the workpiece.
3. By hand, turn the chuck through one complete revolution. Write down the high reading and the low reading from the indicator.
4. Calculate the average reading by adding the high reading to the low reading and then dividing by two. Average = (High Reading + Low Reading)/2
5. Turn the chuck until the indicator needle is at the average reading.
6. Turn the bezel on the dial indicator so that the zero is under the needle.
7. Rotate the chuck so that one jaw is aligned with the plunger of the dial indicator.
8. Adjust the jaw that is aligned with the dial indicator plunger and the opposite jaw, so the indicator reads zero.
9. Rotate the chuck 90 degrees so another jaw is aligned with the indicator plunger.
10. Adjust the jaw that is aligned with the dial indicator plunger and the opposite jaw, so the indicator reads zero.

Check your work by rotating the chuck. If you are not happy with the result, repeat steps 3 through 8.

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Lathe Tooling

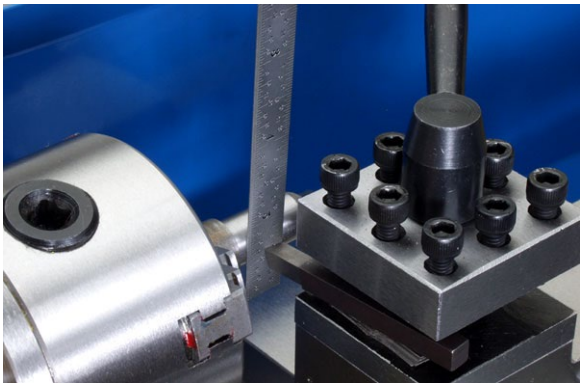
The 7600 includes a 4-way turret style tool post that allows for several tools to be mounted and adjusted. The post comes set for 10mm tooling, but with shims, it accommodates tooling from ¼" to 3/8". These can be HSS bits, boring bars, indexable insert tools, cut off blades, grooving tools, threading tools, radius tools, knurling tools, and more.

The turret is adjusted by loosening the handle and rotating to the selected tool. There is a spring detent that clicks in 90 degree increments. The turret can also be tightened and locked at any angle in between.

Adjusting Tool Bit Height

The cutting edge of the tool bit should almost always be set to the center height of the lathe spindle. There are several methods for checking the height of the tool bit.

Method 1 is to place a thin strip of metal, such as a steel rule or feeler gage, between the work piece and the point of the tool bit. If the height is correct, the strip of metal will be held vertically. If the



top is leaning toward you, the tool bit is too low. If the top is leaning away from you, the tool bit is too high.

Using the turret tool post, you adjust the tool bit height using shims under the tool bit. You can get an economical set of shims, about the right size, at any auto parts store. Purchase a set of feeler gages and remove the pivot pin.

> Chris' Tip: The easy way to adjust the tool bit height is to get a quick change tool post (QCTP). Virtually all quick change tool posts incorporate a mechanism for easily adjusting the tool bit height for various sized bits.

Method 2 - Another quick and accurate method is to use the tailstock with a dead center point to adjust the tool top cutting edge to the same height. This can be a very quick method to ensure the correct tool height for all your tooling.

Simply rotate the turret around with the tool to be adjusted and slide your tailstock with a dead center up to the tip of the tool tip and make sure they are exactly the same height, tip to point. Use shims to adjust height and when the same height, rotate the turret back and then tighten locking lever.

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Lathe Operations

Turning

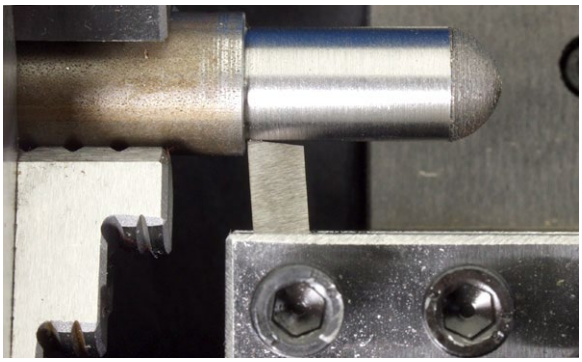
The most common use of a lathe is turning down the diameter of a work piece.

Manual Turning

Follow these steps to turn the outside diameter of a work piece.

To turn manually:

1. Put a turning tool bit in the tool holder and adjust the cutting edge to center height.
2. Angle the tool so that the front cutting edge forms an acute angle with the axis of the work piece, as shown in the illustration below.



3. Ensure that the power feed lever is in the disengaged (45 deg) position.
4. Move the carriage so that the tool bit is near the right end of the work piece.
5. Turn the lathe on and adjust the speed to an appropriate speed for the diameter and material on which you are working. The LittleMachineShop.com website has a calculator to help you determine appropriate cutting speeds at https://littlemachineshop.com/speeds.
6. Using the cross slide feed handle, slowly advance the tool bit into the work until it just touches the surface of the work piece.
7. Move the carriage to the right so that the tool bit is past the end of the work piece.
8. Using the cross slide feed handle, advance the tool bit about 0.010". On softer materials, it may be possible to take a deeper cut.
9. Using the carriage handwheel, move the carriage slowly to the left. As the tool bit meets the work piece, it starts cutting.

Chris' Tip: Listen to the cutter and the machine. If it seems happy, then continue. You might try a deeper cut on the next pass if you need to remove a lot of material. When the machine seems to bog down, the tool chatters, squeals, or complains, then back off and take a shallower cut. Lubrication and coolants reduce tooling pressure and heat buildup and can allow deeper cuts than without it.

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Turning with Power Feed

The bench lathe incorporates a power carriage feed that can move the carriage.

Change Gears for Turning

There are two options for turning. Use the finer feed for finish turning and the coarser feed for roughing cuts. The bench lathes are shipped with the gears set for finish turning.

	Feed per Spindle Revolution	A	B	C	D
Fine Feed	0.0018" (0.045 mm)	30	120	60	120
Coarse Feed	0.0049" (0.126 mm)	50	100	70	100

To learn how to change the gears, see "Change Gears".

To turn with power feed:

1. Follow previous instructions for manual turning from 1 to 8
2. Make sure Power Feed lever is set to carriage feed. When the ⇔ arrows are visible, the lever is operating the carriage power feed. To change between the two modes, pull the lever ball out and rotate to the right to choose between carriage power or cross slide power. The lever must be in the neutral position (45 deg) to change between carriage power feed and cross slide power feed.
3. Pull the ball and move the lever down to engage the carriage feed and back to neutral to disengage. You do not need to pull on the ball to disengage, simply move the lever up.
4. As the tool bit meets the work piece, it will start cutting.
5. When the carriage has moved as far as you want, raise the power feed lever to neutral (45 deg) to disengage the power feed. The carriage then stops.
6. Be sure to back out the cross slide a small amount before returning carriage to starting point to avoid marking workpiece.

Facing

Facing is cutting on the end (or face) of the work piece.

To face a work piece manually:

1. Put a facing tool bit in the tool holder and adjust the cutting edge to center height.
2. Angle the tool so that the side cutting edge forms an acute angle with the face of the work piece.
3. Ensure that the power feed lever is in the disengaged (45 deg) position.
4. Move the carriage to the right so that the tool bit is past the right end of the work piece.
5. Turn the lathe on and adjust the speed to an appropriate speed for the diameter and material on which you are working. The LittleMachineShop.com website has a calculator to help you determine appropriate cutting speeds at https://littlemachineshop.com/speeds.

6. Using the compound rest feed handle, slowly advance the tool bit into the work until it just touches the surface of the work piece.
7. Move the cross slide back so that the tool bit is clear of the diameter of the work piece.
8. Using the compound rest feed handle, advance the tool bit about 0.005".
9. Using the cross slide feed handle, advance the cross slide slowly. As the tool bit meets the work piece, it starts cutting.
10. Continue advancing the cross slide until the tool bit reaches the center.
11. Be sure to back out the compound rest a small amount before returning cross slide to starting point to avoid marking workpiece.

Facing with Power Feed

The bench lathe incorporates a power cross feed that can move the cross slide.

The change gear settings for turning also affect the cross slide speed. The cross slide moves at less than half the speed of the carriage.

	Feed per Spindle Revolution	A	B	C	D
Fine Feed	0.0007" (0.019 mm)	30	120	60	120
Coarse Feed	0.0019" (0.048 mm)	50	100	70	100

To learn how to change the gears, see "Change Gears".

To face with power feed:

1. Follow previous instructions for manual facing from 1 to 7
2. Make sure power feed lever is set to cross slide feed. When the ⇳ is visible, the power feed is operating the cross slide power feed. To change between the two modes, pull the lever ball out and rotate to the right to choose between carriage power or cross slide power. The lever must be in the neutral position (45 deg) to change between carriage power feed and cross slide power feed.
3. Pull the ball and move the lever up to engage the cross slide feed and back to neutral to disengage.
4. As the tool bit meets the work piece, it will start cutting.
5. When the cross slide has moved as far as you want, lower the power feed lever to neutral (45 deg) to disengage the power feed. You do not need to pull on the ball to disengage, simply move the lever and the cross slide stops.
6. Be sure to back out the compound rest a small amount before returning cross slide to starting point to avoid marking workpiece.

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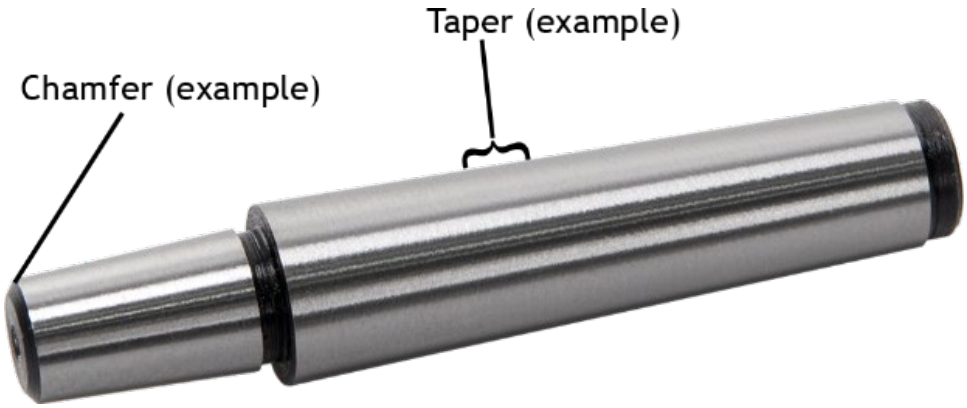
Turning Angles

There are several methods of turning angles or tapers.

- For large angles of short length, such as a chamfer, turn the compound rest to the angle you want. Advance the tool across the work with the compound rest and advance the tool into the work with the cross slide or the carriage.
- You can use the same method for small angles (usually called tapers) of a length less than the compound rest travel.



- For longer tapers, the work is usually placed between centers with the tail center offset from the centerline of the lathe or by using a Taper Turning attachment.

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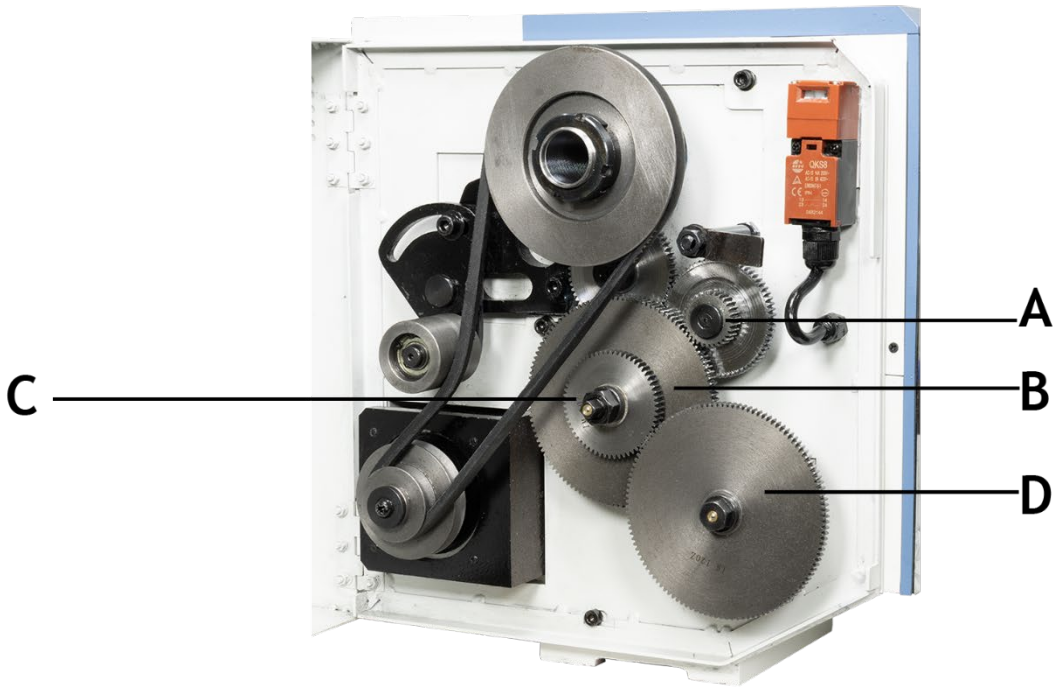
Threading

Much of the mechanism of your lathe is provided to allow you to cut threads. Your lathe can cut a broad range of thread pitches. In fact, with the standard change gears, you can cut many more thread pitches than those shown on the table on the lathe. These can be found on the LMS website: Learning Center>How-To Articles> Change Gears for Threading.

