KENT USA®
Since 1979

HIGH SPEED PRECISION LATHE

MODEL: ML—1740 / 1760/ 1780
ML—2040 / 2060/ 2080

INSTRUCTION
AND
SPARE PARTS MANUAL

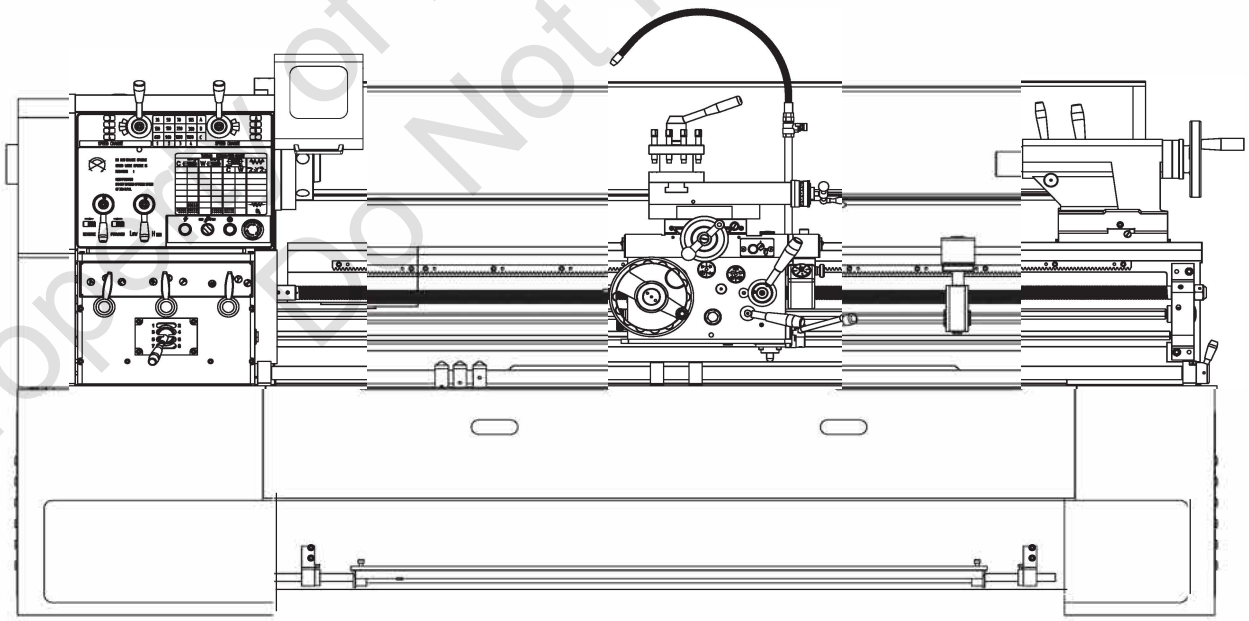

Photo shown model : 1760

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ML Series

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Safety Instructions

ATTENTION

It is essential to read this operation manual and understand the program instructions and maintenance instructions before operating the machine.

This operation manual should be attached to the machine at all time where it is readily available to the operator for reference.

1. **Owner's Manual :** All machinery and machining equipment presents serious injury hazards to untrained users. To reduce the risk of injury, anyone who uses this item must read and understand this entire manual before starting.

2. **Safe Environment :** Operating electrically powered equipment in a wet environment may result in electrocution; operating near highly flammable materials may result in a fire or explosion. Only operate this item in a dry location that is free from flammable materials.

3. **Trained / Supervised Operators Only :** Untrained users can seriously injure themselves. Only allow trained and properly supervised personnel to operate this item. Make sure safe operation instructions are clearly understood. If electrically powered, use padlocks and master switches, and remove start switch keys to prevent unauthorized use or accidental starting.

4. **Work Area :** Clutter and dark shadows increase the risks of accidental injury. Only operate this item in a clean, non-glaring, and well-lighted work area.

5. **Personal Protective Equipment :** Operating or servicing this item may expose the user to flying debris, dust, smoke, dangerous chemicals, or loud noises. These hazards can result in eye injury, blindness, long-term respiratory damage, poisoning, cancer, reproductive harm or hearing loss. Reduce your risks from these hazards by wearing approved eye protection, respirator, gloves, or hearing protection.

6. **Guards / Covers :** Accidental contact with moving parts during operation may cause severe entanglement, impact, cutting, or crushing injuries. Reduce this risk by keeping any included guards/covers/doors installed, fully functional, and positioned for maximum protection.

7. **Entanglement :** Loose clothing, gloves, neckties, jewelry or long hair may get caught in moving parts, causing entanglement, amputation, crushing, or strangulation. Reduce this risk by removing / securing these items so they cannot contact moving parts.

8. **Mental Alertness :** Operating this item with reduced mental alertness increases the risk of accidental injury. Do not let a temporary influence or distraction lead to a permanent disability! Never operate when under the influence of drugs/ alcohol, when tired, or otherwise distracted.

9. **Electrical Connection :** With electrically powered equipment, improper connections to the power source may result in electrocution or fire. Always adhere to all electrical requirements and applicable codes when connecting to the power source. Have all work inspected by a qualified electrician to minimize risk.

10. **Disconnect Power :** Adjusting or servicing electrically powered equipment while it is connected to the power source greatly increases the risk of injury from accidental startup. Always disconnect power before any service or adjustments, including changing blades or other tooling.

11. **Secure Workpiece / Tooling :** Loose workpieces, cutting tools, or rotating spindles can become dangerous projectiles if not secured or if they hit another object during operation. Reduce the risk of this hazard by verifying that all fastening devices are properly secured and items attached to spindles have enough clearance to safely rotate.

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Lathe Safety

1. **Clearing Chips :** Metal chips can easily cut bare skin—even through a piece of cloth. Avoid clearing chips by hand or with a rag. Use a brush or vacuum to clear metal chips.

2. **Chuck Key Safety :** A chuck key left in the chuck can become a deadly projectile when the spindle is started. Always remove the chuck key after using it. Develop a habit of not taking your hand off of a chuck key unless it is away from the machine.

3. **Tool Selection :** Cutting with an incorrect or dull tool increases the risk of accidental injury because extra force is required for the operation, which increases risk of breaking or dislodging components, which can cause small shards of metal to become dangerous projectiles. Always select the right cutter for the job and make sure it is sharp. A correct, sharp tool decreases strain and provides a better finish.

4. **Securing Workpiece :** An improperly secured workpiece can fly off of the lathe spindle with deadly force, which can result in a severe impact injury. Make sure the workpiece is properly secured in the chuck or faceplate before starting the lathe.

5. **Large Chucks :** Large chucks are very heavy and difficult to grasp, which can lead to crushed fingers or hands if mishandled. Get assistance when installing or removing large chucks to reduce this risk. Protect your hands and the precision-ground ways by using a chuck cradle or piece of plywood over the ways of the lathe when servicing chucks.

6. **Safe Clearances :** Workpieces that crash into other components on the lathe may throw dangerous projectiles in all directions, leading to impact injury and damaged equipment. Before starting the spindle, make sure the workpiece has adequate clearance by hand-rotating it through its entire range of motion. Also, check the tool and tool post clearance, chuck clearance, and saddle clearance.

7. **Speed Rates :** Operating the lathe at the wrong speed can cause nearby parts to break or the workpiece to come loose, which will result in dangerous projectiles that could cause severe impact injury. Large workpieces must be turned at slow speeds. Always use the appropriate feed and speed rates.

8. **Stopping Spindle by Hand :** Stopping the spindle by putting your hand on the workpiece or chuck creates an extreme risk of entanglement, impact, crushing, friction, or cutting hazards. Never attempt to slow or stop the lathe spindle with your hand. Allow the spindle to come to a stop on its own or use the brake (if equipped).

9. **Crashes :** Driving the cutting tool or other lathe components into the chuck may cause an explosion of metal fragments, which can result in severe impact injuries and major damage to the lathe. Reduce this risk by releasing automatic feeds after use, not leaving lathe unattended, and checking clearances before starting the lathe. Make sure no part of the tool, tool holder, compound slide, cross slide, or carriage will contact the chuck during operation.

10. **Long Stock Safety :** Long stock can whip violently if not properly supported, causing serious impact injury and damage to the lathe. Reduce this risk by supporting any stock that extends from the chuck/headstock more than three times its own diameter. Always turn long stock at slow speeds.

11. **Coolant Safety :** Contaminated cutting fluid is a very poisonous biohazard that can cause personal injury from skin contact alone. Incorrectly positioned cutting fluid nozzles can splash on the operator or the floor, resulting in an exposure or slipping hazard. To decrease your risk, change cutting fluid regularly and position the cutting fluid nozzle where it will not splash or end up on the floor.

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Section 1 : Controls & Components

Identification

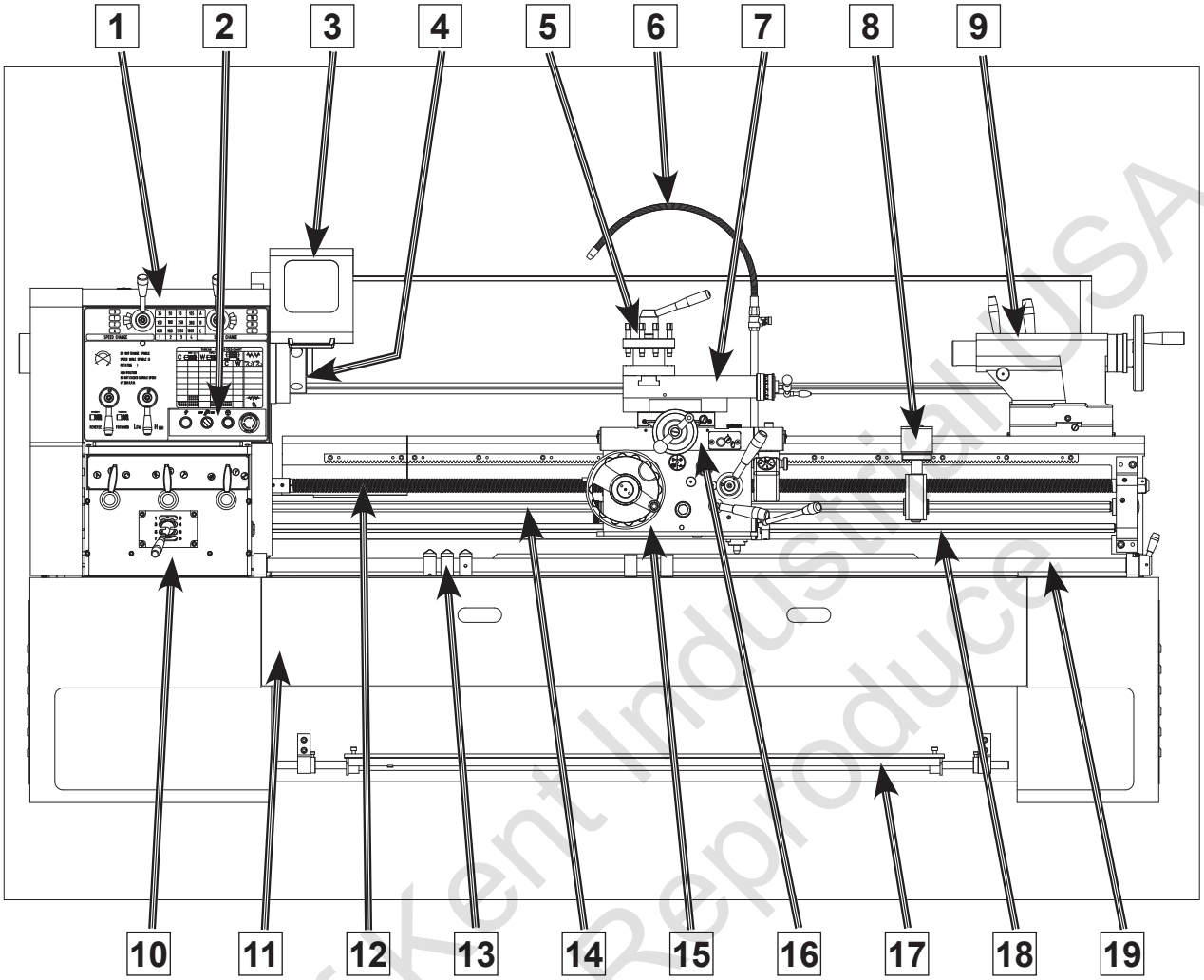

Figure 1. The ML-1760 Lathe.

1. Headstock
2. Control Panel
3. Chuck Safety Guard
4. D1-6 Camlock MT#5 Spindle
5. 4-Way Tool Post
6. Cutting Fluid Tube and Nozzle
7. Compound Rest
8. Leadscrew & Feed Rod Support (1760 & 2060 only)
9. Tailstock
10. Gearbox
11. Removable Chip Drawer
12. Leadscrew
13. Stopper
14. Feed Rod
15. Apron
16. Cross Slide
17. Brake Pedal
18. Spindle ON / OFF Rod
19. Position Rod

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Control Panel

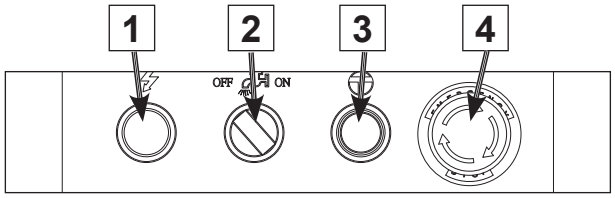

Figure 2. Control Panel.

1. **Power Light :** Illuminates when lathe is receiving power.

2. **Cutting Fluid Pump Switch :** Turns cutting fluid delivery ON / OFF.

3. **Jog Button :** Turns the spindle motor ON while being pressed and held.

4. **Emergency Stop Button :** Stops all machine functions. Twist clockwise to reset.

Headstock Controls

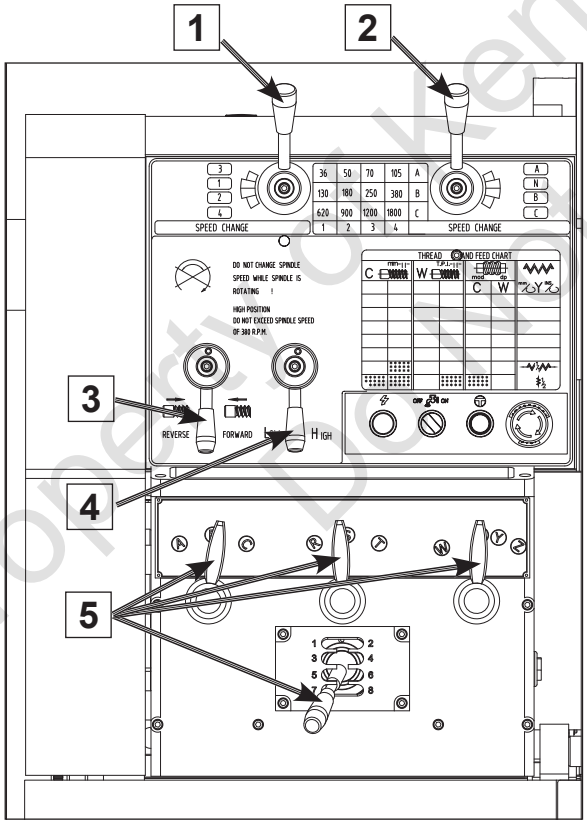

Figure 3. Headstock Panel.

1. **Spindle Speed Lever :** Selects 1, 2, 3 or 4 gear position on the spindle speed chart.

2. **Spindle Range Lever :** Selects A, B or C range of spindle speeds on the spindle speed chart

3. **Feed Direction Lever :** This lever changes the direction that the gearbox is turning at, and as a result the leadscrew and feed rod change direction.

4. **Gearbox Range Lever :** This lever puts the gearbox in high or low range and has no effect on spindle RPM.

5. **Gearbox Levers :** Moves the gearbox gears into particular ratios, which then turn the leadscrew and feed rod for threading and power feed operations.

Carriage Controls

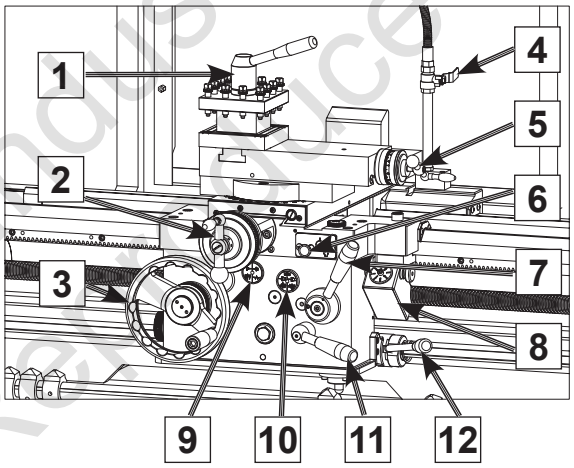

Figure 4. Carriage Controls.

1. **4-Way Tool Post Lever :** Used for locking the rotary tool post in eight possible detents.

2. **Cross Slide Handwheel :** Positions the cross slide in or out.

3. **Carriage Handwheel :** Allows for manual movement of the carriage from left to right along the bed.

4. **Cutting Fluid Flow Control Lever :** Used to vary the flow of cutting fluid out of the nozzle.

5. **Compound Hand Crank :** Used to position the compound along the compound slide.

6. **Manual Carriage Oil Pump :** Draws oil from the apron case and lubricates the carriage and ways through various oil ports.

7. **Halfnut Lever :** Engages and disengages the apron with the leadscrew for threading operations.

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8. **Thread Dial :** Indicates when to engage the half nut during threading operations.

9. **Feed Selection Knob :** Selects the carriage or cross slide for power feed.

10. **Apron Feed Direction Knob :** Changes direction of carriage or the cross slide feed without having to stop the lathe and move the headstock feed direction lever.

11. **Feed ON / OFF Lever :** Engages / disengages power feed.

12. **Spindle ON / OFF Lever :** Used to start and stop the lathe during normal operation.

13. **Feed Clutch:** This adjustable clutch helps protect the feed system against broken gears and shafts caused by accidental overloads.

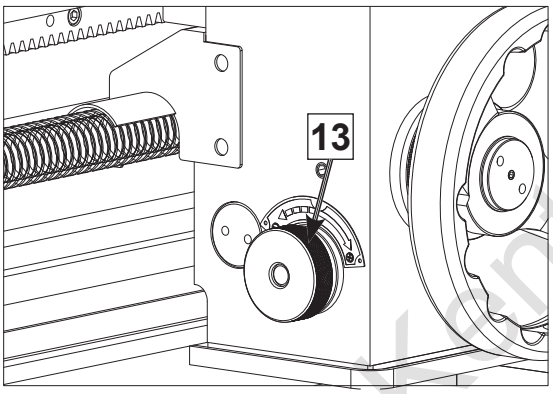

Figure 5. Feed clutch.

Tailstock Controls

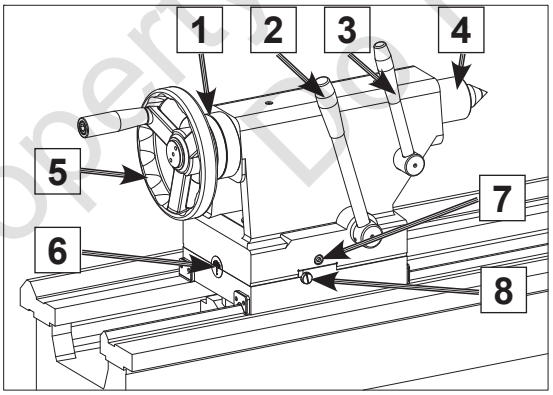

Figure 6. Tailstock Controls.

1. **Graduated scale :** Indicates quill movement in increments of 0.001" or 0.02mm.

2. **Tailstock Lock Lever :** Secures the tailstock in place along the bedway.

3. **Quill Lock Lever :** Locks the quill in position.

4. **Quill :** Moves toward and away from the spindle and holds centers and tooling.

5. **Quill Handwheel :** Moves the quill toward or away from the spindle.

6. **Offset Scale :** Indicates the distance of tailstock offset from the spindle center line.

7. **Tailstock Offset Screw :** Adjusts and secures the tailstock offset (1 of 2).

8. **Tailstock Gib Screw :** Adjust the tapered gib to control tailstock offset accuracy.

Foot Brake

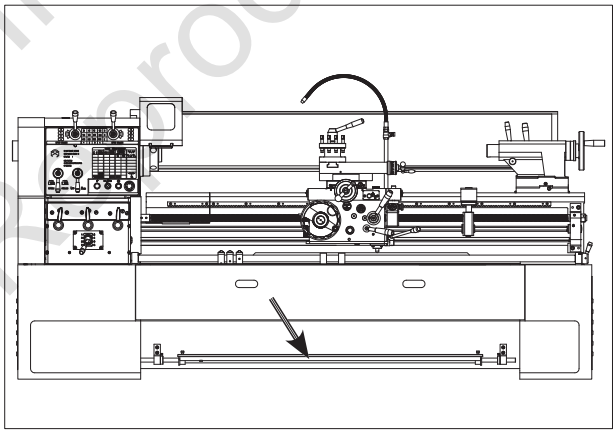

Figure 7. Foot Brake.

This lathe is equipped with a foot brake (Figure 7) to quickly stop the spindle. Pushing the foot brake while the spindle is ON cuts power to the motor and stops the spindle. Once stopped, the spindle lever MUST be returned to the neutral position before the spindle can be restarted.

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Section 2 : Setup

Physical Environment

The physical environment where your machine is operated is important for safe operation and longevity of parts. For best results, operate this machine in a dry environment that is free from excessive moisture, hazardous or flammable chemicals, airborne abrasives, or extreme conditions. Extreme conditions for this type of machinery are generally those where the ambient temperature is outside the range of 9° ~ 72ºC(48.2° ~ 161.6ºF); the relative humidity is outside the range of 20–95% (non-condensing); or the environment is subject to vibration, shocks, or bumps.

Electrical Installation

Place this machine near an existing power source. Make sure all power cords are protected from traffic, material handling, moisture, chemicals, or other hazards. Make sure to leave access to a means of disconnecting the power source or engaging a lockout / tagout device.

Lighting

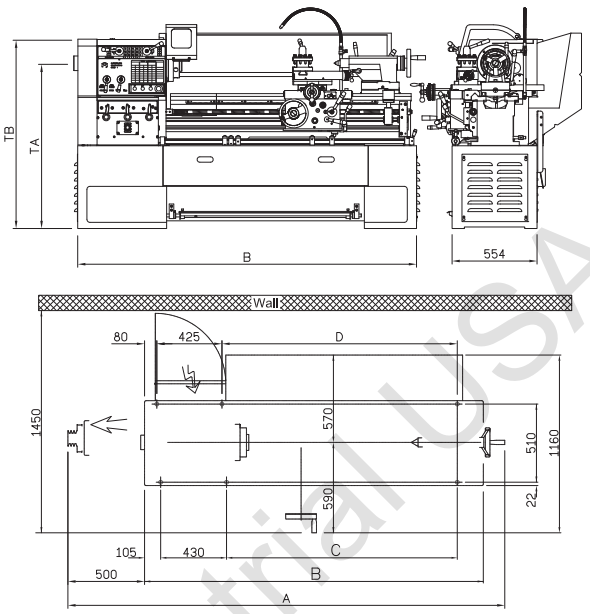
Lighting around the machine must be adequate enough that operations can be performed safely. Shadows, glare, or strobe effects that may distract or impede the operator must be eliminated.

Weight Load

Make sure that the surface upon which the machine is placed will bear the weight of the machine, additional equipment that may be installed on the machine, and the heaviest workpiece that will be used. Additionally, consider the weight of the operator and any dynamic loading that may occur when operating the machine.

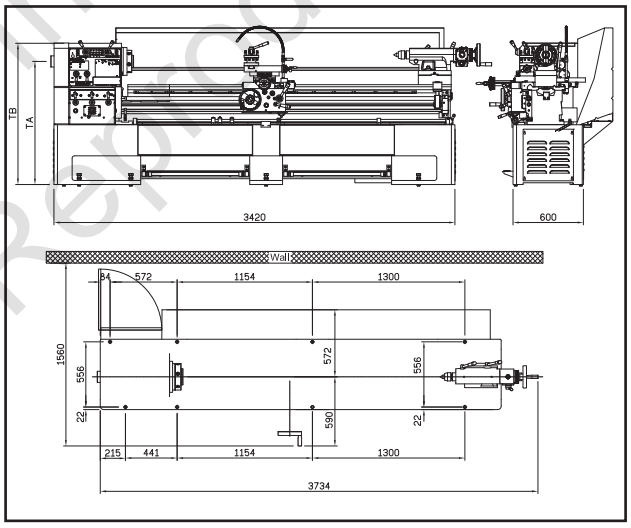
Space Allocation

Consider the largest size of workpiece that will be processed through this machine and provide enough space around the machine for adequate operator material handling or the installation of auxiliary equipment. With permanent installations, leave enough space around the machine to open or remove doors/covers as required by the maintenance and service described in this manual.



Model	A	B	C	D	TA	TB
1740/2040	2850	2210	1505	1535	1078/1116	1226/1264
1760/2060	3350	2710	2005	2035	1078/1116	1226/1264

UNIT:mm



Model	TA	TB
1780	1050	1205
2080	1088	1243

UNIT:mm

Figure 8. Space required for full range of movement.

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Lifting & Moving

This lathe is an extremely heavy machine. Serious personal injury or death may occur if safe lifting and moving methods are not followed. Get assistance from a professional rigger if you are unsure about your abilities or maximum load ratings of your lifting equipment.

To lift and move your lathe :

1. Prepare the permanent location for the lathe.

2. Remove the shipping crate top and sides, then remove the small components from the shipping pallet.

3. To balance the lifting load, loosen the tailstock lock lever (Figure 9), move the tailstock to the end of the bedway, then lock it in place.

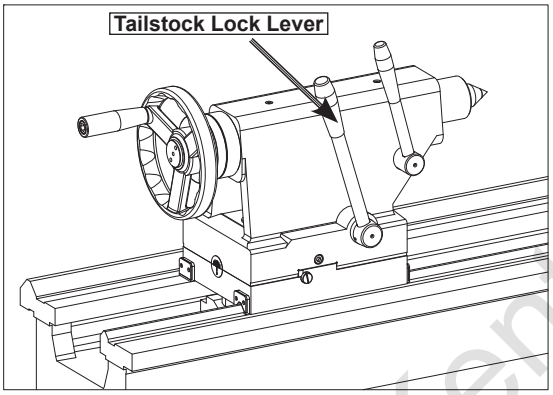

Figure 9. Tailstock lock lever.

4. To further balance the load, loosen the carriage lock bolt, disengage the half nut lever, then use the carriage handwheel to move the carriage next to the tailstock. (Figure 10)

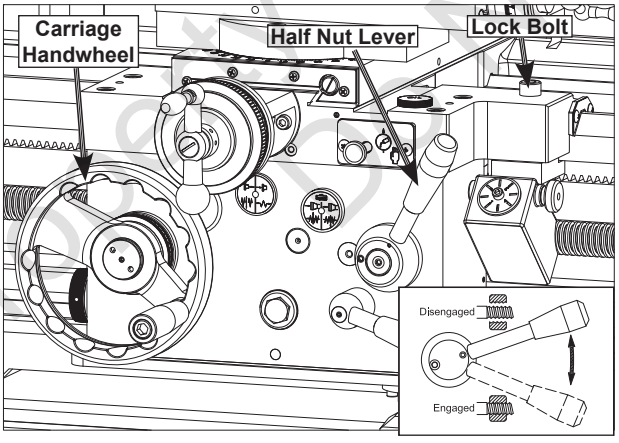

Figure 10. Carriage controls set for moving the carriage.

5. Locking the carriage lock bolt and tailstock lock lever.

6. **Lifting the machine with crane.**
   a. Make sure that minimum crane capacity is more than 3 tons for security.

   b. Only an authorized crane operator should use the lift machine.

   c. Crane work should be cooperatively done by two persons, that is, an operator and a watchman, not to damage projecting on the machine perimeter.

   d. To put in the jig with wire set inserting to bed way.

   e. Make sure that two hexagon nuts is fixed.

   f. Keep the machine's center of gravity at the center of the crane.

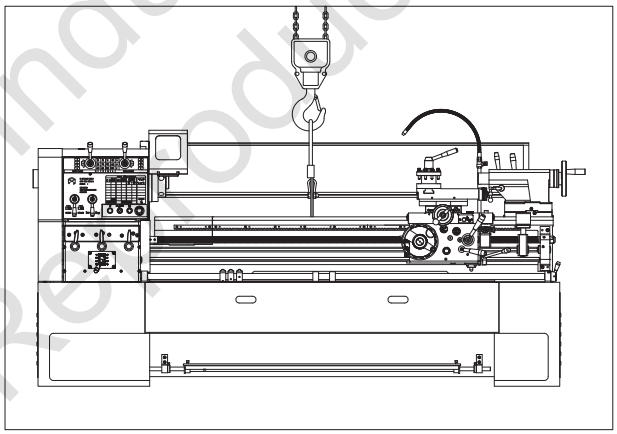

Figure 11. Lifting the machine with crane.

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7. **Moving the machine with a forklift.**
   a. Make sure that the minimum forklift capacity is more than 3 tons for security.

   b. Forklift work should be cooperatively done by two persons, that is an operator and watchman, not to damage projecting on the machine perimeter.

   c. To put the fork, use the fork inserting the plinth mid-lift.

   d. Keep the machine's balance of gravity at the center of the forks.

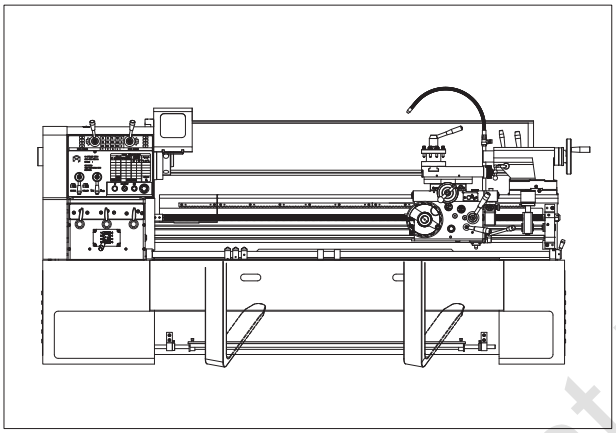

Figure 12. Moving the machine with a forklift.

Leveling

This lathe must be placed on the included leveling studs and cast-iron feet. Complete support at each of the six leveling stud locations is mandatory. The bed cannot be twisted or bent, and the ways must be perfectly level with the floor. If a misalignment condition arises, adjust the leveling studs, or shim the cast iron feet where they touch the floor until the bed and ways are in alignment.

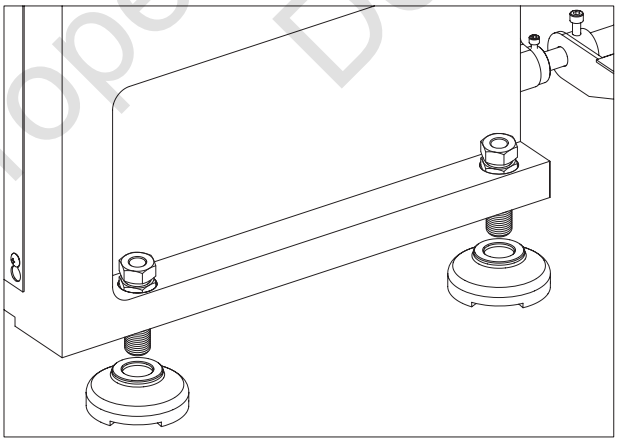

Figure 13. Leveling pads and screws.

To level the machine, use a precision level to make sure the bedways are level from side-to-side and from front-to-back.

Leveling machinery helps precision components, such as bedways, remain straight and flat during the lifespan of the machine. Components on an unleveled machine may slowly twist due to the dynamic loads placed on the machine during operation.

Figure 14. Example of a precision level.

Test Run

After all preparation steps have been completed, the machine and its safety features must be tested to ensure correct operation. If you discover a problem with the operation of the machine or its safety components, shut the machine down, disconnect it from power, and do not operate it further until you have resolved the problem.

To test run the lathe:

1. Disconnect the lathe from POWER !

2. Make sure that the headstock oil tank, gearbox, apron oil levels are full.

3. Make sure that the chuck and jaws are secure, If a chuck is not installed on the lathe, you do not need to install one for this test.

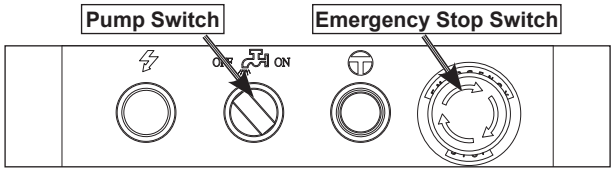

Figure 15. Control Panel.

4. Move the spindle range lever so that the indicator points to the A. (Figure 16)

5. Rotate the spindle speed lever so that the indicator points to the 1. (Figure 16)

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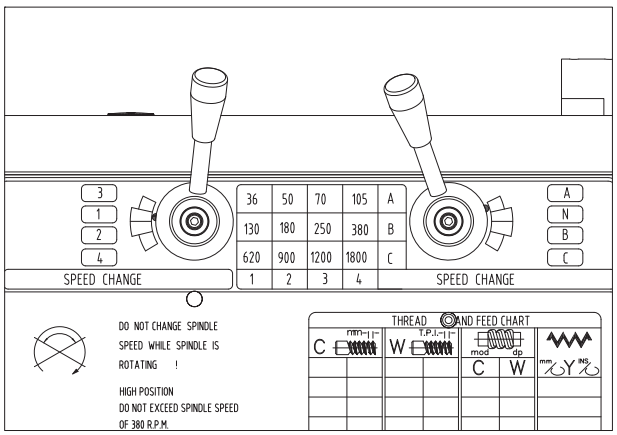

Figure 16. Headstock range lever.

6. Pull up on the half nut and the feed ON/OFF levers as shown in Figure 17.

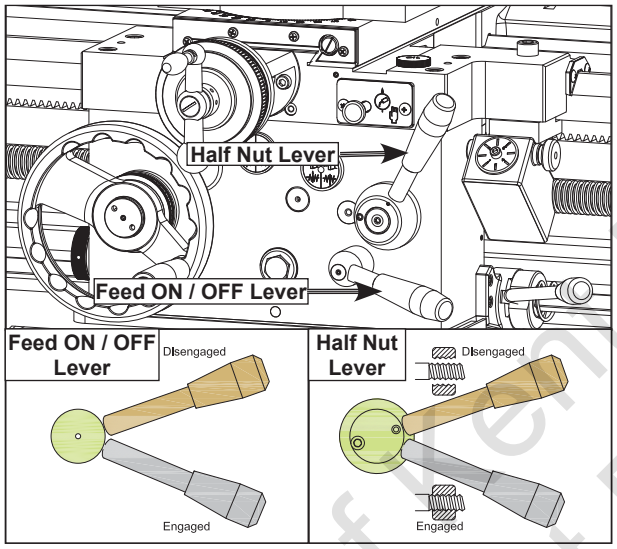

Figure 17. Apron controls for test run.

7. Using a 10mm hex wrench, loosen the carriage lock (Figure 18) so the carriage is free to slide.

8. Move the spindle ON / OFF lever to the OFF (middle) position as shown in Figure 18.

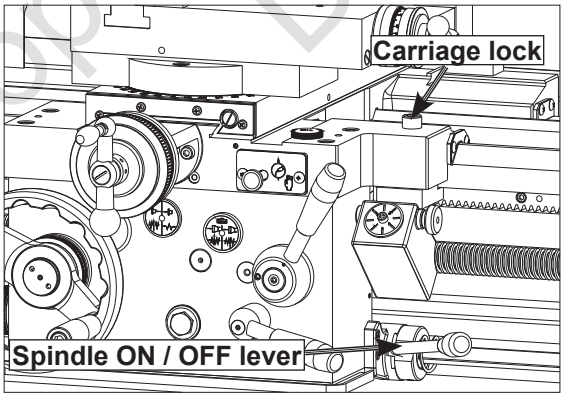

Figure 18. Carriage lock & Spindle ON / OFF lever.

9. Press the STOP button on the control panel to ensure that the lathe does not unexpectedly start when connected to power during the next step.

10. Connect the lathe to power source.

11. Rotate STOP button clockwise until it pops out. The power light on the control panel should illuminate.

12. Move the spindle ON / OFF lever down and the spindle/chuck will rotate.

13. Observe and listen for any abnormal noises or vibration. The lathe should run smoothly with little or no vibration or rubbing noises.

14. Push the foot brake, and the lathe should come to a quick stop.

15. Lift the chuck guard and try to start the lathe again. The cover kill switch should prevent the lathe from starting while the guard is open.

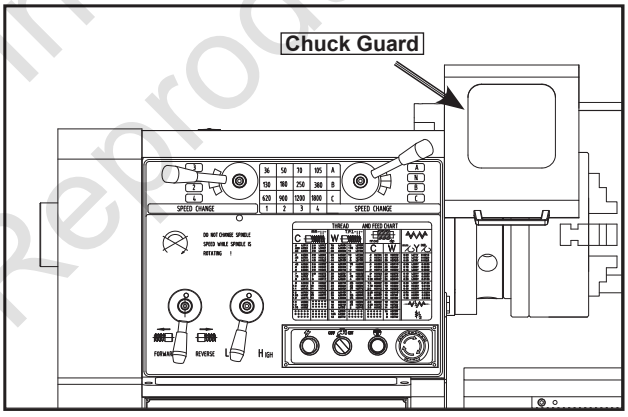

Figure 21. Chuck safety cover.

16. Move the spindle ON/OFF lever to the OFF (middle) position. Remove the lathe end gear cover so the safety switch opens and disables the lathe from starting.

17. Attempt to start the lathe. Should the lathe start, the safety switch is faulty and needs replacement.

18. Push the STOP button in, move the spindle ON/ OFF lever to the OFF position, then replace the end gear cover.

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19. Point the coolant nozzle down into the chip drawer and verify that there is coolant in the reservoir.

20. Start the lathe, turn the coolant pump on, then open the valve. Verify that the coolant flows from the nozzle, then close the valve and turn the pump OFF.

21. The test run is now finished. Shut the lathe down and begin the Spindle Break-In procedure.

Spindle Break-in

It is essential to closely follow the proper break-in procedures to ensure trouble-free performance. Complete this process once you have familiarized yourself with all instructions in this manual and completed the test run.

To break-in the spindle :

1. Complete the Test Run procedure.

2. Set the spindle speed for 36 RPM.

3. Run the lathe for 10 minutes.

4. Turn the lathe OFF and wait until the spindle is completely stopped.

5. Repeat Steps 2–4 for each of the remaining 11 spindle speeds.

6. Set the spindle speed to 36 RPM and let the lathe run for a final 15 minutes to allow it to cool down, then turn the lathe OFF.

7. Change the oil in the headstock, quickchange gearbox, and apron reservoirs.

8. Check and, if necessary, re-tension the V-belts.

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Section 3 : Operation

Chuck

This lathe is shipped with the 3-jaw chuck installed. This is a scroll-type chuck, meaning that all three jaws move in unison when adjusted.

The optional 4-jaw chuck features independent jaws, which are used for square or unevenly-shaped stock.

If neither chuck can hold your workpiece, the cast-iron faceplate has slots for T-bolts that hold standard or custom clamping hardware. With the correct clamping hardware, this faceplate will hold non-cylindrical parts such as castings.

The chucks and faceplate have a D-6 camlock mount. A chuck key is used to turn the locking cams (Figure 19) to secure / release the chuck / faceplate.

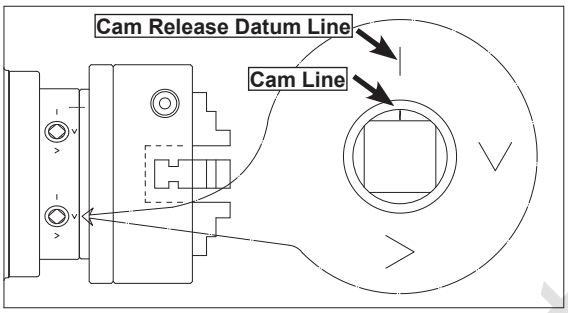

Figure 19. Camlock loosened with the cam line aligned with the datum line.

To install a chuck :

1. Disconnect lathe from POWER !

2. Place a piece of plywood across the lathe ways and position it just under the chuck.

3. Place the chuck on the cradle.

4. Make sure the chuck taper and spindle taper mating surfaces are perfectly clean.

5. Inspect and make sure that all camlock studs are undamaged, are clean and lightly oiled, and that the camlock stud cap screws are in place and snug.

6. If equipped, align the chuck-to-spindle timing marks (Figure 20), and slide the chuck onto the spindle.

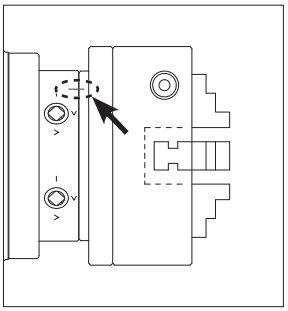

Figure 20. Chuck timing marks aligned.

7. Turn a camlock with the chuck key until the cam line falls between the "V" marks shown in Figure 21.

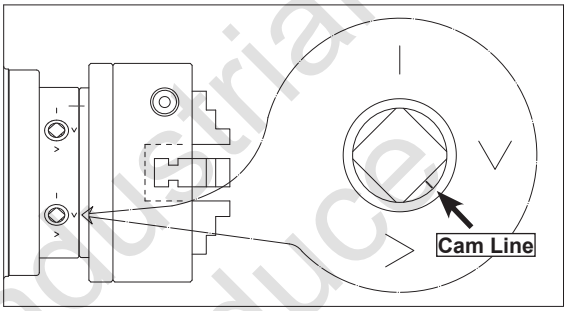

Figure 21. Cam and lines.

8. Lock the other cams in a crisscross or star pattern so the chuck is drawn up evenly on all sides without any chance of misalignment.

9. Remove the chuck key.

To remove a chuck :

1. Disconnect lathe from POWER !

2. Place a piece of plywood across the lathe ways to protect the ways, or use a support cradle and position it just under the chuck.

3. Turn a cam with the chuck key until the cam line aligns with the cam release datum line.

4. Unlock the other cams in the same manner. Make sure to support the chuck as you align the last cam.

5. Remove the chuck key.

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Installing and Adjusting Camlock Stud

When fitting a chuck or faceplate with camlock studs, or when mounting a new chuck or faceplate, it may be necessary to install or adjust the camlock studs. In order to properly install or adjust one or more camlock studs, you must remove a stud locking cap screw, then thread the camlock stud in or out until the line on the side of the stud is flush with the top of the chuck casting.

3-Jaw Chuck

The 3-jaw scroll-type chuck included with this lathe features hardened steel jaws that center the workpiece. When the operator opens or closes the jaws with the chuck key, the jaws move in unison.

There are two sets of jaws included with the 3-jaw chuck ─ inside and outside jaws. Use the correct jaws for the size and configuration of the workpiece to hold it firmly and securely on the chuck.

Numbered from 1-3, the jaws must be used in the matching numbered jaw guides, as shown in Figure 22.

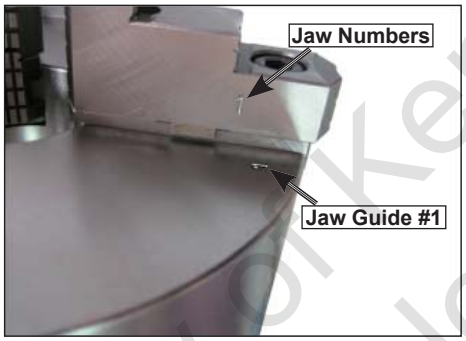

Figure 22. Jaw guides and jaw numbers.

To change the jaw :

1. Disconnect Lathe from POWER !
2. Place a piece of wood over the ways to protect them from potential damage.
3. Insert the chuck key and turn it counterclockwise to back the jaws out and remove them.
4. Clean the jaw mating surfaces and apply a thin film of white lithium grease to the mating surfaces.
5. Set the previously mounted jaws aside in a safe place free of moisture and abrasives.
6. Rotate the chuck key clockwise until you see the tip of the scroll gear lead thread just begin to Insert jaw #1 into jaw guide #1 and hold the jaw against the scroll gear lead thread.
7. Rotate the chuck key clockwise one turn to engage the tip of the scroll gear lead thread into the jaw.

Figure 23. Inserting jaw.

8. Pull on the jaw—now it should be locked into the jaw guide.
9. Repeat the Steps 6–8 on the remaining jaws.

To mount a workpiece in the 3-jaw chuck :

1. Disconnect Lathe from POWER !
2. Place a chuck cradle or plywood on the bedway below the chuck to protect it.
3. Use the chuck key to move the jaws and mount the workpiece to the chuck, similar to one of the methods shown in Figure 24. Make sure the workpiece is mounted firmly on the chuck.

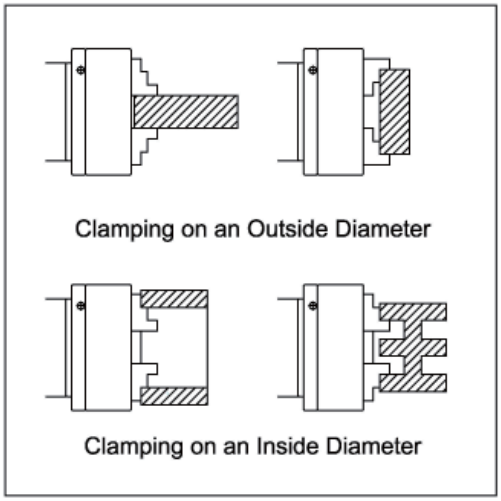

Figure 24. Examples of workpiece mounted in the 3-jaw chuck.

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4. Rotate the chuck by hand to make sure the workpiece makes even contact with all three jaws and is centered.

4-Jaw Chuck

The 4-jaw chuck features independently adjustable hardened steel jaws to hold non-cylindrical or off-center workpieces. Each jaw can be removed from the chuck body and reversed for a wide range of work holding versatility.

To mount a workpiece on the 4-jaw chuck :

1. Disconnect Lathe from POWER !

2. Place a chuck cradle or plywood on the bedway below the chuck to protect it.

3. Use the chuck key to open each jaw so the workpiece will lay flat against the chuck face or jaw steps.

4. With help from another person or a supporting device, mount the workpiece centered on the chuck, then turn each jaw until it makes contact with the workpiece.

5. Tighten each jaw in small increments. After you have adjusted the first jaw, continue tightening in an opposing sequence.

6. After the workpiece is held in place by the jaws, turn the chuck by hand and pay attention to the workpiece alignment.

Tailstock

The tailstock on your lathe can be used to support workpieces with the use of a live or dead center.

It can also be used to drill or bore holes in the center of a part or cut shallow tapers by using the offset adjustment.

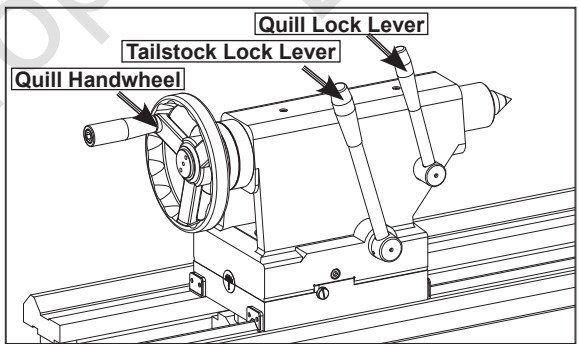

Figure 25. Tailstock and quill lock handles in locked position.

To move the tailstock :

1. Pull back on the lock lever.

2. Slide the tailstock to the desired position.

3. Push the tailstock lock lever forward to lock the tailstock to the lathe bed.

To use the tailstock quill :

1. With the tailstock locked to the bed, release the quill lock lever.

2. Turn the quill feed handwheel clockwise to feed/move the quill towards the spindle, or turn counterclockwise to move the quill away from the spindle.

3. Push the quill lock lever forward to lock the quill in place.

To install tooling in the tailstock :

1. With the tailstock locked, unlock the quill lock lever.

2. Turn the quill handwheel CW to extend quill about 25mm out of the casting.

3. Insert a tapered drill arbor or a tapered drill bit into the quill until the taper is firmly seated and the tang is locked to the quill slot.

4. Turn the quill handwheel CW to feed the drill bit into the rotating workpiece.

5. To remove the tooling from the tailstock, turn the quill handwheel CCW until the tooling is pushed out of the taper.

To offset the tailstock :

1. Lock the tailstock in position.

2. Loosen two nuts of bottom, adjust the left and right jack screws until the scale (Figure 26) indicates the offset you want. See Figure 27 for adjustment direction.

3. When the offset is achieved, snug the jack screws so the tailstock position is locked.

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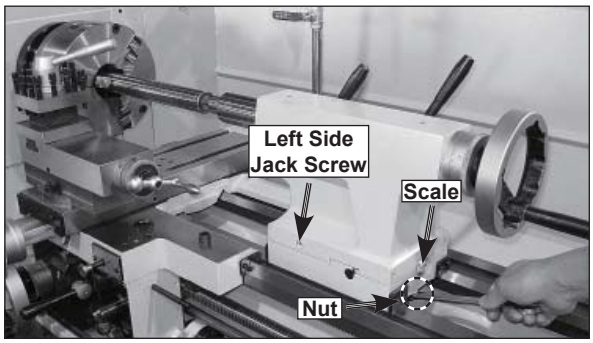

Figure 26. Tailstock offset adjustments.

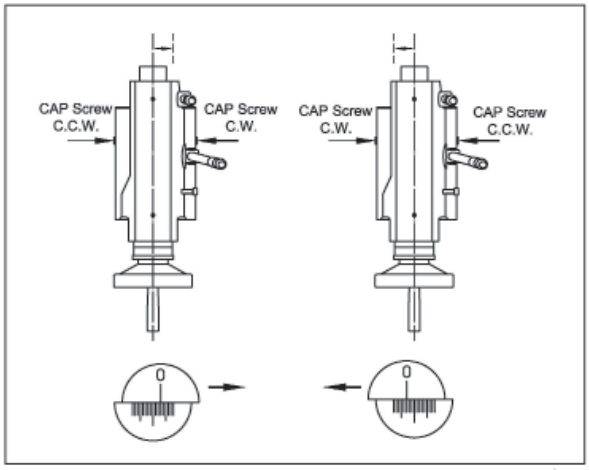

Figure 27. Jack screw adjustment verses tailstock movement.

Centers

Dead Centers

The dead center achieves more accurate results than a live center, but it requires low spindle speeds and a small amount of oil to reduce friction heat that may damage the workpiece.

Use the HSS dead center in the spindle, where the workpiece does not rotate on the tip and does not generate friction.

Use the carbide-tipped dead center in the tailstock where the workpiece will rotate against it and generate friction. The carbide-tipped dead center can better withstand the effects of friction; however, the tip of the center must be lubricated to avoid premature wear and maximize smooth operation. Also, using low spindle speeds will also reduce the heat and wear from friction.

Live Centers

A live center has bearings that allow the center tip and the workpiece to rotate together, and can be installed in the spindle and the tailstock quill for higher speeds, but with a slight bit of accuracy loss.

Mounting Dead Center in Spindle

1. Disconnect Lathe from POWER !

2. Thoroughly clean and dry the tapered mating surfaces of the spindle bore, tapered sleeve, and the center.

3. Insert the center into the sleeve, then insert the sleeve into the spindle bore through the chuck or faceplate.

Removing Center from Spindle

To remove the sleeve and center from the spindle, insert a piece of round bar stock or similar tool through the outboard end (on the left side of the headstock), then tap the sleeve loose.

Mounting Center in Tailstock

Either a dead center or live center can be mounted in the tailstock. Mounting instructions are the same for both.

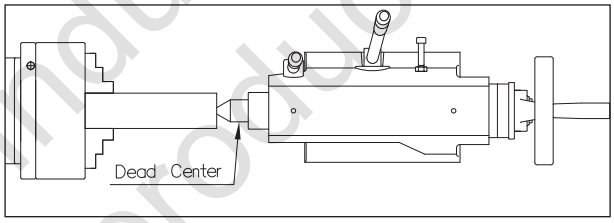

Figure 28. Example of using a dead center installed in the tailstock.

To mount a center in the tailstock :

1. Disconnect Lathe from POWER !

2. Thoroughly clean and dry the tapered mating surfaces of the tailstock quill bore and the carbide-tipped dead center.

3. Use the tailstock quill handwheel to feed the quill out from the casting about 25mm.

4. Insert the center into the tailstock quill.

5. Seat the center firmly into the quill during workpiece installation by rotating the quill handwheel clockwise to apply pressure.

Removing Center from Tailstock

To remove the center from the quill, hold onto it with a rag in one hand, then rotate the tailstock handwheel counterclockwise to draw the quill back into the casting until the center released.

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Steady Rest

The steady rest supports long shafts and can be mounted anywhere along the length of the bed.

To install and use the steady rest :

1. Disconnect Lathe from POWER !

2. Thoroughly clean the machined base of the steady rest, then place it on the lathe bedways so the triangular notch fits over the bedway prism.

3. Position the steady rest where required to properly support the workpiece, then tighten the hex nut shown in Figure 29 to secure it in place.

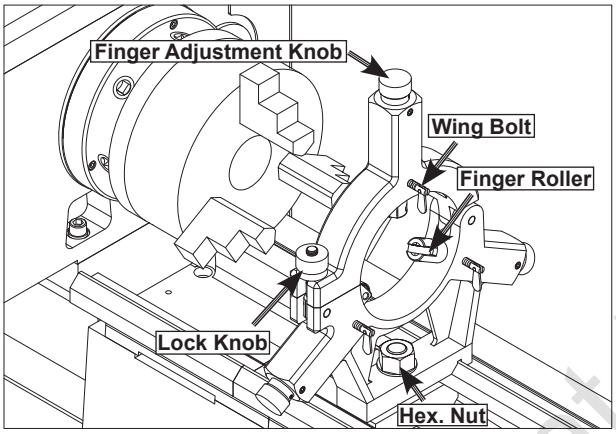

Figure 29. Steady rest components.

4. Loosen the lock knob and open the steady rest so the workpiece can rest on the bottom two finger rollers, as shown in Figure 30.

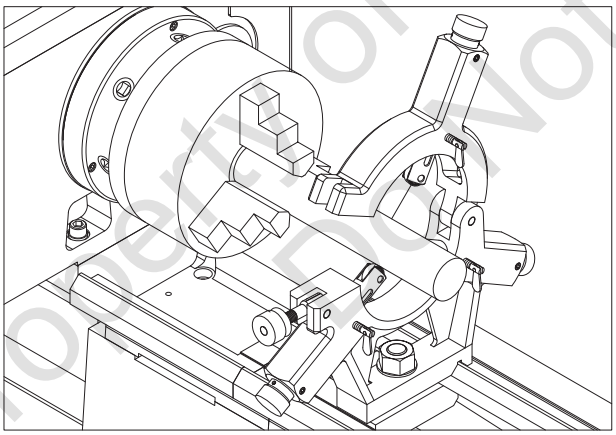

Figure 30. Workpiece mounted in the steady rest.

5. Close the steady rest so that the workpiece is inside the finger rollers, then tighten the lock knob.

6. Loosen the three wing bolts so the finger roller positions can be adjusted.

7. Use the finger adjustment knobs to just touch the finger rollers against the workpiece without causing workpiece deflection.

8. Tighten the three wing bolts.

Follow Rest

The follow rest mounts to the saddle with two cap screws (Figure 31). It is used on long, slender parts to prevent workpiece flexing from the pressure of the cutting tool during operation.

Adjust the sliding finger rollers on the follow rest in the same manner as those on the steady rest.

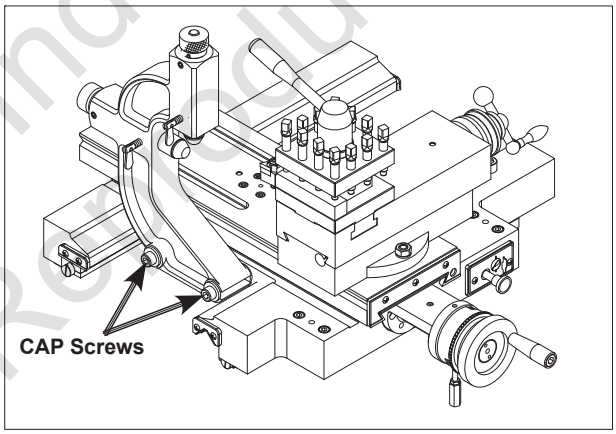

Figure 31. Follow rest attachment.

Compound Slide

The compound slide handwheel has an indirect-read graduated scale. This means that the distance shown on the scale represents the actual distance the tool moves, which of course, will remove twice as much material from the diameter of the workpiece. The base of the compound slide has another graduated scale used for setting the tool to a specific angle.

To set the compound slide at a certain angle :

1. Loosen the three CAP screws at the base of the compound slide (Figure 32).

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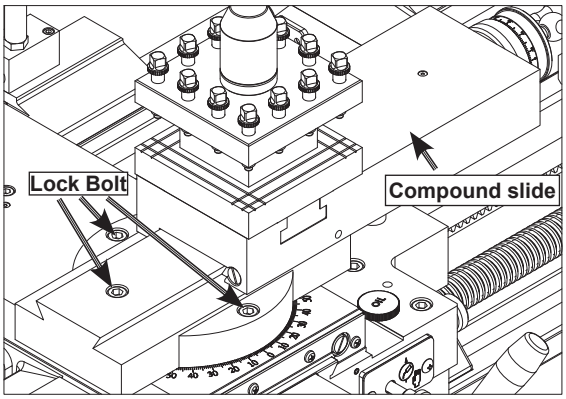

Figure 32. Compound slide set at an angle.

2. Rotate the compound to the desired angle, as indicated by the scale at the base, then retighten the two CAP screw.

4-Way Tool Post

The four-way tool post is mounted on top of the compound slide, and allows a maximum of four tools to be loaded simultaneously.

The four-way tool post allows for quick indexing to different tools. This is accomplished by loosening the top handle, rotating the tool post to the desired position, then re-tightening the handle to lock the tool into position.

To load the tool post :

1. Choose the desired cutting tool.

2. Loosen the tool post bolts so that the cutting tool can fit underneath them.

3. Firmly secure the cutting tool with at least two tool post bolts, as shown in Figure 33.

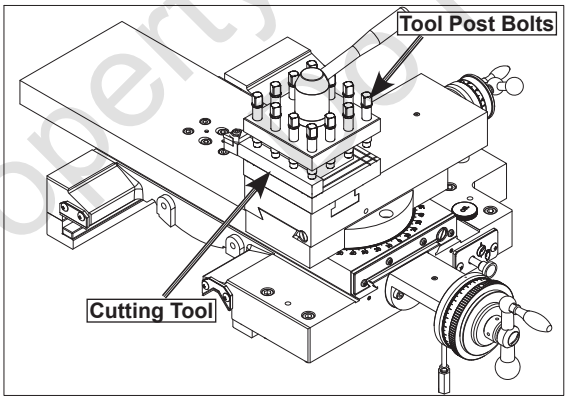

Figure 33. 4-way tool post.

Aligning Cutting Tool with Tailstock Center

For most operations, the cutting tool tip should be aligned with the spindle center line, as illustrated in Figure 34.

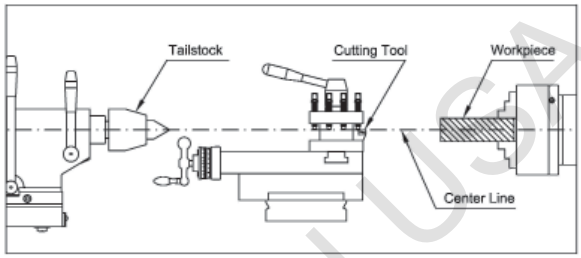

Figure 34. Cutting tool aligned with workpiece center.

There are a number of ways to check and align the cutting tool to the spindle center line. Below are two common methods :

- Align the tip of the cutting tool with a center installed in the tailstock. For this to work, the tailstock must be aligned to the spindle center line.

- Make a facing cut on a piece of round bar stock. If the tool is above/below the spindle center line, a nub will be left in the center of the workpiece. Adjust the height of the workpiece, then repeat the facing cut to check the adjustment. Repeat as necessary until the center of the workpiece is smoothly faced.

To align the cutting tool with the tailstock center :

1. Mount the cutting tool in the tool post, then turn the tool post so the tooling faces the tailstock.

2. Install a center in the tailstock, and position the center tip near the tip of the cutting tool.

3. Lock the tailstock and quill in place.

4. Adjust the height of the cutting tool with a steel shim, so the tip just touches the end of the tailstock center.

Apron Stop

Use the adjustable apron stop collar to set the location where the carriage will be disengaged by the feedrod friction clutch.

When the adjustable apron stop contacts the stop collar during a longitudinal feeding operation, the clutch disengages the feedrod from the apron and the carriage movement stops.

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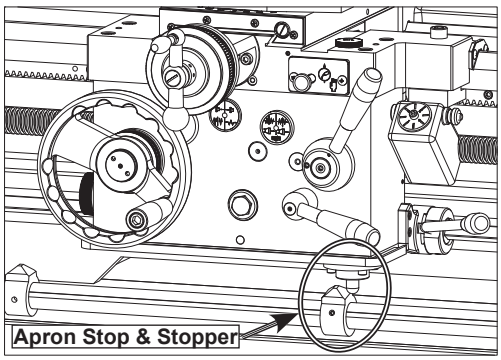

Figure 35. Apron stop and Stopper.

Manual Feed

You can manually move the cutting tool around the lathe for facing or turning operations using the handwheels shown in Figure 36 and described below.

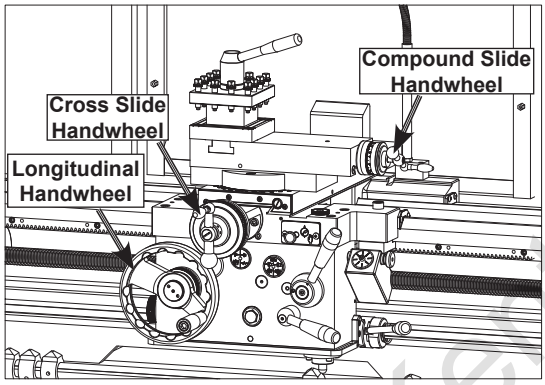

Figure 36. Carriage Controls.

Longitudinal Handwheel

The longitudinal handwheel moves the carriage left or right along the bed. Use this control when setting up the machine for facing or turning.

Cross Slide Handwheel

The cross slide handwheel moves the top slide toward and away from the work. Turning the dial clockwise moves the slide toward the workpiece. Adjust the graduated scale by holding the handwheel with one hand and turning the dial with the other.

Compound Slide Handwheel

The compound slide handwheel controls the position of the cutting tool relative to the workpiece. The compound is adjustable for any angle within its range. The combo inch/metric graduated scale is engraved into a rotatable barrel. Angle adjustment is secured by cap screws on the base of the compound.

Spindle Speed

Using the correct spindle speed is important for safe and satisfactory results, as well as maximizing tool life.

To set the spindle speed for your operation, you will need to :

1. Determine the best spindle speed for the cutting task.

2. Configure the lathe controls to produce the required spindle speed.

Determining Spindle Speed

Many variables affect the optimum spindle speed to use for any given operations, but the two most important are the recommended cutting speed for the workpiece material and the diameter of the workpiece, as noted in the formula :

$$RPM = \frac{CSx4}{D}$$

RPM = Spindle speed, revolution per minute.
CS = Cutting speed in surface feet per minute (SFM)
D = Diameter of workpiece

EXAMPLE :
If the cutting speed is 40 for a certain alloy steel and the workpiece is 2 inches in diameter, find the rpm as follows :

RPM = (40x4)/2 = 80
After calculating the RPM, use the nearest or next lower speed on the lathe and set the spindle speed.
Cutting speed, typically defined in feet per minute (FPM), is the speed at which the edge of a tool moves across the material surface.

A recommended cutting speed is an ideal speed for cutting a type of material in order to produce the desired finish and optimize tool life.

The books Machinery's Handbook or Machine Shop Practice, and some internet sites, provide excellent recommendations for which cutting speeds to use when calculating the spindle speed.
These sources also provide a wealth of additional information about the variables that affect cutting speed and they are a good educational resource.

Also, there are a large number of easy-to-use spindle speed calculators that can be found on the internet. All of these sources will help you take into account all the applicable variables in order to determine the best spindle speed for the operation.

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Setting Spindle Speed

1. Make sure the spindle is turned OFF and it has come to a complete stop.

2. Use the chart in Figure 37 to determine the available spindle speed range closest to your calculated spindle speed.

SPEED				
A	36	50	70	105
B	130	180	250	380
C	620	900	1200	1800
LEVER	1	2	3	4

Figure 37. Spindle speed range chart.

3. Move the spindle speed range lever to the range that covers your calculated spindle speed.

4. Move the spindle speed lever to your calculated spindle speed.

Power Feed

On this machine, both the carriage and cross slide have power feed capability. The rate that these components move (feed rate) is controlled by how the levers are configured on the gearbox.

Feed rate and spindle speed must be considered together. The sources you use to determine the optimum spindle speed for an operation will also provide the optimal feed rate to use with that spindle speed.

Often, the experienced machinist will use the feeds and speeds given in their reference charts or web calculators as a starting point, then make minor adjustments to the feed rate (and sometimes spindle speed) to achieve the best results.

The carriage can alternately be driven by the leadscrew for threading operations. However, this section covers using the power feed option for the carriage and cross slide components for non-threading operations.

Power Feed Controls

The headstock feed direction lever shown in Figure 45 controls the direction the carriage moves. However, it is important to understand that there is a direction change relationship between the headstock feed direction lever and the apron feed direction knob (Figure 46). The apron feed direction knob and the headstock feed direction lever reverse the feed direction of each other. For example:

- When the apron feed direction knob is pushed-in, the direction of carriage travel shown on the headstock feed direction lever plate is applicable only when threading. For feeding, the directions shown will be opposite.

- When the apron feed direction knob is pulled-out, the direction of carriage travel shown on the headstock feed direction plate is accurate only when feeding. For threading, the directions shown will be opposite.

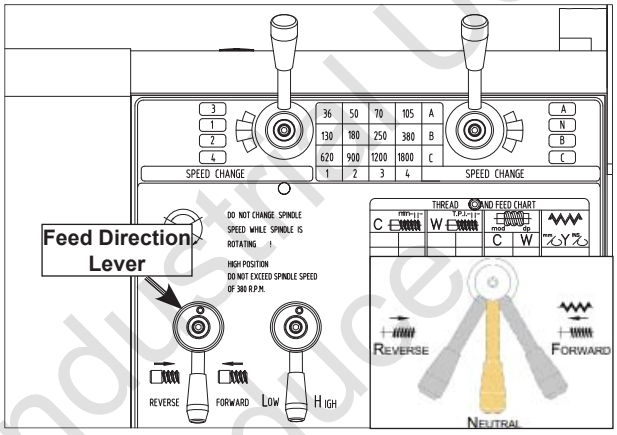

Figure 38 . Feed Direction Lever.

The main benefit of the apron feed direction knob shown in Figure 39 is that it changes the direction of the selected feed without having to stop the lathe, and walk over and shift the headstock feed direction lever.

The feed selection knob shown in Figure 39 engages either the carriage or cross slide feed.

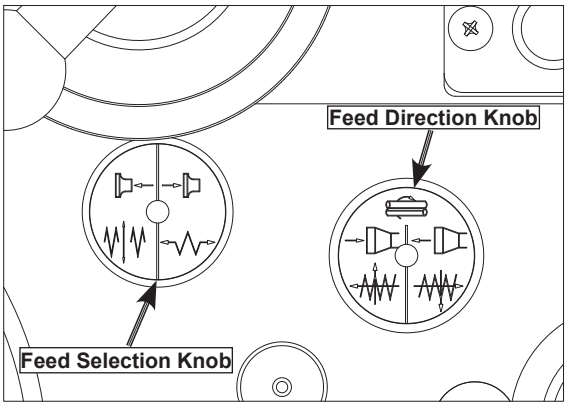

Figure 39. Apron feed knobs.

If the threading or general carriage feed is required, the carriage lock (Figure 40) must be disengaged. If the cross feed will be used for facing, the carriage lock should be engaged and the cross feed gib lock screw should be loose. If it is tight, loosen the cross feed gib lock using a 3mm hex wrench.

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To engage the power feed :

1. Make sure the spindle is OFF and has come to a complete stop.

2. Shift the headstock feed direction lever to engage the leadscrew or feed rod. Sometimes you need to slightly rotate the handwheel of the component you are trying to engage, so that the gears can mesh.

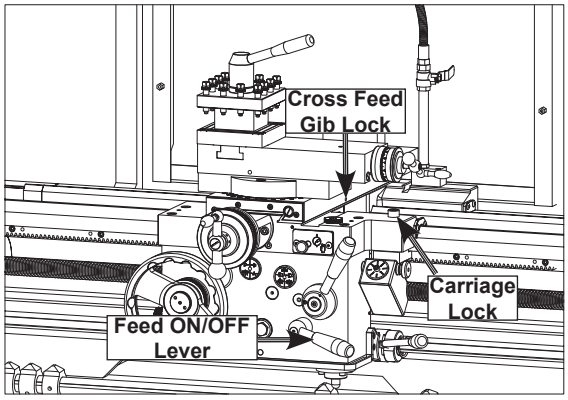

Figure 40. Carriage lock and gib lock.

3. Push down on the feed ON / OFF lever (Figure 40) on the front of the apron to engage power feed for either the carriage or the cross slide.

4. Push the feed selection knob in to select carriage feed, or pull the feed selection knob out to select cross feed.

5. Adjust the feed clutch knob, shown in Figure 41, to set at which point the feed clutch will slip to avoid feed system overload.

   Tighten the feed clutch knob completely to seat the clutch. Next, count how many turns it takes to back it off completely.

   Then tighten the knob ⅓ of the distance that was backed-off. If the clutch slips too easily at this conservative setting, the knob can be tightened further. But keep in mind that when the knob is completely tight, the feed clutch is overridden and will not slip in the event of a feed system overload, resulting in feed system damage.

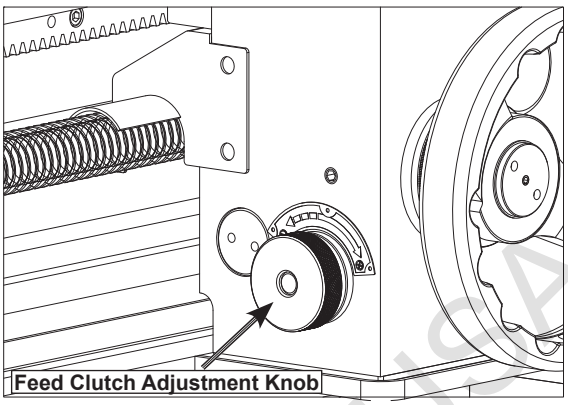

Figure 41. Feed clutch knob.

To use the quick change feed direction knob :

1. While the lathe is running, place the feed control lever in neutral.

2. Push or pull the quick change feed direction knob to change the direction of the feed rod.

3. Re-engage the feed direction lever. The feed rod rotation will now be reversed, causing the engaged carriage or cross slide to move in the opposite direction.

Leadscrew & Feed Rod support

This support bracket was used for protect the Leadscrew and Feed rod to prevent these parts to be out of shape when the apron has been moved toward the chuck side, when the shorter cutting job required.

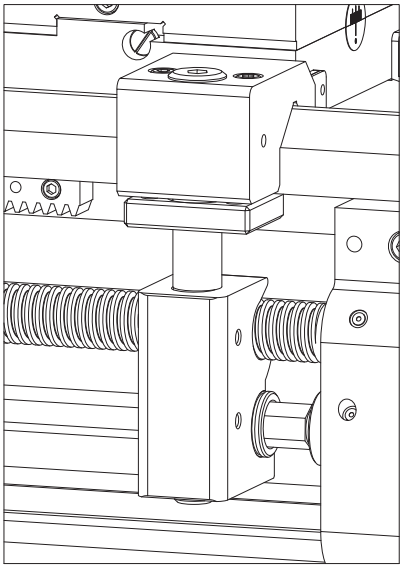

Figure 42. Leadscrew & Feed rod support

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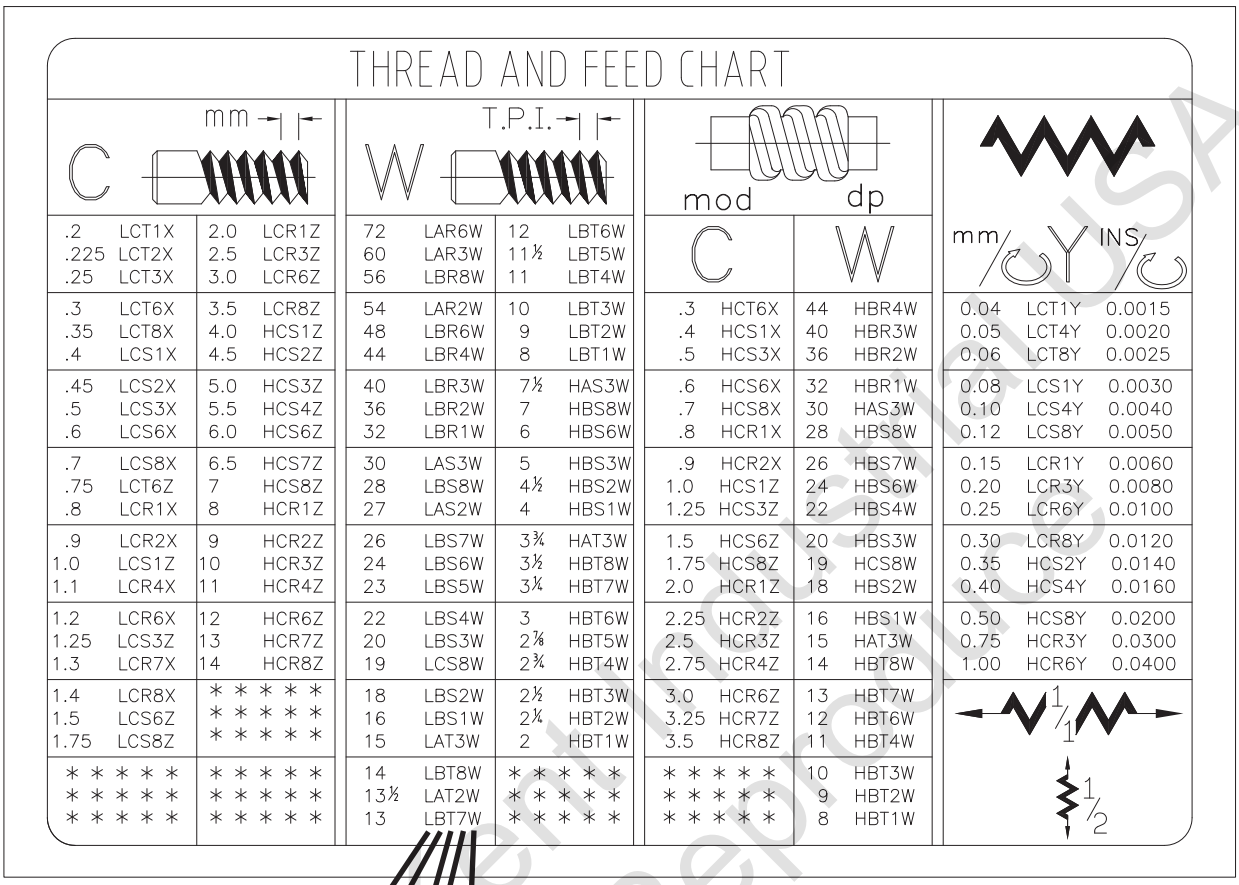
Thread & Feed Rate Chart

Figure 43 shows the configurations of gearbox levers that are required to set the available feed rates. This same chart can also be found on the machine.



THREAD AND FEED CHART

C (mm)				W (T.P.I.)				C (mod)		W (dp)		Y (mm/INS)		
.2	LCT1X	2.0	LCR1Z	72	LAR6W	12	LBT6W	.3	HCT6X	44	HBR4W	0.04	LCT1Y	0.0015
.225	LCT2X	2.5	LCR3Z	60	LAR3W	11½	LBT5W	.4	HCS1X	40	HBR3W	0.05	LCT4Y	0.0020
.25	LCT3X	3.0	LCR6Z	56	LBR8W	11	LBT4W	.5	HCS3X	36	HBR2W	0.06	LCT8Y	0.0025
.3	LCT6X	3.5	LCR8Z	54	LAR2W	10	LBT3W	.6	HCS6X	32	HBR1W	0.08	LCS1Y	0.0030
.35	LCT8X	4.0	HCS1Z	48	LBR6W	9	LBT2W	.7	HCS8X	30	HAS3W	0.10	LCS4Y	0.0040
.4	LCS1X	4.5	HCS2Z	44	LBR4W	8	LBT1W	.8	HCR1X	28	HBS8W	0.12	LCS8Y	0.0050
.45	LCS2X	5.0	HCS3Z	40	LBR3W	7½	HAS3W	.9	HCR2X	26	HBS7W	0.15	LCR1Y	0.0060
.5	LCS3X	5.5	HCS4Z	36	LBR2W	7	HBS8W	1.0	HCS1Z	24	HBS6W	0.20	LCR3Y	0.0080
.6	LCS6X	6.0	HCS6Z	32	LBR1W	6	HBS6W	1.25	HCS3Z	22	HBS4W	0.25	LCR6Y	0.0100
.7	LCS8X	6.5	HCS7Z	30	LAS3W	5	HBS3W	1.5	HCS6Z	20	HBS3W	0.30	LCR8Y	0.0120
.75	LCT6Z	7	HCS8Z	28	LBS8W	4½	HBS2W	1.75	HCS8Z	19	HCS8W	0.35	HCS2Y	0.0140
.8	LCR1X	8	HCR1Z	27	LAS2W	4	HBS1W	2.0	HCR1Z	18	HBS2W	0.40	HCS4Y	0.0160
.9	LCR2X	9	HCR2Z	26	LBS7W	3¾	HAT3W	2.25	HCR2Z	16	HBS1W	0.50	HCS8Y	0.0200
1.0	LCS1Z	10	HCR3Z	24	LBS6W	3½	HBT8W	2.5	HCR3Z	15	HAT3W	0.75	HCR3Y	0.0300
1.1	LCR4X	11	HCR4Z	23	LBS5W	3¼	HBT7W	2.75	HCR4Z	14	HBT8W	1.00	HCR6Y	0.0400
1.2	LCR6X	12	HCR6Z	22	LBS4W	3	HBT6W	3.0	HCR6Z	13	HBT7W			
1.25	LCS3Z	13	HCR7Z	20	LBS3W	2⅞	HBT5W	3.25	HCR7Z	12	HBT6W			
1.3	LCR7X	14	HCR8Z	19	LCS8W	2¾	HBT4W	3.5	HCR8Z	11	HBT4W			
1.4	LCR8X	*	*	*	*	*	18	LBS2W	2½	HBT3W	*	*	*	*	*
1.5	LCS6Z	*	*	*	*	*	16	LBS1W	2¼	HBT2W	*	*	*	*	*
1.75	LCS8Z	*	*	*	*	*	15	LAT3W	2	HBT1W	*	*	*	*	*
*	*	*	*	*	*	*	14	LBT8W	*	*	*	*	*	*	*
*	*	*	*	*	*	*	13½	LAT2W	*	*	*	*	*	*	*
*	*	*	*	*	*	*	13	LBT7W	*	*	*	*	*	*	*

Figure 43. Thread and feed rate chart.

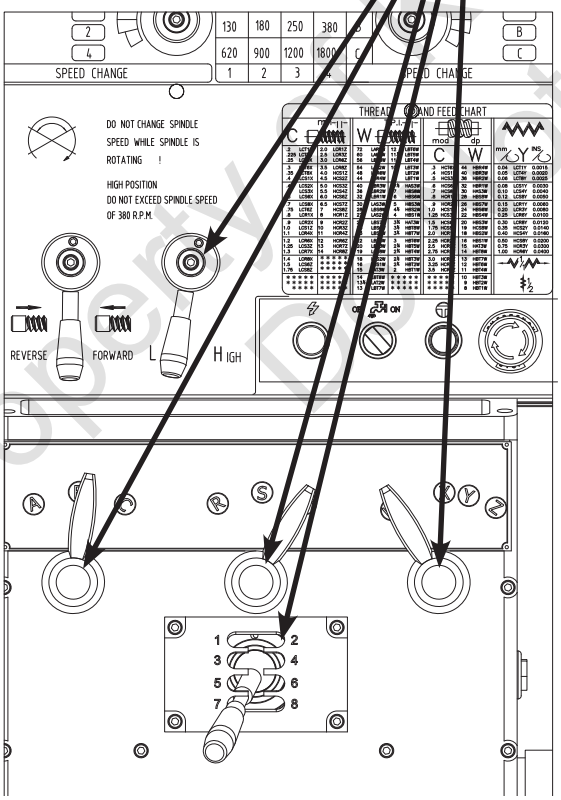


Figure 44. Example for thread and feed rate chart.

Positioning Gearbox Levers

To cut a particular thread or establish a particular feed rate, you may need to first swap the gearbox drive gear, depending on where it is currently set.

Once you have confirmed that the end gear is set up properly, you can then move the gearbox levers to the required positions. The arrows going from Figure 43 to Figure 44 show which gearbox levers must be moved to achieve an example feed rate.

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End Gear Setup

The gearbox drive gear on this lathe can be configured for the normal position or the alternate position, depending upon the type of operation to be performed. The lathe is shipped with the end gears in the normal position. Gears must be thoroughly cleaned and re-coated in grease before installing, and the backlash must be maintained at 0.127mm (0.005") for correct meshing.

Normal Position (Inch)
The 24T end gear is installed in the top position, the 44T/56T end gears in the middle position, and the 57T end gear in the bottom position, as shown in Figure 45. In the normal position, the 56T and 57T gears are meshed, which allows for inch threading and all general feed operations.

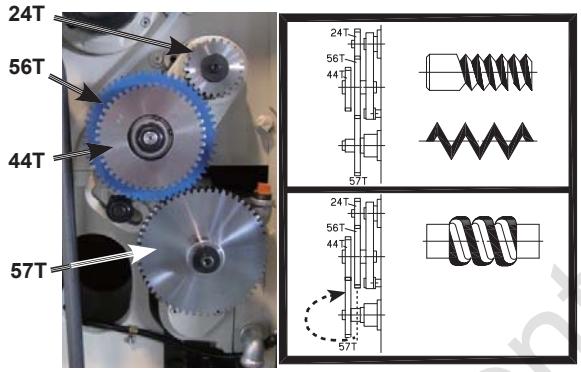

Figure 45. Normal end gear position.

Alternate Position (Inch)
When the 44- and 57-tooth end gears are meshed, you can perform modular and diametral pitch turning.

Configuring the End Gears
1. Disconnect Lathe from POWER !