Change Gears

The series of gears that drive the lead screw are called change gears because you change them to turn different thread pitches.

There are 4 positions for the change gears, commonly called A, B, C, and D.



A. This is the top change gear position. It is forward of and slightly below the spindle.

B. Gear positions B and C are on the same shaft, between positions A and D. Position B is the inside gear on this shaft.

C. Position C is the outside gear on this shaft.

D. Position D is the end of the lead screw.

The change gears are commonly tight on the shaft when new. You might need to use a screwdriver behind them to pry them off.

The set screws on the “A” gear and the 66T spindle gear are often very tight. To avoid stripping the hex drive, hold your hex wrench close to the gear and slowly apply pressure.

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To change a gear in position A, use a Phillips screwdriver and remove the countersunk screw and washer, and slide the gear off the shaft.

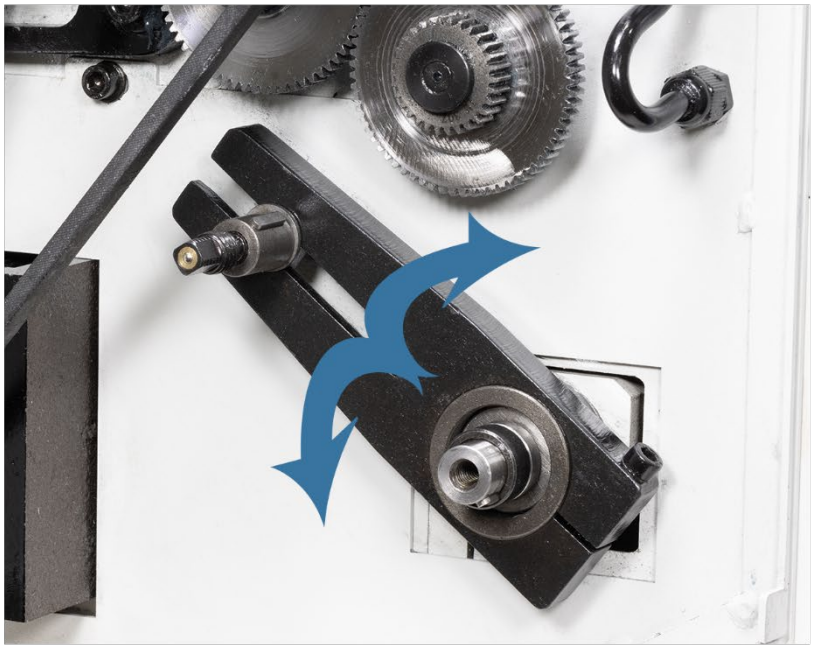
To change gears in positions B or C, use an 8 mm end wrench on the square end of the shaft to keep it from turning. Loosen the nut with a 19 mm end wrench and remove the notched washer from behind the nut. Remove the nut so you can slide the gear off the shaft.

> *The B and C gears ride on a sleeve that is free to turn on the shaft. It has a keyway and key that keeps the B and C gears turning together. Lubricate this sleeve every time you change a B or C gear. Bad things happen when these sleeves seize on the shaft.*

To change the gear in position D, use a 5/8 in end wrench to remove the shoulder bolt that retains the gear. Gear position D has a spacer behind the gear. When you only use three gears, put the spacer outside the gear so the gear will align with the gear in position B.

In the change gear tables, some combinations have “Any” in column C. For these combinations, you can use any gear for position C; this gear acts only as a spacer and does not engage the other gears. Position B is an idler and does not affect the overall gear ratio. The table shows a gear that makes it easy to properly engage the gears, although you can use any gear in position B as well.

The B-C Gear shaft is mounted on an arm that pivots around the lead screw. You can move the B-C shaft location to engage different gear combinations. To engage a new set of gears, use a 5 mm hex wrench to loosen the socket head cap screw that locks the B-C arm around the lead screw. Use an 8 mm end wrench on the square end of the B-C shaft to loosen it in the slot in the arm. Move the gears so they are all engaged. Tighten the arm around the lead screw and tighten the B-C shaft.



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Change Gear Tables

The following tables list basic setup combinations of the change gears for both inch and metric threading. There are other combinations of gears to produce many of these threading results. You can explore other combinations by visiting our website and utilizing the Change Gear Threading Calculator at https://littlemachineshop.com/reference/change_gears.php.

Inch Threads

TPI	A	B	C	D
6	60	120	127	30
7	60	120	127	35
8	50	100	127	40
9	50	100	127	45
10	50	100	127	50
11	55	127	120	55
11.5	40	90	87	35
12	50	100	127	60
13	49	94	Any	49
14	50	120	Any	35
16	30	120	127	40
18	30	120	127	45
20	30	120	127	50
24	45	120	Any	60
26	45	87	85	90
27	40	85	Any	100
28	49	94	87	100
32	56	100	85	120
36	45	85	80	120
40	49	90	70	120
44	40	127	80	87
48	56	127	60	100
50	35	100	87	120
56	45	127	60	94
64	45	127	56	100
72	40	127	56	100
80	40	127	60	120

Metric Threads

Pitch	A	B	C	D
0.25	30	120	60	120
0.30	30	100	60	120
0.35	35	100	60	120
0.40	40	100	60	120
0.45	45	100	60	120
0.50	30	80	Any	120
0.60	30	100	Any	100
0.70	50	100	70	100
0.75	45	80	Any	120
0.80	50	100	80	100
1.00	50	80	Any	100
1.25	50	100	Any	80
1.50	45	100	Any	60
1.75	49	120	Any	56
2.00	50	120	Any	50
2.50	50	120	Any	40
3.00	50	100	120	40
3.50	49	40	100	70
4.00	35	30	120	70

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Making Left Hand Threads

You can make left hand threads with this lathe by changing one gear. Move the driver gear (A) from the idler shaft to the drive shaft and also swap the spacer. This will cause the spindle and the lead screw to rotate in opposite directions. If the spindle and lead screw are turning the opposite direction, then it will make a left hand thread. If spindle and lead screw are turning in same direction, it will cut a right hand thread.

The gear combinations listed in the change gear tables are the same for left hand and right hand threading.

Gears set for right hand threads

Gears set for left hand threads

Tool Bit

For threading, the tool bit is ground to the profile of the thread. For most threads, this is a point with a 60 degrees included angle. The front of the tool should have about 10 degrees of relief. No back rake is used. The left side should have about 8 degrees of relief, and the right side should have about 10 degrees of relief. The tip of the tool should have a flat that is 1/8 of the thread pitch.

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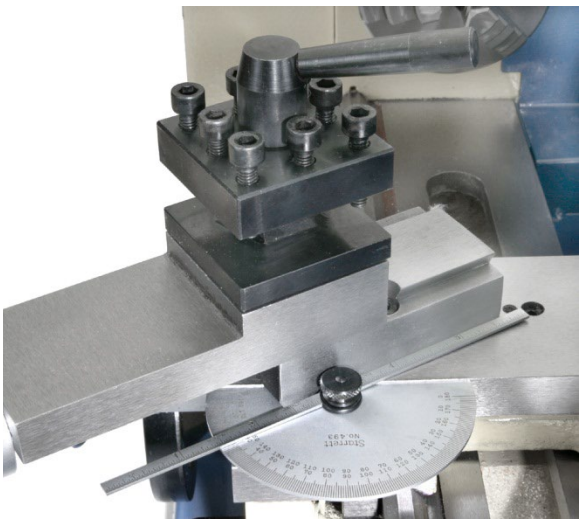
Compound Angle

Set the compound rest at a 29.5 degree angle from a line perpendicular to the axis of the lathe. This allows you to advance the tool with the compound rest. At this angle the tool cuts only on the left side of the thread form. This helps prevent chatter that might result from cutting the entire V form of the thread at once.

> Chris' Tip: Use an accurate protractor when setting the compound rest. The scale on the lathe is not accurate enough.

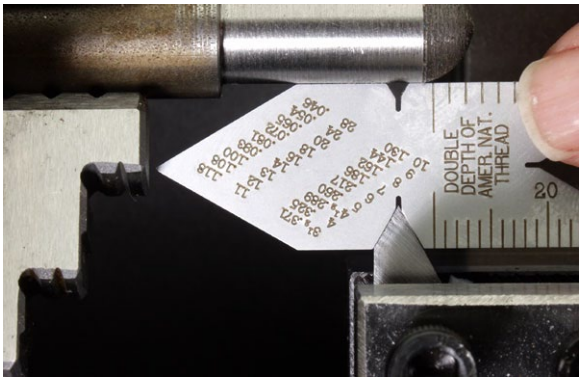


Setting the Cutting Tool

Even though the compound rest is set at an angle to the work piece, the thread cutting tool must be set square to the work piece. A center gage makes this setting possible. A center gage has several V-shaped cutouts. They can be used to check the tool bit as you grind it, and to check the angle of the tool with respect to the work piece.

To align the tool bit to the work:

1. Ensure that the point of the tool bit is set at the center height of the lathe.
2. Place the center gage between the point of the tool bit and the work piece. Leave enough room so that the center gage can be moved back and forth so you can check each side of the tool bit separately.



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3. Align the tool bit to the sides of the V-shaped cutout in the side of the center gage.
4. Secure the tool bit in position.
5. Advance the tool bit until the point just contacts the work piece.
6. Zero the cross slide dial by holding the cross slide feed handle and rotating the graduated dial.

Threading Process

It takes several passes to cut a thread to full depth. You must follow the correct procedure during each pass to ensure the thread is cut correctly. More, shallower passes will produce cleaner threads. Slow speeds will also produce cleaner threads.

Confirm threading direction by engaging the power feed lever. The carriage should move from right to left (toward the head stock with spindle turning same counterclockwise direction as lead screw) to cut right-hand threads, or from left to right (away from the head stock with spindle turning counterclockwise and lead screw turning opposite direction (clockwise)) to cut left-hand threads.

> Chris' Tip: Spindle and lead screw turning same direction will cut right hand threads, while spindle and lead screw turning opposite directions will cut left hand threads.

NOTE: After this test, ensure that the power feed lever is in the disengaged (45 deg) position. It will not be used in the threading process.

For each pass in cutting threads:

1. Move the carriage to the beginning of the cut.
2. Advance the cross slide to the initial position. For the first pass, you are already there. For additional passes, advance 2 complete turns to the 0 mark.
3. Advance the compound rest to move the tool bit into the work. For the first pass, this should be only 0.001". For additional passes, it should be 0.005" to 0.010".
4. Start the lathe. Run it at the lowest speed.
5. Engage half nuts.

NOTE: Once you have engaged the half-nut lever for thread cutting, it must not be released until threading of the workpiece is completed.

6. When the tool reaches the end of the thread, stop the lathe.
7. Back off the cross slide exactly 2 turns. This provides clearance to reverse the carriage.
8. Run the lathe in reverse back to the beginning of the thread. You can use the speed control knob to move it quickly back to the starting position.
9. The first pass, the scratch pass, should leave just a spiral mark on the work piece. Use a thread gage to check that you are cutting the correct number of threads per inch.
10. Repeat steps 2 through 8 until the thread is finished. Remember, cross slide for clearance, compound for cutting.

Use a nut or the matching part to check thread and tell when you are done cutting the thread.

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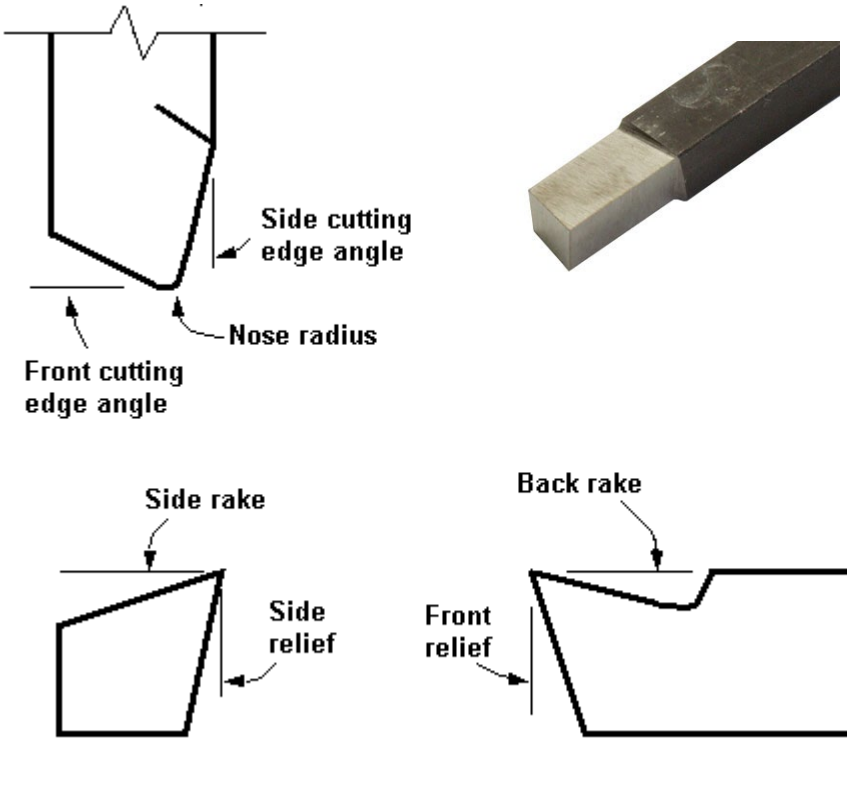
Grinding Tool Bits

When you purchase a new lathe tool bit, it might have an angle on the end, but it is not properly sharpened for turning. Grinding lathe tool bits is a bit of an art. It takes some practice to get good at it.

You need to create a cutting edge that is sharp, extends out so that the cutting edge and not the side of the tool contacts the work, but that still has enough support to maintain sufficient strength to cut metal.

Before diving in, there are some terms you need to understand. The following illustration shows these terms.

First, notice that there are two cutting edges on the tool bit. There is a cutting edge on the end of the tool bit called the front cutting edge. There is also a cutting edge on the side of the tool. Between these cutting edges is a rounded section of cutting edge called the nose.



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Side cutting edge	The side cutting edge does most of the cutting. As the tool bit moves along the work piece the side cutting edge removes most of the material.
Front cutting edge	The front cutting edge cuts when the tool is advanced into the work.
Nose	The nose is a critical part of the cutting edge, because it produces the surface finish of the work piece.
Side rake	The side rake produces the side cutting edge that cuts into the work piece.
Side relief	Side relief provides clearance for the side cutting edge. Without side relief, the side of the tool bit would hit the work piece and not allow the cutting edge to penetrate the work piece.
Back rake	The back rake produces the front cutting edge that cuts into the work piece.
Front relief	Front relieve provides clearance for the front cutting edge. Without front relief, the front of the tool bit would hit the work piece and not allow the cutting edge to penetrate the work piece.

How to Grind Tool Bits

Use a bench grinder to sharpen your tool bits. Even an inexpensive bench grinder can do a good job grinding lathe tool bits. In some cases, you might want to purchase a higher quality fine grit wheel.

Keep a small cup of water near your grinder. Grinding generates heat, which can cause two problems. The tool bit will become too hot to hold. Overheating can also affect the heat treatment of the tool bit, leaving the cutting edge soft.

Use a protractor to measure the angles. They are not super critical, but you should try to stay within one degree of the recommendations.

Grind the Front Relief

The first step in creating a tool bit is to grind the front relief. For most work, a relief angle of 10 degrees works well. Many bit blanks come pre-ground with this relief.

While you are grinding the front relief, you are also creating the front cutting edge angle. Make this angle about 10 degrees also, so that the corner formed by the front cutting edge and the side cutting edge is less than 90 degrees.

Grind the Left Side Relief

Form the left side relief next. Again, create about a 10 degree angle. You don’t need to form a side cutting angle. The side cutting edge can be parallel to the side of the tool blank.

Grind the Top Rake

The top of the tool bit is ground at an angle that combines the back rake and the side rake. The side rake is most important, because the side cutting edge does most of the work. For cutting steel and aluminum, the side rake should be about 12 degrees, and the back rake should be about 8 degrees. For cutting brass, the rake angles should be much less, or even 0 degrees.

Round the Nose

A small nose radius allows you to turn into tight corners. A large nose radius produces better surface finishes. Create a nose radius that is appropriate for the tool bit you are creating.

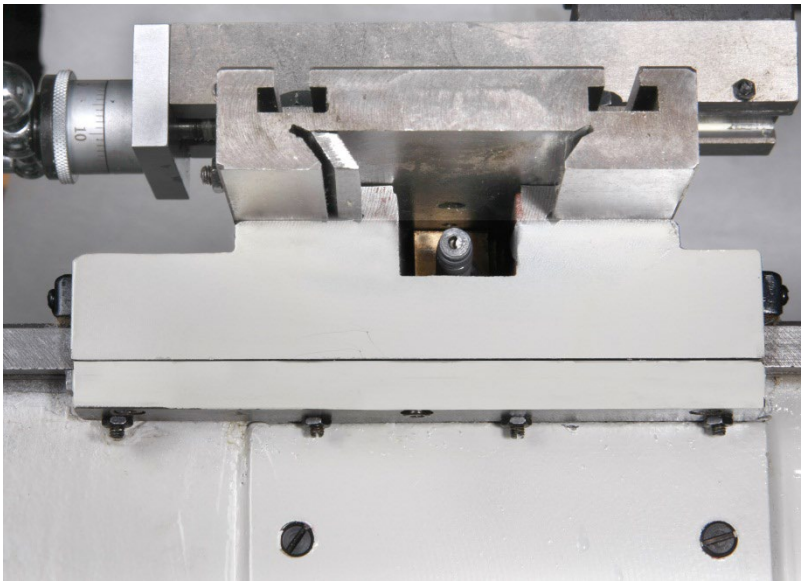
Lathe Adjustments

Keeping your lathe in adjustment is an ongoing process. You should check all the following adjustments when you set up your lathe and then periodically as you use your lathe. Looseness in the carriage retaining plates or the gibs can cause chatter when you are using the lathe. If you experience chatter, check all these adjustments.

Carriage

The carriage is held on the ways by retainers with gibs that are bolted to the bottom of the carriage.

A gib is a strip of metal placed between the bearing surface of two machine parts to ensure a precision fit and provide adjustment for wear. The bench lathe has gibs in several places, including the carriage.



To adjust the carriage gibs:

1. Loosen the three socket head cap screws on the back bottom of the carriage.
2. Loosen the four lock nuts on the back bottom of the carriage.
3. Slightly loosen all four set screws.
4. Snug each cap screw equally. This will lock the carriage in position.
5. Loosen each cap screw about 1/8 turn to allow carriage to move, but without play.
6. Snug the set screws to lock the cap screws in position. Do not overtighten.
7. While holding the set screws from turning, tighten the lock nuts.

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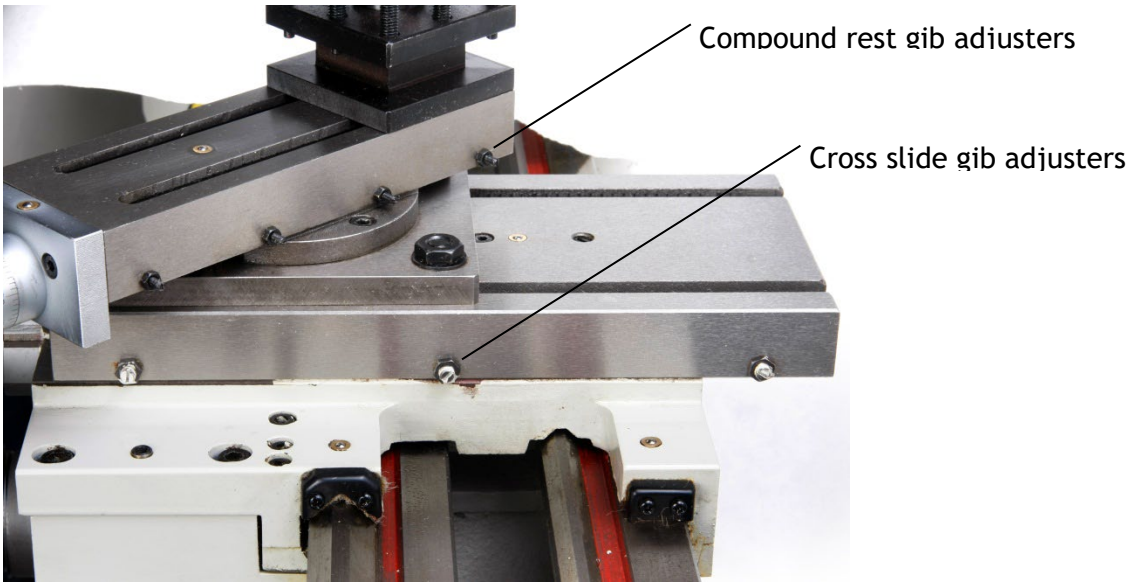
8. Test by moving the carriage. Loosen or tighten all the cap screws the same amount until the carriage moves freely, but without play on the ways.

Cross Slide Gib



To adjust the cross slide gib:

1. Loosen the three lock nuts on the side of the cross slide.
2. Slightly loosen all three set screws on the side of the cross slide.
3. Snug each set screw equally. This will lock the cross slide in position.
4. Loosen each set screw 1/8 turn to allow the cross slide to move.
5. While holding the set screws from turning, tighten the lock nuts.
6. Test by turning the handle. Loosen or tighten all the set screws the same amount until the cross slide moves freely, but without play in the dovetail.

Cross Slide Nut

The cross slide nut is adjustable to remove free play from the cross slide feed screw.

The cross slide nut is partially split and set screws adjust the gap to allow adjustment of play in the nut.

To adjust the cross slide nut:

1. Move the cross slide as far back as it will go. The screw disengages.
2. Engage the nut and move the cross slide back toward you enough that the nut is fully engaged.
3. Adjust the set screws in the cross slide nut to remove play without making it hard to turn.

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Compound Rest Gib

The compound rest also incorporates a gib for adjustment.

To adjust the compound rest gib:

1. Loosen the four lock nuts on the side of the compound rest.
2. Slightly loosen all four set screws on the side of the compound rest.
3. Snug each set screw equally. This will lock the compound rest in position.
4. Loosen each set screw 1/8 turn to allow the compound rest to move.
5. While holding the set screws from turning, tighten the lock nuts.
6. Test by turning the handle. Loosen or tighten all the set screws the same amount until the compound rest moves freely, but without play in the dovetail.

Compound Rest Nut

The compound rest nut is adjustable to remove free play from the compound rest feed screw.

The compound rest nut is partially split and set screws adjust the gap to allow adjustment of play in the nut.

To adjust the compound rest nut:

1. Remove the compound rest by removing the two socket head cap screws that lock it from rotating.
2. Turn the compound rest over to access the adjustable nut.
3. Adjust the cap screw in the cross slide nut to remove play without making it hard to turn.
4. Replace the compound rest and the two socket head cap screws.

Apron Position

The apron can be adjusted to center the half nuts horizontally on the lead screw.

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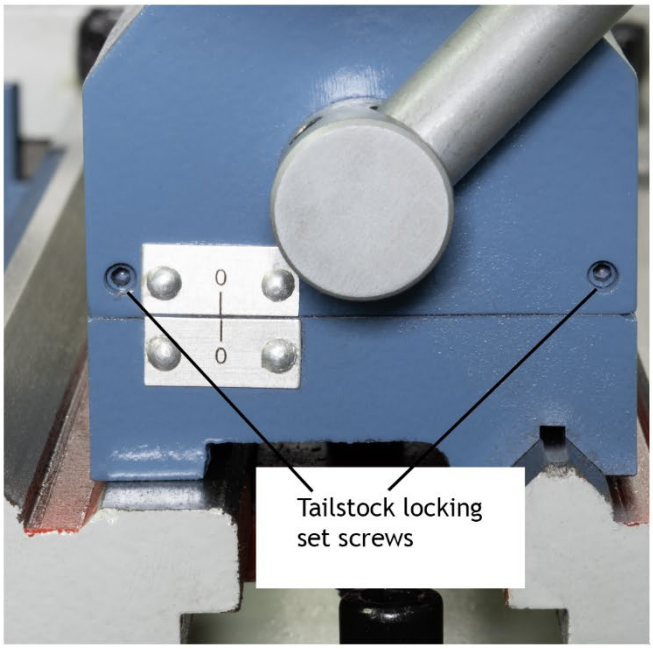
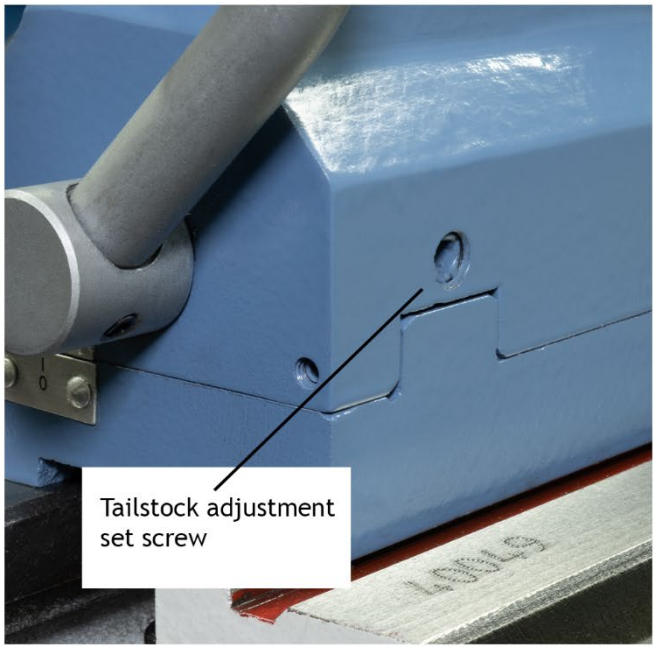
To adjust the apron position:

1. Loosen the four socket head cap screws that secure the apron to the carriage. There are two on the left side of the carriage and two on the right side of the carriage
2. Engage the half nuts on the lead screw.
3. Tighten the four socket head cap screws.

Tailstock Position

The tailstock is adjustable from front to rear so you can align it with the spindle.