2. Move the gearbox range lever to "Low" so that the gears will not rotate in the following steps, then open the lathe headstock side cover.

3. **To change the position of the 57T gear :**
   a. Remove the cap screw and flat washer that secures the gear, then remove the gear.

   b. Clean away debris and grime from the gear and apply a light coat of machine oil.

   c. Swap the position of the gear, then align it with the key and insert it on the gear shaft.

   d. Re-install the flat washer and cap screw.

4. Close and secure the headstock side cover.

Normal Position (Metric)
The 28T end gear is installed in the top position, the 55T/54T end gears in the middle position, and the 64T/22T end gear in the bottom position, as shown in Figure 46. In the normal position, the 55T and 64T gears are meshed, which allows for metric threading and all general feed operations.

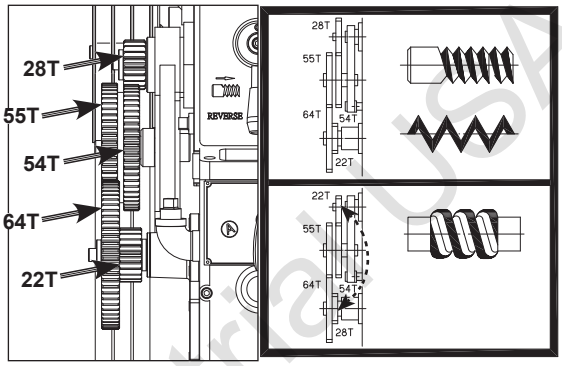

Figure 46. Normal end gear position.

Alternate Position (Metric)
When the 28- and 22-tooth end gears are exchanged, you can perform modular and diametral pitch turning.

Configuring the End Gears
1. Disconnect Lathe from POWER !

2. Move the gearbox range lever to "Low" so that the gears will not rotate in the following steps, then open the lathe headstock side cover.

3. To change the position of the 22T/28T gear :
   a. Remove the cap screw and flat washer that secures the gear, then remove the gear.

   b. Clean away debris and grime from the gear and apply a light coat of machine oil.

   c. Swap the position of the gear, then align it with the key and insert it on the gear shaft.

   d. Re-install the flat washer and cap screw.

4. Close and secure the headstock side cover.

Threading Controls

If you are unfamiliar with threading procedures on a lathe, we strongly recommend that you read books, review industry trade magazines, or get formal training before beginning any threading projects.

Power Feed Lever

The feed control lever must be in the fully up disengaged position or the internal lockout will prevent the half nut lever from applying the half nut. Also to avoid shearing the leadscrew shear pin, the carriage lock (Figure 47) must be loosened before threading begins.

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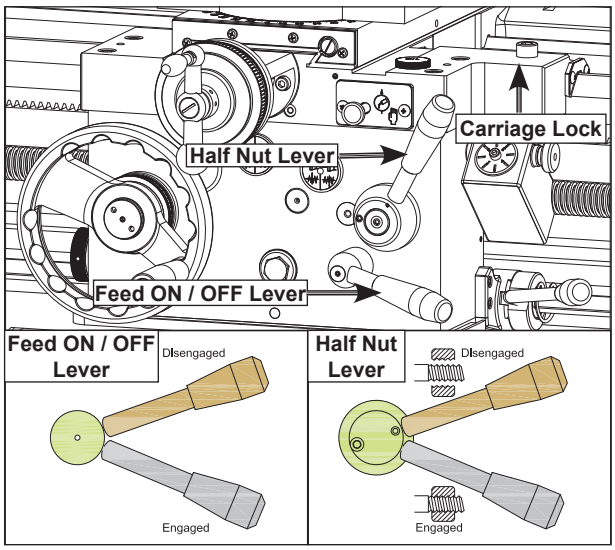

Figure 47. Carriage controls.

Half Nut Lever

The half nut lever engages the carriage with the leadscrew which moves the cutting tool along the length of the workpiece.

Thread Dial & Chart Overview

The numbers on the thread dial are used with the thread dial chart to show when to engage the half nut during inch threading. The thread dial gear must be engaged with the leadscrew for this to work. Loosen the knurled hand knob on the thread dial, pivot the dial gear into mesh with the leadscrew, then tighten the hand knob (Figure 48).

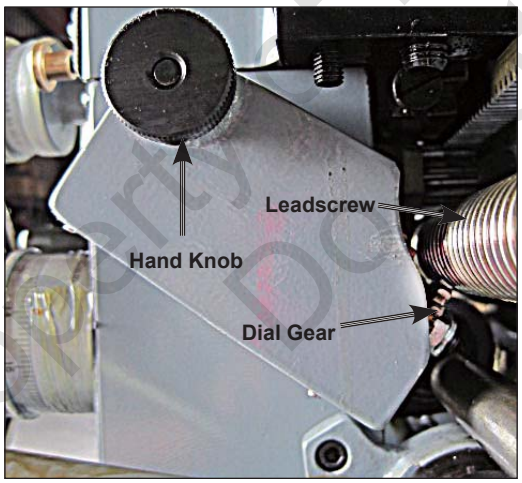

Figure 48. Thread dial engaged with the leadscrew.

Using Thread Dial and Chart (Inch)

Find the TPI (threads per inch) that you want to cut in the left column (Figure 49), then reference the dial number to the right of it. The dial numbers indicate when to engage the half nut for a specific thread pitch. The thread dial chart can also be found on the front of the thread dial housing.

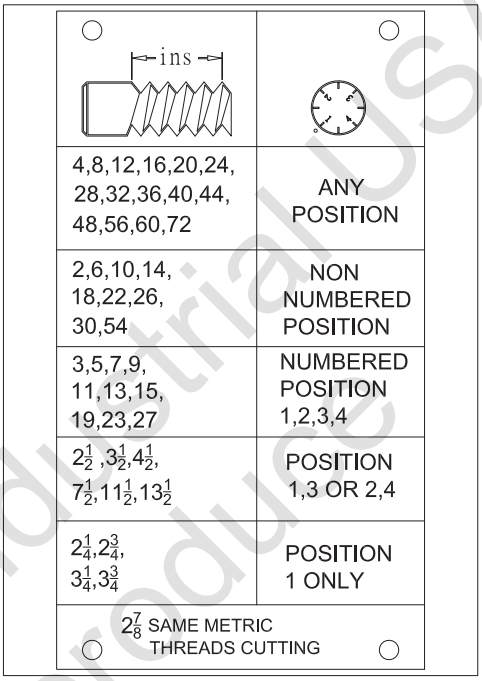

Figure 49. Thread dial chart (Inch).

TPI 4-72 Divisible By 4

Use any line (position) on the thread dial, shown in Figure 50, or threading TPI divisible by 4.

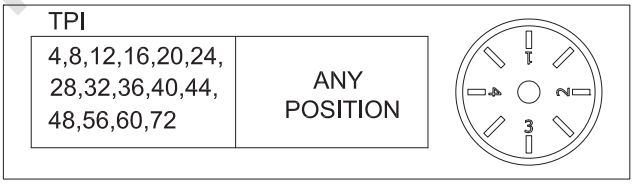

Figure 50. Any position is selected on the dial for threading 4-72 TPI.

TPI 2-54 Not Divisible By 4

Use any of the non-numbered lines on the thread dial for threading the TPI shown in Figure 51.

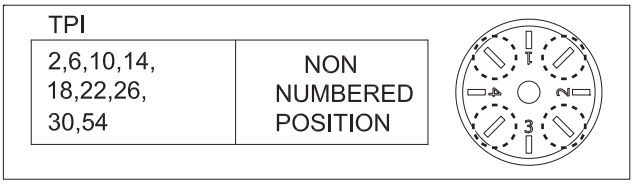

Figure 51. Marks are selected on the dial for threading 2-54 TPI.

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Odd Numbered TPI
Use any of the numbered lines on the thread dial for threading the TPI shown in Figure 52.

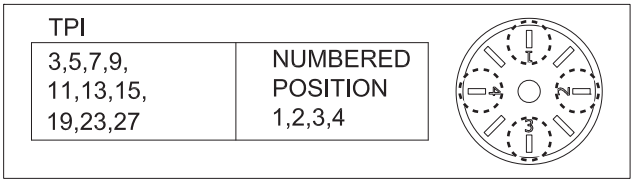

Figure 52. Numbers are selected on the dial for threading odd numbered TPI.

1/2 Fractional TPI
Use any opposing number pairs—2 or 4, or 1 or 3 on the thread dial for 1/2 fractional TPI (Figure 53). For example, to cut a 3 1/2 thread, select 1 on the dial, then start threading.

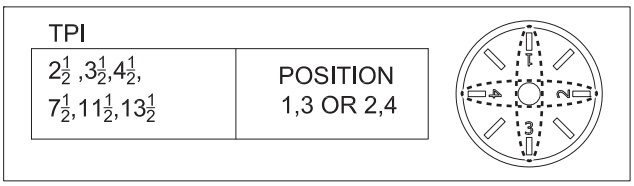

Figure 53. Opposing number group are selected on dial for cutting 1/2 thread TPI.

Other Fractional TPI
Use position 1 on the thread dial for cutting the TPI shown in Figure 54.

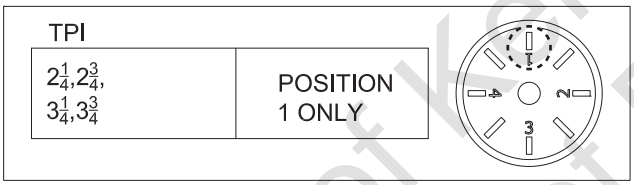

Figure 54. Position for 1/4 or 3/4 fractional TPI.

2 7/8 TPI
Use any numbered or non-numbered line on the thread dial to cut the TPI shown in Figure 55.

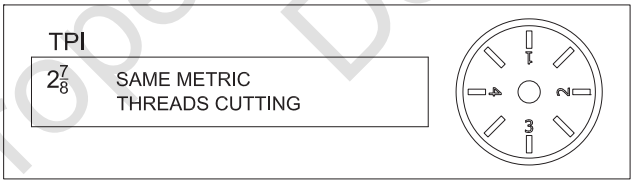

Figure 55. Half nut stays engaged for 27/8 TPI.

Using Thread Dial and Chart (Metric)

Find the length of each thread that you want to cut in the left column (Figure 56), then reference the dial number to the right of it. The dial numbers indicate when to engage the half nut for a specific thread pitch. The thread dial chart can also be found on the front of the thread dial housing.

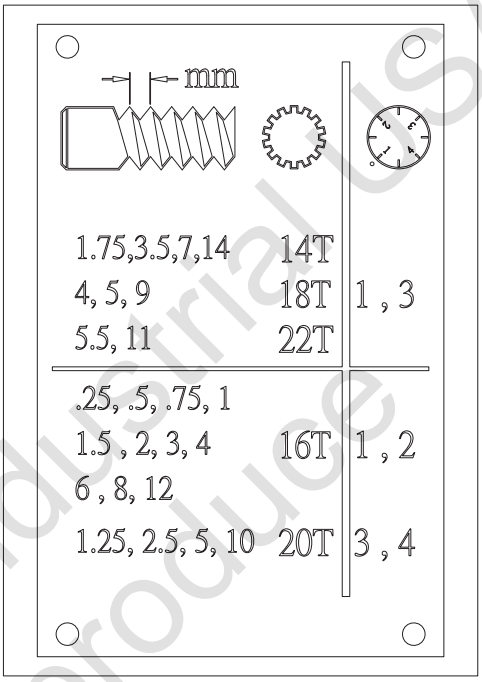

Figure 56. Thread dial chart (Metric).

Length of each thread 1.75, 3.5, 7, 14
Select position 1, 3 on the thread dial and use the 14T gear on the buttom of thread dial for threading length of each thread 1.75, 3.5, 7, 14. (Figure 57 - 58)

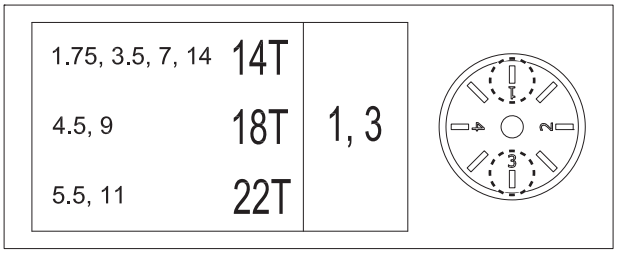

Figure 57. Thread dial chart of numbered position 1, 3.

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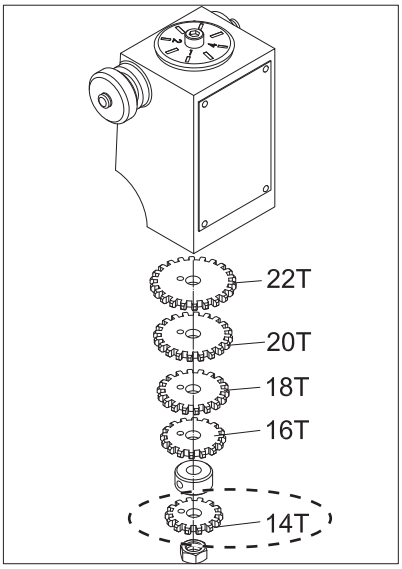

Figure 58. Example of thread dial - 14T.

Length of each thread 4.5, 9
Select position 1, 3 on the thread dial and use the 18T gear on the buttom of thread dial for threading length of each thread 4.5, 9. (Figure 57 - 58)

Length of each thread 5.5, 11
Select position 1, 3 on the thread dial and use the 22T gear on the buttom of thread dial for threading length of each thread 5.5, 11. (Figure 57 - 58)

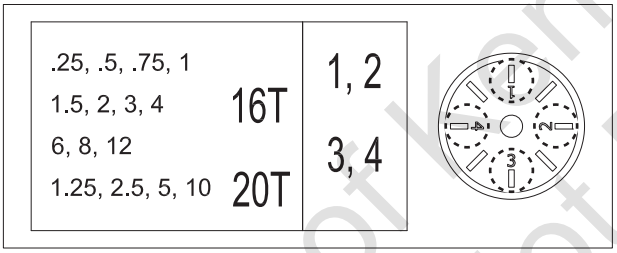

Figure 59. Thread dial chart of numbered position 1, 2, 3, 4.

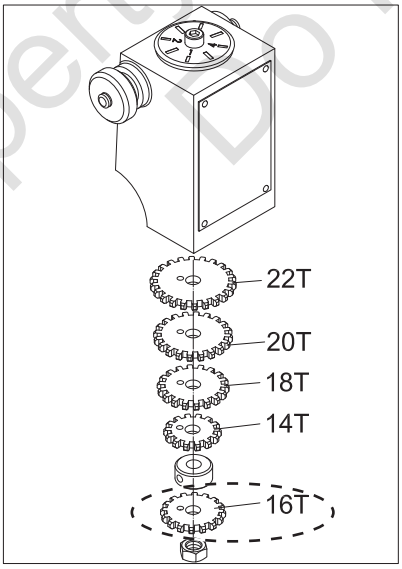

Figure 60. Example of thread dial - 16T.

Length of each thread 0.25 - 12 divisible by 0.25
Select position 1, 2, 3 or 4 on the thread dial and use the 16T gear on the buttom of thread dial for threading length of each thread 0.25 - 12 divisible by 0.25. (Figure 59 - 60)

Length of each thread 1.25, 2.5, 5, 10
Select position 1, 2, 3 or 4 on the thread dial and use the 20T gear on the buttom of thread dial for threading length of each thread 1.25, 2.5, 5, 10. (Figure 59 - 60)

Cutting Fluid System

The cutting fluid system delivers cutting fluid through a positionable nozzle and is controlled by the control panel cutting fluid pump switch and the valve lever near the base of the nozzle hose.

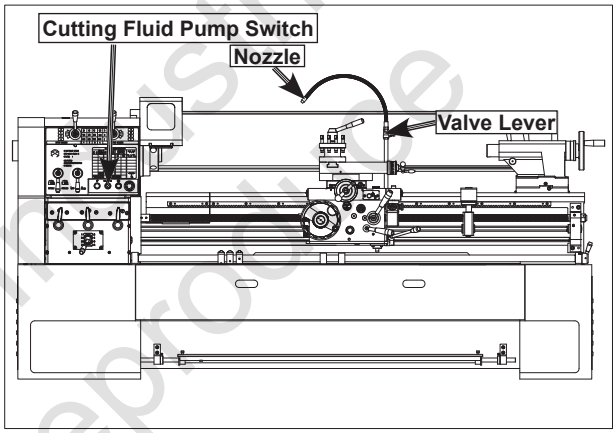

Figure 61. Coolant system controls and components.

Always use high quality cutting fluid in your coolant system and follow the manufacturer's instructions for diluting.

Refer to Cutting Fluid System on Page 28 for detailed instructions on how to add or change cutting fluid. Check the cutting fluid regularly and promptly change it when it becomes overly dirty or rancid.

To use the cutting fluid system on your lathe :

1. Make sure the tank is properly serviced and filled with cutting fluid, and that you wear the necessary personal protection equipment.

2. Position the cutting fluid nozzle for your operation.

3. Use the control panel cutting fluid pump switch to turn the coolant pump ON.

4. Adjust the flow of cutting fluid by using the valve lever near the base of the nozzle hose.

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Section 4 : Maintenance

Schedule

Each operator of this machine is responsible for ensuring proper care of the equipment. We strongly recommend all operators make a habit of following the daily maintenance procedures.

For optimum performance from this machine, this maintenance schedule must be strictly followed.

Ongoing
To maintain a low risk of injury and proper machine operation, if you ever observe any of the items below, shut the machine down immediately and fix the problem before continuing operations :

- Loose mounting bolts or fasteners.
- Worn, frayed, cracked, or damaged wires.
- Guards removed.
- Limit/kill switches bypassed.
- Emergency stop button not working correctly or not requiring you to reset it before starting the machine again.
- A reduction in braking speed or efficiency.
- Headstock oil not flowing against sight glass.
- Cutting fluid not flowing out.
- Any other unsafe condition.

Daily, Before Operations

- Check / add gearbox oil.
- Check / add apron oil.
- Check cutting fluid level.
- Lubricate the ways.
- Put oil in the ball oilers.
- Check / add leadscrew & feedrod bearing oil.
- Clean / lubricate the leadscrew.
- Move the power feed lever on the apron to neutral (to prevent crashes upon startup).
- Ensure carriage lock bolt is loose.

Daily, During Operations

- Verify headstock oil flows when power is turned ON.
- Verify electrical box cooling fan is operating.
- Verify headstock oil temperature is under 138°C (280° F).

Daily, After Operations

- Vacuum/clean all chips and swarf from bed, slides, and chip drawer.
- Wipe down all unpainted or machined surfaces with an oiled rag.
- Depress emergency stop button and shut OFF the main power switch (to prevent accidental startup).

Monthly

- Drain and clean the cutting fluid tank, then add new cutting fluid.
- Remove electrical box air filter and clean with compressed air or a vacuum.

Annually (or Semi-Annually with Hard Use)

- Drain and clean the headstock oil reservoir, then add new oil.
- Change the apron oil.
- Change the gearbox oil.

Cleaning

Regular cleaning is one of the most important steps in taking good care of this lathe. Each operator is responsible for cleaning the machine immediately after using it or at the end of the day. We recommend that the cleaning routine be planned into the workflow schedule, so that adequate time is set aside to do the job right.

Typically, the easiest way to clean swarf from the bed ways and chip drawer is to use a wet/dry shop vacuum that is dedicated for this purpose only. The small chips leftover after vacuuming can be wiped up with a slightly oiled rag. Avoid using compressed air to blow off chips, as it may drive them deeper into moving surfaces and could cause sharp chips to fly into your face or hands.

All visible swarf should be removed from the lathe during cleaning. Remember, personal neatness gives you personality.

Lubrication

Headstock

Checking & Adding Oil
Before operating the lathe, please check the status of the oil inside of the headstock from the oil sight glass. To replenish it up to the center line of the oil sight glass when it is lower than this center line.

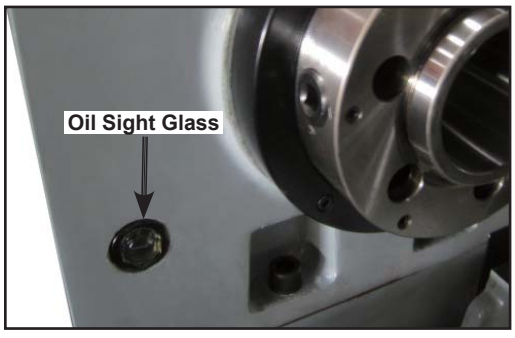

Figure 62. Location of the headstock oil sight glass.

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Changing Oil
The headstock oil must be changed after the break-in period and then annually (or every six months with heavy service or extreme working conditions). The fill and drain plug is shown in Figure 63.

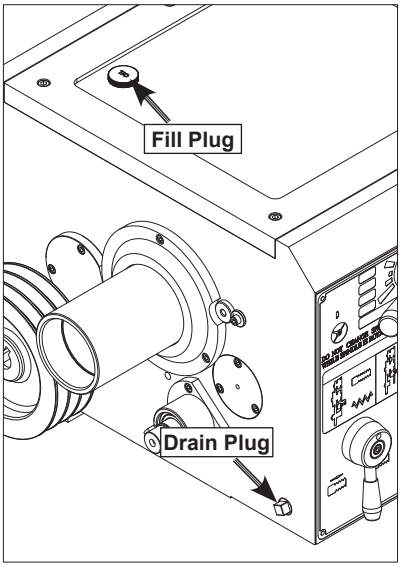

Figure 63. Location of headstock fill and drain plugs.

Gearbox

Checking & Adding Oil
The sight glass shown in Figure 64 shows the oil level in the gearbox. At the maximum level, the oil fills approximately 3⁄4 of the sight glass. At the minimum level, the oil only fills 1⁄4 of the sight glass.

Check the oil level daily. When the oil approaches the minimum level, add enough oil to bring it up to the maximum level.

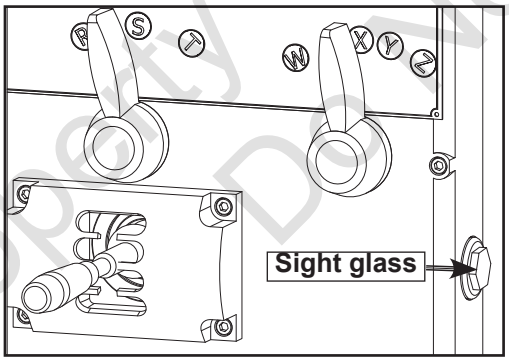

Figure 64. Gearbox sight glass location.

Changing Oil
The gearbox oil must be changed after the break-in period and then annually (or every six months with hard service or extreme working conditions). Figure 65 shows fill and drain plugs used when changing the gearbox oil.

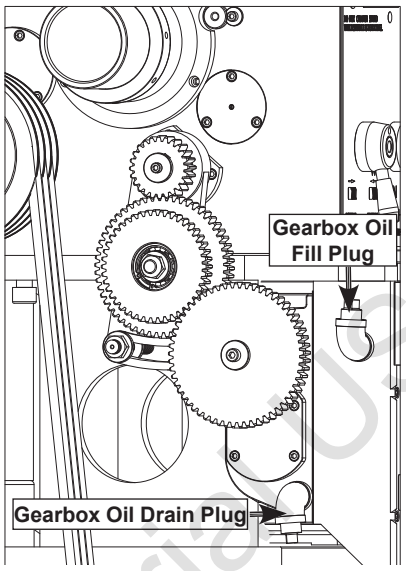

Figure 65. Location of gearbox fill and drain plugs.

Apron

Checking & Adding Oil
The sight glass shown in Figure 66 shows the oil level in the apron. At the maximum level, the oil fills approximately 3⁄4 of the sight glass. At the minimum level, the oil only fills 1⁄4 of the sight glass.

Check the oil level daily. When the oil approaches the minimum level, add enough oil to bring it up to the maximum level. This oil is also used by the way pump to lubricate the ways and slides.

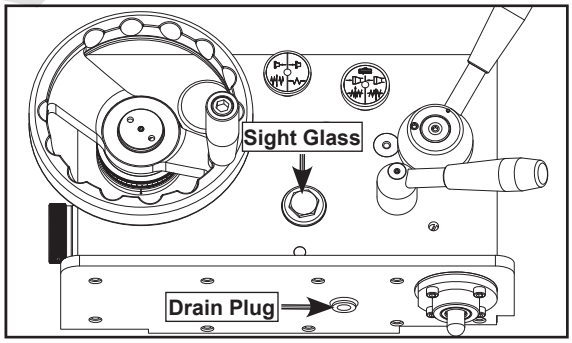

Figure 66. Location of apron drain plug & sight glass.

Changing Oil
The oil in the apron reservoir must be changed after the break-in period and then annually (or every six months with hard service or extreme working conditions). The drain plug is shown in Figure 66 and the fill plug is shown in Figure 67.

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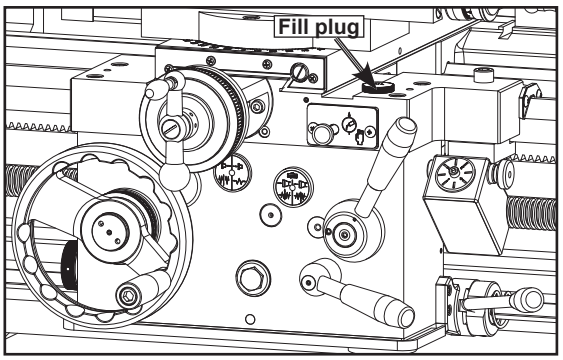

Figure 67. Location of fill plug for apron oil reservoir.

Lead Screw

Before lubricating the leadscrew, clean it first with mineral spirits. A paint brush works well to help clean out the threads. Make sure to move the carriage out of the way, so you can clean the entire length of the leadscrew.

Apply oil along the length of the leadscrew. Use a paint brush to make sure the oil is evenly applied and down in the threads.

Ways & Slides

The way pump shown in Figure 68 lubricates the saddle and cross slide way guides with the oil from the apron reservoir.

To use the way pump to lubricate the ways, pull the pump knob out for two or three seconds and then push it in. The pump draws oil from the apron reservoir and then forces it through drilled passages to the way guides.

Repeat this process and move the carriage left/ right and the cross slide forward/backward to distribute oil along the way guides.

Lubricate the guides once before and once after operating the lathe. If the lathe is in a moist or dirty environment, increase the lubrication interval and make sure to keep the oil level full.

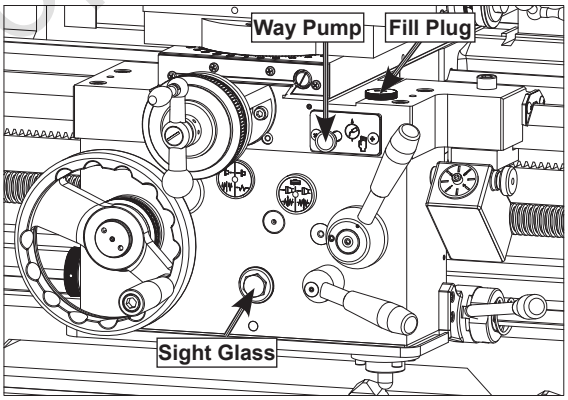

Figure 68. Location of way pump, fill plug and sight glass on the apron.

Unpainted & Machined Surfaces

Besides the ways and leadscrew, all other unpainted and machined surfaces should be wiped down daily to keep them rust-free and in top condition. This includes the top of the saddle, the cross slide, compound slide, tool post, chuck, feedrod, and any other surface you can find that could be vulnerable to rust if left unprotected (this especially includes any parts that may be exposed to water soluble cutting fluids). Typically with these parts, a thin film of oil is all that is necessary for protection.

Ball Oilers

Proper lubrication of ball oilers is done with a pump-type oil can that has a plastic or rubberized cone tip. We do not recommend using metal needle or lance tips, as they can push the ball too far into the oiler, break the spring seat, and lodge the ball in the oil galley.

Lubricate the ball oilers before and after machine use, and more frequently under heavy use. When lubricating ball oilers, first clean the outside surface to remove any dust or grime. Push the rubber or plastic tip of the oil can nozzle against the ball oiler to create a hydraulic seal, then pump the oil can once or twice. If you see sludge and contaminants coming out of the lubrication area, keep pumping the oil can until the oil runs clear. When finished, wipe away any excess oil. (Figure 69 - 70)

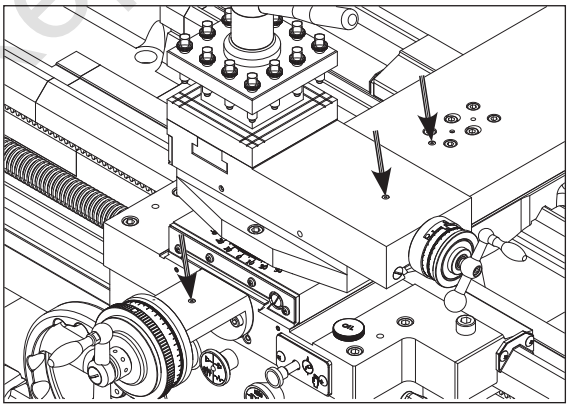

Figure 69. Carriage ball oiler .

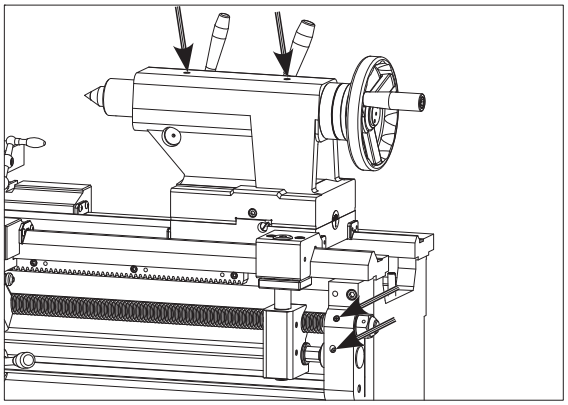

Figure 70. Tailstock and Leadscrew end ball oiler.

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End Gearing

The end gears, shown in Figure 71, should always have a thin coat of heavy grease to reduce the minimize/prevent corrosion, noise, and wear. Care must be taken to avoid over-greasing because excess grease may be flung onto the V-belts, which will reduce optimal power transmission from the motor.

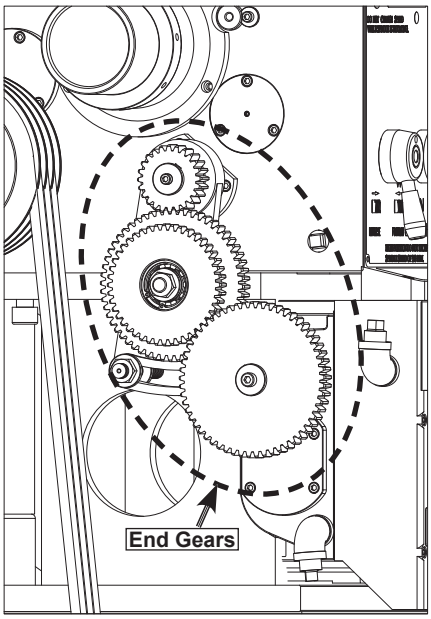

Figure 71. Location of end gears that require grease.

Handling & Care

Make sure to clean and lubricate any gears you install or swap. Unless you are very careful during handling and storage, the coating of grease on the gears will easily pickup dirt or debris, which can then spread to the other gears and increase the rate of wear.

Make sure to the cover remains installed whenever possible to keep the gears free of dust or debris from the outside environment.

Lubricating

1. Disconnect Lathe from POWER !

2. Remove the headstock side cover and all the end gears.

3. Clean the end gears thoroughly in mineral oil to remove all the old grease. Use a small brush if necessary to clean between the teeth.

4. Clean the shafts from which the end gears were removed, and wipe up any old grease splatters in the vicinity and on the inside of the headstock cover.

5. With clean hands, apply a thin layer of grease on both sides of the gears. Make sure to get grease between the gear teeth, but not so much that it fills the voids between the teeth.

6. Install the end gears and mesh them together with an approximate backlash of 0.127mm. Once the gears are meshed together, apply a small dab of grease in the crux of where the gears mesh together—this grease will spread around when the gears start moving and re-coat any areas scraped off during installation.

Annual Maintenance

Once a year, remove all the end gears, clean them thoroughly, and apply a new coating of grease. Even if the headstock side cover has been kept in place throughout the year, it is still possible for dust from the V-belts to build-up in the grease, and the grease may also start to break down with extended or heavy use.

Cutting Fluid System

The cutting fluid system consists of a fluid tank, pump, and flexible nozzle. The pump pulls fluid from the tank and sends it to the valve, which controls the flow of cutting fluid to the work area. When the valve is opened or closed, the fluid comes out of the nozzle and drains through the chip drawer and into the catch tray and then into the tank where it is picked up again by the pump. Figure 72 shows many of these components and their locations.

Although most swarf from machining operations falls into the chip tray and stays there, some small chips drain into the tank. The pump uses a screen to prevent it from picking up the small swarf that ends up in the tank.

Since the swarf is spread throughout the coolant system, cleaning the system on a regular basis is a requirement to maintain the life of the pump.

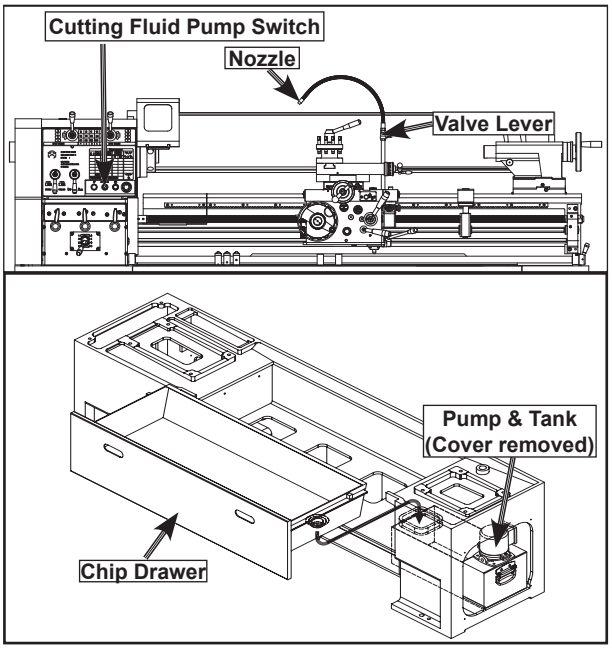

Figure 72. Cutting fluid system components and locations.

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Hazards

As some cutting fluid ages, dangerous microbes can proliferate and create a biological hazard.
The risk of exposure to this hazard can be greatly reduced by replacing the old cutting fluid on a monthly basis, as indicated in the maintenance schedule.
The important thing to keep in mind when working with the cutting fluid is to minimize exposure to your skin, eyes, and respiratory system by wearing the proper PPE (personal protective equipment), such as splash-resistant safety glasses, long-sleeve gloves, protective clothing, and a NIOSH approved respirator.

Adding Fluid

1. Disconnect Lathe from POWER !

2. Remove the vented cover and slide the tank out, as shown in Figure 73.

3. Pour cutting fluid in the tank until it is nearly full.

4. Slide the tank back into the base and replace the vented cover.

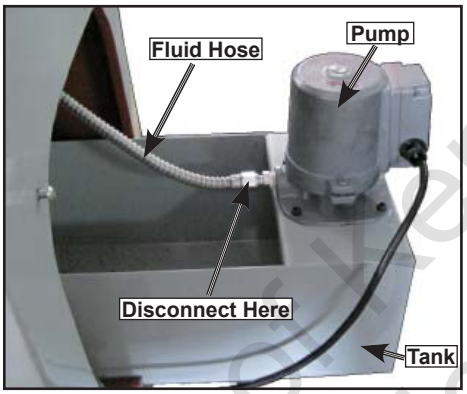

Figure 73. Cutting fluid pump and tank.

Changing Cutting Fluid

When you replace the old cutting fluid, take the time to thoroughly clean out the chip drawer, catch tray, and chip tray while you are at it. The entire job only takes about a 1⁄2 hour when you are prepared with the proper materials and tools.

To change the cutting fluid :

1. Position the coolant nozzle over the splash guard, so it is pointing behind the lathe. If you have the optional hose, connect it to the end of the coolant nozzle now.

2. Place the 5-gallon bucket behind the lathe and underneath the coolant nozzle. If you have the optional hose, place the hose in the bucket. Otherwise, you may need to hold the bucket up to the coolant nozzle to prevent coolant from splashing outside of the bucket.

3. Turn cutting fluid the pump ON (or have another person turn it ON if you are holding the bucket), and pump the old cutting fluid out of the tank. Turn the pump OFF immediately after fluid stops flowing.

4. Disconnect Lathe from POWER !

5. Remove the vented cover and slide the tank half way out of the base, as shown in Figure 73.

If necessary, disconnect the fluid hose from the pump, where shown in Figure 73.

6. Pour out the old cutting fluid into your 5-gallon bucket and close the lid.

7. Flush the tank with hot soapy water, making sure the intake screen at the bottom of the pump intake pipe (inside the tank) is clean, and wipe up any remaining fluid residue.

8. Slide the tank partially into the base and reconnect the fluid hose.

9. Refill the tank with new cutting fluid, then slide the tank completely into the base.

10. Connect Lathe to power.

11. Open the valve on the cutting fluid nozzle.

12. Turn the cutting fluid pump ON to verify that fluid cycles properly, then turn it OFF.

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Machine Storage

If the machine is not properly prepared for storage, it may develop rust or corrosion. If decommissioning this machine, use the steps in this section to ensure that it remains in good condition for later use.

To prepare your machine for short-term storage (up to a year) :

1. Pump out the old cutting fluid, and flush the lines and tank.

2. Disconnect Lathe from POWER !

3. Thoroughly clean all unpainted, bare metal surfaces, then apply a liberal coat of way oil.

4. Lubricate the machine as outlined in the lubrication section.

5. Cover and place the machine in a dry area that is out of direct sunlight and away from hazardous fumes, paint, solvents, or gas. Fumes and sunlight can bleach or discolor paint and make plastic guards cloudy.

6. Once or twice a month, depending on the ambient humidity levels in the storage environment, wipe down the machine as outlined in Step 3.

7. Every few months, start the machine and run all gear-driven components for a few minutes. This will keep the bearings, bushings, gears, and shafts well lubricated and protected from corrosion, especially during the winter months.

To prepare your machine for long-term storage (a year or more) :

1. If the machine has oil-lubricated gearboxes, bring the machine to operating temperature and drain and refill the all gearboxes with fresh oil.

2. Pump out the old cutting fluid, and flush the lines and tank.

3. Disconnect Lathe from POWER !

4. Thoroughly clean all unpainted, bare metal surfaces, then apply a liberal coat of way oil, a heavy grease, or rust preventative. Take care to ensure these surfaces are completely covered but that the rust preventative or grease is kept off of painted surfaces.

5. Lubricate the machine as outlined in the lubrication section.

6. Loosen or remove machine belts so they do not become stretched during the storage period. Be sure to also affix a maintenance note on the machine as a reminder that the belts have been loosened or removed.

7. Place a few moisture absorbing desiccant packs inside of the electrical box.

8. Cover and place the machine in a dry area that is out of direct sunlight and away from hazardous fumes, paint, solvents, or gas. Fumes and sunlight can bleach or discolor paint and make plastic guards cloudy.

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Section 5 : Service

Backlash Adjustment

Compound Leadscrew

Backlash is adjusted by tightening the set screws shown in Figure 74. When these screws are adjusted against the leadscrew nut, they offset part of the half nut to remove play between the nut and leadscrew.

If you end up adjusting the half nut too tight, loosen the set screws, tap the compound a few times with a rubber or wooden mallet, and turn the handle slowly back and forth until it moves freely.

To readjust the backlash, rock the handle back and forth, and tighten the screws slowly until the backlash is at approximately 0.025mm as indicated on the handwheel dial.

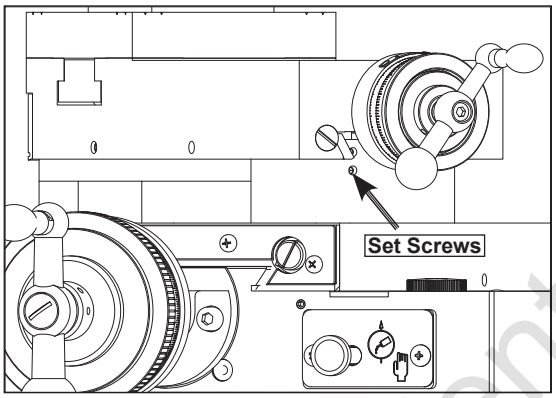

Figure 74. Compound slide backlash adjustment set screws.

Cross Slide Leadscrew

Backlash can be felt by turning the cross slide handwheel in one direction, then turning the handwheel the other direction, then noticing the amount the handwheel moves while the cross slide does not. When the cross slide begins to move, the backlash has been taken up.

Backlash is adjusted by loosening all four cap screws shown in Figure 75, and then tightening the center set screw, which pushes down on a wedge and forces the half nut apart, taking up lash in the half nut and leadscrew. If you end up adjusting the half nut too tight, loosen the set screw, tap the cross slide a few times with a rubber or wooden mallet, and turn the handle slowly back-and-forth, until the handle turns freely.

To re-adjust the backlash, rock the handle back and forth and tighten the set screw slowly until the backlash is at approximately 0.025mm as indicated on the handwheel dial.