To adjust the tailstock position:

1. Remove the 3-jaw chuck from the lathe spindle.
2. Put a #4 Morse taper (4MT) dead center in the spindle.
3. Slide the tailstock to the end of the way to improve access to the locking set screws.
4. Loosen the two small locking set screws on the back of the base.
5. Put a #2 Morse taper (2MT) dead center in the tailstock quill.
6. Move the tailstock toward the spindle until the two centers almost touch.
7. Use the tailstock adjustment set screws to move the upper part of the tailstock casting until the centers are aligned.
8. Place a steel rule between the two centers. The length of the rule should be horizontal and roughly perpendicular to the axis of the lathe; the width of the rule should be vertical. Bring the centers together to hold the rule in place.
9. Adjust the upper part of the tailstock casting until the steel rule is perpendicular to the axis of the lathe. If the near end of the rule angles toward the headstock, move the tailstock back.

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10. When the tailstock is in the correct position, tighten the tailstock locking set screws.

11. Check the adjustment.

Half Nuts

The half nut gib takes the play out of the half nut.

To adjust the half nut gibs:

- Tighten the three set screws in the right side of the apron to remove play from the half nuts.
- You will need to remove the power feed lever support block to access the upper two set screws. Note: A small steel ball and spring are located inside the support block.

Maintenance

Maintenance of the bench lathe is simple, but important. Regular maintenance will keep your bench lathe working like new for many years.

Cleaning

The maintenance you perform most often is cleaning. Keeping swarf (chips, shavings, and debris) off wearing surfaces is the most important thing you can do to prolong the life of your bench lathe.

- Use a 1" paintbrush to remove swarf from the ways as you work.
- Clean swarf from the lathe, from top down after each use.

Lubrication

We recommend the use of two lubricants on your mill.

- Where oil is required, we recommend Mobil Vactra Oil No. 2, an oil specially designed for machine tool way lubrication and bearing lubrication.

> Chris' Tip: Mobil Vactra Oil No. 2 is available from LittleMachineShop.com (part number 6385). If you prefer to purchase locally, get Mobil 1 synthetic motor oil, any viscosity, available at most auto parts stores.

- Where grease is required, we recommend Lubriplate 630-AA Lithium-Based Grease. Lubriplate 630-AA is an NLGI No. 1 lubricant. Lithium grease is a plastic-friendly general use grease that is easy to find and easy to use.

> Chris' Tip: Lubriplate 630-AA grease is available from LittleMachineShop.com (part number 3984), but you might have trouble finding it locally. Don't worry about the brand name. Get white lithium grease. Every auto parts store and most hardware stores have it.

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The following points on your lathe require lubrication.

Location	Lubricant	Frequency	Notes
Lathe ways	Oil	Every 8 hrs of use	Apply oil to both the front and back ways on both sides of the carriage. Move the carriage back and forth to spread the oil.
Lead screw threads	Oil	Every 8 hrs of use	Clean swarf (chips, shavings, and debris) after use.
Compound rest dovetail	Oil	Every 8 hrs of use	Advance the compound rest to the extent of its normal travel. Apply oil to the end of the gib and the ends of the dovetails. Retract the compound rest.
Cross slide dovetail	Oil	Every 8 hrs of use	Advance the cross slide to the extent of its travel. Apply oil to the end of the gib and the ends of the dovetails. Retract the cross slide.
Oil fittings	Oil	Every 40 hrs of use	There are several oil fittings on the lathe. Lubricate each one with one squirt from a pump oiler.
Other machined surfaces	Oil	As needed	Oil lubricates and prevents corrosion.
Chuck	Oil	Every 160 hrs of use	Disassemble, clean and lubricate. Wrap with a paper towel, secure with an elastic band, and run the lathe to sling out excess oil.
Change gears	Grease	Every 40 hrs of use	Apply a light coat of grease to the change gears each time you change them. Apply grease to the installed gears at least monthly.
Change gear B-C shaft and bushing	Oil	Every 40 hrs of use	Oil the B-C shaft and bushing every time you change gears, and at least monthly.
Tailstock quill and screw	Grease	Yearly	

The spindle bearings are tapered roller bearings that are behind seals and do not require additional lubrication. The countershaft and other bearings are ball bearings that are shielded and do not require additional lubrication.

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Common Accessories

You will soon find that the purchase of a lathe is just an initial step. There are many tools and accessories that you will need to get full use from your lathe. LittleMachineShop.com carries a full selection of accessories. The following are some common accessories used with the bench lathe, a small sampling of the complete LittleMachineShop.com line.

Quick Change Tool Post

The standard bench lathe tool post has positions for up to four tools. While this is useful, the standard bench lathe tool post does not have the capability to hold boring bars or cut-off tools without an adapter of some sort.

Quick-change tool posts provide several advantages. They provide an easy way to adjust the height of the tool bit. They provide a quick way to change from one tool to the other. They provide a way to hold several different kinds of tools, usually including turning tools, cut-off blades, and boring bars. And they are indexable, meaning that you can remove a tool, and when you replace it, it returns to the same position, with no adjustment necessary.

LittleMachineShop.com part number 2280. This is a very high quality quick-change tool post for the ***HiTorque®*** Bench Lathe.

It holds tools up to 1/2" shank.

The set includes:

- Tool post
- Turning & facing tool holder
- Boring, turning & facing tool holder
- Heavy duty boring tool holder (5/8" and ¾")
- Universal parting blade holder
- Knurling, facing & turning tool holder

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Indexable Turning Tools

Indexable turning tools usually come in a set of five tools, providing a range of cutting angles. These tools use indexable inserts, usually made from carbide, but sometimes from high-speed steel. They are called indexable because you can change an insert and the new insert will take the exact position of the insert it replaces. You can resume work with no further adjustments. Indexable inserts are pre-sharpened.

LittleMachineShop.com part number 1669. This set of indexable 3/8" turning tools includes 5 tools (AR, AL, BR, BL, TE), wrenches, and extra screws. It comes in a fitted case. (The letters designate the angles of the cutting edge.)

We also have a set of indexable 1/2" turning tools Part number 2286

4-Jaw Chuck

The 3-jaw scroll chuck that comes with the bench lathe provides a quick way to clamp round and hexagonal work accurately.

A 4-jaw independent chuck provides several advantages over a 3-jaw scroll chuck. It can hold square or rectangular work, as well as round. Work can be centered more accurately because you adjust each jaw independently. It can hold larger work than the same size 3-jaw chuck. You can offset work in a 4-jaw chuck by clamping it off center.

LittleMachineShop.com part number 2338. 5 inch, 4-jaw chuck. Each jaw is independently adjustable and reversible. This set includes a chuck key and reversible jaws. The through bore of this chuck is 1.18". The chuck can hold work up to 125 mm (4.92") in diameter.

LittleMachineShop.com part number 2038. 6 inch, 4-jaw chuck. Each jaw is independently adjustable and reversible. With an appropriate adapter a 6" chuck can be mounted on the bench lathe. The through bore of this chuck is 1.77". The chuck can hold work up to 160 mm (6.30") in diameter.

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Faceplate

A faceplate allows you to mount work that can't be held in a chuck. You can bolt odd-shaped work pieces to the faceplate.

LittleMachineShop.com part number 2499. Faceplate for the ***HiTorque®*** Bench Lathe. The faceplate is 8.66" in diameter and has 8 slots for mounting work.

LittleMachineShop.com part number 3401. Clamping kit for faceplate. This kit includes clamping bars and fasteners to attach work to the faceplate.

Live and Dead Centers

A live center goes in the tailstock and is used to support the end of a long work piece; it rotates with the work piece. A dead center goes in the spindle and supports work being turned between two centers. It does not rotate and requires a dab of lubrication to prevent wear.

The live center is LittleMachineShop.com part number 1592. It has a 2 Morse taper shank. This center fits the tailstock of the bench lathe.

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Steady Rest and Follower Rest

Steady and follower rests support small diameter work that would otherwise flex too much. A steady rest mounts in a fixed position on the ways of the lathe. A follower rest mounts on the carriage and moves with the cutting tool, providing support where it is needed.

The steady rest is LittleMachineShop.com part number 6722. The steady rest can support work up to 2.2" in diameter. The follower rest is LittleMachineShop.com part number 6723.

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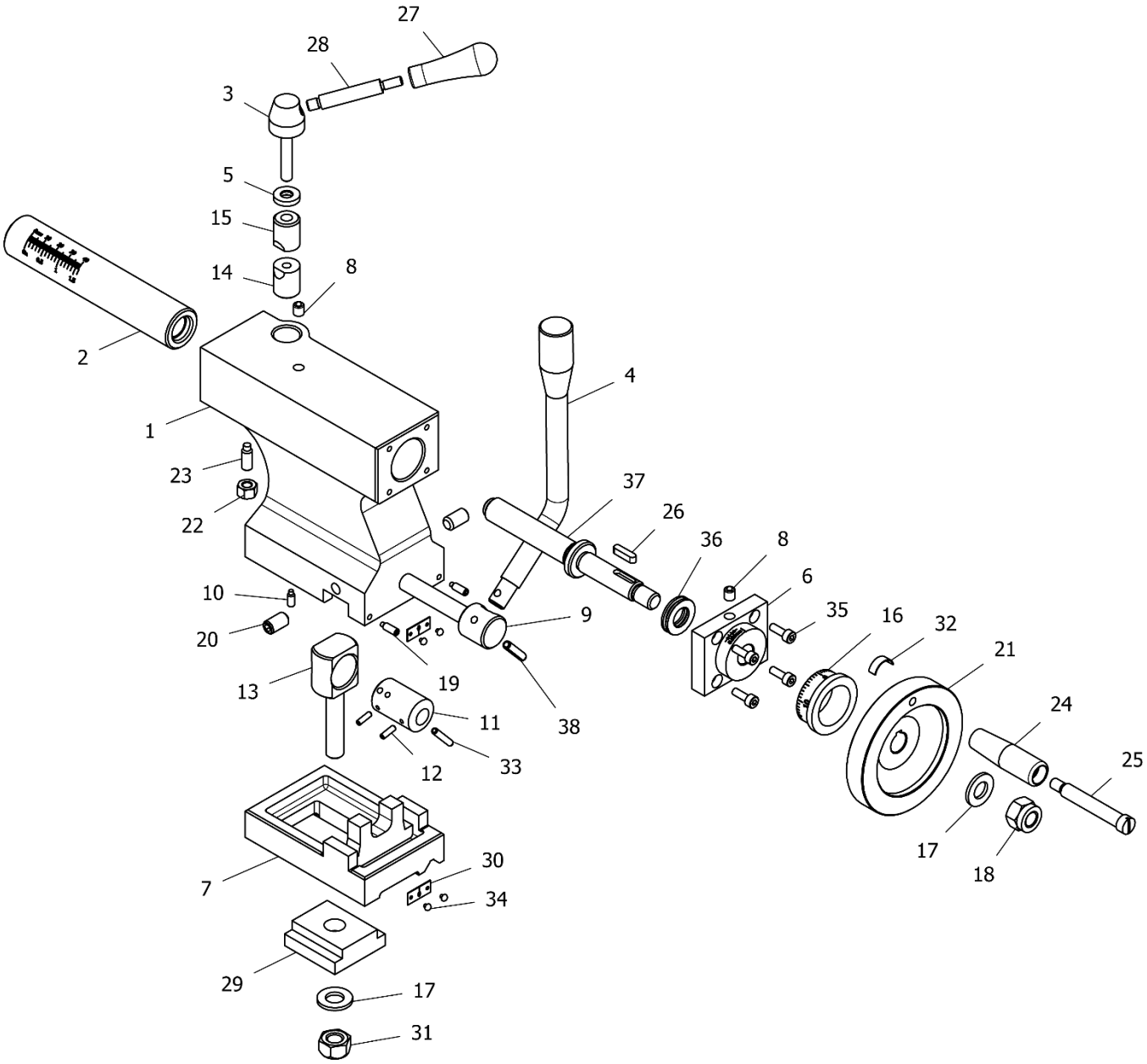
Parts Diagrams: 7600

Drawing 1 of 10



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Parts for Drawing 1 of 10

No:	Part
1-1	Tailstock Casting
1-2	Quill
1-3	Locking Axis, Tailstock
1-4	Locking Lever, Tailstock
1-5	Adjusting Washer, Tailstock
1-6	Retainer, Tailstock Feed Screw
1-7	Base Casting, Tailstock
1-8	Oil Fitting, 6 mm
1-9	Rotating Shaft, Tailstock
1-10	Set Screw, M4x10, Socket Dog Point
1-11	Eccentric Sleeve, Tailstock
1-12	Set Screw, M3x10 Socket Flat Point
1-13	Tension Shaft, Tailstock
1-14	Locking Nut, Tailstock
1-15	Locking Sleeve, Tailstock
1-16	Scale Ring, Tailstock
1-17	Washer, M10 Flat
1-18	Nut, M10 Nylon Insert Lock
1-19	Set Screw, M4x12, Socket Dog Point

No:	Part
1-20	Set Screw, M8x14, Socket Flat Point
1-21	Handwheel, Tailstock
1-22	Nut, M6
1-23	Set Screw, M6x16, Socket Dog Point
1-24	Handle, Handwheel
1-25	Bolt, Handwheel, 6 mm
1-26	Key, 4x16 mm
1-27	Handle, Tailstock Quill Lock
1-28	Handle Shaft, Tailstock Quill Lock
1-29	Press Plate, Tailstock
1-30	Label, Zero
1-31	Nut, M10
1-32	Spring, Adjustable Dial
1-33	Pin, Spring 3x20
1-34	Rivet, M2x4
1-35	Cap Screw, M4x12, Socket Head
1-36	Bearing, Thrust 12x22x5
1-37	Feed Screw, Tailstock
1-38	Pin, Spring 4x20