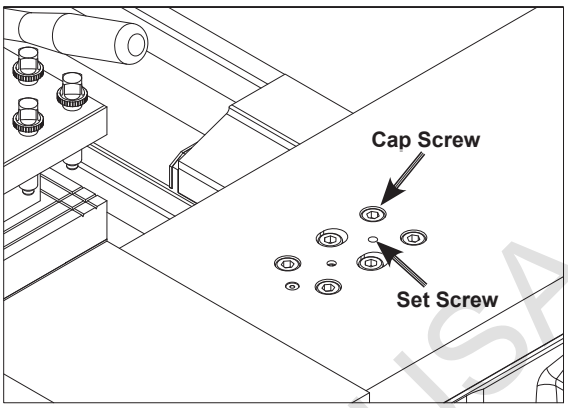

Figure 75. Cross slide backlash adjustment screws.

Leadscrew End Play Adjustment

After a long period of time, you may find that the leadscrew develops a small amount of end play. This lathe is designed so that leadscrew end play can be easily removed with adjustment.

To remove leadscrew end play :

1. Disconnect Lathe from POWER !
2. Remove the two cap screws and end cover.
3. Loosen both retaining nut set screws shown in Figure 76.

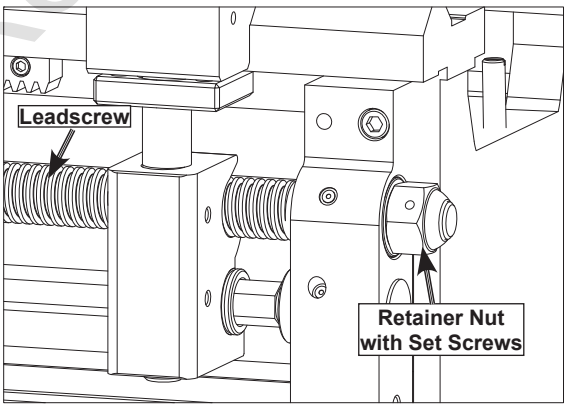

Figure 76. Leadscrew end play adjustment.

4. Engage the half nut lever.
5. Rotate the carriage feed handwheel back and forth slightly and tighten the retaining nut at the same until the end play is removed.
6. Tighten both set screws and reinstall the cover.

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Gib Adjustment

The goal of adjusting the cross slide, tailstock, saddle, and compound gib screws is to remove sloppiness in the ways without over-adjusting them to the point where the slides become stiff and difficult to move.

In general, loose gibs cause poor finishes and tool chatter; however, over-tightened gibs cause premature wear on the slide, leadscrew, and half nut, and are difficult to operate.

The gibs have a tapered shape and are held in position by screws at opposing ends of the slide. When the opposing screws are turned in the opposite directions from each other, the taper fills the void between the sliding components.

The gib adjustment process usually requires some trial-and-error. Typically, you make a slight adjustment to the gib screw, then check the feel of the adjustment by turning the handwheel.

You then repeat this process as necessary until you find the best balance between loose and stiff movement. Most machinists find that the ideal gib adjustment is where a small amount of drag or resistance is present yet the handwheels are still easy to move.

Figures 77 – 79 show the location of the screws for each gib on this machine.

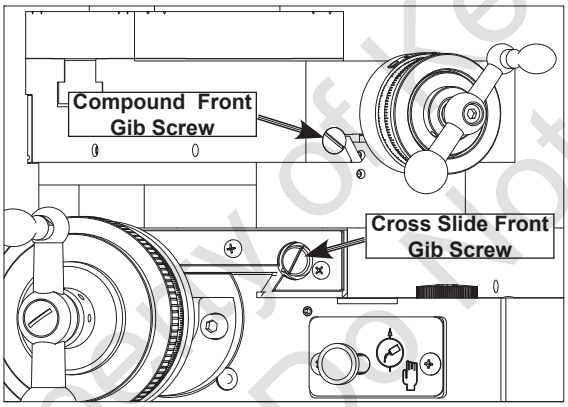

Figure 77. Compound and cross slide gib screw.

Figure 78. One of two front saddle gib screws.

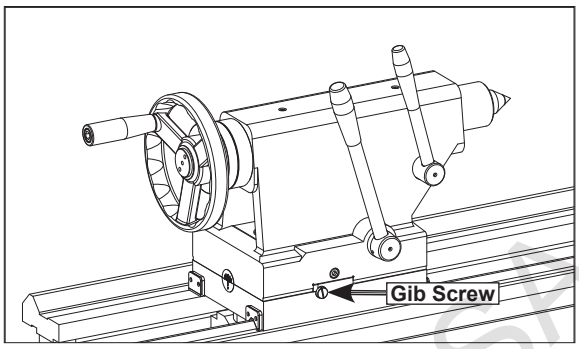

Figure 79. One of two tailstock gib screws.

V-Belts

V-belts stretch and wear with use, so they should be checked on a monthly basis to ensure optimal power transmission. Replace all the V-belts if any of them show signs of glazing, fraying, or cracking.

To adjust or replace the V-belts on the lathe :

1. Disconnect Lathe from POWER !

2. Remove the cover.

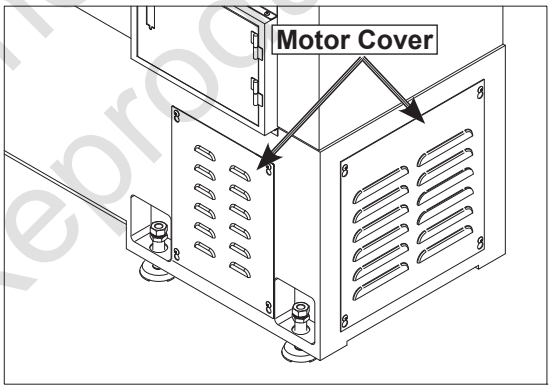

Figure 80. Location of motor cover.

3. Turn the hex nuts on the motor mount bolts shown in Figure 81 to move the motor mount plate up or down and adjust the V-belt tension. When correctly tensioned, each belt should have about 19mm deflection when pressed firmly.

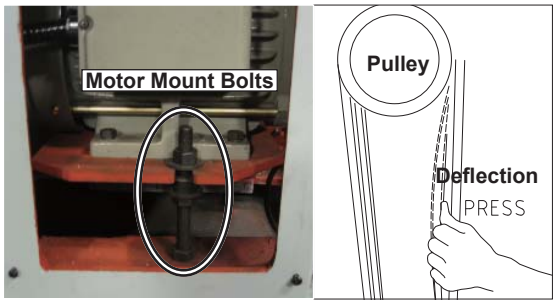

Figure 81. V-belt adjustment.

4. Firmly tighten the hex nuts (loosened in the previous step) against the motor mount plate to prevent it from moving out of adjustment during operation, then reinstall the motor cover.

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Brake & Switch

As the brake lining wears, the foot pedal develops more travel. If the brake band is not adjusted to compensate for normal wear, the limit switch will still turn the lathe off, but the spindle will not stop as quickly. It is especially important that the brake is kept properly adjusted so you can quickly stop the spindle in an emergency.

To adjust the brake and brake switch :

1. Disconnect Lathe from POWER !

2. Put on a respirator and eye protection to protect yourself from hazardous brake dust.

3. Remove the motor cover.

4. Measure the remaining brake band lining at the thinnest point, which is usually at the 8 o'clock position, as shown in Figure 82.

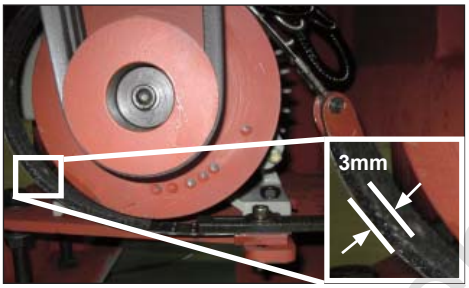

Figure 82. Minimum brake band lining thickness.

When the brake band is new, the lining is approximately 6mm thick. If the lining thickness wears to 3mm or less, the brake band must be replaced; otherwise, the rivets that secure the lining to the band will soon grind into the brake hub. If the hub becomes damaged, it must be replaced, which will substantially increase the cost of repair, compared to just replacing the brake band.

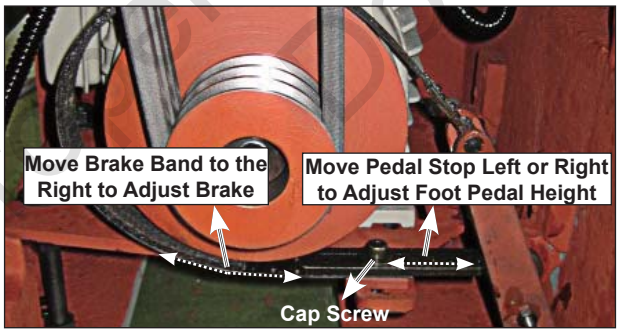

Figure 83. Brake linkage adjustments.

5. Remove pedal stop shown in Figure 84.

6. Move the brake band to the right one hole, and reinstall the pedal stop, tightening it until it is just snug.

7. Firmly push the pedal lever to the right until it stops and the brake band is fully clamped around the brake hub.

8. Tap the pedal stop into position so there is approximately a 25mm gap between the pedal lever and the stop.

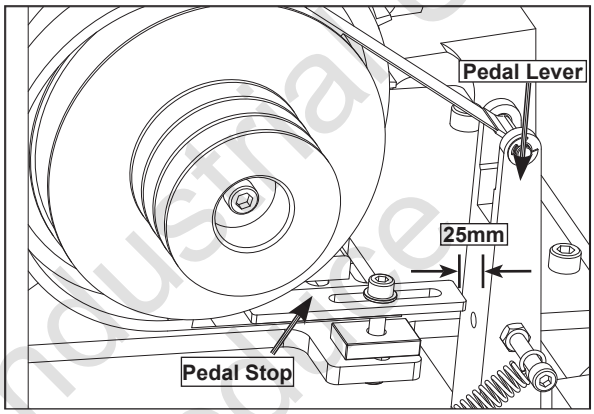

Figure 84. Pedal travel adjustment.

9. Tighten the cap screw on the pedal stop.

10. Locate the motor kill switch (Figure 85) at the tailstock end of the lathe.

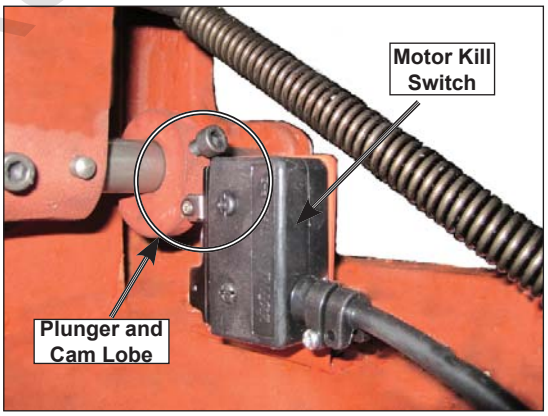

Figure 85. Motor kill switch.

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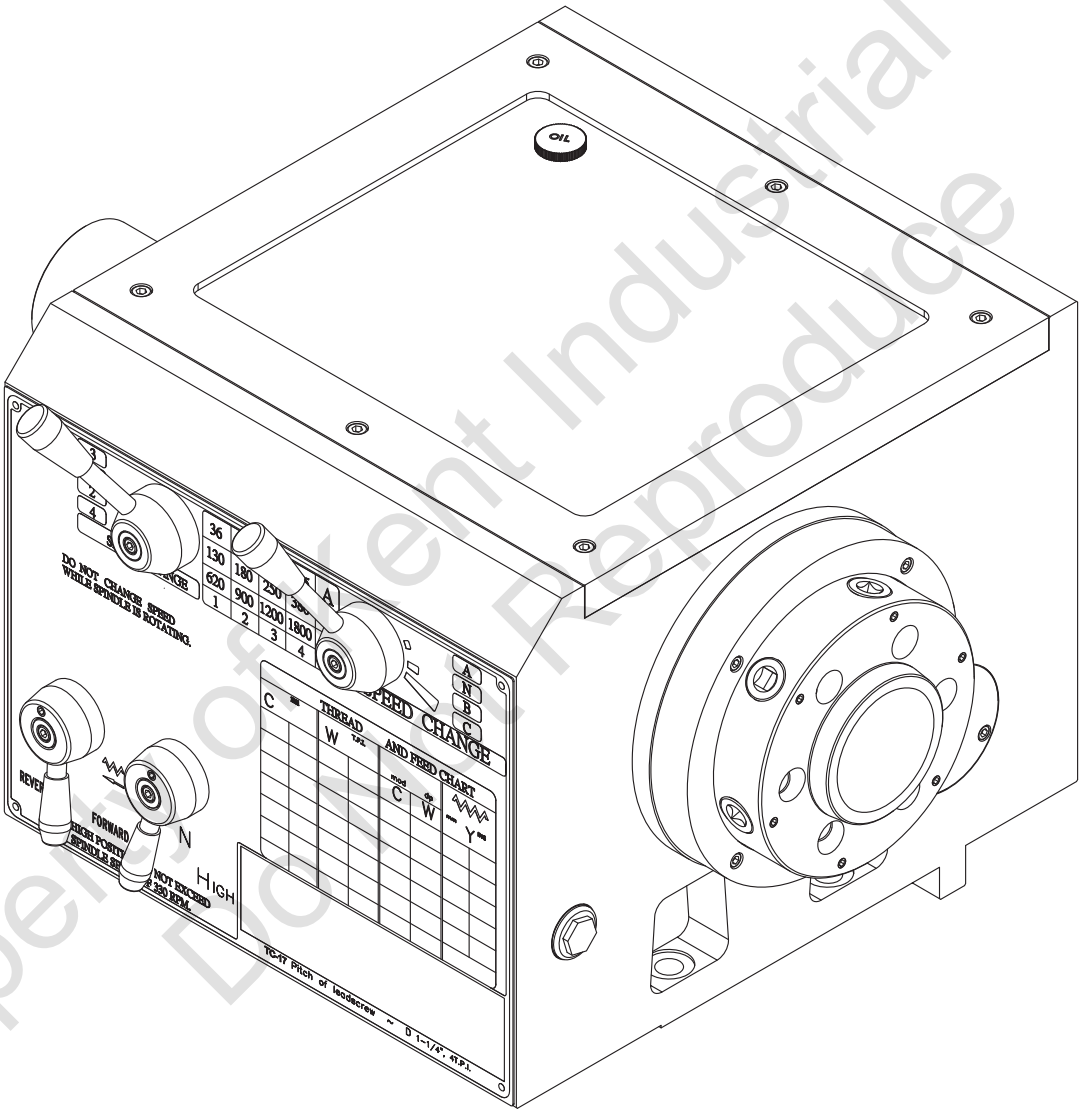
Section 6 : Parts

Headstock



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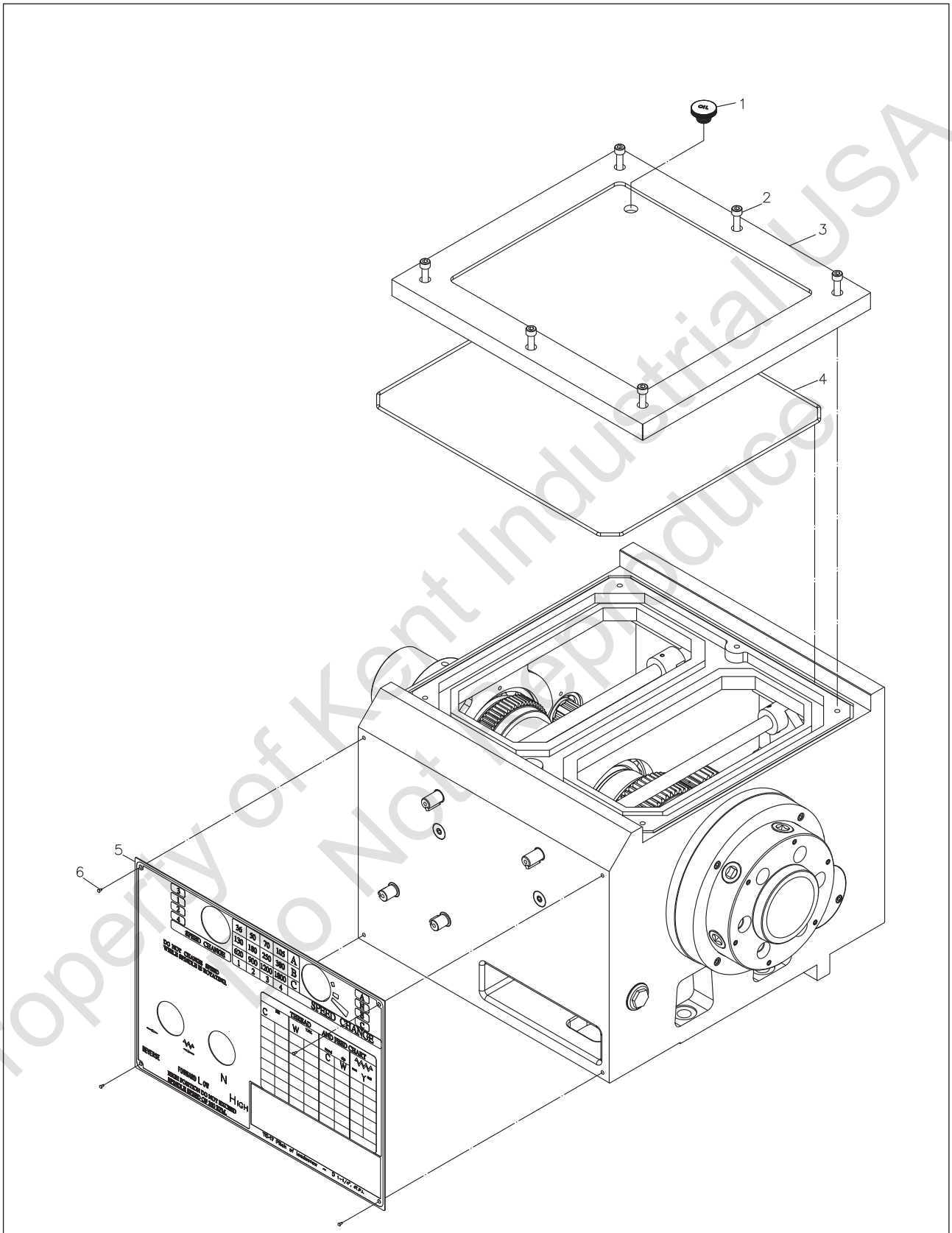

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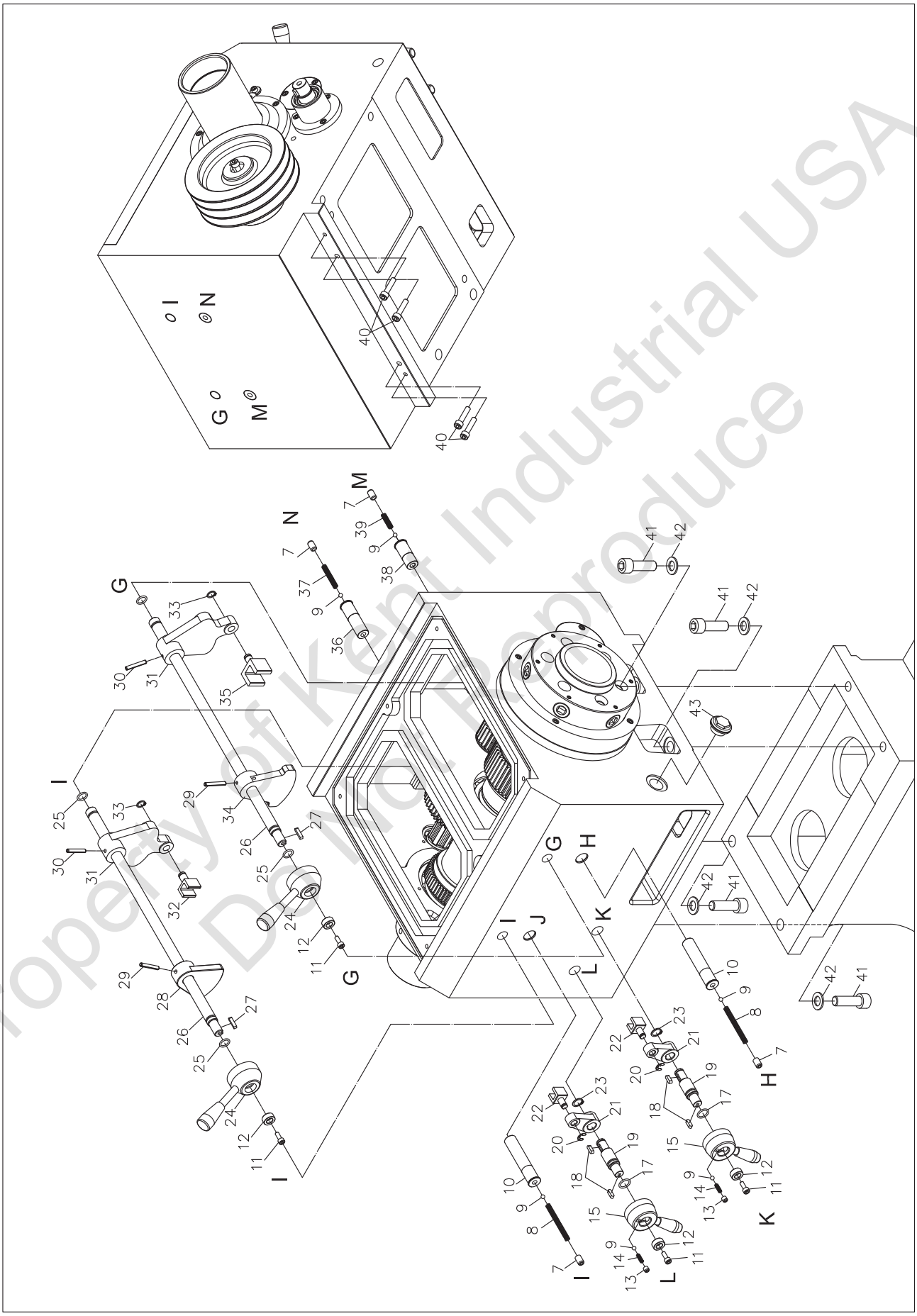

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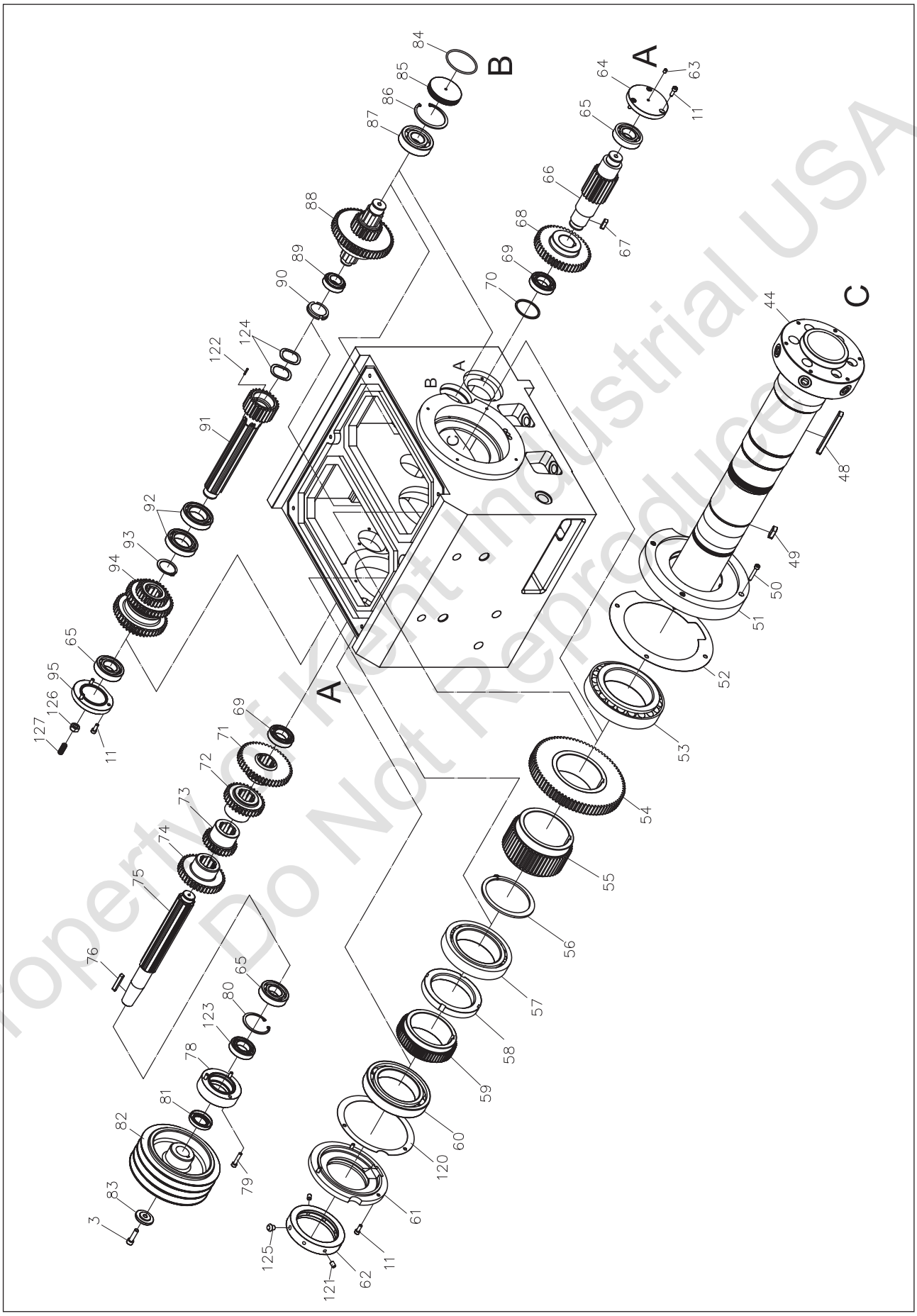

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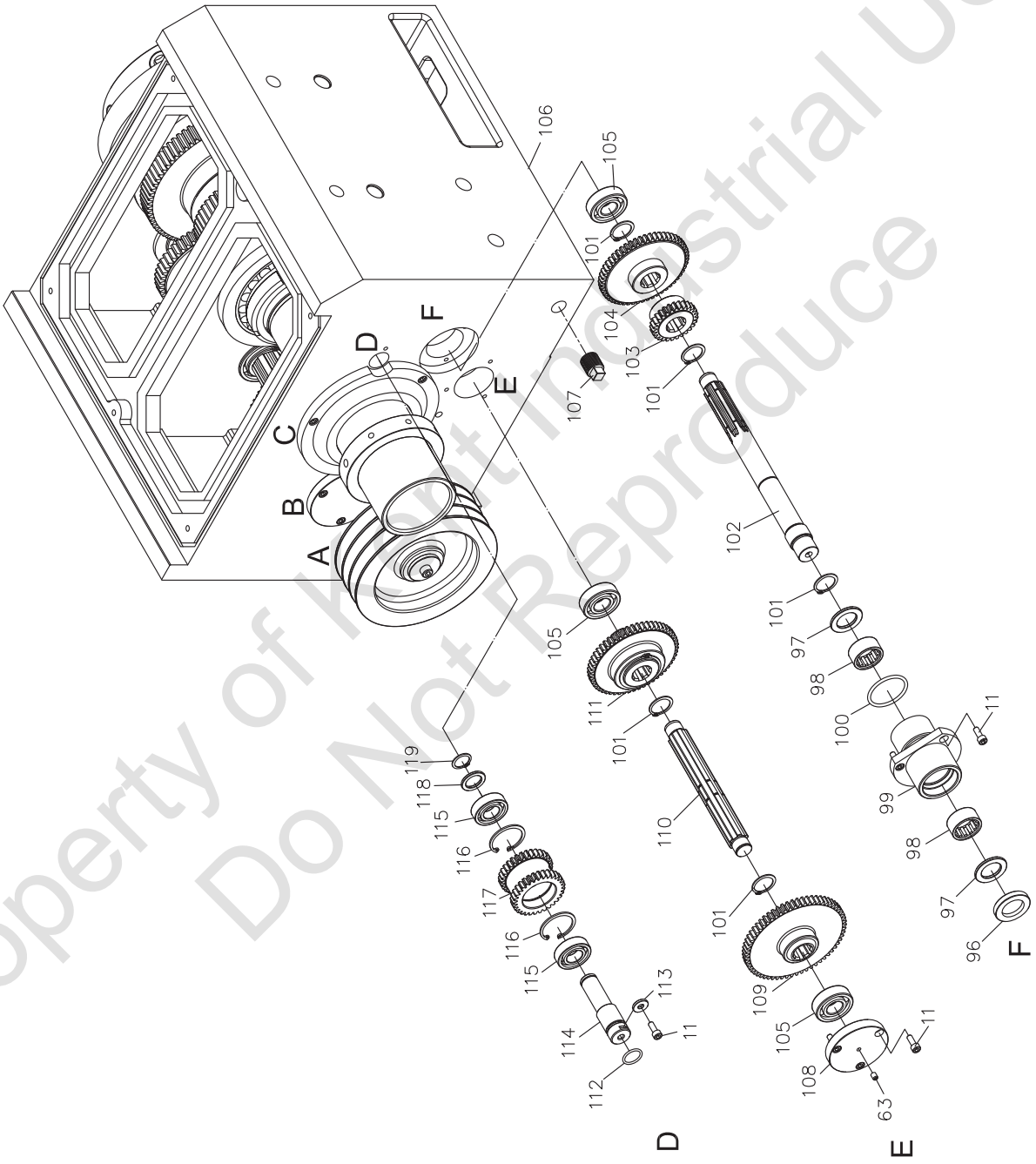

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Headstock

No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1		Oil Cover	1	3/4"	43		Oil sight	1	3/4"
2		Hex. socket head bolt	7	CAP 8x30	44	10069-D6	Set screw	6	
3	10002	Headstock cover	1			10003-D6	Spindle	1	
4		O ring	1	Ø4x1800		10070-D6	Spring	6	
5	17-61001-6	Name plate	1	194		10068-D6	Cams	6	
	20-61001-6			195					
6		Rivet	4	Ø2					
7		Set screw	4	SET 10x16	48		Key	1	12x8x120L
8	10082	Spring	2		49		Key	1	12x8x30L
9		Steel ball	6	Ø1/4"	50		Hex. socket head bolt	3	CAP 6x35
10	10049	Bush	2		51	10038-D1	Front bearing cover	1	
11		Hex. socket head bolt	20	CAP 6x16	52	10038-P	Washer	1	
12	10045	Washer	4		53		Taper roller bearing	1	32022X
13		Set screw	2	SET 8x8	54	10019	Gear	1	82T
14	10081	Spring	2		55	10020	Gear	1	53T
15	10053	Hub	2		56		Clip	1	S105
	10054	Handle	2		57		Taper roller bearing	1	32020X
		Spring pin	2	Ø3x25	58		Nut	1	YSR100
					59	10021	Gear	1	62T
17		O ring	2	P16	60		Ball bearing	1	6019
18		Key	4	5x5x16L	61	10040	Outside cover	1	
19	10055	Shaft	2		62	10064	Balance ring	1	
20		Clip	2	E8	63		Set screw	2	SET 6x8
21	10056	Lever	2		64	10035	Cover	1	
22	10057	Fork	2		65		Ball bearing	3	6206
23		Clip	2	S15	66	10014	Gear shaft	1	20T
24	10043	Hub	2		67		Key	2	8x7x25L
	10044	Handle	2		68	10015	Gear	1	47T
		Spring pin	2	Ø3x25	69		Ball bearing	2	6006
25		O ring	4	P14	70	10065	Collar	1	
26	10046	Rod	2		71	10008	Gear	1	46T
27		Key	2	5x5x22L	72	10007	Gear	1	33T
28	10047	Lever	1		73	10006	Gear	1	27T
29		Spring pin	2	Ø6x36	74	10005	Gear	1	39T
30		Spring pin	2	Ø6x40	75	10004	Shaft	1	
31	10050	Lever	2		76		Key	1	7x7x45L
32	10051	Fork	1						
33		Clip	2	S12	78	10033	Flanged bearing	1	
34	10048	Lever	1		79		Hex. socket head bolt	3	CAP 6x30
35	10052	Lever	1		80		Clip	1	R58
36	10066	Bush	1		81		Oil seal	1	TC30x50x8
37	10083	Spring	1		82	10031	Pulley	1	
38	10067	Bush	1		83	10032	Washer	1	
39	10084	Spring	1		84		O ring	1	G65
40		Hex. socket head bolt	4	CAP 8x35	85	10037	Plug	1	
41		Hex. socket head bolt	4	CAP 16x50	86		Clip	1	R72
42		Washer	4	M16	87		Ball bearing	1	6306

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Headstock

No.	Part No.	Part's name	QTY	REMARK
88	10017	Gear	1	23T
	10018	Gear	1	25T/52T
		Key	2	8x7x25
		Clip	1	S50
	10016	Shaft	1	
89		Taper roller bearing	1	32005XJ
90	10036	Washer	1	
91	10009	Gear shaft	1	25T
92		Ball bearing	2	6008
93		Clip	1	S38
94	10010	Gear	1	26T
	10011	Gear	1	39T
	10012	Gear	1	45T
	10013	Gear	1	33T
		Key	1	8x7x70
		Clip	1	S55
95	10034	Cover	1	
96		Oil seal	1	TC28x44x7
97	10060	Washer	2	
98		Needle bearing	2	RNA6904
99	10042	Flanged bearing	1	
100		O ring	1	P44
101		Clip	5	R25
102	10028	Shaft	1	
103	10029	Gear	1	27T
104	10030	Gear	1	54T
105		Ball bearing	3	6204
106	17-10001	Head stock	1	
	20-10001			
107		Square head plug	1	PT 1/2"
108	10041	Cover	1	
109	10025	Gear	1	62T
110	10024	Shaft	1	
111	10026	Gear	1	27T
	10027	Gear	1	54T
		Key	1	7x7x20
		Clip	1	S45
112		O ring	1	P20
113	10058	Washer	1	
114	10022	Shaft	1	
115		Ball bearing	2	6004
116		Clip	2	R42
117	10023	Gear	1	31T
118	10059	Washer	1	
119		Clip	1	S20
120	10040-P	Washer	1	
121		Set screw	3	SET 8x12
122		Pin	2	Ø3x16
123		Ball bearing	1	6006LU
124		Spring washer	2	
125	10077-V	Minor Tip	1	
126		Nut	1	M10
127		Set Screw	1	SET10x20

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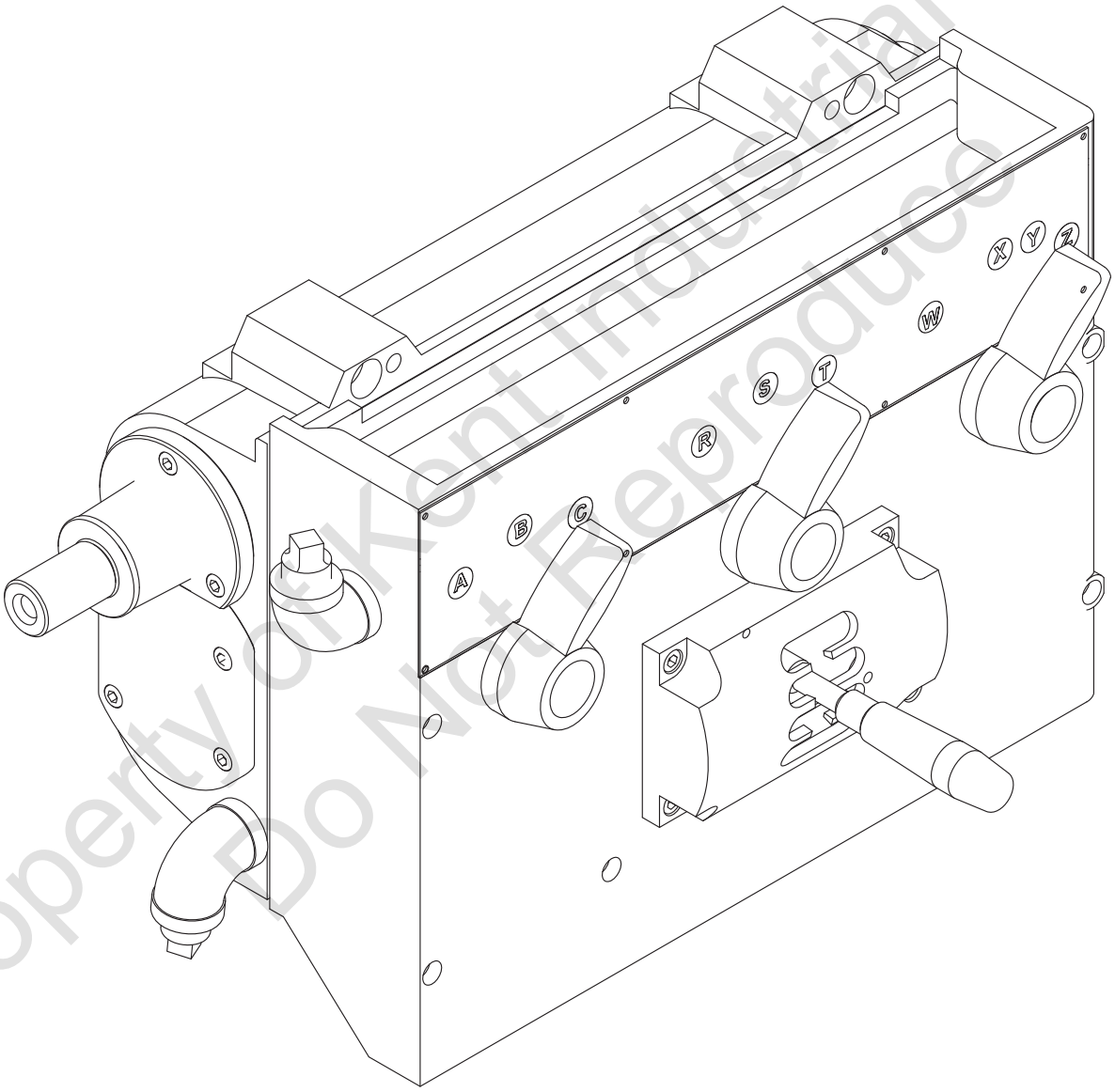
Gearbox



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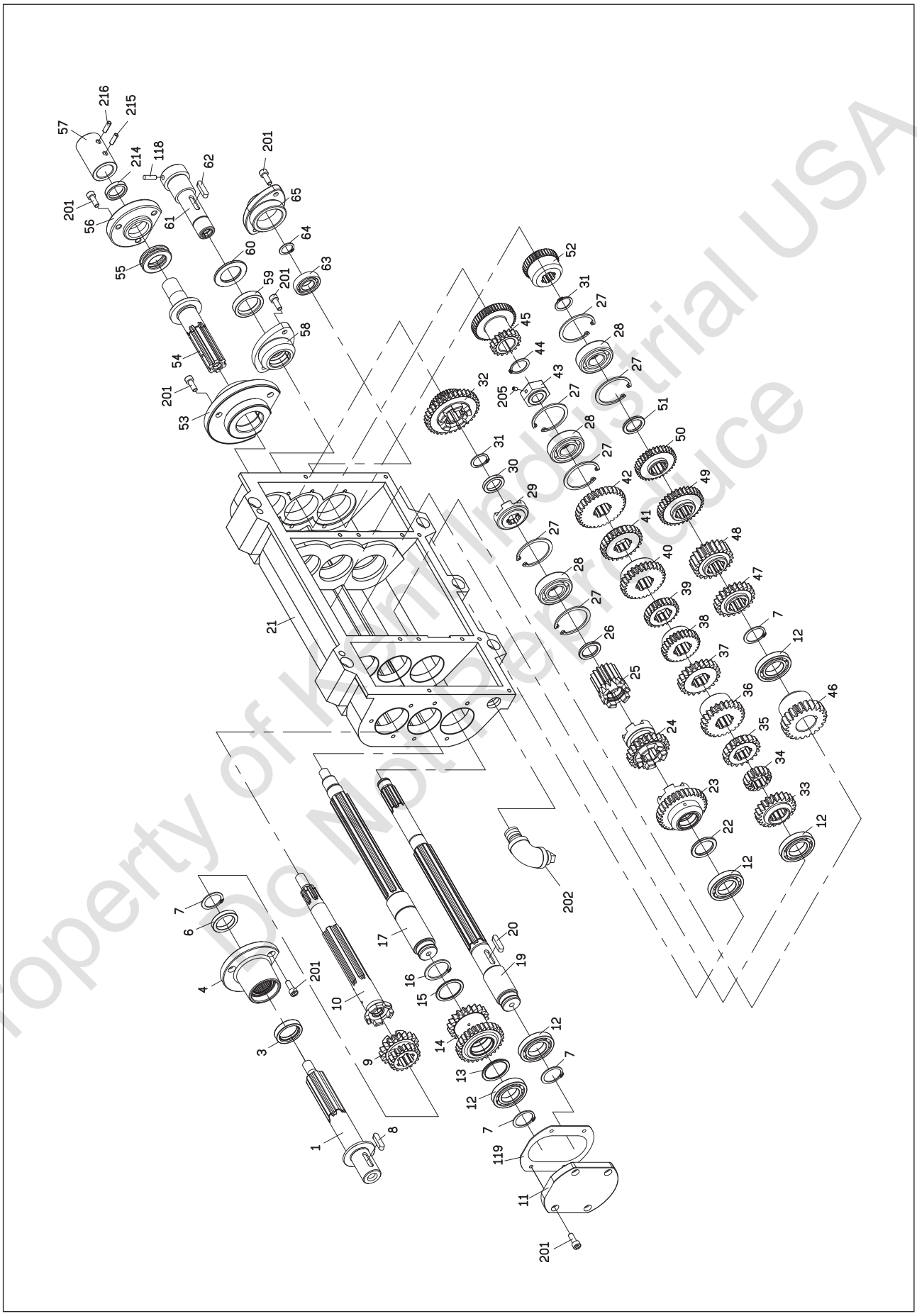
Gearbox