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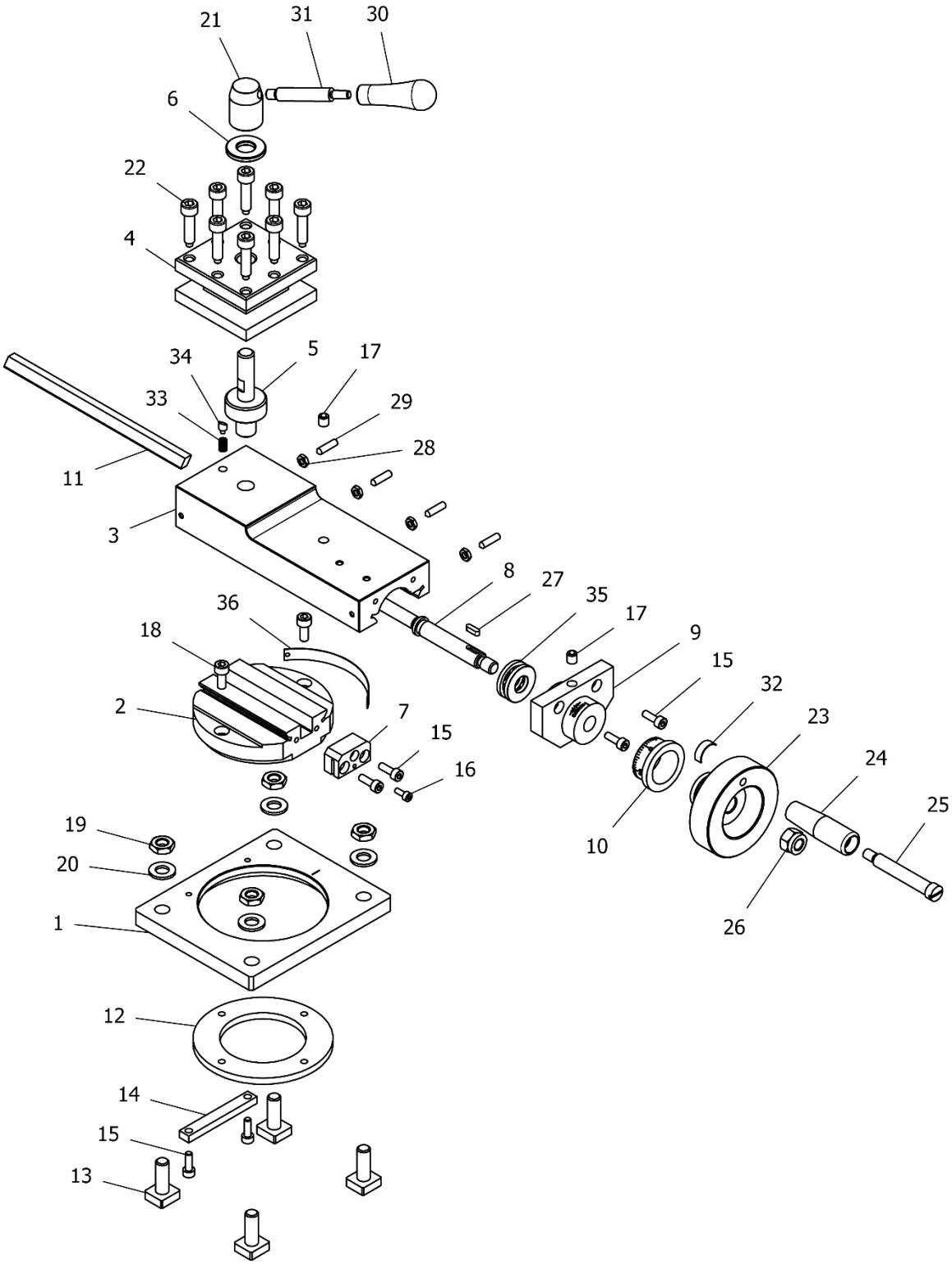

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Parts for Drawing 2 of 10

No:	Part
2-1	Base, Compound Rest
2-2	Mounting Disc, Compound Rest
2-3	Compound Rest Top
2-4	Tool Post
2-5	Tool Post Mount
2-6	Adjusting Washer
2-7	Nut, Feed Screw Compound, 20 TPI
2-8	Feed Screw, Compound Rest
2-9	Support, Compound Rest Feed Screw
2-10	Graduated Scale, Compound Rest
2-11	Gib, Compound Rest
2-12	Press Plate, Compound Rest Mount
2-13	T-Bolt, Compound Rest, M8
2-14	Locating Block, Compound Rest
2-15	Cap Screw, M4x12, Socket Head
2-16	Cap Screw, M3x8, Socket Head
2-17	Oil Fitting, 6 mm
2-18	Cap Screw, M5x12, Socket Head
2-19	Nut, Hex Thin Chamfered M8

No:	Part
2-20	Washer, M8 Flat
2-21	Handle, Tool Post
2-22	Cap Screw, M6x25, Socket Head
2-23	Handwheel, Compound Rest
2-24	Handle, Handwheel, Chrome
2-25	Bolt, Handwheel 6 mm
2-26	Nut, M8 Nylon Insert Lock
2-27	Key, 4x12 mm
2-28	Nut, Hex Thin Chamfered M4
2-29	Set Screw, M4x16, Socket Cone Point
2-30	Handle, Tailstock Quill Lock
2-31	Handle Shaft, Tailstock Quill Lock
2-32	Spring, Adjustable Dial
2-33	Spring, 4 mm x 12 mm
2-34	Fixed Block, Compound Rest
2-35	Bearing, Thrust 51100
2-36	Angle Scale, Compound Rest
2-37	Rivet, M2x4

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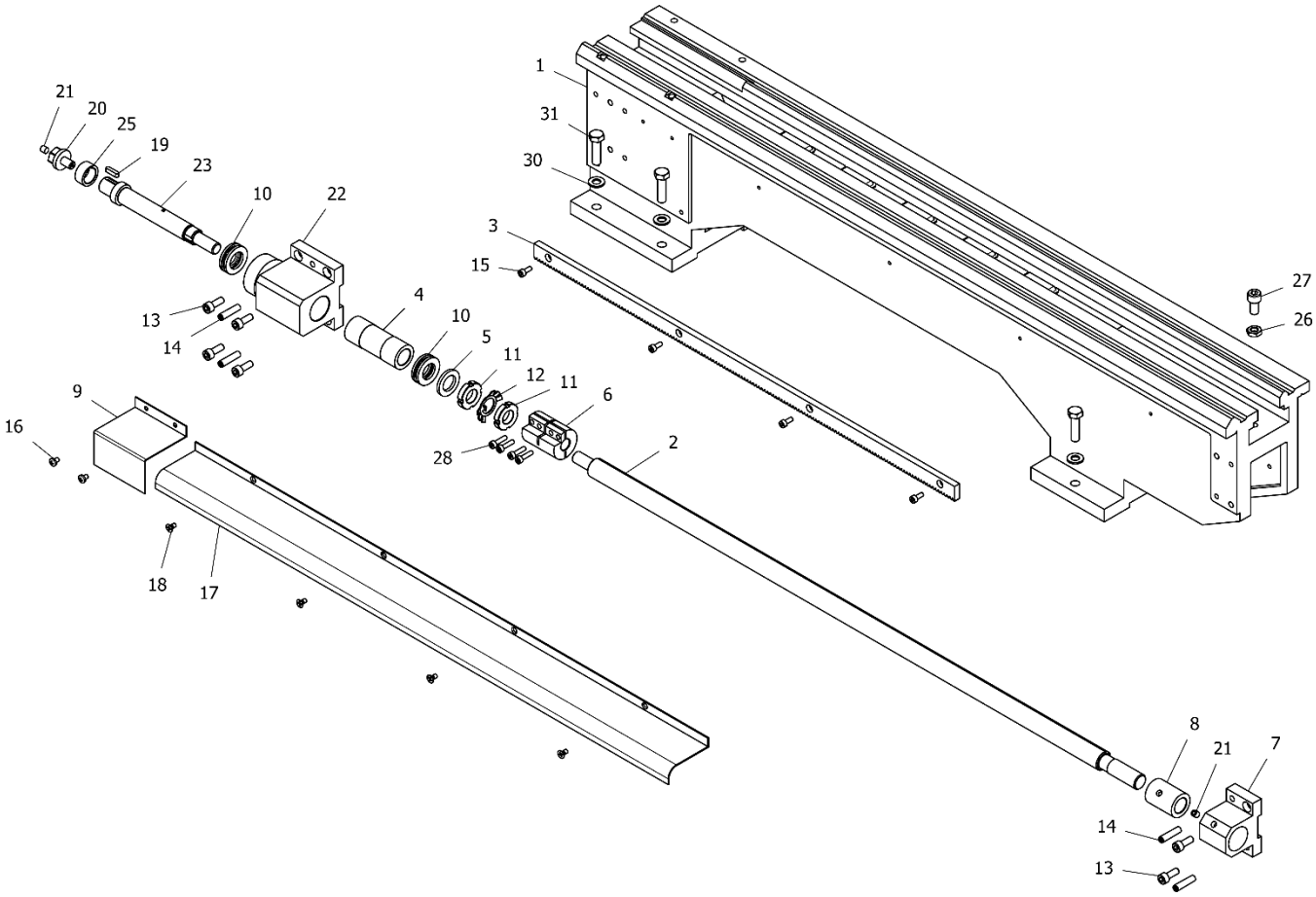

Parts for Drawing 3 of 10

No:	Part
3-1	Bed Way
3-2	Lead Screw
3-3	Rack
3-4	Copper Cover, Lead Screw
3-5	Washer, Lead Screw
3-6	Connecting Sleeve, Lead Screw
3-7	Support, Lead Screw
3-8	Brass Cover, Lead Screw
3-9	Protection Cover, Lead Screw Support
3-10	Bearing, Thrust 51103
3-11	Nut, Bearing Lock M16x1.5
3-12	Washer, M16 Tab
3-13	Cap Screw, M6x16, Socket Head
3-14	Pin, M6x26, Tapered and Threaded
3-15	Cap Screw, M4x10, Socket Head

No:	Part
3-16	Screw, M4x6 Pan Head Phillips Machine
3-17	Leadscrew Protection Cover
3-18	Screw, M4x8 Flat Head Phillips Machine
3-19	Key, 4x16 mm
3-20	Bolt, Shoulder
3-21	Oil Fitting, 6 mm
3-22	Support, Lead Screw Left
3-23	Drive Shaft, Lead Screw
3-25	Spacer, D-Gear
3-26	Nut, Hex Thin Chamfered M8
3-27	Cap Screw, M8x16, Socket Head
3-28	Cap Screw, M4x16, Socket Head
3-30	Washer, M8 Flat
3-31	Cap Screw, M8x30, Hex Head

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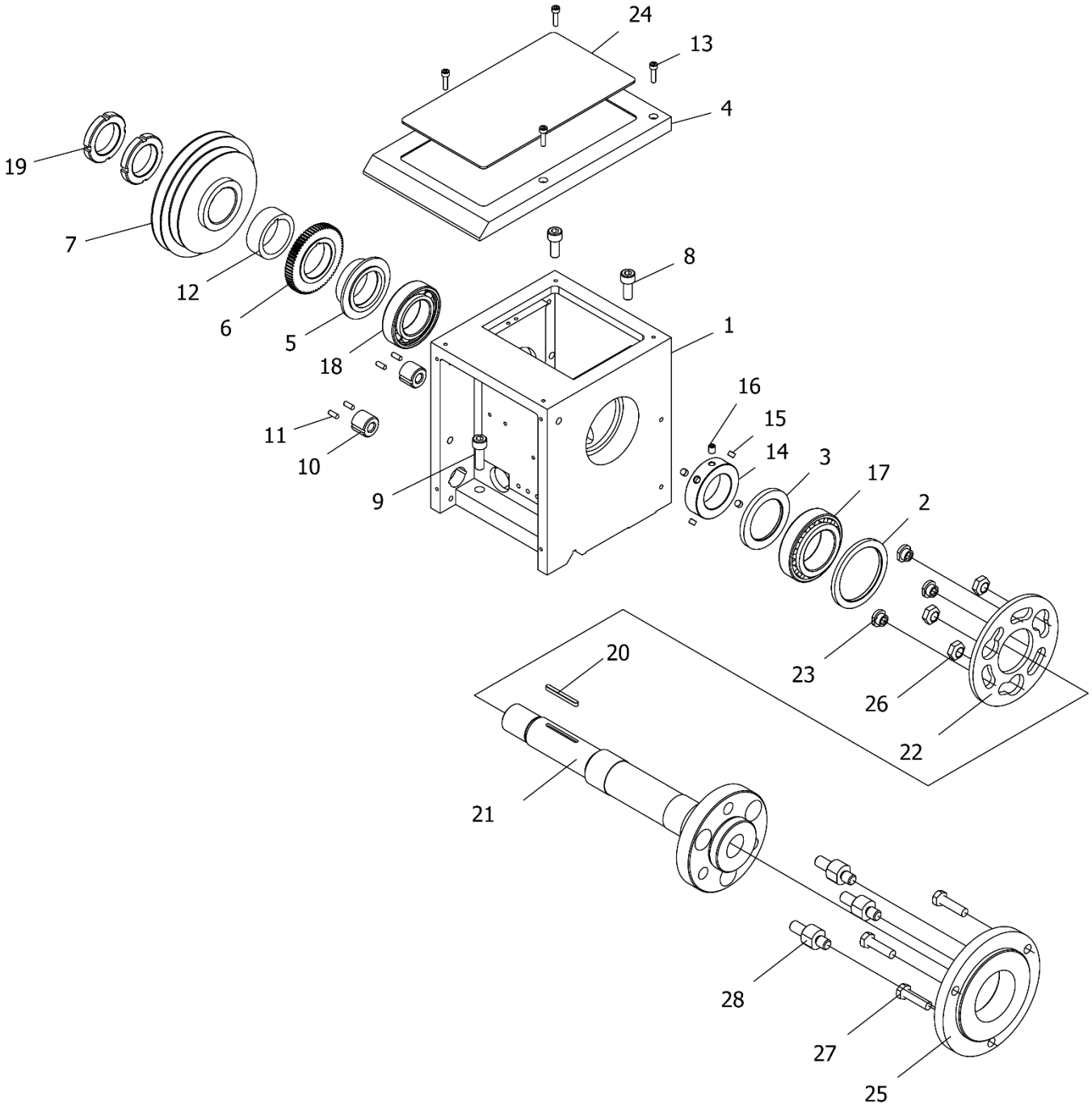