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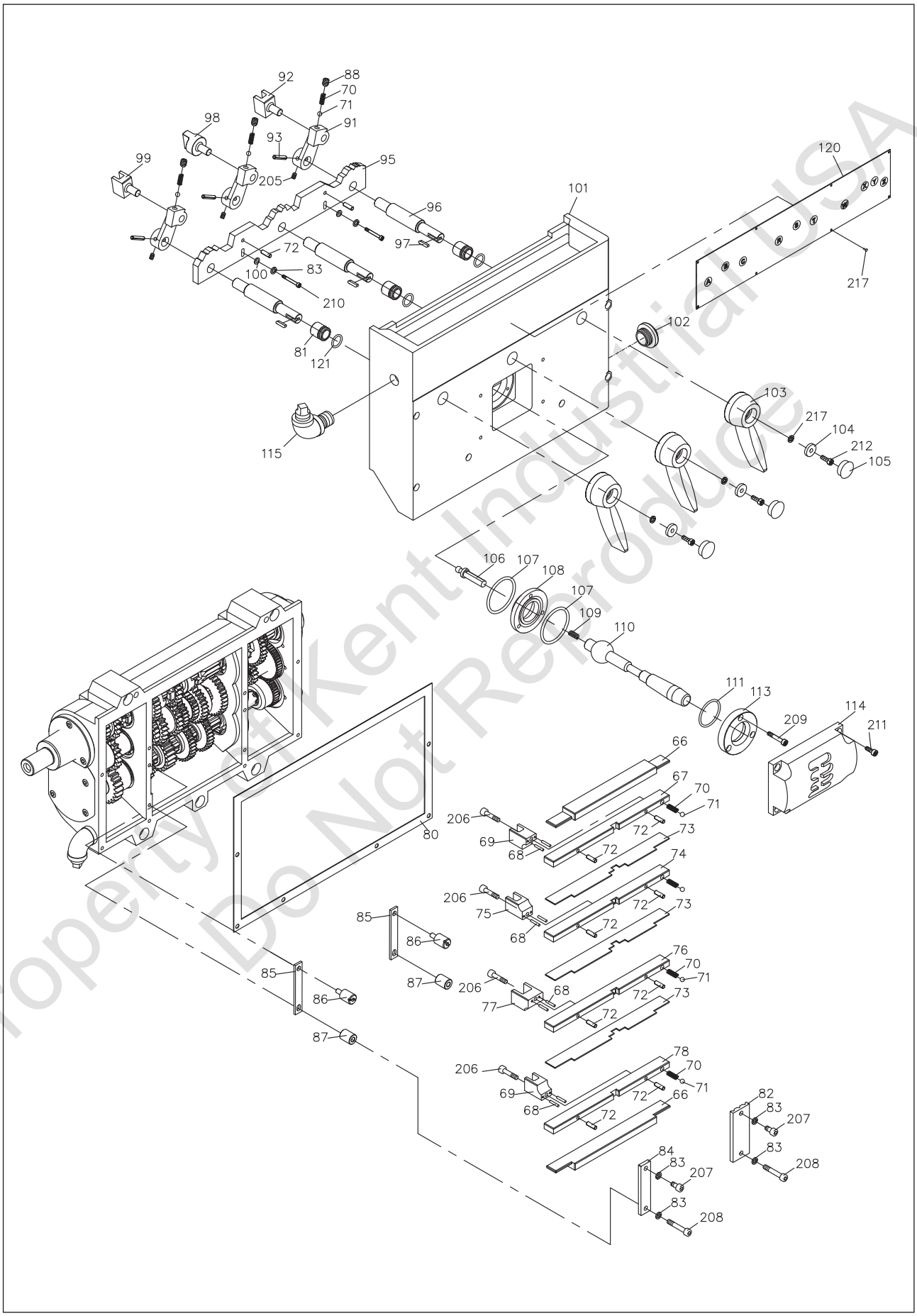
Gearbox



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Gearbox

No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	30003	Shaft	1		48	30042	Gear	1	22T
					49	30043	Gear	1	33T
3		Oil seal	1	25x37x08	50	30044	Gear	1	22T
4		Bearing	2	TAF25/20	51	30005	Washer	1	
	30004	Flanged bearing	1		52	30045	Gear	1	36T
	30004-1	Washer	1		53	30020	Flanged bearing	1	
6	30019	Washer	1		54	30016	Shaft	1	
7		Clip	4	S25	55		Bearing	1	51105
8		Key	1	7x7x30	56	30018	Flanged bearing	1	
9	30006	Gear	1	19T/19T	57	63006	Sleeve	1	
10	30007	Shaft	1		58	30038	Flanged bearing	1	
11	30021	Cover	1		59		Oil seal	1	28x40x05
12		Bearing	5	16005	60	30090	Washer	1	
13	30013	Washer	1		61	30036	Shaft	1	
14	30023	Gear	1	30T/20T	62		Key	1	5x5x35
15	30024	Washer	1		63		Bearing	1	16003
16		Clip	1	S30	64		Clip	1	S17
17	30022	Shaft	1		65	30046	Flanged bearing	1	
					66	30059	Upper plate	2	
19	30039	Shaft	1		67	30060	Fort support	1	
20		Key	1	6x6x25	68		Spring pin	8	Ø3×16
21	30001	Gearbox body	1		69	30058	Fork	2	
22	30008	Washer	1		70		Spring	7	Ø4×19
23	30009	Gear	1	32T	71		Steel ball	7	1/4"
24	30010	Gear	1	23T	72		Spring pin	10	Ø5x16
25	30011	Gear	1	16T	73	30061	Partition	3	
26	30012	Washer	1		74	30062	Fort support	1	
27		Clip	6	R47	75	30056	Fork	1	
28		Bearing	3	6204	76	30063	Fort support	1	
29	30014	Clutch	1		77	30057	Fork	1	
30	30015	Washer	1		78	30064	Fort support	1	
31		Clip	2	S20					
32	30017	Gear	1	35T	80	30002-P	Washer	1	
33	30025	Gear	1	22T	81	30054	Spacer	3	
34	30026	Gear	1	16T	82	30069	Reverse-stop	1	
35	30027	Gear	1	20T	83		Spring washer	6	M6
36	30028	Gear	1	24T	84	13-30086	Shoulder plate	1	
37	30029	Gear	1	23T	85	30065	Fixed plate	2	
38	30030	Gear	1	27T	86	13-30084	Partition nut	2	
39	30031	Gear	1	24T	87	13-30085	Spacer	2	
40	30032	Gear	1	28T	88		Set screw	3	SET 8x8
41	30033	Gear	1	26T					
42	30034	Gear	1	32T					
43	30035	Nut	1		91	30051	Lever	3	
44		Clip	1	S22	92	30050	Fork	1	
45	30037	Gear	1	18T/45T	93		Spring pin	3	4x24
46	30040	Gear	1	22T					
47	30041	Gear	1	22T	95	30055	Selector bar	1	

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Gearbox

No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
96	30053	Shaft	3						
97		Key	3	4x4x15					
98	30049	Fork	1						
99	30048	Fork	1						
100		Washer	2	M6					
101	30002	Gearbox cover	1						
102		Oil sight	1						
103	30077	Handle	3						
104		Washer	3						
105	30086	Plug	3						
106	13-30088	Selector lever	1						
107		O ring	2	G40					
108	13-30066	Selector lever support	1						
109	30072	Spring	1	9x38					
110	30074	Selector lever	1						
111		O ring	1	G30					
113	13-30067	Selector lever cover	1						
114	30076	Specifying base	1						
115		Square head plug	1	3/4"					
		Elbow	1	3/4"					
		Nipple	1	3/4"x1"					
118		Pin	1	Ø6×36					
119	30021-P	Washer	1						
120	30103	Plate	1						
121		O ring	3	P16					
201		Hex. socket head bolt	17	CAP 6x16					
202		Square head plug	1	1/2"					
		Elbow	1	1/2"					
		Nipple	1	1/2"x1"					
205		Set screw	4	SET 6x6					
206		Hex. socket head bolt	4	CAP 5x20					
207		Hex. socket head bolt	5	CAP 6x16					
208		Hex. socket head bolt	2	CAP 6x40					
209		Hex. socket head bolt	3	CAP 6x25					
210		Hex. socket head bolt	2	CAP 6x20					
211		Hex. socket head bolt	4	CAP 6x12					
212		Hex. socket head bolt	3	CAP 5x12					
214		Oil seal	1	24x35x08					
215		Pin	1	#4×32					
216		Pin	1	#4×32					
217		Rivet	8	Ø2					

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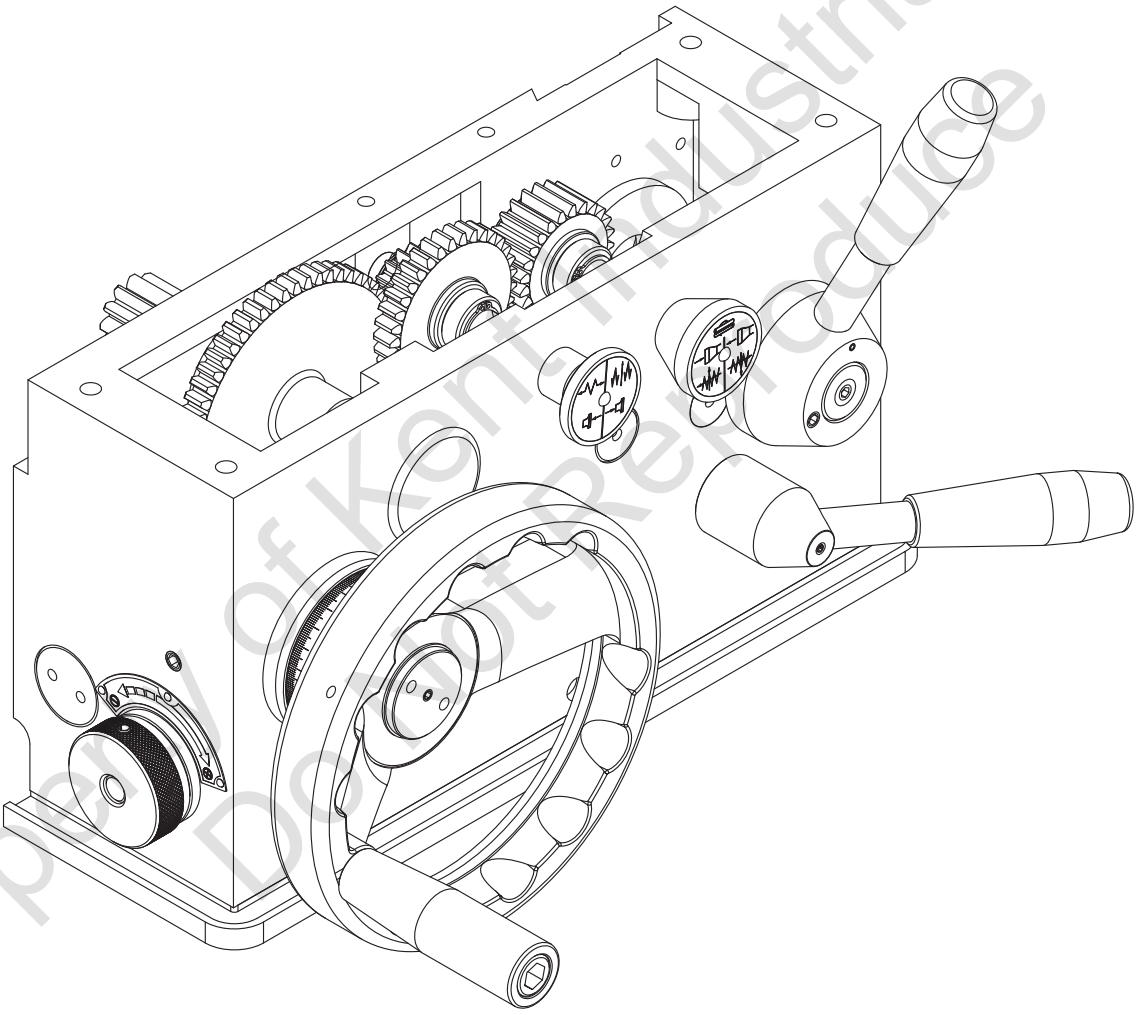
Apron



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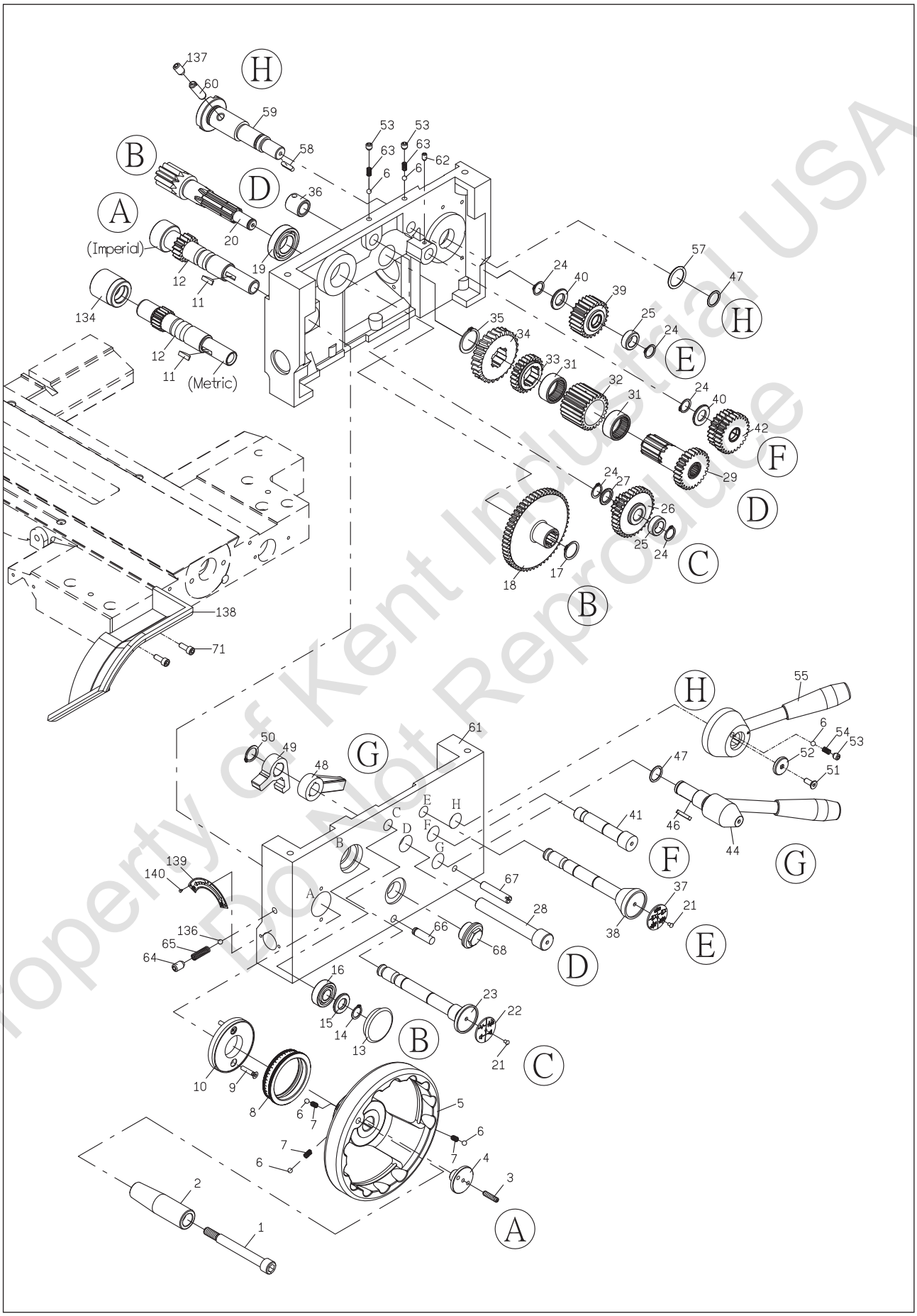

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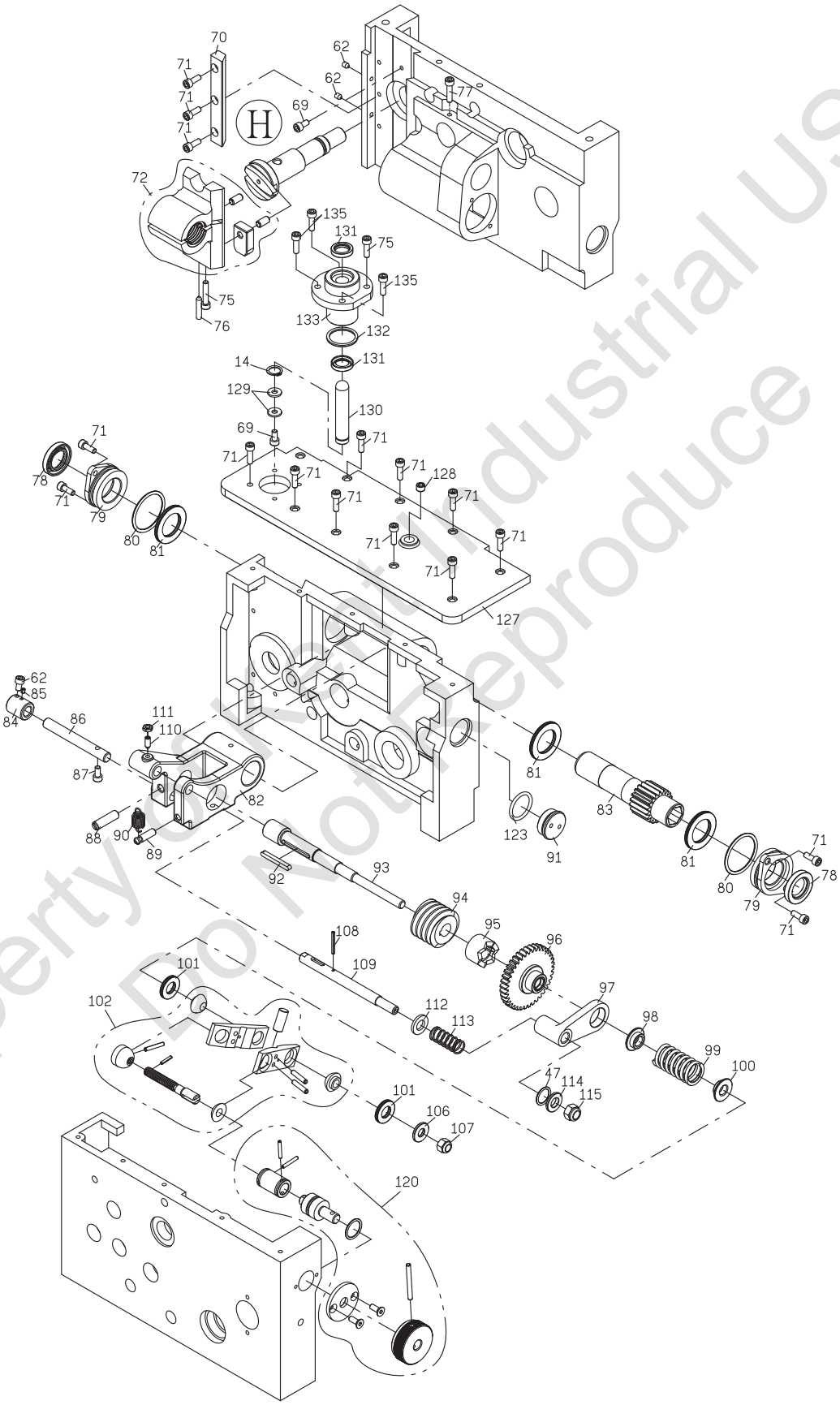

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Apron

No.	Part No.	Part's name	QTY	REMARK
1	40012	Screw	1	
2	40011	Handle	1	
3		Set screw	1	SET 6×25
4	40014	Bolt	1	
5	40010-L	Hand wheell	1	
	40010-R			
6		Steel ball	6	1/4"
7	40004	Spring	3	
8	40007-I	Index ring	1	
	40007-M			
9		Flat hexagon screw	2	5×12
10	40005-IL	Shaft liner	1	
	40005-IR			
	40005-ML			
	40005-MR			
11		Woodruff key	1	Ø5×19
12	40003-IL	Gear shaft	1	
	40003-IR			
	40003-LM			
	40003-RM			
13	40120	Plug	1	
14		Snap ring	2	S15
15	40025	Collar	1	
16		Ball bearing	1	6202LR
17		Snap ring	1	S22
18	40020-I	Gear	1	56T
	40020-M			82T
19		Ball bearing	1	6005LU
20	40017-I	Gear shaft	1	
	40017-M			
21		Rivet	2	Ø2.8×10
22	40023	Name plate	1	
23	40022	shaft	1	
24		Snap ring	5	S16
25	40027	Collar	2	
26	40026-I	Gear	1	15T/33T
	40026-M			18/33T
27	40021	Collar	1	
28	40028	shaft	1	
29		Needle bearing	2	TLA1616
	40029	Gear shaft	1	
31		Needle bearing	2	TLA3016
32	40030	Gear	1	24T
33	40031	Gear	1	24T
34	40032	Worm wheel	1	
35		Snap ring	1	S30
36	40033	Collar	1	

No.	Part No.	Part's name	QTY	REMARK
37	40035	Name plate	1	
38	40034	shaft	1	
39	40036	Gear	1	24T
40	40024	Collar	2	
41	40037	shaft	1	
42	40038	Gear	1	24T/26T
44		Spring pin	1	Ø4×24
	40081	Handle	1	
	40080	Sleeve	1	
46		Key	1	4×4×25
47		O ring	3	P18
48	40122	Pad	1	
49	40113	Elasticity pole	1	
50		Snap ring	1	S18
51		Flat hexagon screw	1	M6×16
52	40045	washer	1	
53		Set screw	3	SET8×8
54	20022	Spring	2	
55	40042	Handle	1	
	40041-L	Lead nut lever	1	
		Spring pin	1	Ø4×24
	40042	Handle	1	
	40114-R	Lead nut lever	1	
		Spring pin	1	Ø4×24
57		O ring	1	P21
58		Key	1	5x5×18
59	40040-L	Cam shaft	1	
	40112-R			
60		Set screw	1	SET 10×40
61	40001-L	Appron	1	
	40001-R			
62		Set screw	4	SET 6×8
63	40006	spring	1	
64		Set screw	1	SET 10×16
65	40083	spring	2	
66	40087	Pin	1	
67	40084	Pin	1	
68		Oil sight	1	3/4"
69		Hex. socket head bolt	2	CAP 6×12
70	40049	Adjust plate	1	
71		Hex. socket head bolt	18	CAP 6×16
72	40047	Pin	2	
	40048	Slide plate	1	
	40046-I	Half nut	1	
	40047	Pin	2	
	40048	Slide plate	1	
	40046-M	Half nut	1	

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No.	Part No.	Part's name	QTY	REMARK
75		Hex. socket head bolt	2	CAP 6×30
76		Set screw	1	SET 6×30
77		Hex. socket head bolt	1	CAP 6×25
78		Oil seal	2	30×40×5
79	40053	Sleeve	2	
80		O ring	2	G40
81		Thrust bearing	3	NTB3047/AS2
82	40055-L	bracket	1	
	40108-R			
83	40054A	Pinion	1	
84	40119	Spacer	1	
85		Spring pin	1	Ø4×20
86	40090	Pin	1	
87		Hex. socket head bolt	1	CAP 5×25
88	40085	Pin	1	
89	40086	Pin	1	
90	40088	spring	1	
91	40091	Nut	1	
92		Key	1	5×5×45
93	40057	shaft	1	
94	40058	Worm	1	
95	40059	Clutch	1	
96	40056	Clutch gear	1	
97	40060	Lever arm	1	
98	40063	washer	1	
99	40064	spring	1	
100	40065	washer	1	
101		Thrust bearing	2	NTB1528/AS2
102	40066	Flanged bearing	2	
		Spring pin	2	Ø5×28
	40070	Pin	1	
	40068	Plate	2	
	40071	Nut	1	
		Spring pin	1	Ø3×16
	40073	Rod	1	
	40072	Washer	1	
106	40115	washer	1	
107	40200	Nylon jam nut	1	M10
108		Spring pin	1	Ø4x24
109	40061	Trip rod	1	
110		Set screw	1	SET 6x16
111		Nylon jam nut	1	M6
112	40116	Washer	1	
113	40062	Spring	1	
114	40117	Washer	1	
115		Nylon jam nut	1	M12

No.	Part No.	Part's name	QTY	REMARK
120		Flat hexagon screw	2	M6×16
		Spring pin	2	Ø3×24
	40074	Coupling	1	
	40075	Shaft	1	
		O ring	2	P21
	40077	Washer	1	
		Spring pin	1	Ø5×36
	40078	Sleeve	1	
123		O ring	1	P21
127	40089-L	Plate	1	
	40110-R			
128		Hex. socket head plug	1	PT1/4"
129		washer	2	
130	40082	Shaft	1	
131		Oil seal	2	TC152505
132		O ring	1	P30
133	40118	Bush	1	
134	40019-M	Spacer	1	
135		Hex. socket head bolt	3	CAP 6×20
136		Steel ball	1	3/8"
137		Set screw	1	SET 10×10
138	18-40126	Handle wheel guard	1	
139	40079	Plate	1	
140		Rivet	3	Ø2

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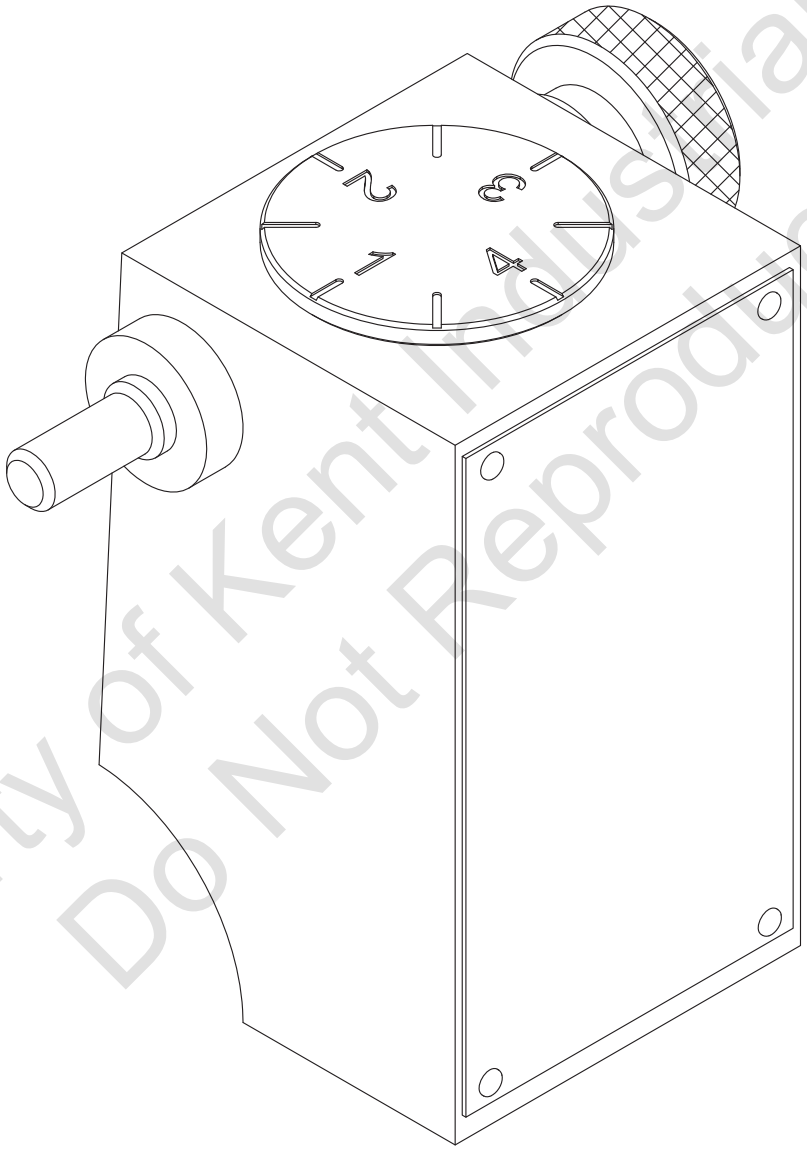
Dail Indicator



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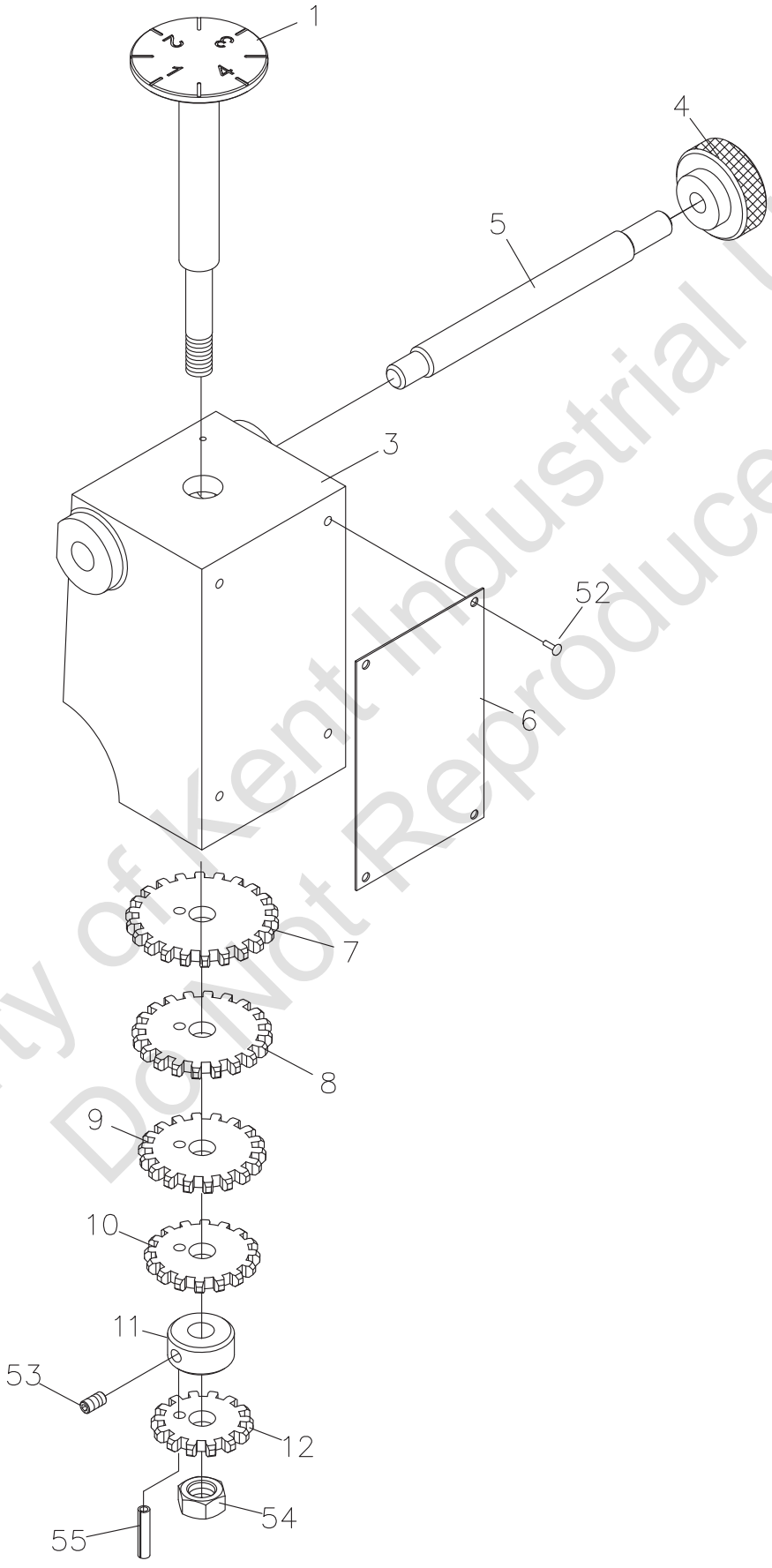
METRIC



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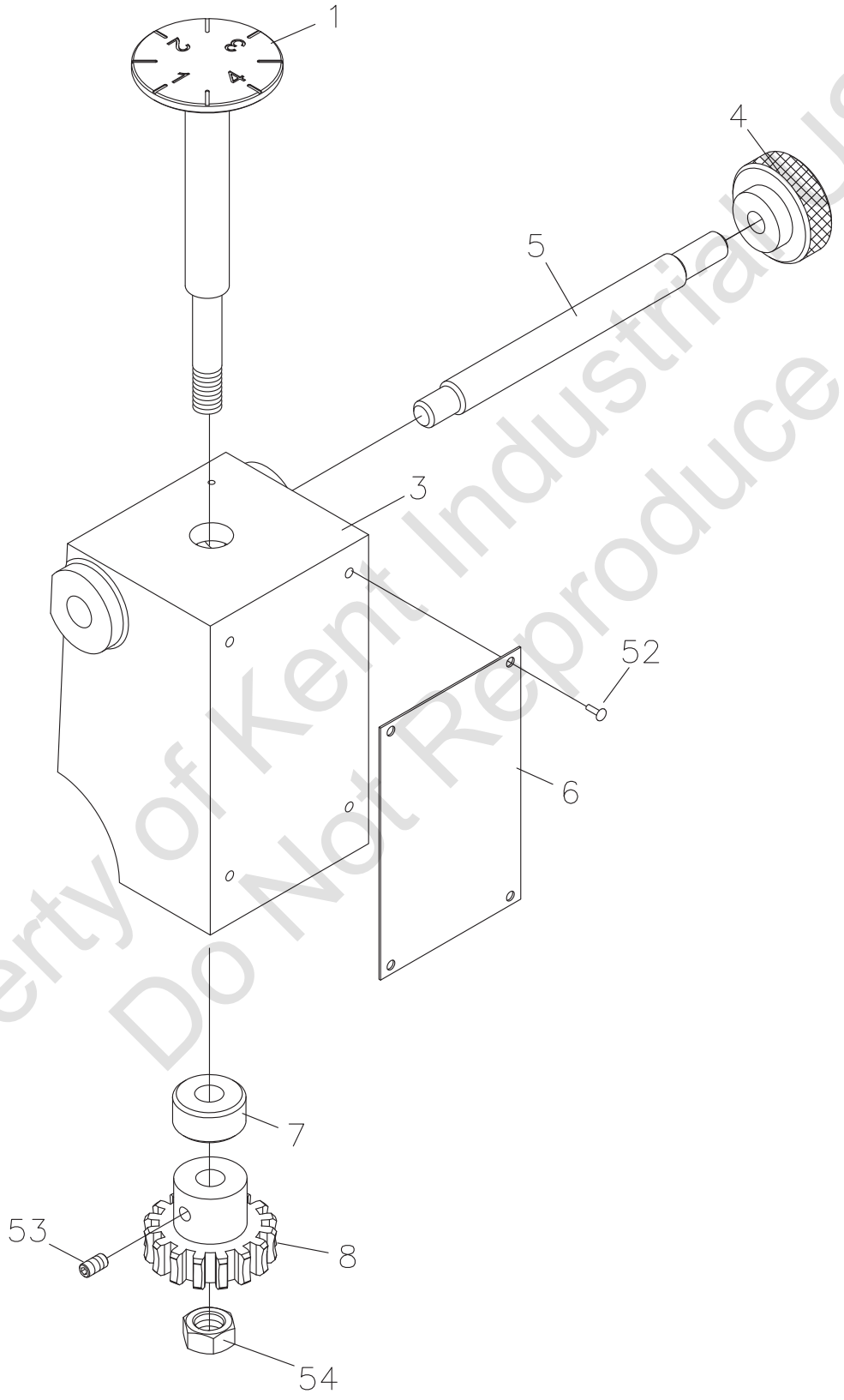
IMPERIAL



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Dail Indicator

METRIC					IMPERIAL				
No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	13-40048	Gear pivot	1		1	13-40048	Gear pivot	1	
3	40092	Body	1		3	40092	Body	1	
4	13-40053	Nut	1		4	13-40053	Nut	1	
5	13-40052	Stud	1		5	13- 40052	Stud	1	
6	13-40074-M	Threading plate	1		6	13-40074-I	Threading plate	1	
7	13-40058	Gear	1	22T	7	13-40050	Spacer	1	
8	13-40057	Gear	1	20T	8	13-40059	Gear	1	16T
9	13-40056	Gear	1	18T					
10	13-40055	Gear	1	16T					
11	13-40051	Spacer	1		52		Rivet	4	Ø2
12	13-40054	Gear	1	14T	53		Set screw	1	M6x6L
					54		Nylon Jam Nut	1	M8
52		Rivet	4	Ø2					
53		Set screw	1	M6x6L					
54		Nylon Jam Nut	1	M8					
55		Spring pin	1	Ø3x10					

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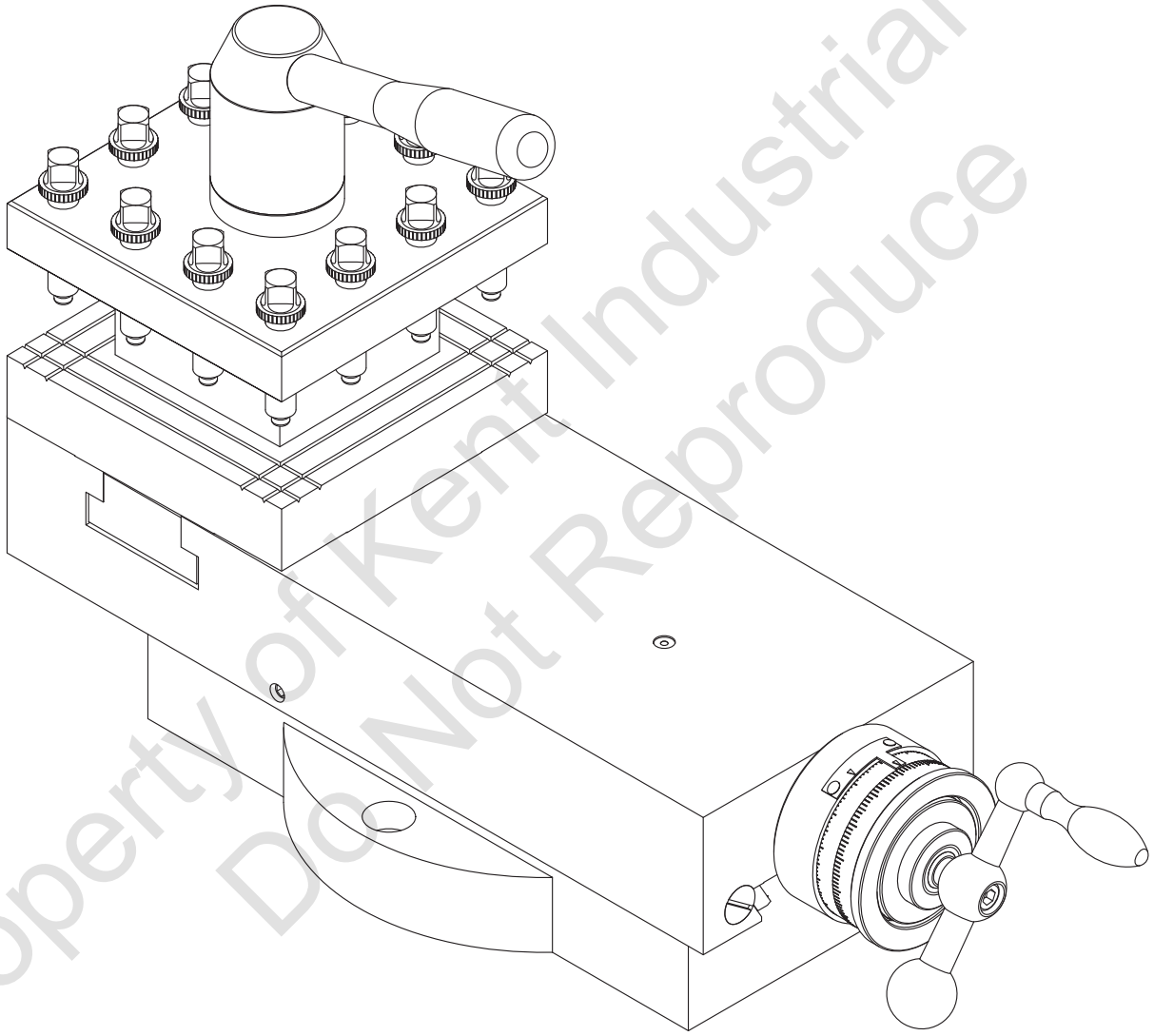
Compound Rest & Tool Post