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Parts for Drawing 4 of 10

No:	Part
4-1	Headstock Casing
4-2	Spindle Bearing Retainer, Outer
4-3	Spindle Bearing Retainer, Inner
4-4	Headstock Cover
4-5	Ring, Spindle
4-6	Transition Gear xx Teeth
4-7	Pulley, Timing - Spindle
4-8	Cap Screw, M8x20, Socket Head
4-9	Cap Screw, M8x25, Socket Head
4-10	Retainer, Intermediate Shaft
4-11	Set Screw, M4x12, Socket Cone Point
4-12	Spacer, Timing Pulley
4-13	Cap Screw, M4x16, Socket Head
4-14	Magnetic steel sleeve

No:	Part
4-15	Magnet, 6mm x 4mm
4-16	Set Screw, M6x8, Socket Flat Point
4-17	Bearing, Tapered Roller 32008
4-18	Bearing, 6007-2RS
4-19	Nut, Spindle M33x1.5
4-20	Key, 4x40 mm
4-21	Spindle
4-22	Adjusting Plate, Spindle
4-23	Positioning sleeve
4-24	Rubber Pad
4-25	5" Chuck Adapter
4-26	Nut, M10
4-27	Bolt, Hexagon Head M8x25
4-28	Chuck Adapter Bolt

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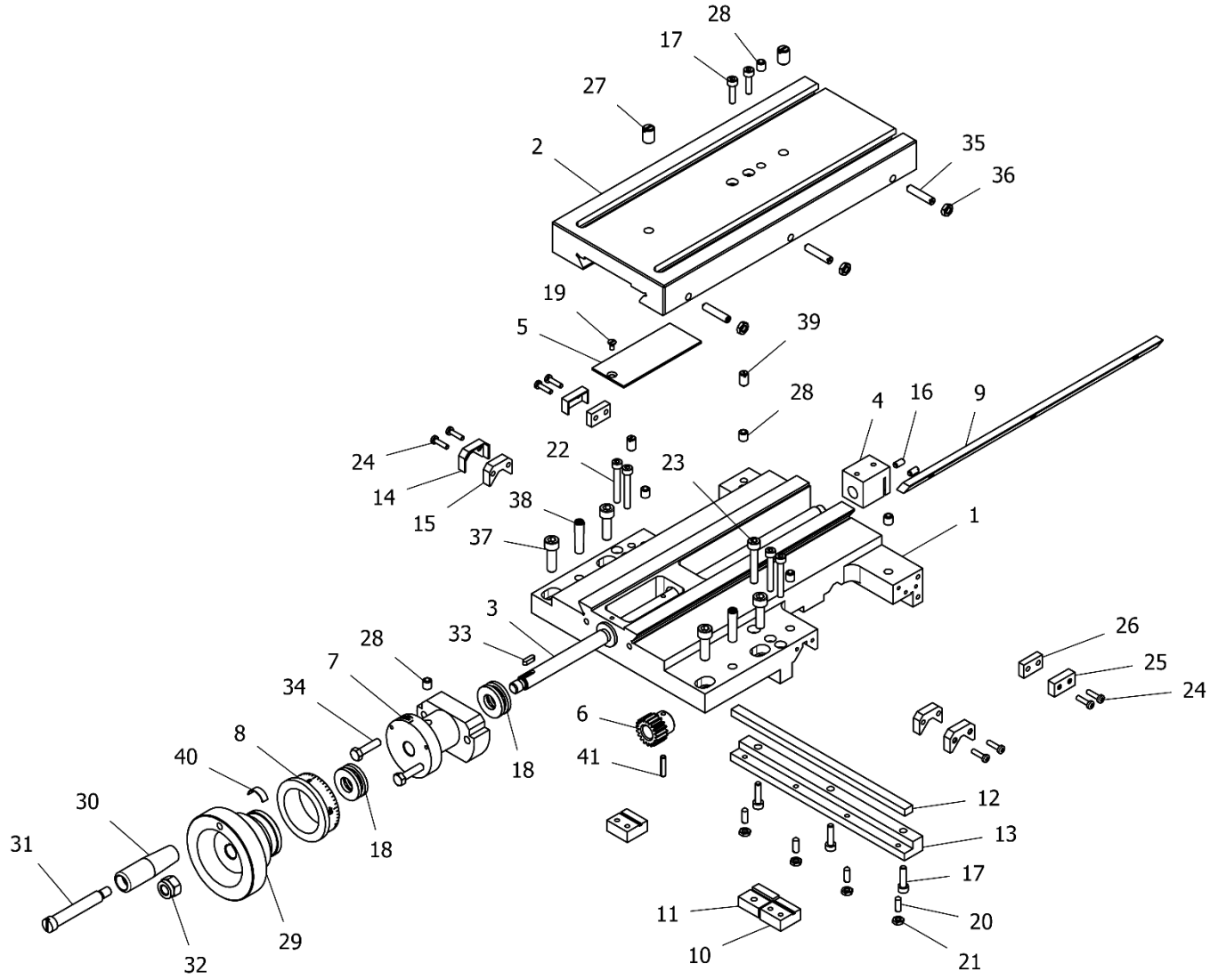

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Parts for Drawing 5 of 10

No:	Part
5-1	Saddle
5-2	Cross Slide
5-3	Feed Screw, Cross Slide, 20TPI
5-4	Nut, Feed Screw Cross Slide
5-5	Cover, Saddle
5-6	Gear, Cross Slide, 19 Teeth
5-7	Bearing Retainer, Cross Slide
5-8	Graduated Scale, Cross Slide
5-9	Gib, Cross Slide, 250 mm
5-10	Press Plate
5-11	Bridled Press Plate
5-12	Saddle Gib, 170 mm
5-13	Retainer, Saddle
5-14	Protection Cover
5-15	Linoleum
5-16	Set Screw, M4x8, Socket Flat Point
5-17	Cap Screw, M4x16, Socket Head
5-18	Bearing, Thrust 51100
5-19	Screw, M3x6 Flat Head Phillips Machine
5-20	Set Screw, M4x12, Socket Cone Point
5-21	Nut, Hex Thin Chamfered M4

No:	Part
5-22	Cap Screw, M4x30, Socket Head
5-23	Cap Screw, M5x30, Socket Head
5-24	Screw, M3x12, Pan Head Phillips Machine
5-25	Protection Cover
5-26	Linoleum
5-27	Set Screw, M8x12, Socket Flat Point
5-28	Oil Fitting, 6 mm
5-29	Handwheel, Cross Slide
5-30	Handle, Handwheel, Chrome
5-31	Bolt, Handwheel 6 mm
5-32	Nut, M8 Nylon Insert Lock
5-33	Key, 3x10 mm
5-34	Cap Screw, M5x20, Hex Head
5-35	Set Screw, M5x25 Slot Cone Point
5-36	Nut, Hex Thin Chamfered M5
5-37	Cap Screw, M6x20, Socket Head
5-38	Pin, M6x26, Tapered and Threaded
5-39	Set Screw, M6x10, Socket Flat Point
5-40	Spring, Adjustable Dial
5-41	Pin, Spring 3x16

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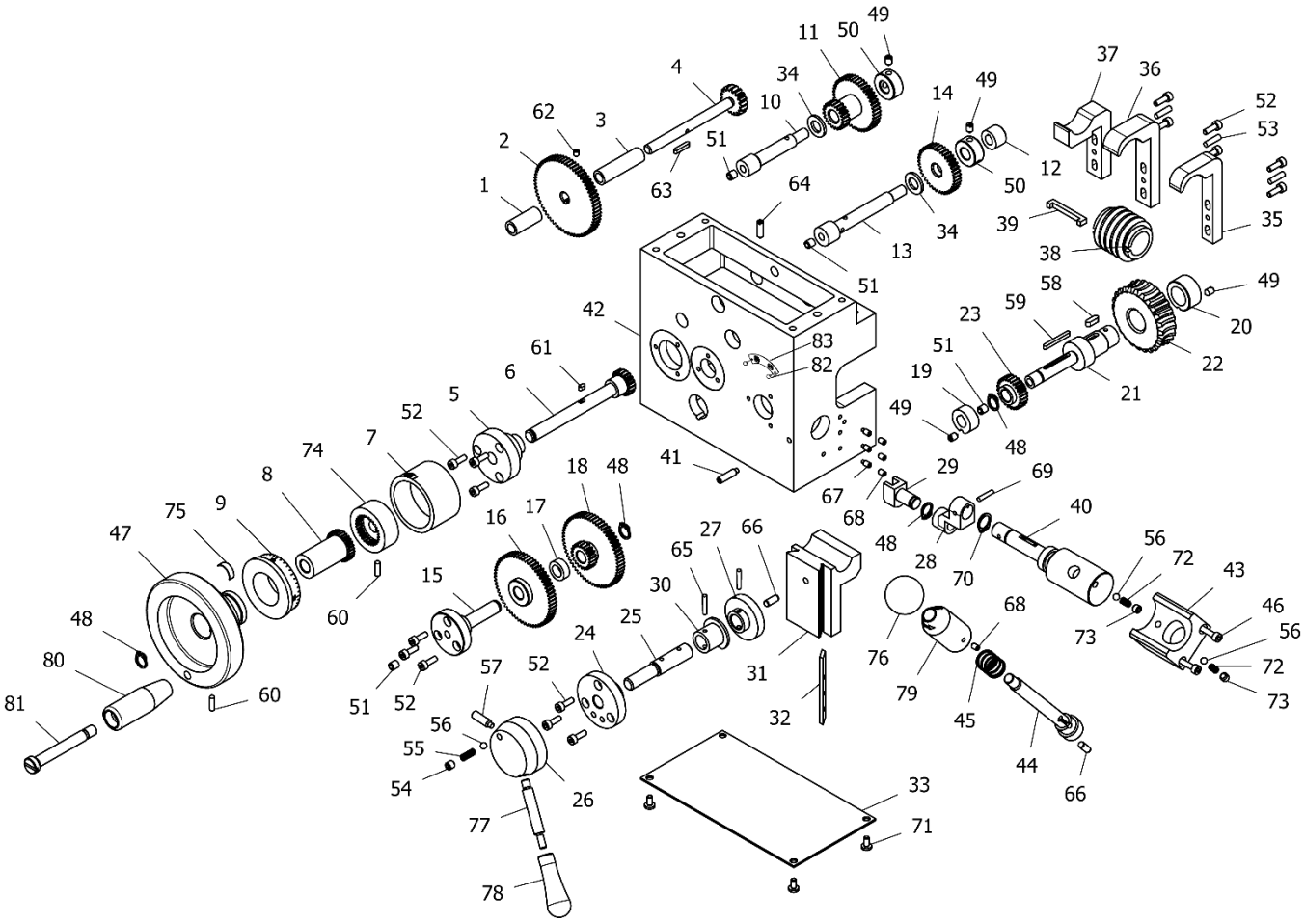

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Parts for Drawing 6 of 10

No:	Part
6-1	Sleeve, Gear Shaft
6-2	Gear, Saddle Drive
6-3	Sleeve, Gear Shaft
6-4	Gear Shaft, Saddle Drive
6-5	Gear Protection Sleeve, Carriage Handwheel
6-6	Gear Shaft I, 19 Teeth, Carriage
6-7	Gear Protection Sleeve, Carriage Handwheel
6-8	Gear, Carriage Handwheel, 30 Teeth
6-9	Graduated Scale, Carriage Handwheel
6-10	Shaft V, Carriage
6-11	Gear, 2-Speed, Carriage Shaft V
6-12	Shaft Sleeve, Carriage
6-13	Shaft IV, Carriage
6-14	Gear, Carriage, 39 Teeth
6-15	Shaft, Saddle Gearing
6-16	Gear, Saddle Drive 60 Teeth
6-17	Sleeve, Saddle Drive
6-18	Gear, Saddle Drive 20/60 Teeth
6-19	Shaft Sleeve II, Worm Wheel
6-20	Shaft Sleeve I, Worm Wheel
6-21	Shaft VI, Worm Wheel
6-22	Worm Wheel
6-23	Gear, Worm 25 Teeth
6-24	Locating Flange Sleeve, Half Nut Lever
6-25	Shaft VII, Half Nut Lever
6-26	Handle Set I, Half Nut Lever
6-27	Center Plate, Half Nut Lever
6-28	Fork, Autofeed
6-29	Block, Autofeed
6-30	Locking Wheel, Half Nut Lever
6-31	Half Nut
6-32	Gib, Half Nut, 63 mm
6-33	Lower Cover, Carriage
6-34	Washer, M10 Flat
6-35	Support, Lead Screw Right
6-36	Support, Lead Screw Center
6-37	Support, Lead Screw Left
6-38	Worm Shaft, Lead Screw
6-39	Key, Lead Screw
6-40	Handle shaft
6-41	Set Screw, M5x20, Socket Dog Point
6-42	Carriage Apron