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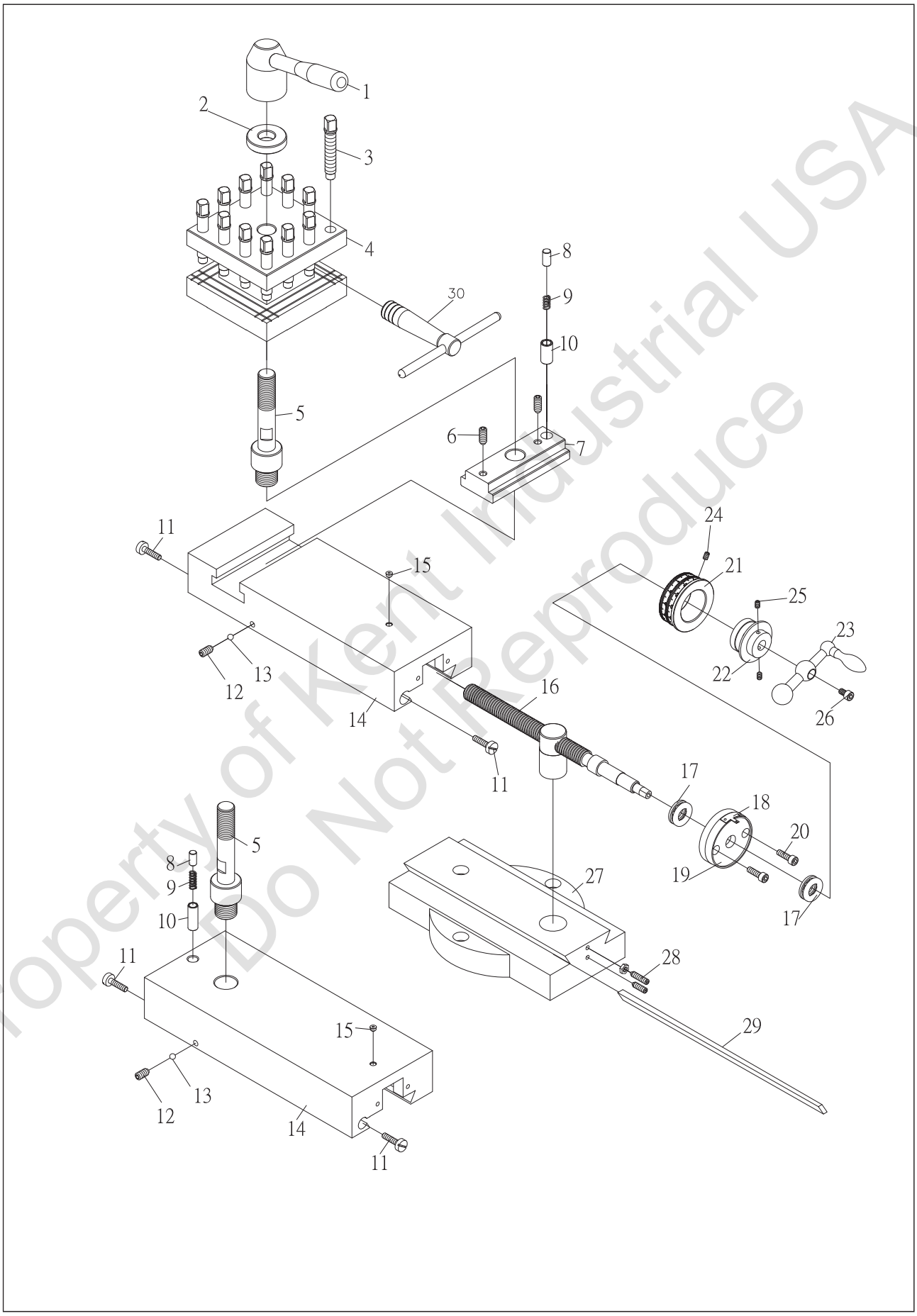
Compound Rest & Tool Post



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Compound Rest & Tool Post

No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	50074	Handle	1						
	50073	Turret nut	1						
2	50072	Collar	1						
3	50075	Bolt	12						
4	50068	Turret body	1						
5	50071	Turret shaft	1						
6		Set screw	2	SET 8x20					
7	50070	Nut	1						
8	50069	Pin	1						
9	50067	Spring	1						
10	50077	Bush	1						
11	50019	Screw	2						
12		Set screw	1	SET 8x12					
13		Steel ball	1	1/4"					
14	50005	Solid topslide	1						
	50005-SP								
15		Oil ball	1	1/4"					
16	50036-M	Nut	1						
		Screw	1						
	50036-I	Nut	1						
		Screw	1						
17		Trust baaring	2	51102					
18	50063	Curve pilot	1						
19	50040-AM	Keep assy	1						
	50040-AI								
20		Hex. socket head bolt	2	CAP 6x20					
21	50039-M	Dial ring	1						
	50039-I								
22	50042-A	Bushs	1						
23	50041-A	Handwheel	1						
		Handle	1						
24		Set screw	1	SET 5x8					
25		Set screw	1	SET 5x6					
26		Hex. socket head bolt	1	CAP 6x16					
27	17-50004	Swivel	1						
	20-50004								
28		Hex. socket head bolt	2	CAP 6x20					
29	50053	Gib	1						
30	50076	T wrench	1						

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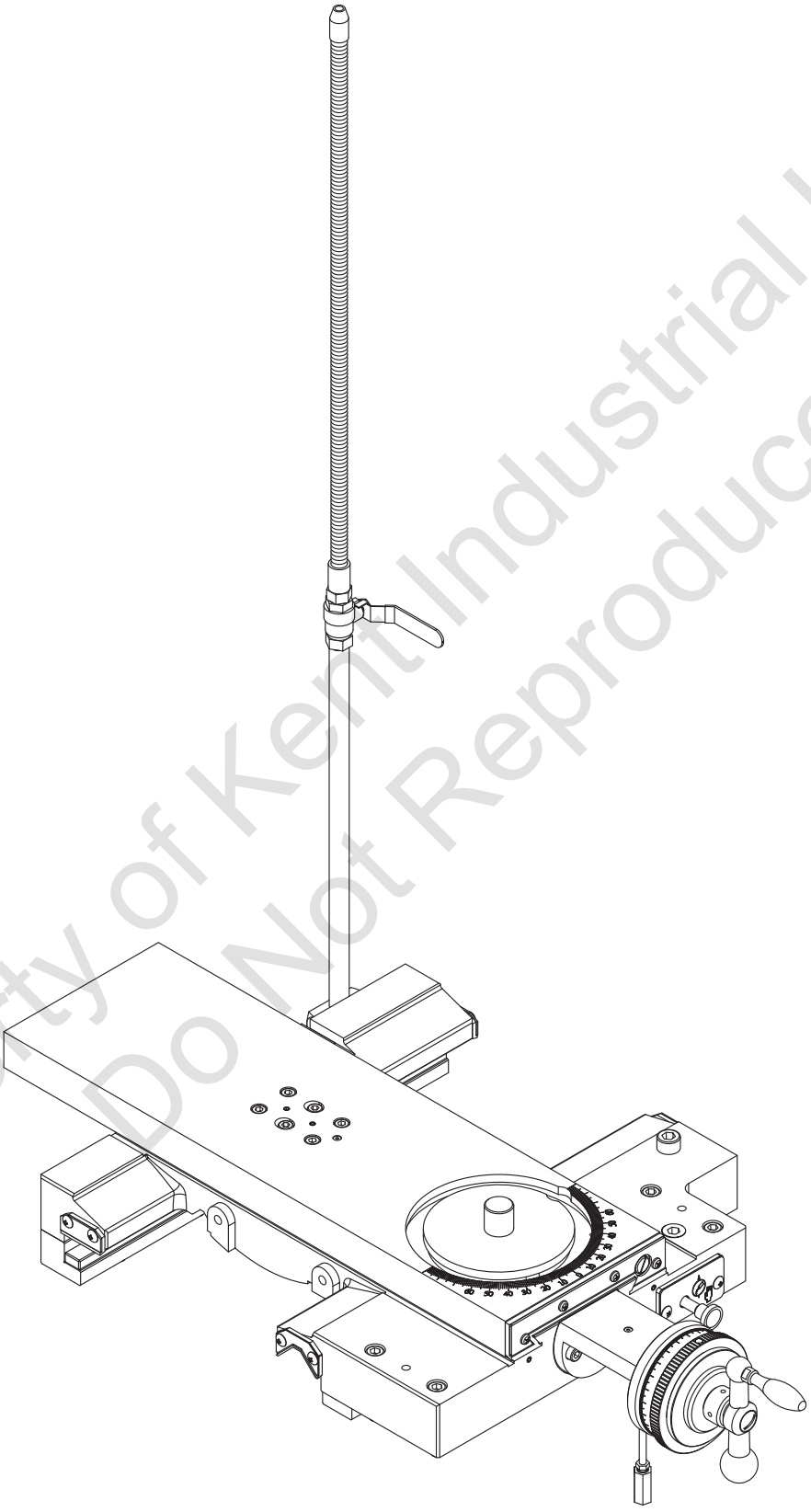
Saddles



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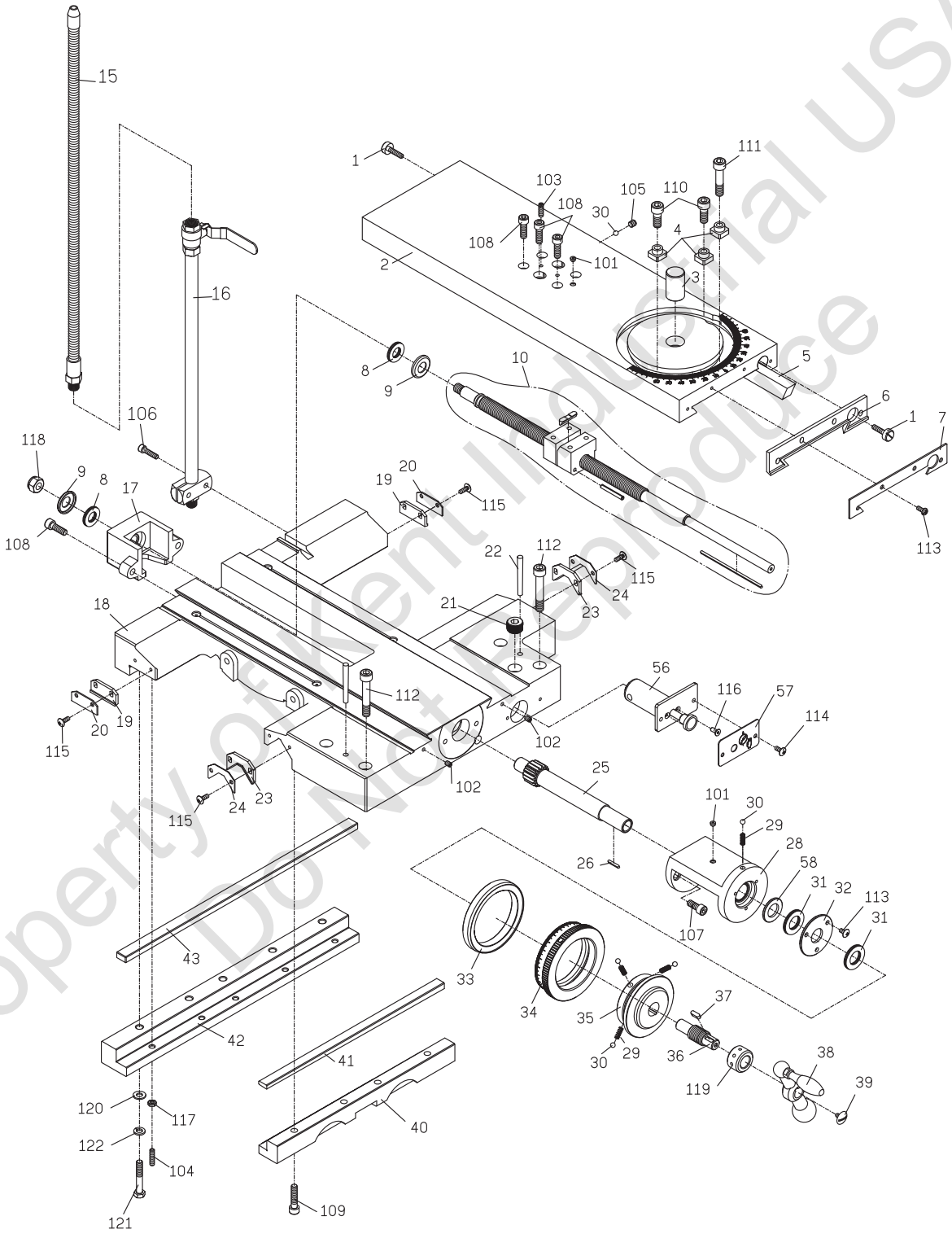
Saddles



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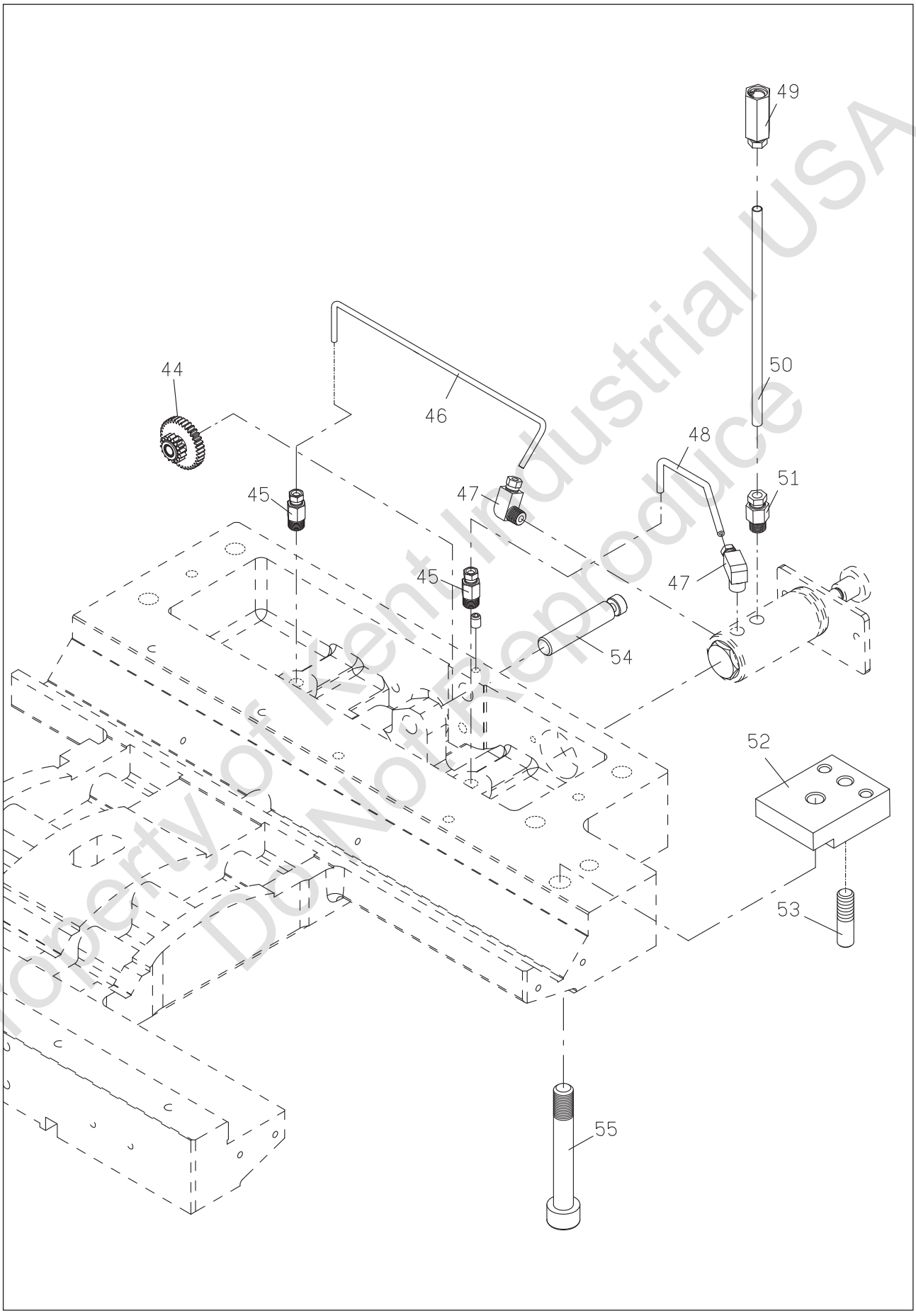
Saddles



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Saddles

No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	50054	Adjust screw	2		38	50027	Handwheel	1	
2	50003	Cross slide	1			50031	Handle	1	
3	50032	Pivot	1	Ø25x35	39	50103	screw	1	
4	50033	T bolt	3		40	50051	Front anti-floater	1	
5	50018	Gib-X	1		41	50050	Gib-Z	1	
6	50078	Wiper-X	1		42	50049	Rear anti-floater	1	
7	50077	Plate -X	1		43	50052	Gib-Y	1	
8		Thrust bearing	2	NTB/AS2 1528	44	50008	Gear	1	16T/36T
9	50020	Cap collar	2		45		Straight adapter	2	Ø4x1/8
10	50016	Pin	1		46		AL. tube	1	Ø4x258
	50011-SI	Screw	1		47		Elbow adapter	2	Ø4x1/8
	50014-5I	Nut	1		48		AL. tube	1	Ø4x121
		Key	1		49		Oil filter	1	Ø6
		Spring pin	2		50		AL. tube	1	Ø6x170
	50016	Pin	1		51		Straight adapter	2	Ø6x1/8
	50011-SM	Screw	1		52	50056	Clamp plate	1	
	50014-5M	Nut	1		53	50057	Bolt	1	
		Key	1		54	50007	Short shaft	1	
		Spring pin	2		55		Hex. socket head bolt	1	CAP12x85
					56		Lubricator assy.	1	
15		Spraying pipe	1	PT3/8 x 24"	57	50066	Plate	1	
16		Valve & junction assy.	1	PT3/8	58	50023	Washer	1	
17	50012	Rear bracket	1		58	50023	Washer	1	
18	50001	Saddle	1						
19	50047	Wiper F	2						
20	50048	Plate F	2		101		Oil ball	2	1/4"
21		Hex. socket head plug	1	PT 1/2"	102		Set screw	2	SET 6x8
22		Taper Pin	2	#6x70L	103		Set screw	1	SET 6x20
23	50045	Wiper V	2		104		Set screw	5	SET 6x25
24	50046	Plate V	2		105		Set screw	1	SET 8x8
25	17-50009	Gear	1	16T	106		Hex. socket head bolt	2	CAP 5x35
	20-50009				107		Hex. socket head bolt	2	CAP 8x20
26		Key	1	3x3x20	108		Hex. socket head bolt	8	CAP 8x25
					109		Hex. socket head bolt	4	CAP 8x35
28	50010	Front bracket	1		110		Hex. socket head bolt	2	CAP 10x25
29	50030	Spring	4	Ø6x15 L	111		Hex. socket head bolt	1	CAP 10x45
30		Steel ball	5	1/4"	112		Hex. socket head bolt	4	CAP 10x60
31		Thrust bearing	2	NTB/AS2 2035	113		Dome cross screw	3	M5x10
32	50024	Washer	1		114		Dome cross screw	2	M5x12
33	50021-M	Dial ring	1		115		Dome cross screw	4	M5x15
	50022-I				116		Flat hexagon screw	2	M5x12
34	50025-I	Dual	1		117		Nut	5	M6
	50025-M				118		Nylon nut	1	M12
	50025-X				119	50105	Nut	1	
35	50029-I	Bush	1		120		Washer	5	M8
	50029-M				121		Hexagon head bolt	5	M8x50
36	50028	Shaft	1		122		Spring washer	5	M8
37		Key	1	5x5x20					

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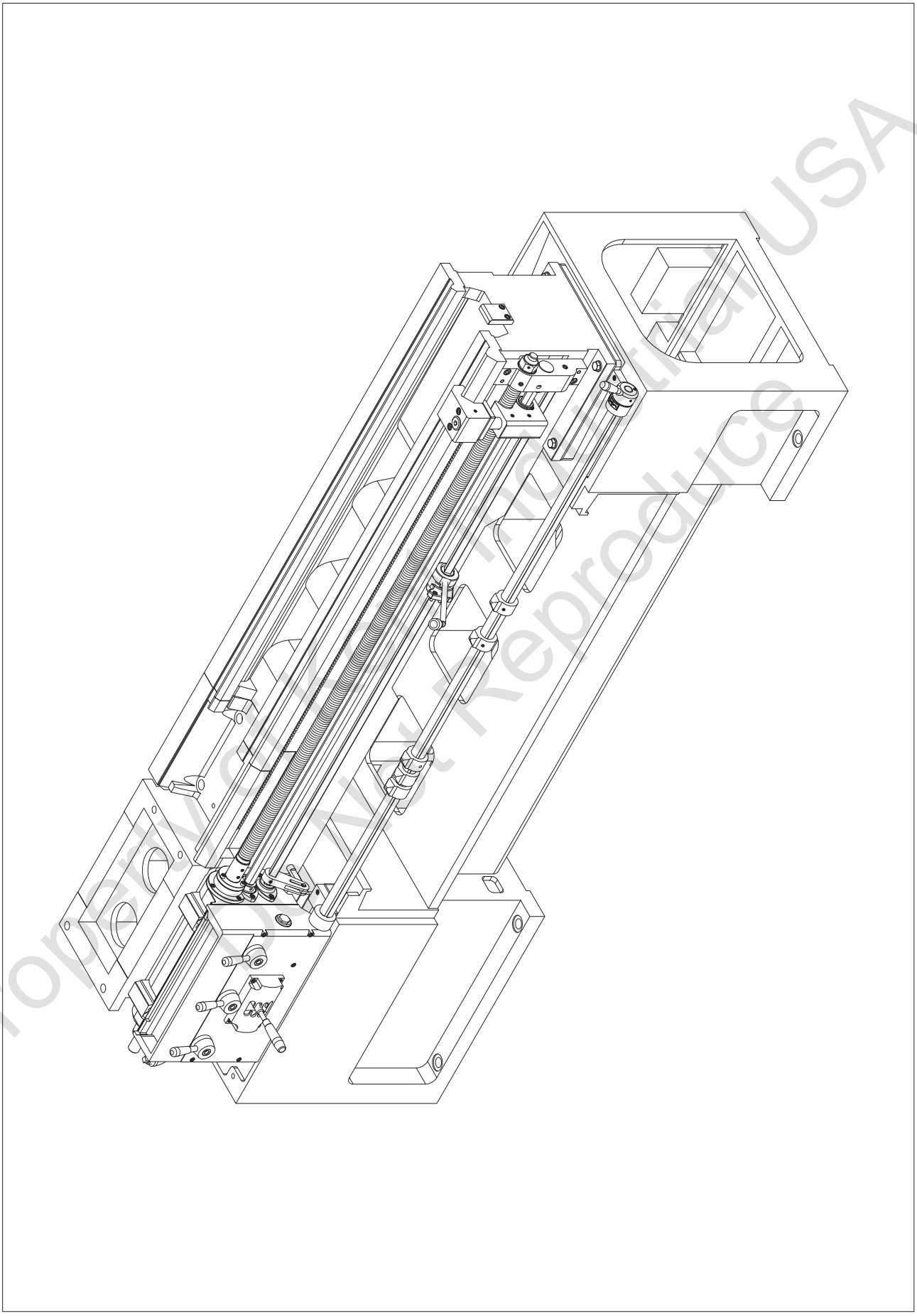
Bed & Shafts



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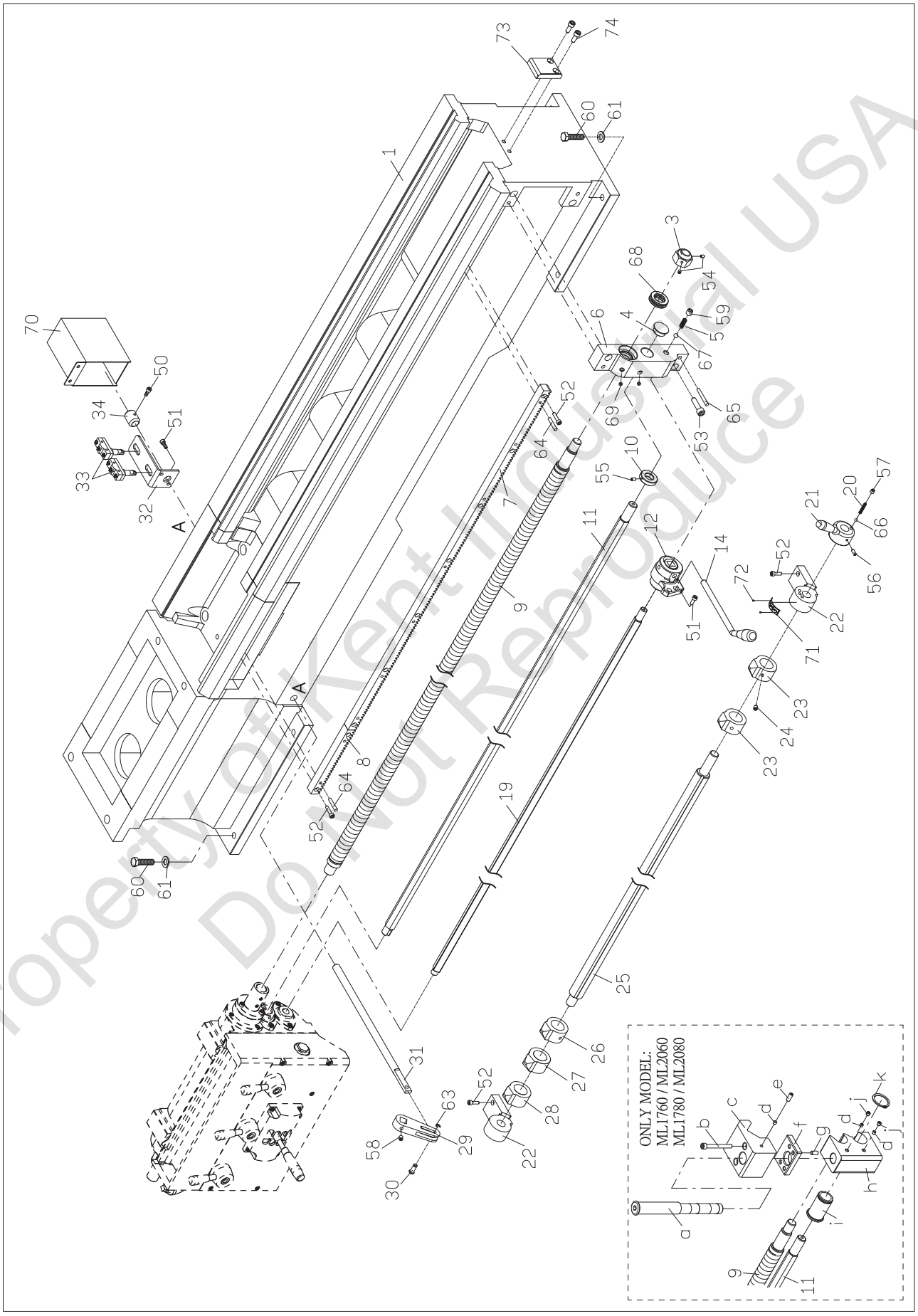
Bed & Shafts



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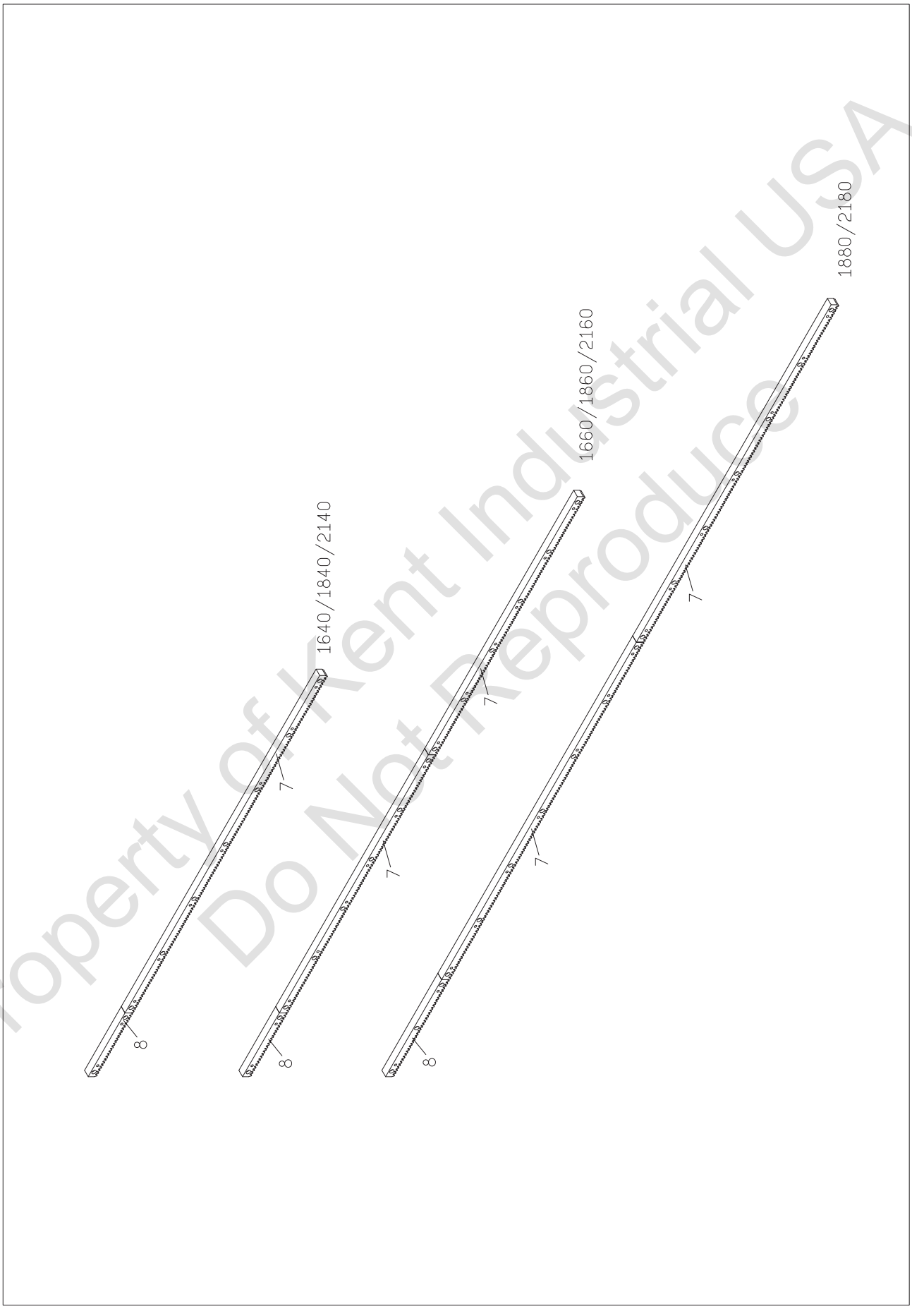
Bed & Shafts



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Bed & Shafts

No.	Part No.	Part's name	QTY	REMARK
1	63001-40	Bed	1	
	63001-60			
	63001-86			
2	63027	Bolt	1	
3	63023	Nut	1	
4	63025	Plug	1	
5	63041	Spring	1	
6	63024	Bracket	1	
7	13-63021-40	Rack (METRIC)	1	40
	14-63023-60		2	60
	13-63021-40		2	80
	17-63021-I4	Rack (IMPERIAL)	1	40
	17-63018-I6		2	60
	17-63021-I4		2	80
8	13-63024-GL	Rack (METRIC)	1	40
	14-63024-60G		1	60/80
	17-63022-I	Rack (IMPERIAL)	1	40/60
	21-63022-86		1	80
9	63005-40M	Leadscrew	1	
	63005-60M			
	63005-86M			
	63005-40I			
	63005-60I			
	63005-86I			
10	60035	Collar	1	
11	63011-40A	Feed rod	1	
	63011-60A			
	63011-86			
12	63020	Lever assy	1	
	63019	Pin	2	
	63014	Bracket	1	
	63017	Sleeve	1	
	63026	Spring	1	
	63015	Spring cover	1	
		Clip	1	S32
14	63040	Knob	1	
	63020	Handle	1	
19	63016-40	Third rod shaft	1	
	63016-60			
	63016-86			
20	20022	Spring	1	
21	63030	Handle base	1	

No.	Part No.	Part's name	QTY	REMARK
22	63032	Beracket	2	
23	63033	Dog	2	
24	63038	Screw	5	
25	63028-40	Position rod	1	
	63028-60			
	63028-86			
26	63034	Dog	1	
27	63035	Dog	1	
28	63036	Dog	1	
29	60042	Connecting rod	1	
30	60030	Pin	1	
31	60036	Connecting rod	1	
32	61044	Switch base	1	
33		Limit switch	2	TM1308
34	60041	Collar	1	
50		Hex. socket head bolt	1	CAP 6x12
51		Hex. socket head bolt	4	CAP 6x16
52	CAP 6x20	Hex. socket head bolt	9	40M
			13	60M
			17	80M
			9	40I
			14	60I
			17	80I
53		Hex. socket head bolt	2	CAP 10x35
54		Set screw	2	SET 6x8
55		Set screw	1	SET 6x10
56		Set screw	1	SET 6x16
57		Set screw	1	SET 8x8
58		Set screw	1	SET 8x10
59		Set screw	1	SET 12x12
60		Hexagon head bolt	8	M12x50
61		Washer	8	M12
63		Snap ring	1	E6
64	Ø6×25	Pin	6	40M
			8	60M
			10	80M
			9	40I
			14	60I
			16	80I
65		Pin	2	Ø6×50
66		Steel ball	1	1/4"
67		Steel ball	1	3/8"

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Bed & Shafts

No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
68		Thrust bearing	2	51105					
69		Oil ball	2	1/4"					
70	61046	Block oil plate	1						
71	61029	Plate	1						
72		Rivet	2	Ø2					
73	60051	Block	1						
74		Hex. socket head bolt	2	CAP 8x25					
a	63046-60	Shaft	1						
b		Hex. socket head bolt	2	CAP 8x70					
c	63043-60	Block	1						
d	63047-60	Pin	3						
e		Set screw	1	SET 8x20					
f	63049-60	Block	1						
g		Set screw	1	SET 8x16					
h	63044A60	Beracket	2						
i	63052A60	Barrel	1						
j		Set screw	1	SET 8x8					
k		Clip	1	S35					

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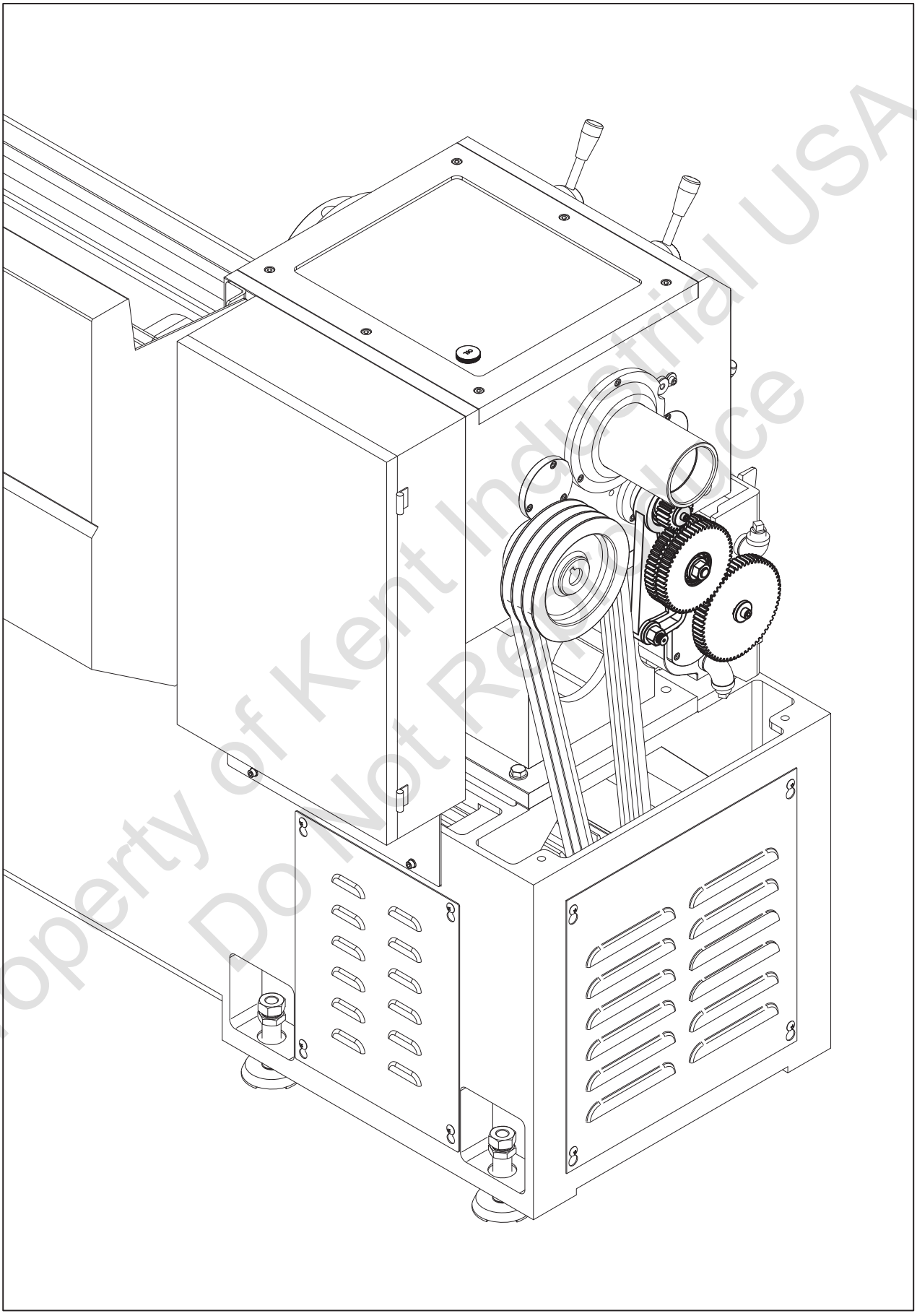
End Gear



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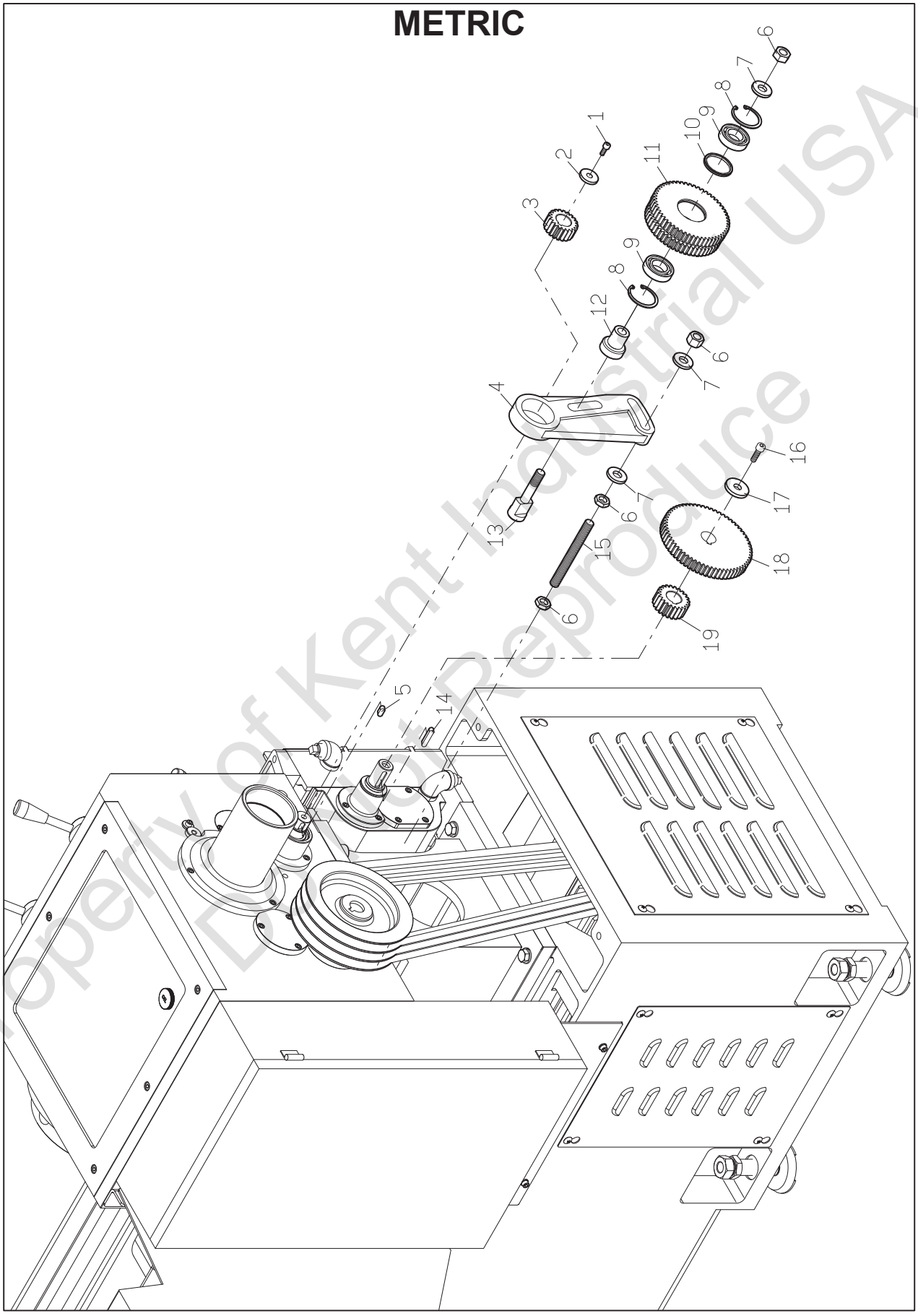
End Gear - 17"