No:	Part
6-43	Block
6-44	Controlling lever
6-45	Pressure spring
6-46	Cap Screw, M4x40, Socket Head
6-47	Handwheel, Main
6-48	Retaining Ring, M10 External
6-49	Set Screw, M5x8, Socket Cone Point
6-50	Positioning Ring, Carriage Shaft
6-51	Oil Fitting, 6 mm
6-52	Cap Screw, M4x12, Socket Head
6-53	Pin, M4x16, Tapered
6-54	Set Screw, M6x6, Socket Flat Point
6-55	Spring, 4 mm x 12 mm
6-56	Ball, Steel, 5 mm
6-57	Set Screw, M6x20, Socket Dog Point
6-58	Key, 4x12 mm
6-59	Key, 3x28 mm
6-60	Set Screw, M4x14, Socket Dog Point Self-Locking
6-61	Key, 3x6 mm
6-62	Set Screw, M4x6, Socket Cone Point
6-63	Key, 3x16 mm
6-64	Set Screw, M5x16, Slotted Cone Point
6-65	Pin, M3x18, Tapered
6-66	Pin, M5x12
6-67	Set Screw, M4x8, Socket Dog Point
6-68	Set Screw, M4x6, Socket Flat Point
6-69	Pin, M3x16, Tapered
6-70	Retaining Ring, M12 External
6-71	Screw, M4x8 Pan Head Phillips Machine
6-72	Spring, 4 mm x 8 mm
6-73	Set Screw, M6x5 Socket Flat Point
6-74	Inner Gear, Carriage Handwheel 30 Teeth
6-75	Spring, Adjustable Dial
6-76	Knob handle
6-77	Handle Shaft, Tailstock Quill Lock
6-78	Handle, Tailstock Quill Lock
6-79	Positioning sleeve
6-80	Handle, Handwheel
6-81	Bolt, Handwheel
6-82	Rivet, M2x4
6-83	Label, Half Nut Lever

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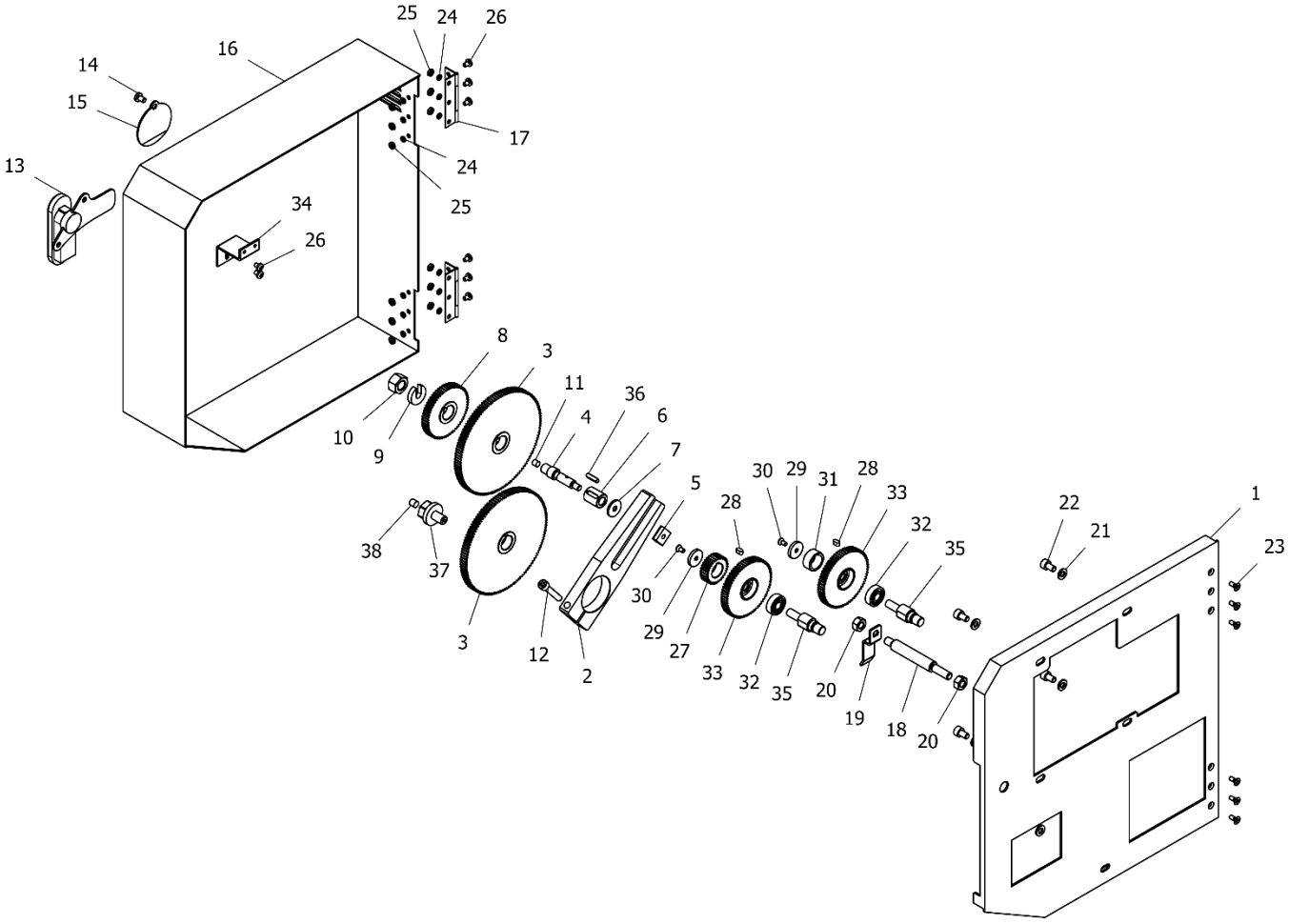

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Parts for Drawing 7 of 10

No:	Part
7-1	Back plate of gear box
7-2	Gear Lever
7-3	Gear, 120 Teeth
7-4	Shaft, Change Gears
7-5	Nut
7-6	Bushing
7-7	Washer, M6 Flat Large Diameter
7-8	Gear, 60 Teeth
7-9	Washer, Change Gears
7-10	Nut, M12
7-11	Oil Fitting, 6 mm
7-12	Cap Screw, M6x35, Socket Head
7-13	Latch, Stand Cabinet
7-14	Screw, M5x8 Pan Head Phillips Machine
7-15	Cover, Spindle Access
7-16	Gear box cover
7-17	Hinge
7-18	Lock adjusting lever
7-19	Door lock catch

No:	Part
7-20	Nut, M8
7-21	Washer, M6 Flat
7-22	Cap Screw, M6x10 Hex Socket Button Head
7-23	Screw, M4x10 Flat Head Phillips Machine
7-24	Washer, M4 Lock
7-25	Nut, Hex Thin Chamfered M4
7-26	Screw, M4x6 Pan Head Phillips Machine
7-27	Gear, Transmission Shaft 30 Teeth
7-28	Key, 4x8 mm
7-29	Ring
7-30	Cap Screw, M4x8 Hex Socket Countersunk Head
7-31	Spacer, Timing Pulley
7-32	Bearing, 608-2RS
7-33	Transition gear
7-34	Bracket
7-35	Transforming shaft
7-36	Key, 4x16 mm
7-37	Bolt, Shoulder
7-38	Oil Fitting, 6 mm

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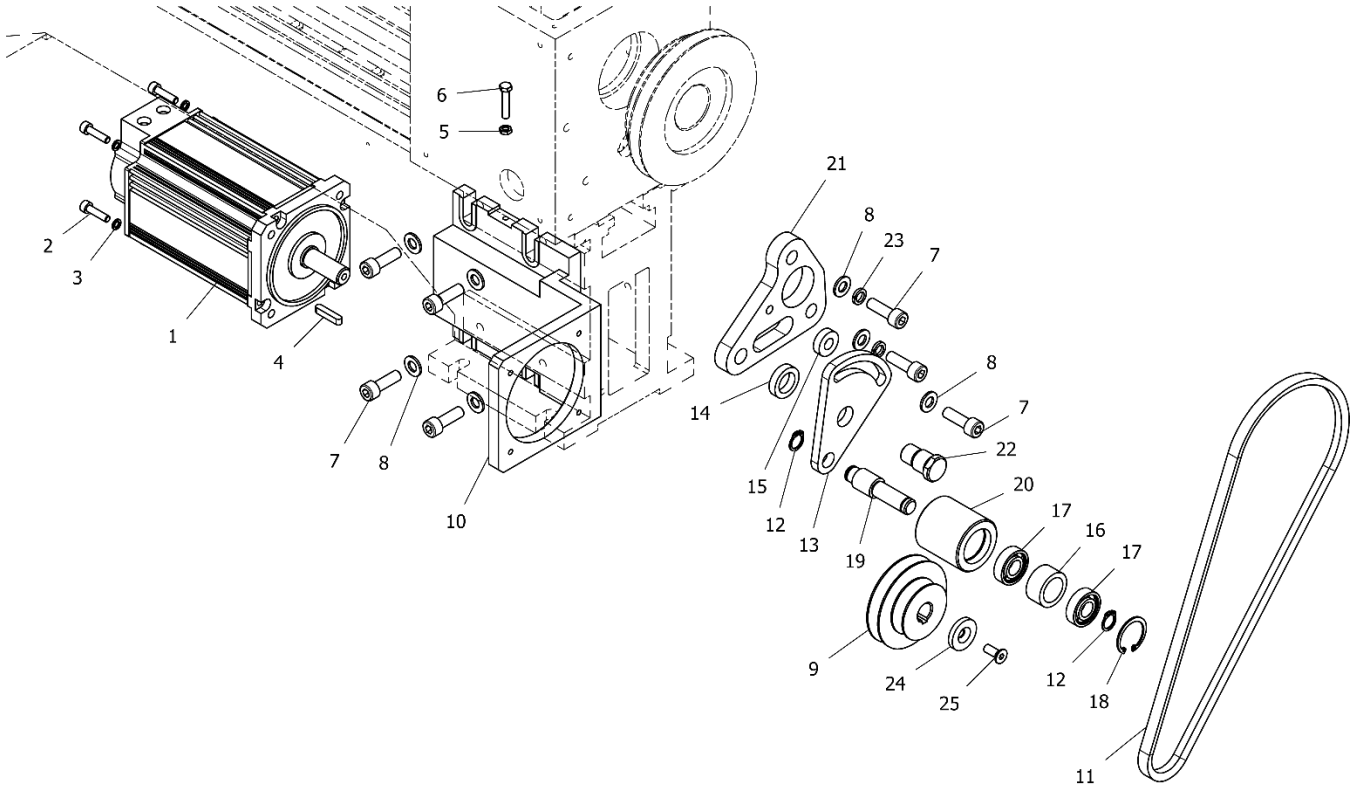
Model 7600 Drawing 8 of 10



Parts for Drawing 8 of 10

No:	Part
8-1	Motor, 1000 Watt Brushless
8-2	Cap Screw, M5x20, Socket Head
8-3	Washer, M5 Spring Lock, Thin
8-4	Key, 5x25 mm
8-5	Nut, Hex Thin Chamfered M5
8-6	Cap Screw, M5x25, Hex Head
8-7	Cap Screw, M8x25, Socket Head
8-8	Washer, M8 Flat
8-9	Double belt pulley
8-10	Motor bracket
8-11	V-belt
8-12	Retaining Ring, M12 External
8-13	Bracket

No:	Part
8-14	Washer
8-15	Washer
8-16	Sleeve
8-17	Bearing, 6001-2RS
8-18	Retaining Ring, M28 Internal
8-19	Bearing Shaft
8-20	Tensioner pulley
8-21	Press bracket
8-22	Pin
8-23	Washer, M8 Lock
8-24	Retaining Ring
8-25	Cap Screw, M6x16 Hex / Countersunk