METRIC



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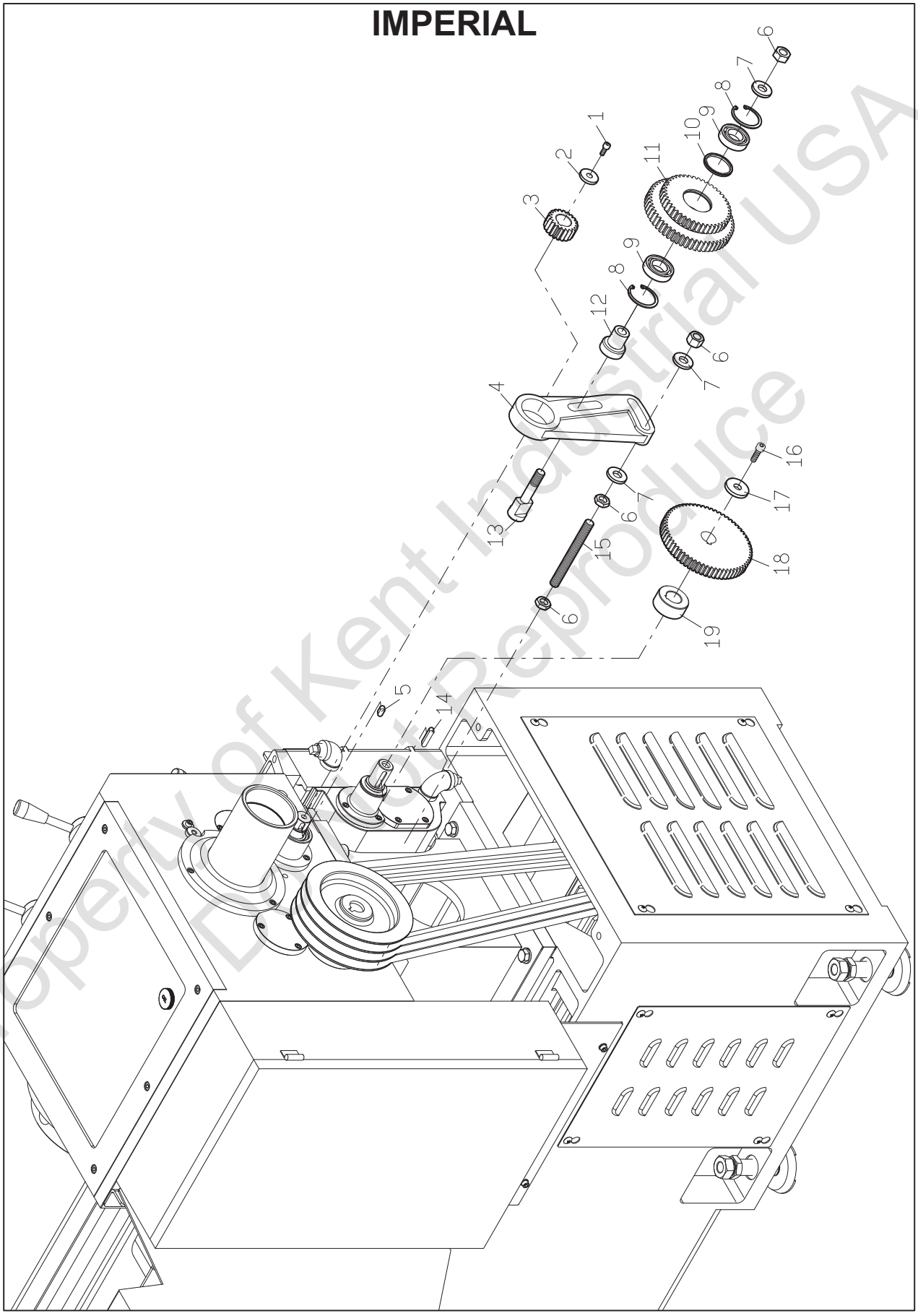
End Gear - 17"



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End Gear - 17"

METRIC - 17"					IMPERIAL - 17"				
No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1		Hex. socket head bolt	1	CAP 6x16	1		Hex. socket head bolt	1	CAP 6x16
2	60022	Washer	1		2	60022	Washer	1	
3	16-60001-M	Gear	1	28T	3	16-60007-I	Gear	1	24T
4	60017	Swing frame	1		4	60017	Swing frame	1	
5		Key	1	7x7x15	5		Key	1	7x7x15
6		Nut	4	M14	6		Nut	4	M14
7	60023	Washer	3		7	60023	Washer	3	
8		Clip	2	R47	8		Clip	2	R47
9		Ball bearing	2	6005Z	9		Ball bearing	2	6005Z
10	60020	Collar	1		10	60020	Collar	1	
11	16-60002-M	Gear	1	54T / 55T	11	15-60008-I	Gear	1	44T / 56T
12	60013	Shaft collar	1		12	60013	Shaft collar	1	
13	60015	Gear shaft	1		13	60015	Gear shaft	1	
14		Key	1	7x7x35	14		Key	1	7x7x35
15	60018	Stud	1		15	60018	Stud	1	
16		Hex. socket head bolt	1	CAP 8x25	16		Hex. socket head bolt	1	CAP 8x25
17	60021	Washer	1		17	60021	Washer	1	
18	16-60004-M	Gear	1	64T	18	15-60010-I	Gear	1	57T
19	16-60005-M	Gear	1	22T	19	15-60045-I	Collar	1	

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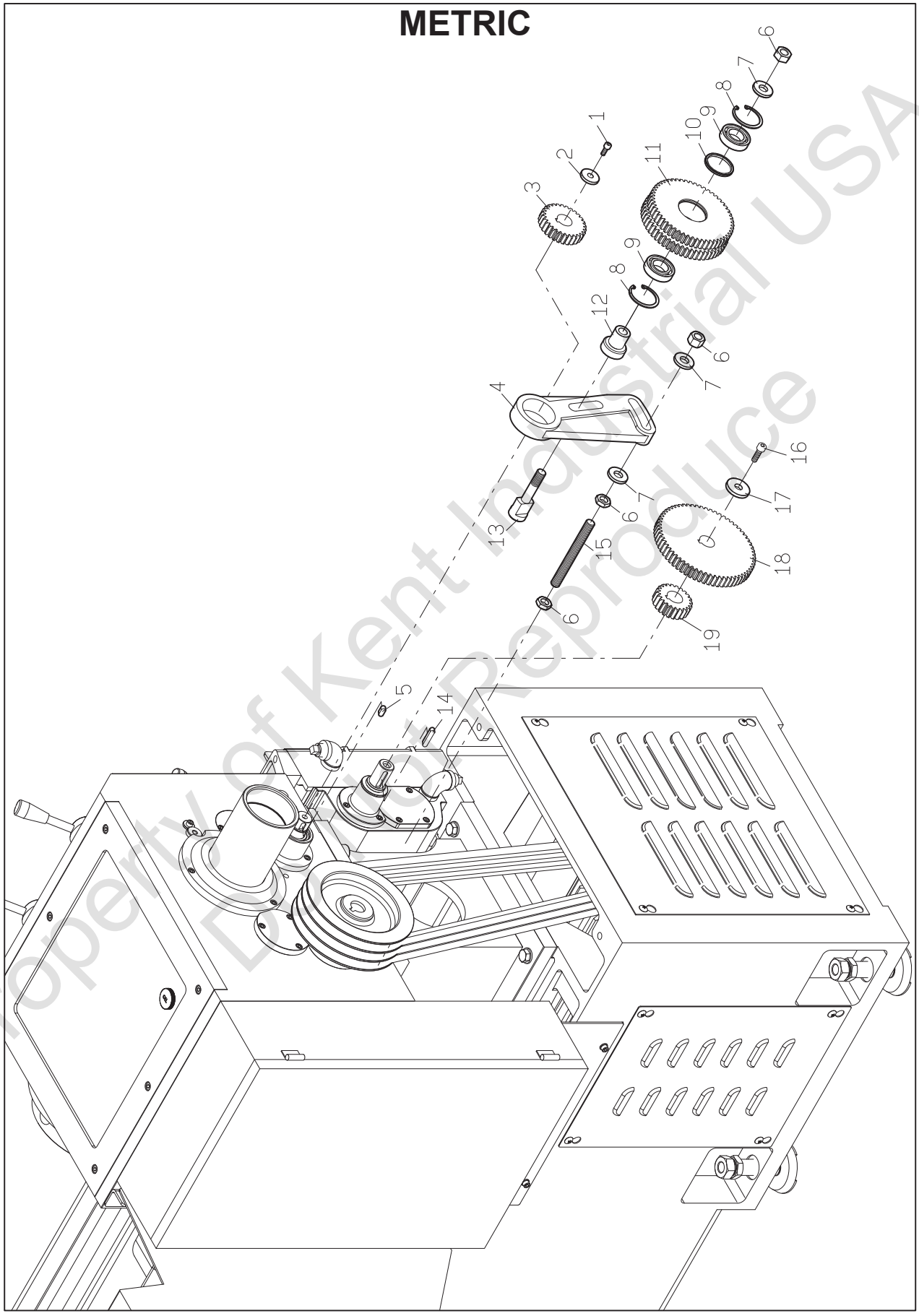
End Gear - 20"

METRIC



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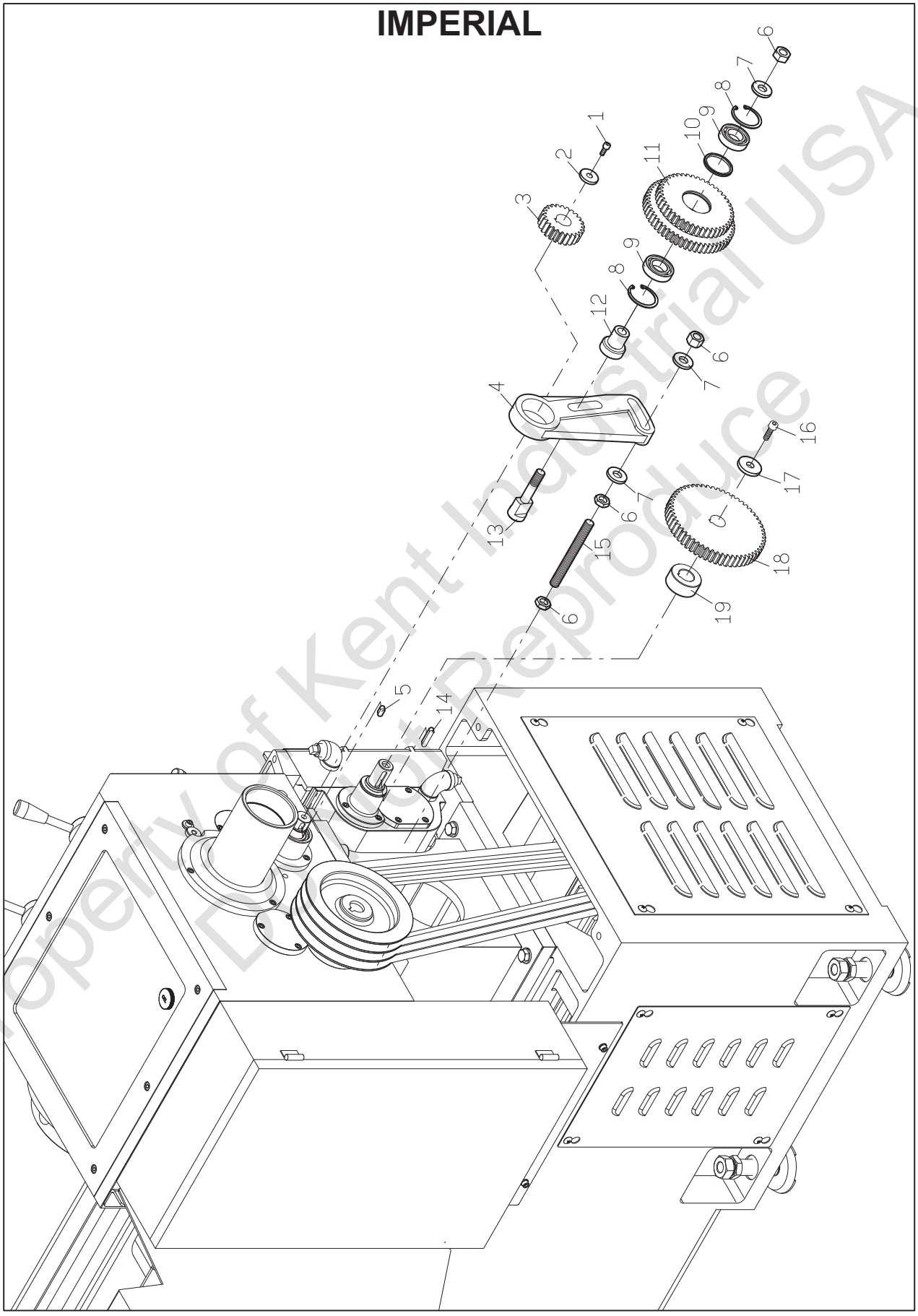
End Gear - 20"

IMPERIAL



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End Gear - 20"

METRIC - 20"					IMPERIAL - 20"				
No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1		Hex. socket head bolt	1	CAP 6x16	1		Hex. socket head bolt	1	CAP 6x16
2	60022	Washer	1		2	60022	Washer	1	
3	15-60001-M	Gear	1	28T	3	20-60008-I	Gear	1	24T
4	60017	Swing frame	1		4	20-60017-I	Swing frame	1	
5		Key	1	7x7x15	5		Key	1	7x7x15
6		Nut	4	M14	6		Nut	4	M14
7	60023	Washer	3		7	60023	Washer	3	
8		Clip	2	R47	8		Clip	2	R47
9		Ball bearing	2	6005Z	9		Ball bearing	2	6005Z
10	60020	Collar	1		10	60020	Collar	1	
11	15-60004-M	Gear	1	54T / 55T	11	20-60010-I	Gear	1	44T / 56T
12	60013	Shaft collar	1		12	60013	Shaft collar	1	
13	60015	Gear shaft	1		13	60015	Gear shaft	1	
14		Key	1	7x7x35	14		Key	1	7x7x35
15	60018	Stud	1		15	60018	Stud	1	
16		Hex. socket head bolt	1	CAP 8x25	16		Hex. socket head bolt	1	CAP 8x25
17	60021	Washer	1		17	60021	Washer	1	
18	15-60012-M	Gear	1	64T	18	20-60007-I	Gear	1	57T
19	20-60002-M	Gear	1	22T	19	15-60045-I	Collar	1	

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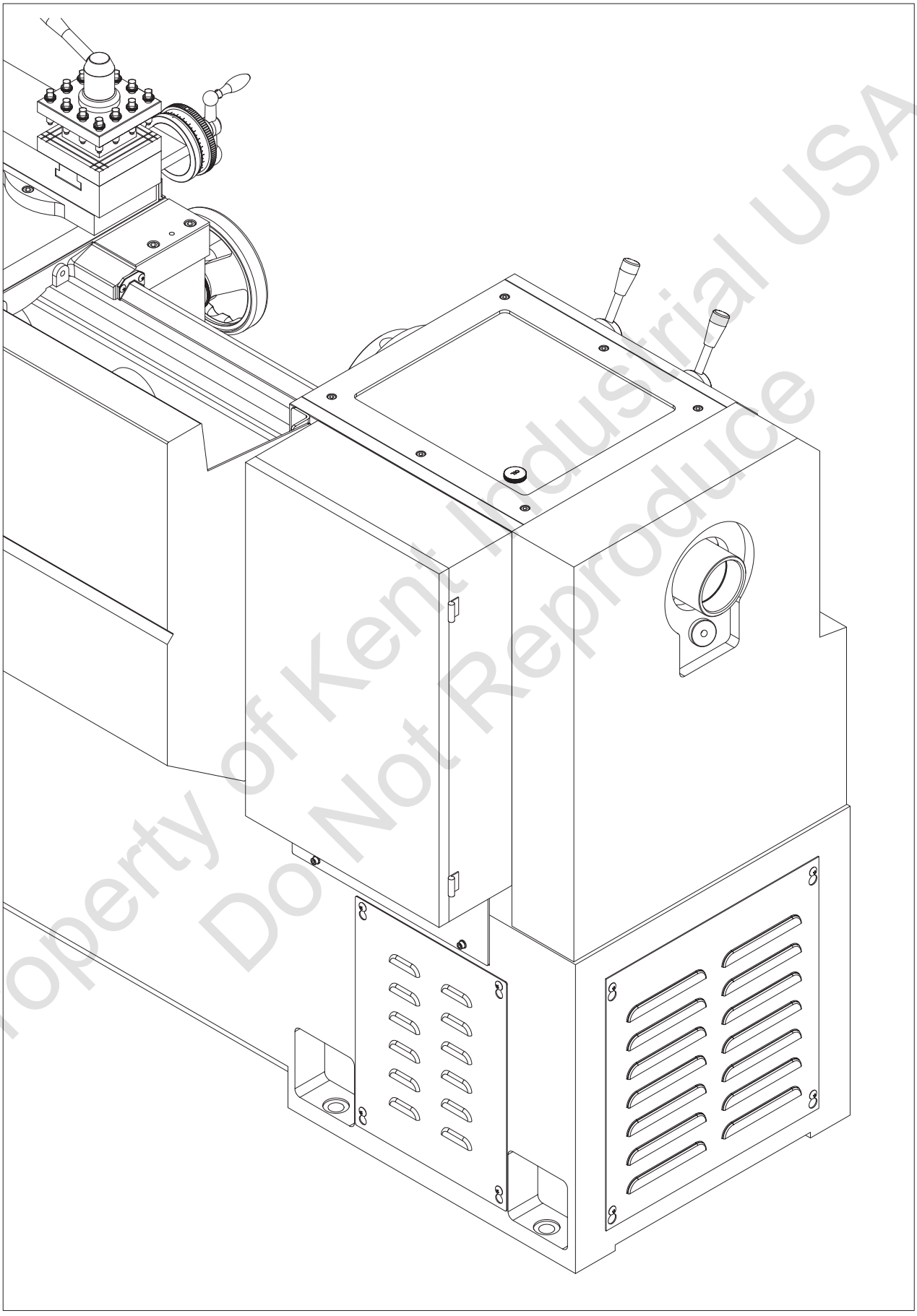
Main Motor



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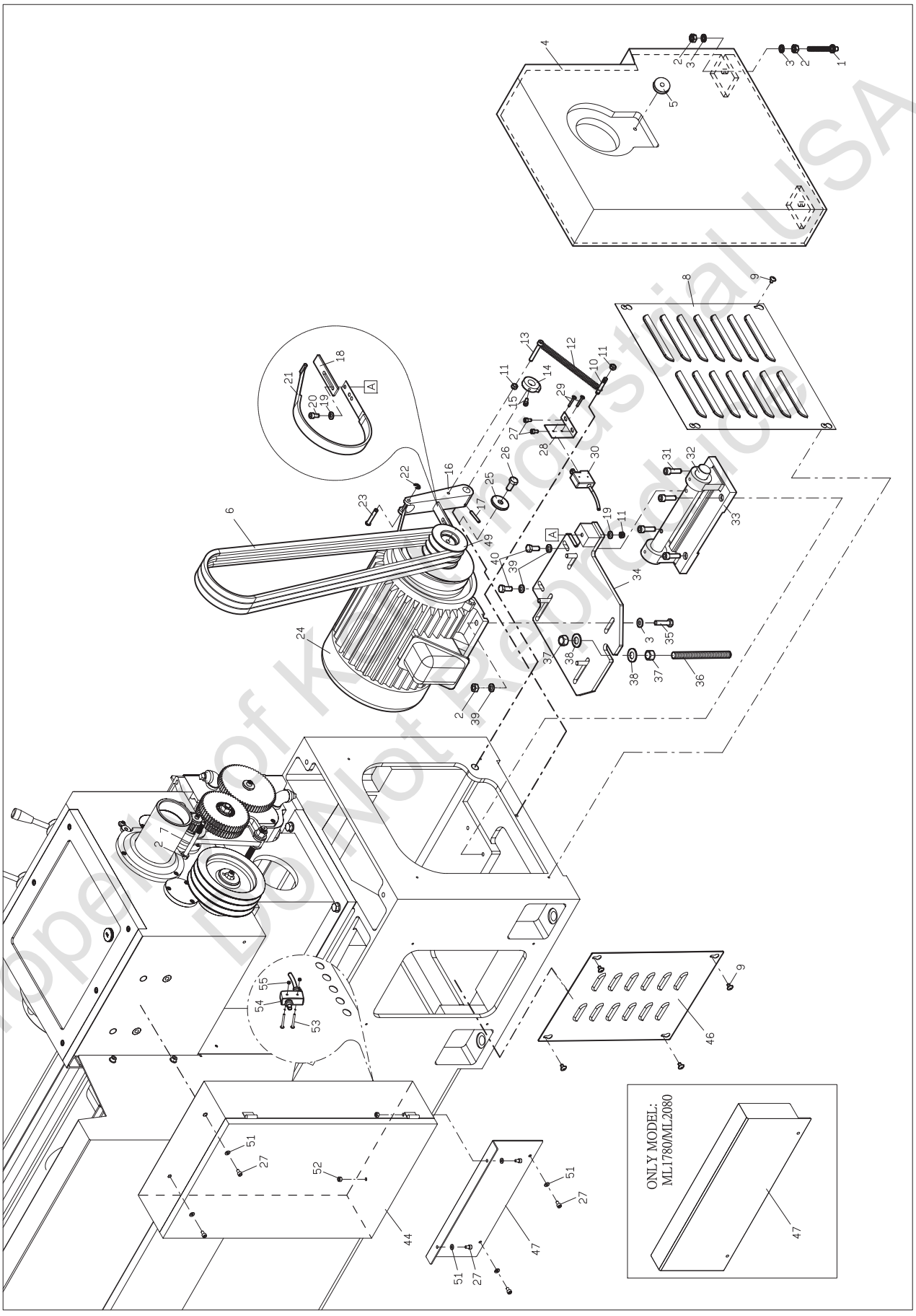
Main Motor



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Main Motor

No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	60058	Pin	2		47	61075	Cover	1	40/60
2		Nut	9	M10		61075-86			80
3		Washer	8	M10	49	10043A76	Motor pully	1	
4	17-61004	Cover	1						
	20-61004				51		Washer	6	M6
5	60056	Nut	1		52		Nut	2	M6
6		V belt 50Z	3	B72	53		Dome cross screw	2	M4x40
		V belt 60Z		B71	54		Limit switch	1	Tm-1307
7	60055	Bolt	1		55		Nut	2	M4
8	61019	Cover	1						
9		Dome cross screw	8	M6x10					
10	60053	Bolt	1						
11		Nut	3	M8					
12	60046	Spring	1						
13		Hex. socket head bolt	1	CAP 8x55					
14	60033	Cam	1						
15		Hex. socket head bolt	1	CAP 6x16					
16	60047	Lever	1						
17		Spring pin	1	Ø6x35					
18	RL-60061	Fixed plate	1						
19		Washer	2	M8					
20		Hex.socket head bolt	1	CAP 8x16					
21	60019	Brake belt	1						
22		Clip	1	E8					
23	60028	Pin	1						
24		Motor	1	7.5 HP					
25	60044	Washer	1						
26		Hexagon head bolt	1	M12x25					
27		Hex. socket head bolt	8	CAP 6x12					
28	61028A	Bracket	1						
29		Dome cross screw	2	M4x30					
30		Limit switch	1	Tm-1704					
31		Hex. socket head bolt	4	CAP 10x35					
32	60036	Shaft	1						
33	60061	Support	1						
34	61045M17	Plate	1						
35		Hexagon head bolt	1	M10x40					
36	60031	Screw	1						
37		Nut	2	M16					
38		Washer	2	M16					
39		Spring washer	6	M10					
40		Hexagon head bolt	2	M10x25					
44	14-61025-ST	Electrical box	1						
46	64018	Cover	1						

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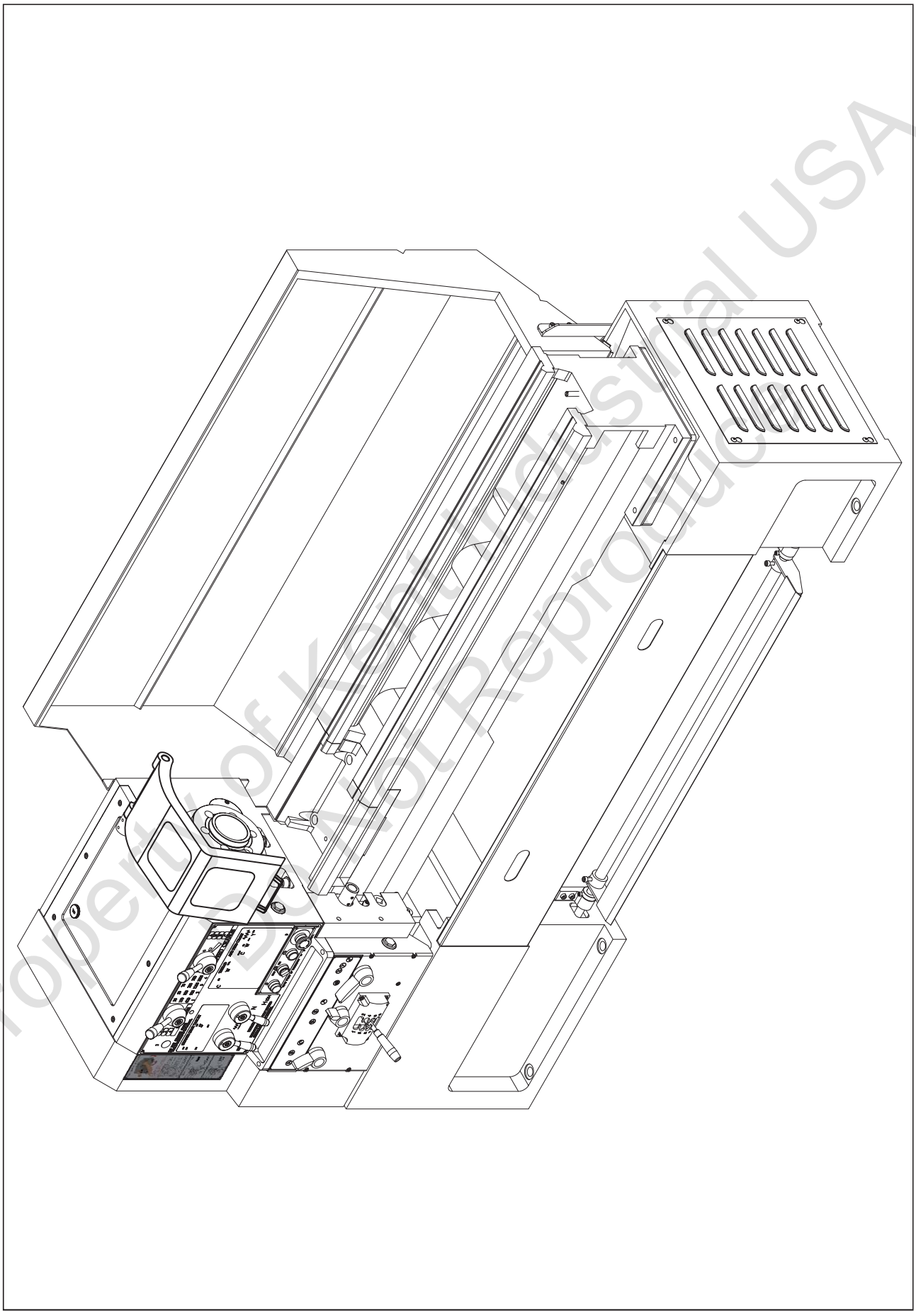
Cabinet & Panel



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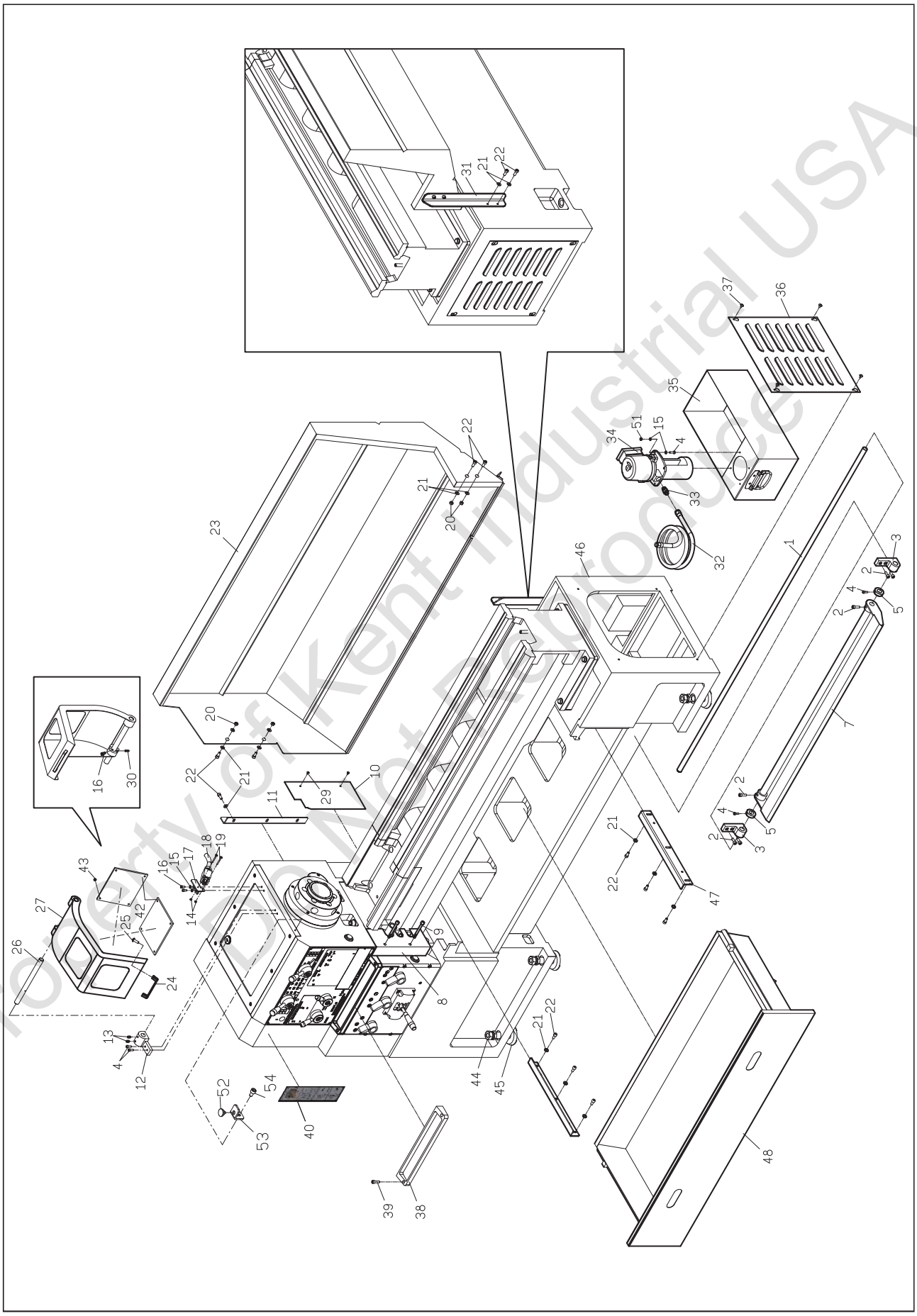
Cabinet & Panel



Cabinet & Panel

No.	Part No.	Part's name	QTY	REMARK
1	60032-40	Shaft	1	
	60032-60			
2		Hex. socket head bolt	6	CAP 8x25
3	60029	Pedal bracket	2	
4		Hex. socket head bolt	8	CAP 6x16
5	60027	Ring	2	
7	61043-40	Saddle	1	
	61043-60			
8	61016	Plate	1	
9		Hex. Socket head bolt	2	CAP 10x45
10	61020	Plate	1	
11	61080M17	Angle steel	1	
	61080M20			
12	10058	Small bracket	1	
13		Set screw	2	SET 8x12
14		Nut	2	M4xP0.7
15		Spring washer	10	M6
16		Hex. socket head bolt	3	CAP 6x12
17	61056	Bracket	1	
18		Limit	1	Tz9212
19		Dome cross screw	2	M4x40
20		Nut	4	M8
21		Washer	17	M8
22		Hex. socket head bolt	15	CAP 8x20
23	61010M40	Splash guard	1	
	61010M60			
24		Knob	1	
25		Hex. socket head bolt	1	screw 3/16"x3/8"
26	13-10102	Piovt	1	
27	15-65053-D	Chuck safety guard	1	
28				
29		Flat hexagon screw	2	M5x8
30		Set screw	1	SET 5x16
31	61079	Angle steel	1	
32		Coolant conduit 40	1	CT801x3/8"x72"
		Coolant conduit 60		CT801x3/8"x78"
33		Nipple	1	3/8"PTx3/8"PH
34		Coolant pump	1	MC8150
35	15-61010	Coolant tank	1	
36	61019	Cover	1	
37		Dome cross screw	4	M6x10
38	30065-1	Cover	1	
39		Hex. socket head bolt	2	CAP 6x20
40	NO.240	Nameplate	1	IMPERIAL
	NO.241		1	METRIC
42		Plate	2	PC

No.	Part No.	Part's name	QTY	REMARK
43		Nylon jam nut	8	M6
44	63055-1	Screw	1	
	63055-2	Nut	1	
45	63042	Block	1	
46	63003-40	Base	1	
	63003-60			
47	61009PB6	Angle steel	2	
48	61009B4	Chip tray	1	
	61009B6			
51		Nut	4	M6
52		Rubber	1	
53	18-61053-C	Fixed support	1	
54		Hex. socket head bolt	1	CAP 6x10

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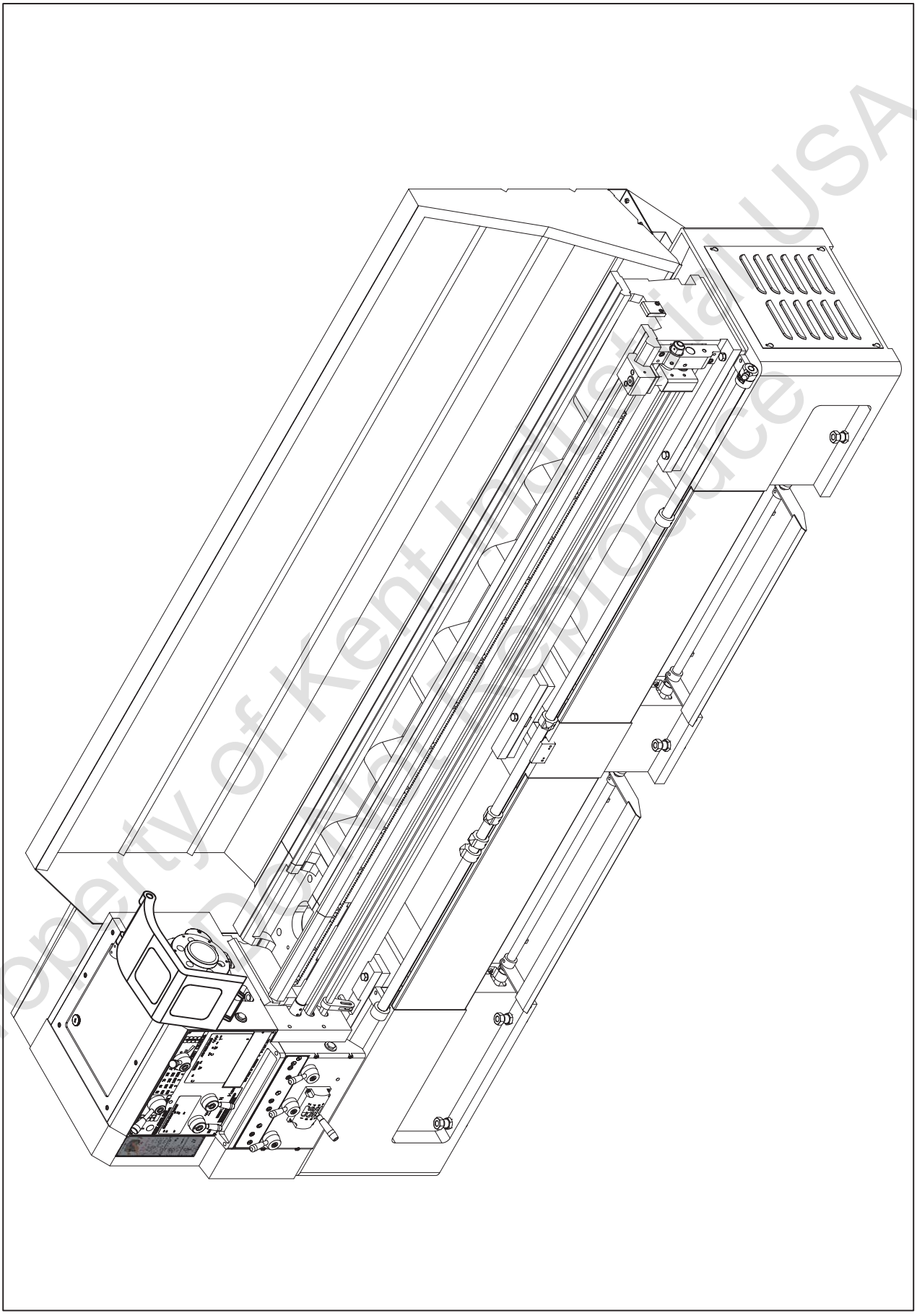
Cabinet & Panel(1780/2080)



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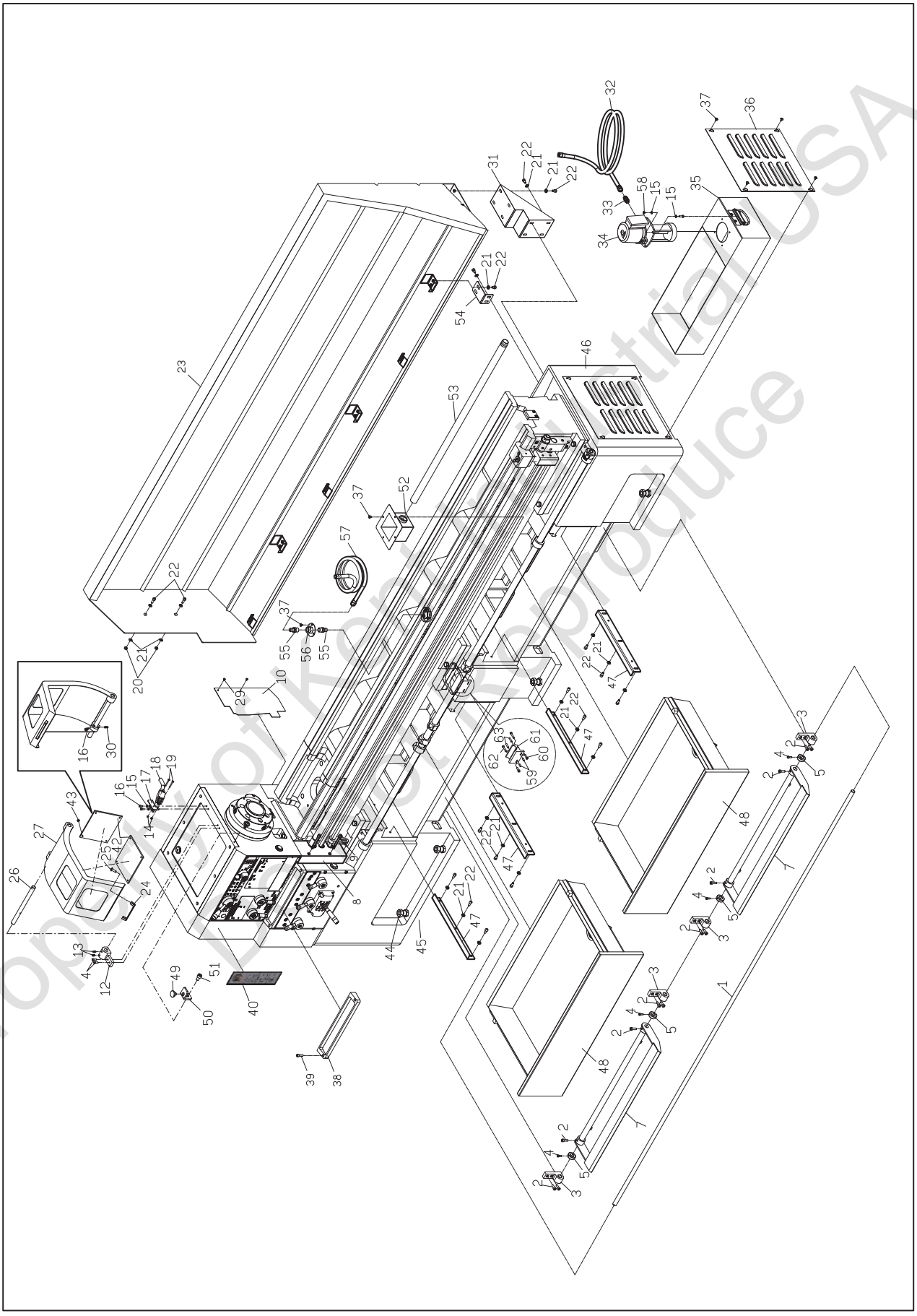
Cabinet & Panel(1780/2080)



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Cabinet & Panel(1780/2080)