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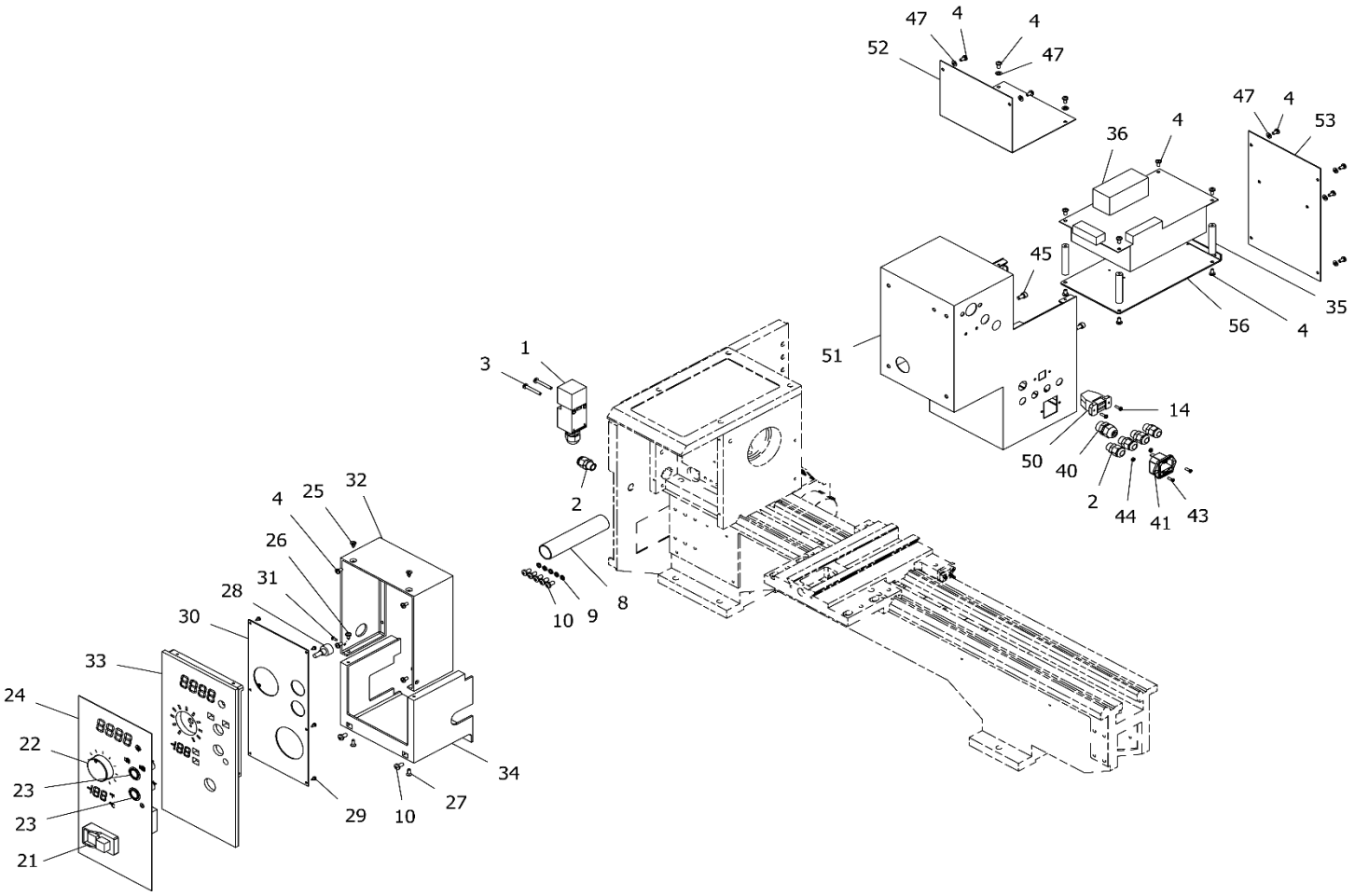

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Parts for Drawing 9 of 10

No:	Part
9-1	Safety Switch
9-2	Strain Relief, 12 mm
9-3	Screw, M4x30 Pan Head Phillips Machine
9-4	Screw, M4x8 Pan Head Phillips Machine
9-8	Plastic Tube, Electrical Box
9-9	Washer, M5 Lock
9-10	Screw, M5x10 Pan Head Phillips Machine
9-14	Screw, M3x10 Pan Head Phillips Machine
9-16	End Plate, Terminal Block
9-17	Double Terminal, Lighting System
9-18	Terminal Block, Lighting System
9-19	End Cover, DIN Rail
9-21	Switch, Power
9-22	Knob, Speed Control, LED Control Panel
9-23	Button, Start/Stop, with Lamp
9-24	Faceplate, Control Panel
9-25	Screw, Tapping M4.2x9.5 Flat Head Phillips
9-26	Screw, Tapping M4.2x9.5 Round Head Phillips
9-27	Cap Screw, M4x10, Socket Head
9-28	Potentiometer, LED Control Panel
9-29	Screw, Self-Tapping M2.9x6.5 Round Head Phillips

No:	Part
9-30	LED light panel
9-31	Screw, Tapping M2.9x9.5 Flat Head Phillips
9-32	Upper electrical box
9-33	Faceplate, Control Panel
9-34	Lower electrical box
9-35	Insert, Electrical Box
9-36	Motor Controller, Updated Control Box
9-40	Strain Relief, 16 mm
9-41	Plug, Power Cord
9-42	Sensor, Z-Axis Limit
9-43	Screw, M3x10 Flat Head Phillips Machine
9-44	Nut, M3
9-45	Cap Screw, M5x10, Socket Head
9-46	Nut, M4
9-47	Washer, M4 Flat
9-50	USB Port
9-51	Back electrical box body
9-52	Upper plate
9-53	Lower plate
9-56	Bottom plate

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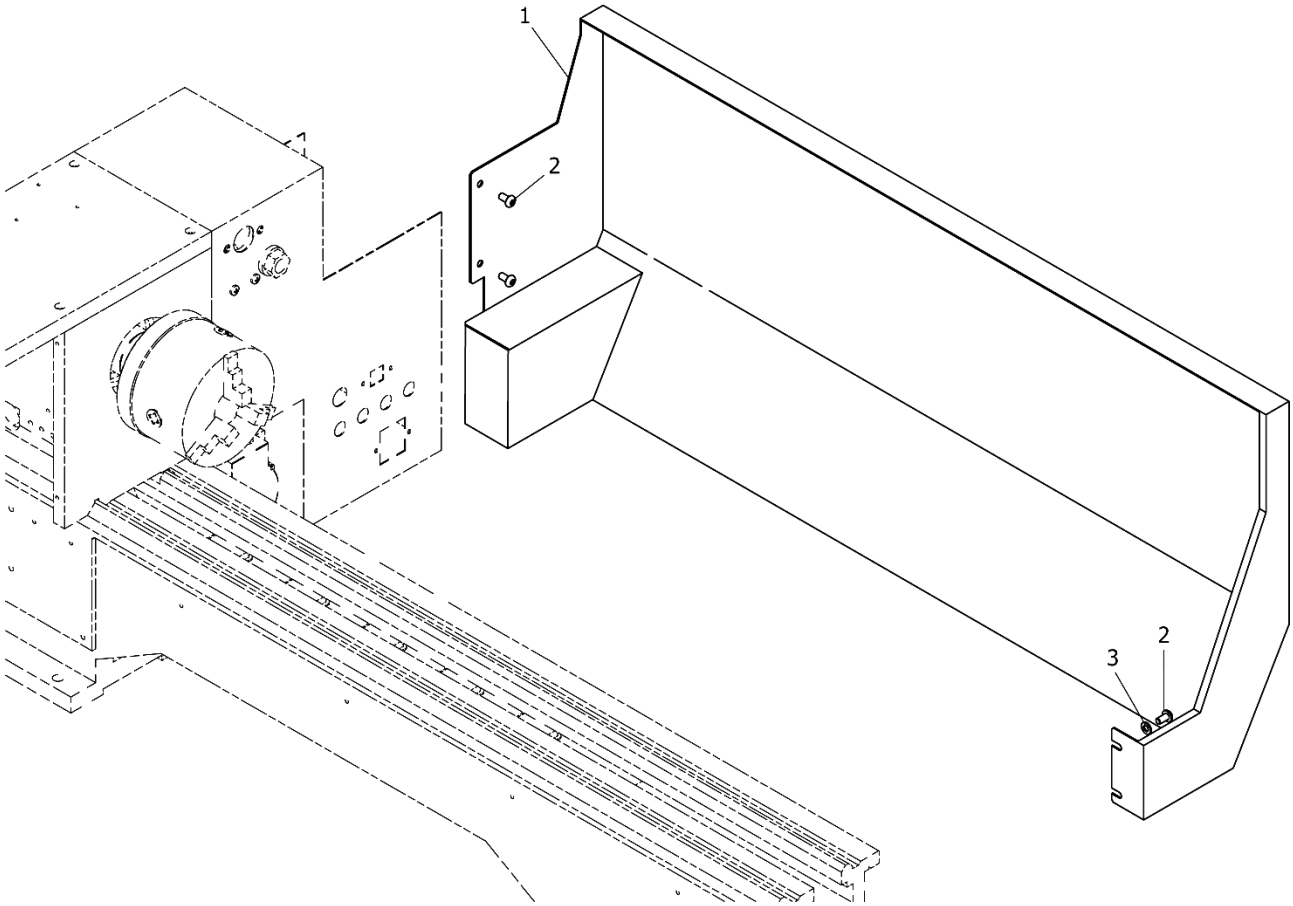
Model 7600 Drawing 10 of 10



Parts for Drawing 10 of 10

No:	Part
10-1	Rear Splashguard
10-2	Cap Screw, M5x10 Hex / Button Head

No:	Part
10-3	Washer, M5 Flat

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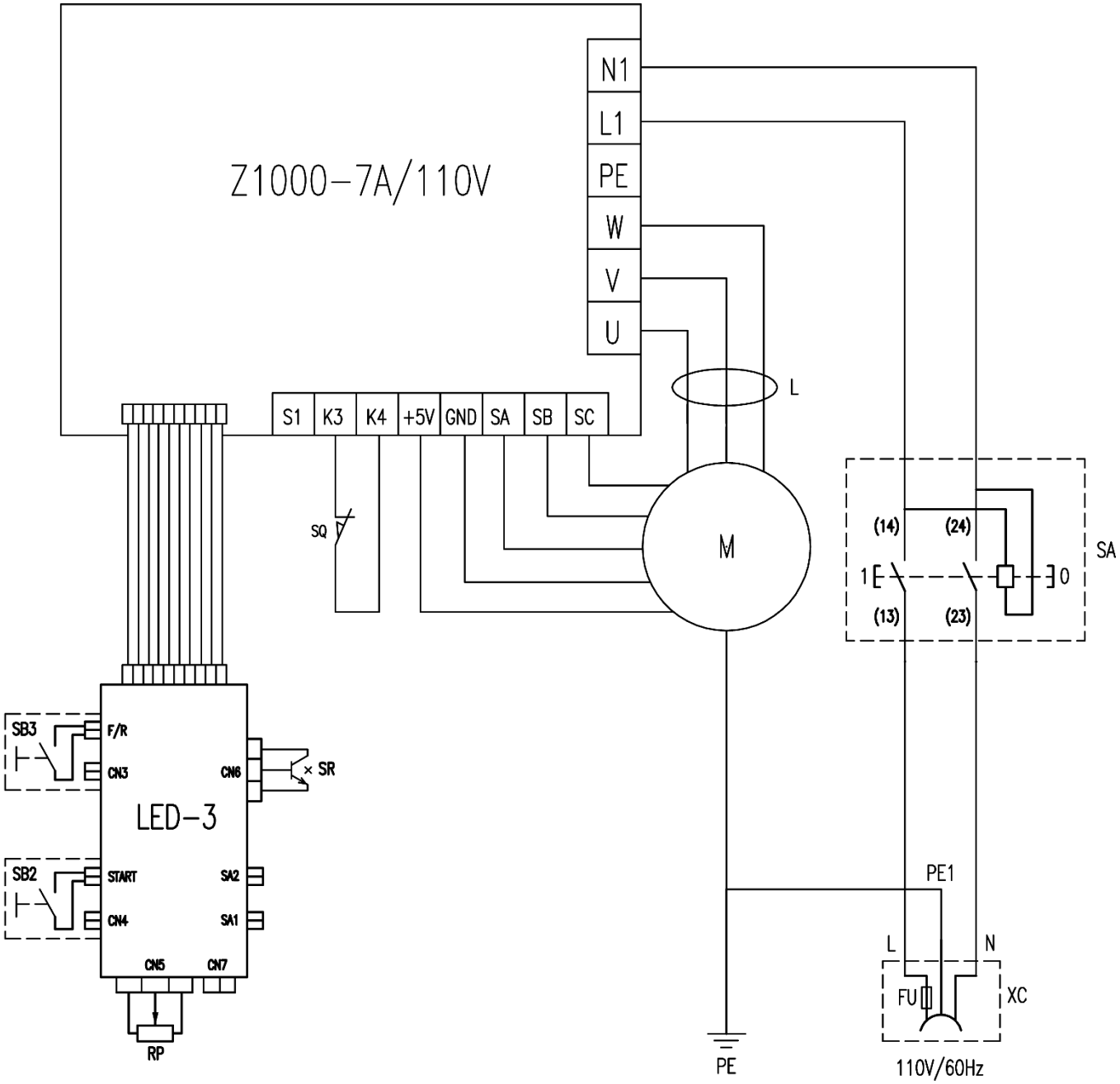
Wiring Diagram



Z1000-7A/110V: Main board	RP: Potentiometer	SB3: FWD/REV button
LED-3: LED Light board	L: Magnet ring	XC: Socket with fuse
SA: Electromagnetic switch	SQ: Safety limit switch	FU: Fuse (10A)
M: Brushless motor	SR: Speed reader	SB2: ON/OFF button

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