No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	60034-80	Shaft	1		42		Plate	2	PC
2		Hex. socket head bolt	12	CAP 8x25	43		Nylon jam nut	8	M6
3	60029	Pedal bracket	4		44	63055-1	Screw	8	
4		Hex. socket head bolt	6	CAP 6x16		63055-2	Nut		
5	60027	Ring	4		45	63042	Block	8	
					46	63003B86	Base	1	
7	13-63043-B30	Saddle	1		47	61009PB6	Angle steel	4	
8	61016	Plate	1		48	61009-86	Chip tray	2	
9		Hex. Socket head bolt	2	CAP 10x45					
10	61020	Plate	1		49		Rubber	1	
					50	18-61053-C	Fixed support	1	
12	10058	Small bracket	1		51		Hex. socket head bolt	1	CAP 6x10
13		Set screw	2	SET 8x12	52	61011	Box	1	
14		Nut	2	M4xP0.7	53	60033	Tube	1	
15		Spring washer	10	M6	54	61210-86-P02	Bracket	1	
16		Hex. socket head bolt	3	CAP 6x12	55		Nipple	1	1/2"PTx3/8"PH
17	61056	Bracket	1		56	61012-86	Cover	1	
18		Limit	1	Tz9212	57		Coolant conduit	1	CT801x3/8"x98"
19		Dome cross screw	2	M4x40	58		Nut	4	M4
20		Nut	2	M8	59		Set screw	2	SET6x10
21		Washer	36	M8	60		Hex. socket head bolt	2	CAP 6x20
22		Hex. socket head bolt	34	CAP 8x20	61	63048-60	Bracket	1	
23	61210-86	Splash guard	1		62		Hex. socket head bolt	2	CAP 6x25
24		Knob	1	A-3-1	63		Set screw	2	SET6x20
25		Hex. socket head bolt	1	screw 3/16"x3/8"					
26	13-10102	Piovt	1						
27	15-65053-D	Chuck safety guard	1						
29		Flat hexagon screw	2	M5x8					
30		Set screw	1	SET 5x16					
31	6210-86-P01	Bracket	1						
32		Coolant conduit	1	CT801x3/8"x74"					
33		Nipple	1	3/8"PTx3/8"PH					
34		Coolant pump	1	MC8150					
35	61010-86	Coolant tank	1						
36	61019	Cover	1						
37		Dome cross screw	11	M6x10					
38	30065-1	Cover	1						
39		Hex. socket head bolt	2	CAP 6x20					
40	NO.240	Nameplate	1	IMPERIAL					
	NO.241		1	METRIC					

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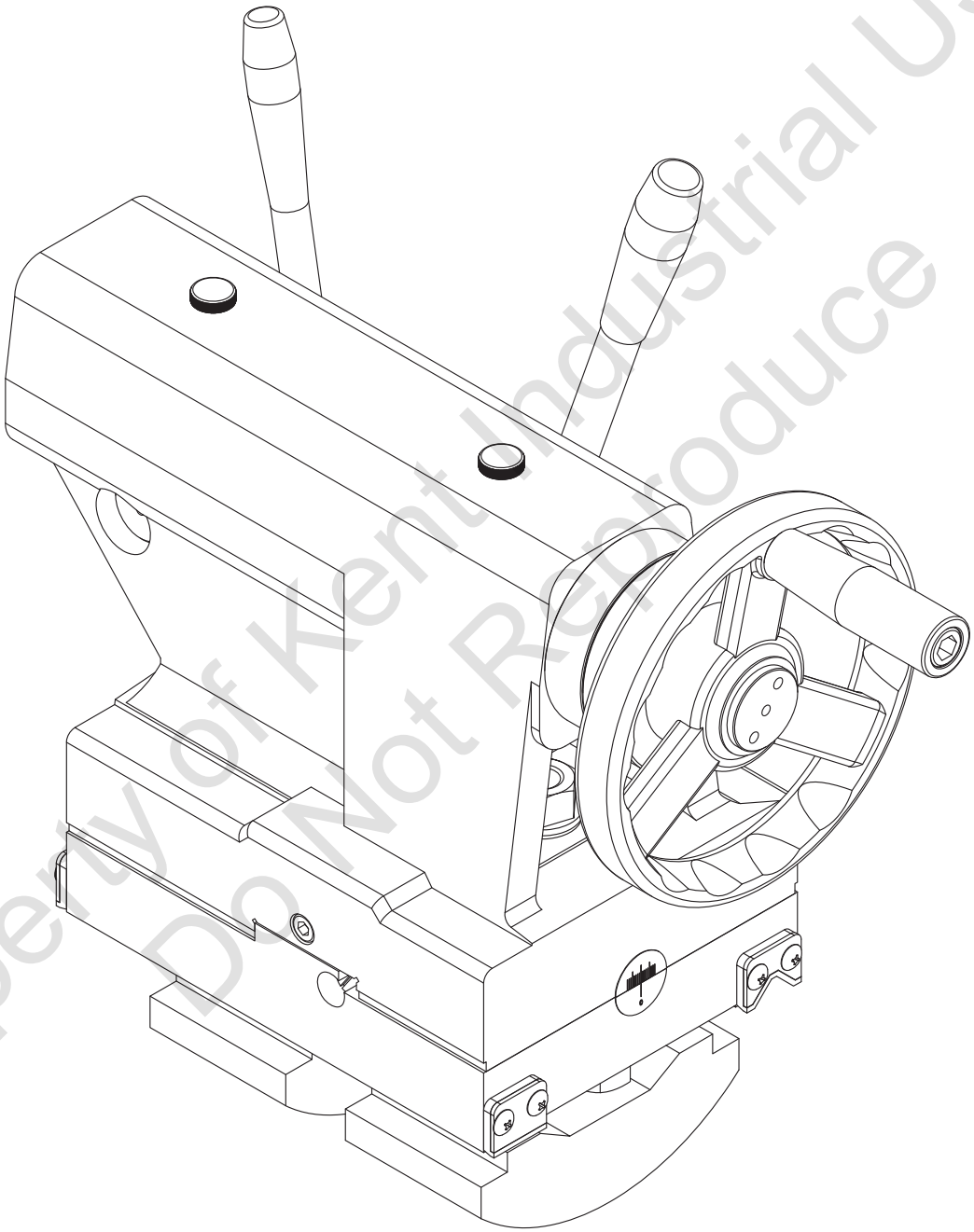
Tailstock



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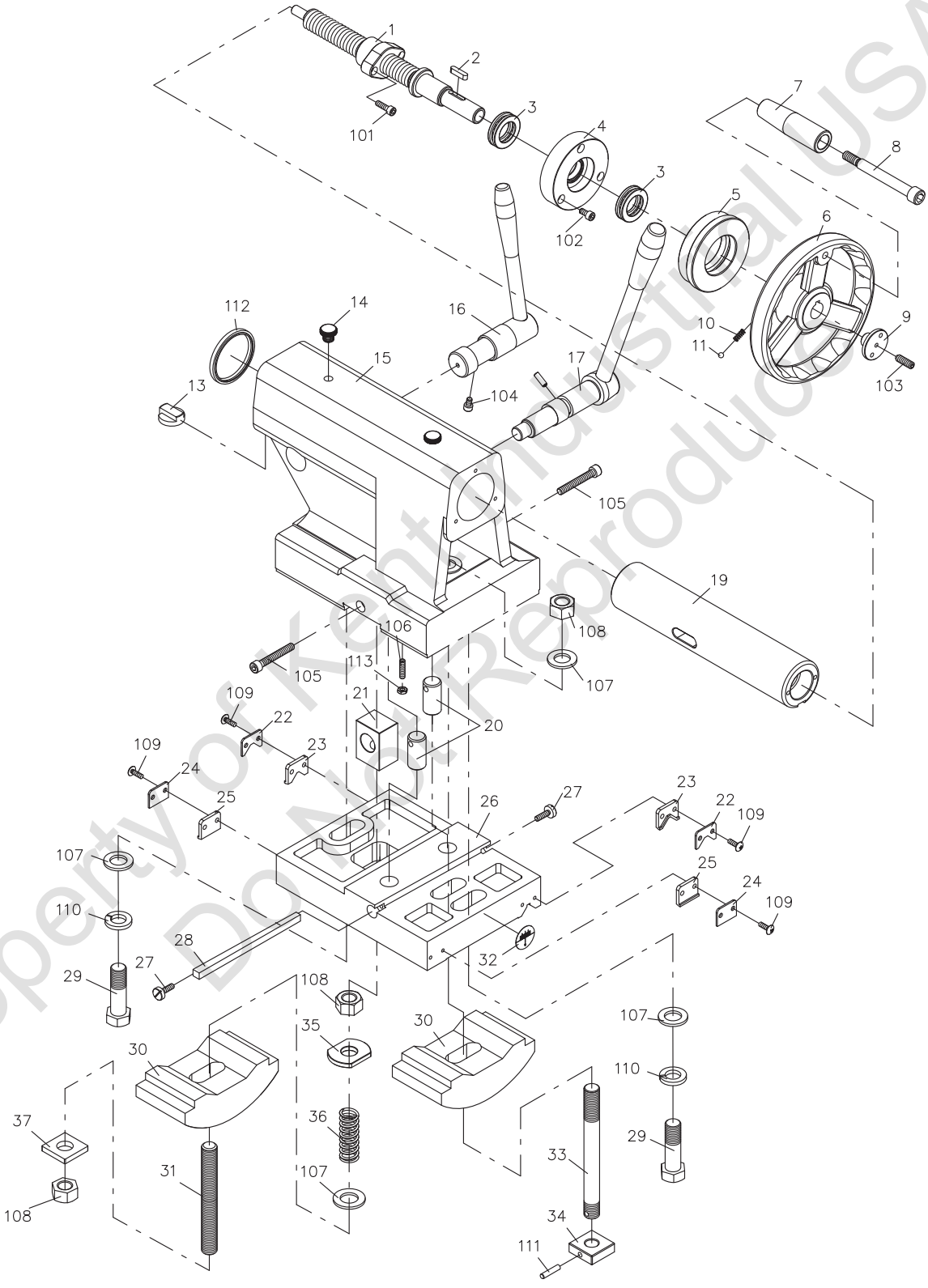
Tailstock



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Tailstock

No.	Part No.	Part's name	QTY	REMARK
1	70004-M	Lead screw	1	
	70005-M	Nut	1	
	70004-I	Lead screw	1	
	70005-I	Nut	1	
2		Key	1	6×6×25
3		Thrust bearing	2	51105
4	70006-M	Flange	1	
	70006-I			
5	70007-M	Index ring	1	
	70007-I			
6	70010	Handle	1	
7	70012	Handle	1	
8	70011	Bolt	1	
9	70009	Fixed screw	1	
10	70008	Spring	3	
11		Steel ball	3	1/4"
13	70018	Guide key	1	
14	70091	Screw	2	
15	70001	Tail stock	1	
16	70017	Clamp lever L	1	
	70019	Cam shaft L	1	
17	70023	Cam shaft R	1	
	70024	Clamp lever R	1	
	70025	Pins	1	
19	70003	Quill	1	
20	70020	Pin nut	2	
21	70022	Pivot block	1	
22	70028	Plate V	2	
23	70026	Wiper V	2	
24	70029	Plate F	2	
25	70027	Wiper F	2	
26	17-70002	Base	1	
	20-70002			
27	70034	Gib screw	2	
28	70033	Gib	1	
29		Hexagon head screw	2	M18x65
30	70016	Clamp block	2	
31		Stud bolt	1	M18×150L
32	70032	Warked plate	1	
33		Stud bolt	1	M18×180L
34	70015	Nut	1	
35	70095	Washer	1	
36	70102	Spring	1	
37	70081	Washer	1	

No.	Part No.	Part's name	QTY	REMARK
101		Hex. socket head bolt	2	CAP 6x20
102		Hex. socket head bolt	3	CAP 6x25
103		Set screw	1	SET 6x25
104		Hex. socket head bolt	1	CAP 6x10
105		Hex. socket head bolt	2	CAP 8×55
106		Set screw	1	SET 6×25
107		Washer	4	M18
108		Nut	3	M18
109		Dome cross screw	8	M5×12
110		Spring washer	2	M18
111		Pin	1	Ø4×38
112		Oil seal	1	DH-60
113		Nut	1	M6

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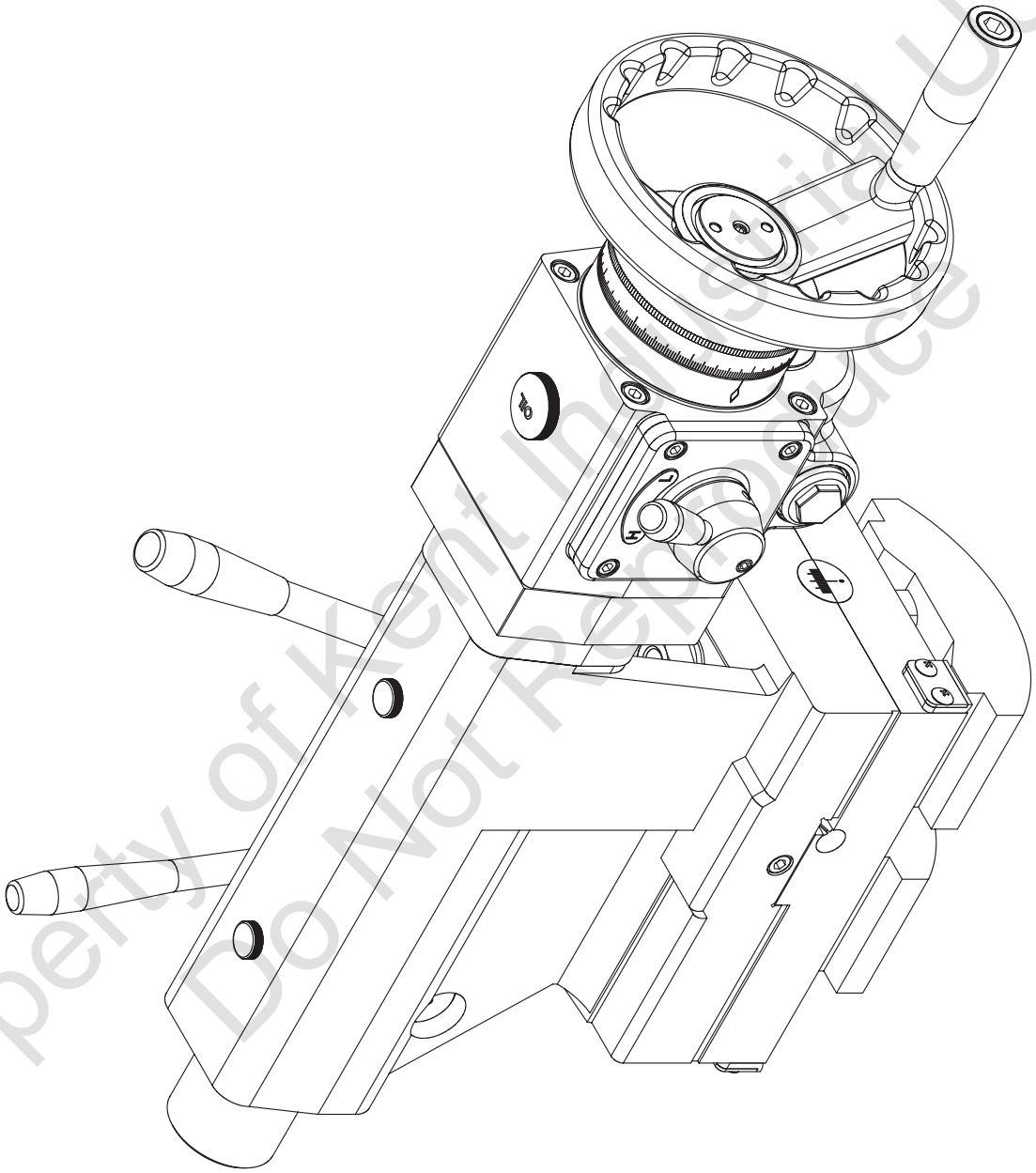
Two-Step Tailstock



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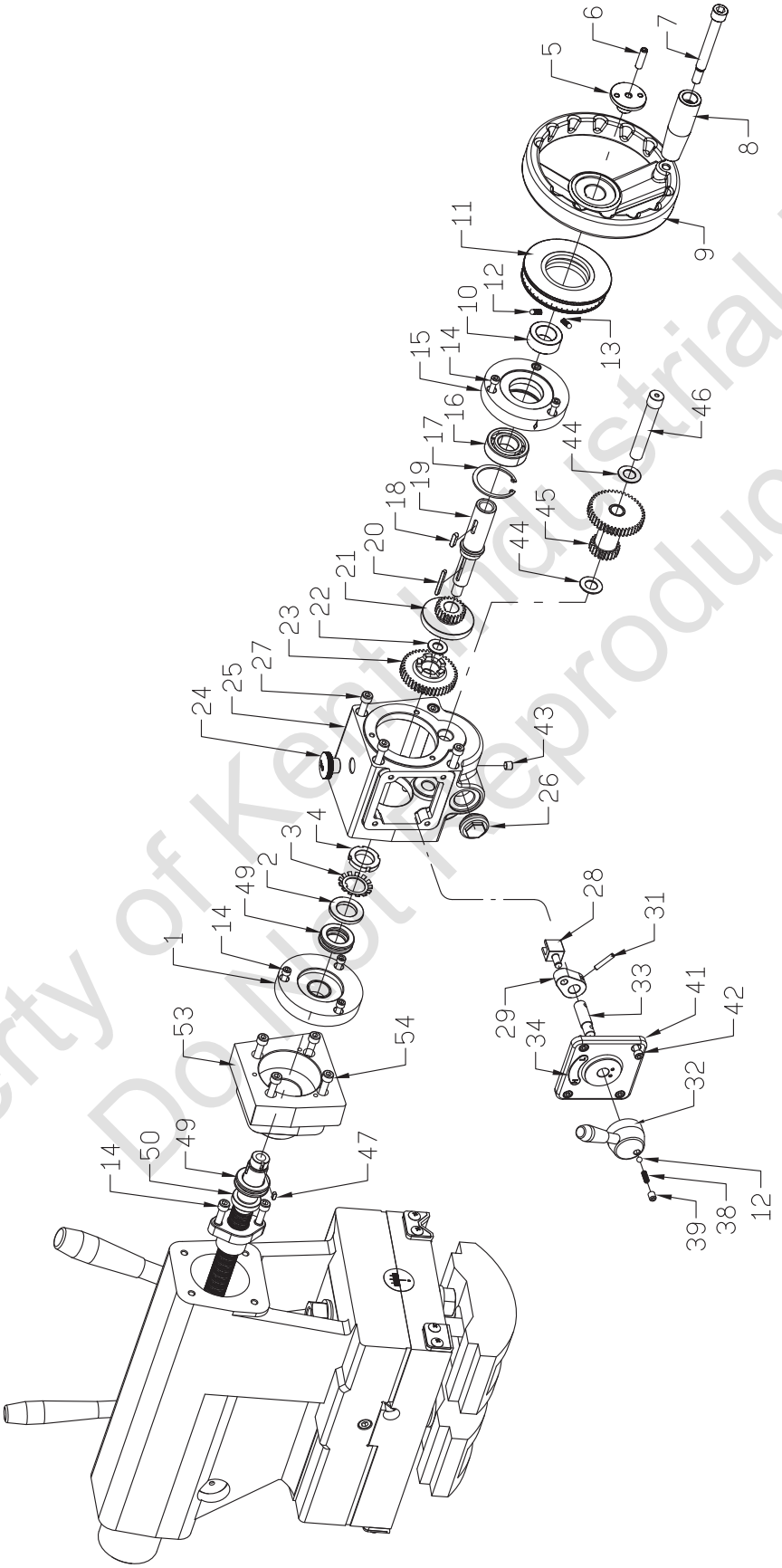
Two-Step Tailstock



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Two-Step Tailstock

NO.	Part NO.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	70006-D	Flange TD	1		44	70073-D	Washer TC	2	
2	70065-D	Washer TD	1		45	70072-D	Gear	1	22T/44T
3		Locking washer	1	AW05	46	70071-D	Fixed shaft	1	
4		Locking nut	1	AN05	47		Key	1	4x4x10
5	70009	Fixed screw	1						
6		Set screw	1	SET 8×30	49		Thrust bearing	2	51105
7	70011	Bolt	1		50	70005-SI	Nut	1	
8	70012	Handle HW	1			70063-DI	Lead screw	1	
9	70010	Handweel	1			70005-SM	Nut	1	
10	70074-D	Collar TA	1			70063-DM	Lead screw	1	
11	70007-I	Index ring	1						
	70007-M								
12		Steel ball	4	1/4"	53	70085-DF	Join seats	1	
13	70008	Spring	3		54		Hex. socket head bolt	4	CAP 6x60
14		Hex. socket head bolt	8	CAP 6×20					
15	70075-DI	Flange	1						
	70075-DM								
16		Ball bearing	1	6205Z					
17		Snap ring	1	R52					
18		Key	1	5x5x18					
19	70067-D	Handweel shaft	1						
20		Key	1	4x4x40					
21	70069-D	Gear	1	22T					
22	70070-D	Washer TB	1						
23	70068-D	Gear	1	44T					
24		Oil cover	1	NF 3/4"					
25	70064-D	Small gear box	1						
26		Oil Sight	1	PS 3/4"					
27		Hex. socket head bolt	4	CAP 8×120					
28	70079-D	Fork TD	1						
29	70076-D	Lever TD	1						
31		Spring pin	1	Ø4x24					
32		Spring pin	1	Ø4x24					
		Set screw	1	SET 6×6					
	70081-D	Handle TD	1						
	70082-D	Hub TD	1						
33	70077-D	Short shaft	1						
34	70080-D	Curve plate	1						
38	20022	Spring	1						
39		Set screw	1	SET 8×8					
41	70078-D	Box cover	1						
42		Hex. socket head bolt	4	CAP 6×12					
43		Hex. socket head plug	1	PT 1/8					

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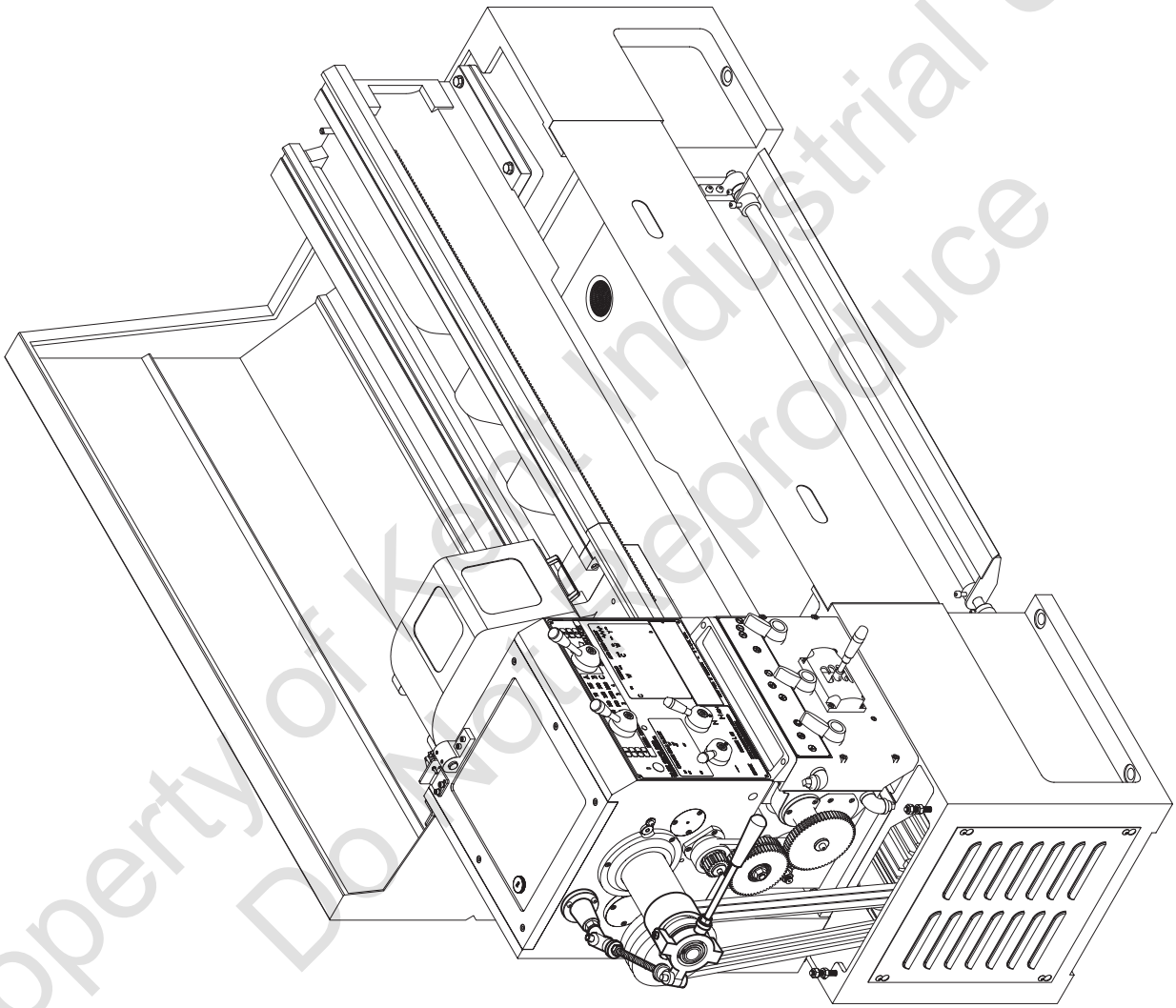
5C Collet Closer Attachment



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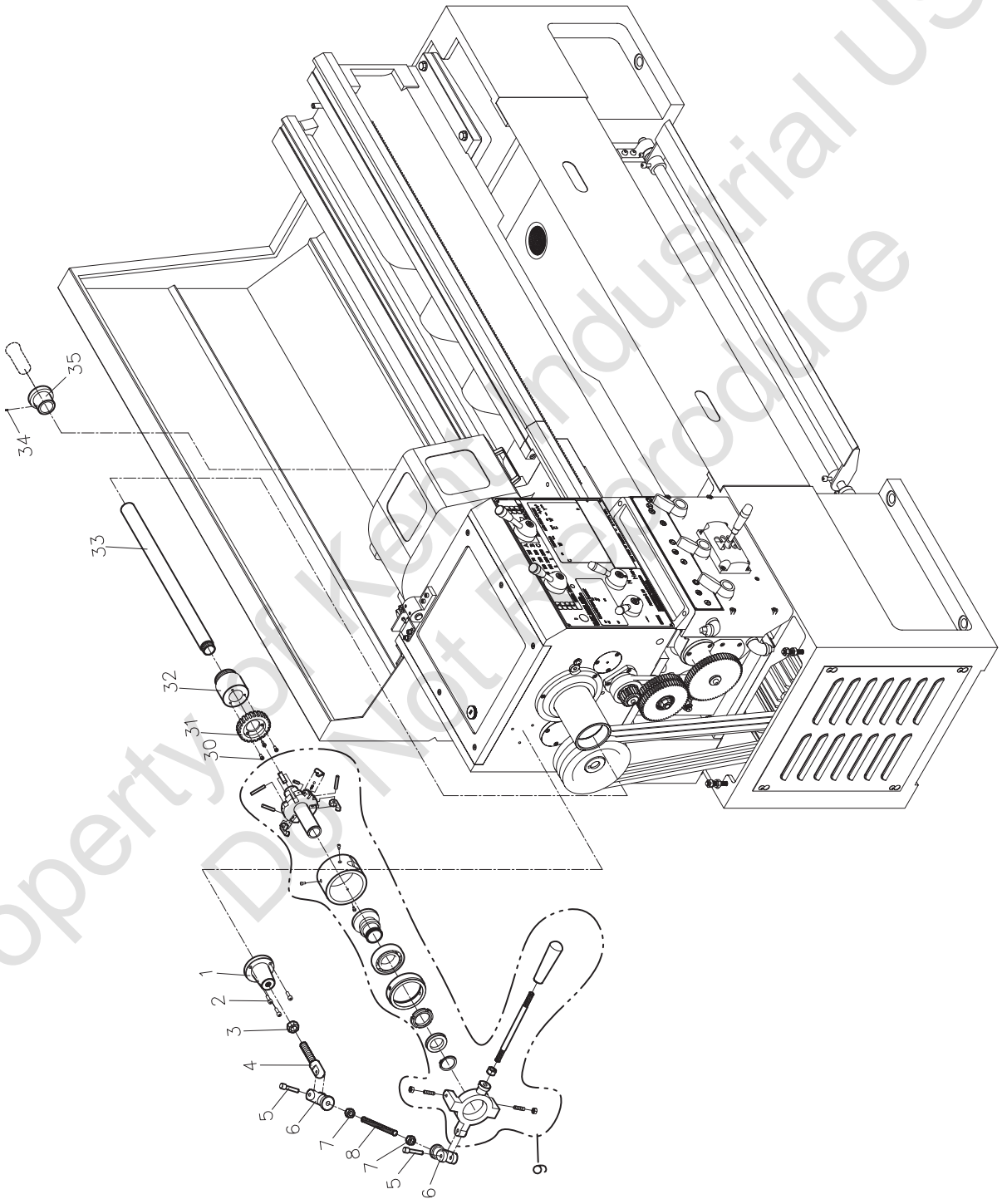
5C Collet Closer Attachment



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5C Collet Closer Attachment

No.	Part No.	Part's name	QTY	REMARK
1		Hex. socket head bolt	3	CAP 6x25
2	90048	Bracket	1	
3		Nut	1	M16
4	90049	Bolt	1	
5	90055	Bolt	2	
6	90047	Connector Casting	1	
7		Nut	2	W½"
8	90050	Screw	1	W½ x 155mm
	90044	Handle Casting	1	
		Set screw	2	SET M8x10
		Nut	2	M8
		Nut	1	½" - 12UNC
	90045	Handle Rod	1	
	90046	Handle	1	
		Clip	1	S34
		Washer	1	Ø52.4xØ34.4x9
	90042	Nut	1	
	90038	Bearing and Retainer	1	
9		Ball bearing	1	6208
	90037	Cam	1	
		Hex. socket head bolt	3	CAP 4x8
	90043	Collar	1	
	90029	Tube	1	
	90031	Finger	3	
	90032	Pivot Pin	3	Ø6x40
	90035	Knob	1	
		Steel ball	1	Ø5
	90033	Spring	1	
		Pin	1	Ø5x18
30		Hex. socket head bolt	3	CAP 5x12
31	90025	Index Ring	1	
32	90023	Hub	1	
33	90028	Tube	1	
34	90027	Pin	1	
35	90026	Bush	1	

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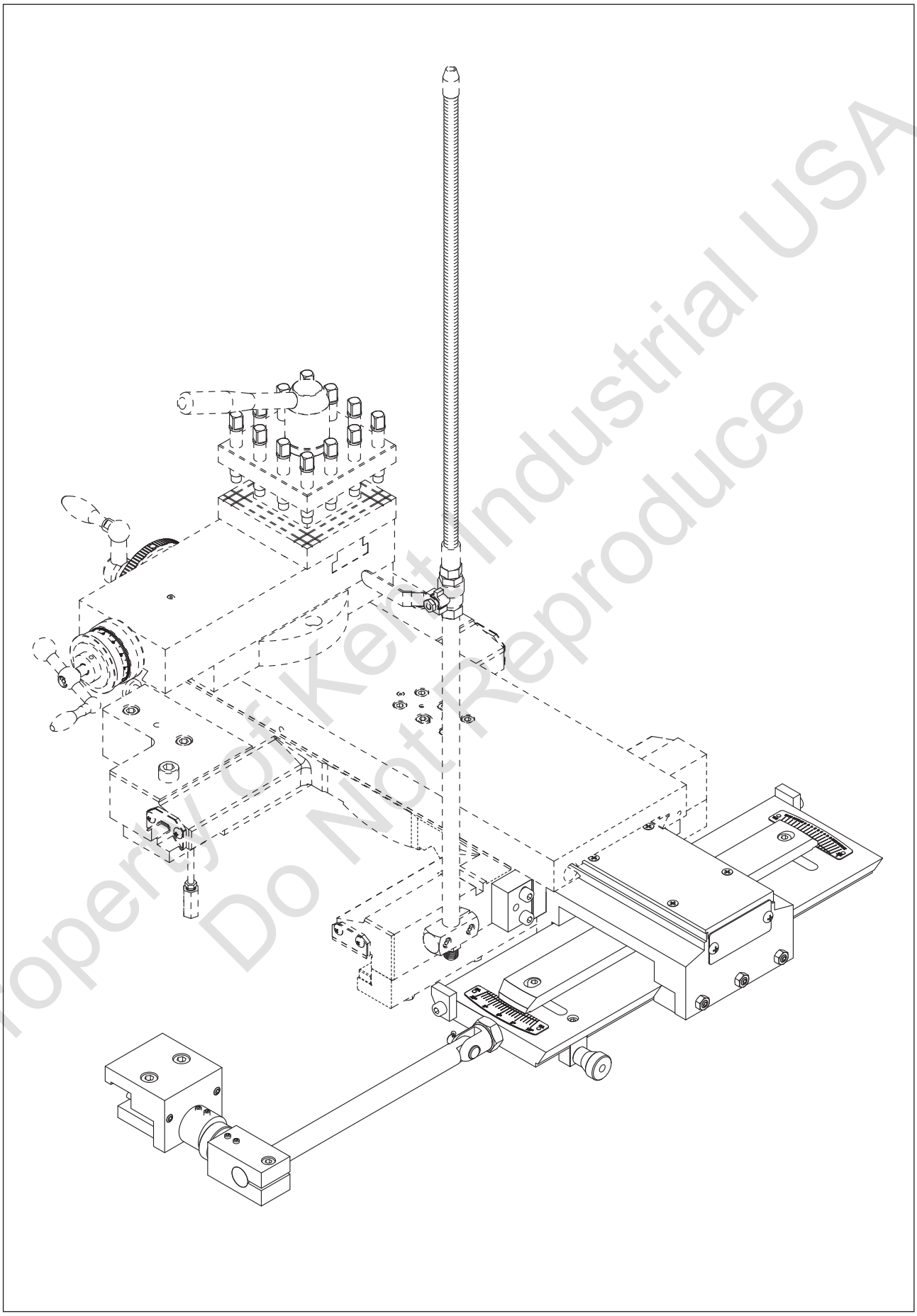
Taper Attachment



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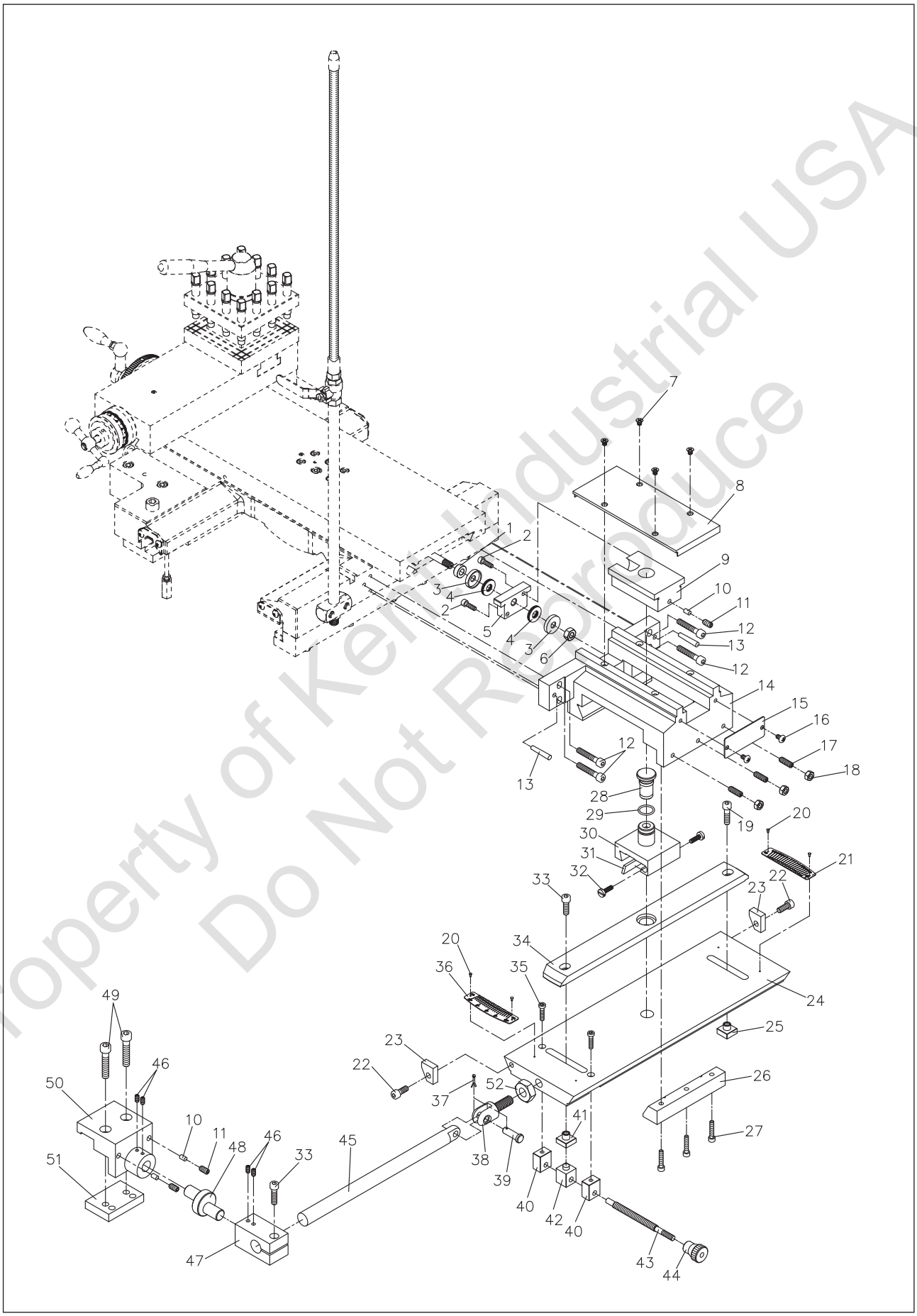
Taper Attachment



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Taper Attachment

No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	50017	Collar	1		49		Hex. socket head bolt	2	CAP 10x50
2		Hex. socket head bolt	2	CAP 6x20	50	80027	Bracket	1	
3	50026	Cap collar	2		51	18-80023	Hub	1	
4		Thrust bearing	2	NTB / AS2-1528	52		Nut	1	
5	80005	Yoke Plate	1						
6		Nut	1	M12					
7		Flat hexagon screw	4	M5x12					
8	80002	Cover plate	1						
9	80004	Yoke	1						
10	18-70083	Copper pin	3						
11		Set screw	3	M8x6					
12		Hex. socket head bolt	4	CAP 8x45					
13		Taper pin	2	#6x1½"					
14	15-80001	Main bracket	1						
15	18-80003	Plate	1						
16		Done cross screw	2	M6x10					
17		Set screw	3	M8x25					
18		Hexagon nut	3	M8					
19		Hex. socket head bolt	1	CAP 8x30					
20		Rivet	4	Ø2					
21	15-80025	Name plate	1						
22		Hex. socket head bolt	2	CAP 8x20					
23	18-80033	Stop	2						
24	15-80010	Plate	1						
25	18-80017	Nut	1						
26	15-80012	Gib	1						
27		Hex. socket head bolt	3	CAP 6x30					
28	18-80011	Slide pivot pin	1						
29		O ring	1	P21					
30	18-80006	Side block	1						
31	80008	Gib	2						
32	80007	Screw	1						
33		Hex. socket head bolt	2	CAP 8x25					
34	15-80009	Swive slide	1						
35		Hex. socket head bolt	2	CAP 6x25					
36	15-80024	Name plate	1						
37		Split pin	1	Ø2.5x16					
38	18-80031	Bolt	1						
39	18-80030	Pin	1						
40	18-80019	Block	2						
41	18-80016	Nut	1						
42	18-80018	Block	1						
43	18-80015	Screw	1						
44	18-80014	Knob	1						
45	18-80028	Bolt	1						
46		Set screw	4	M6x12					
47	18-80021	Bracket	1						
48	18-80020	Eccentric pin	1						

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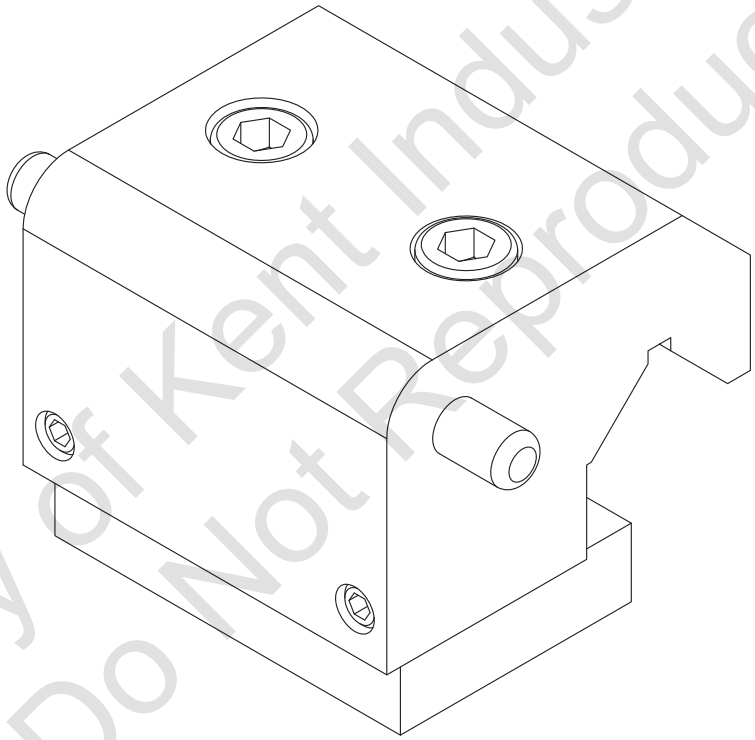
Bed Stop



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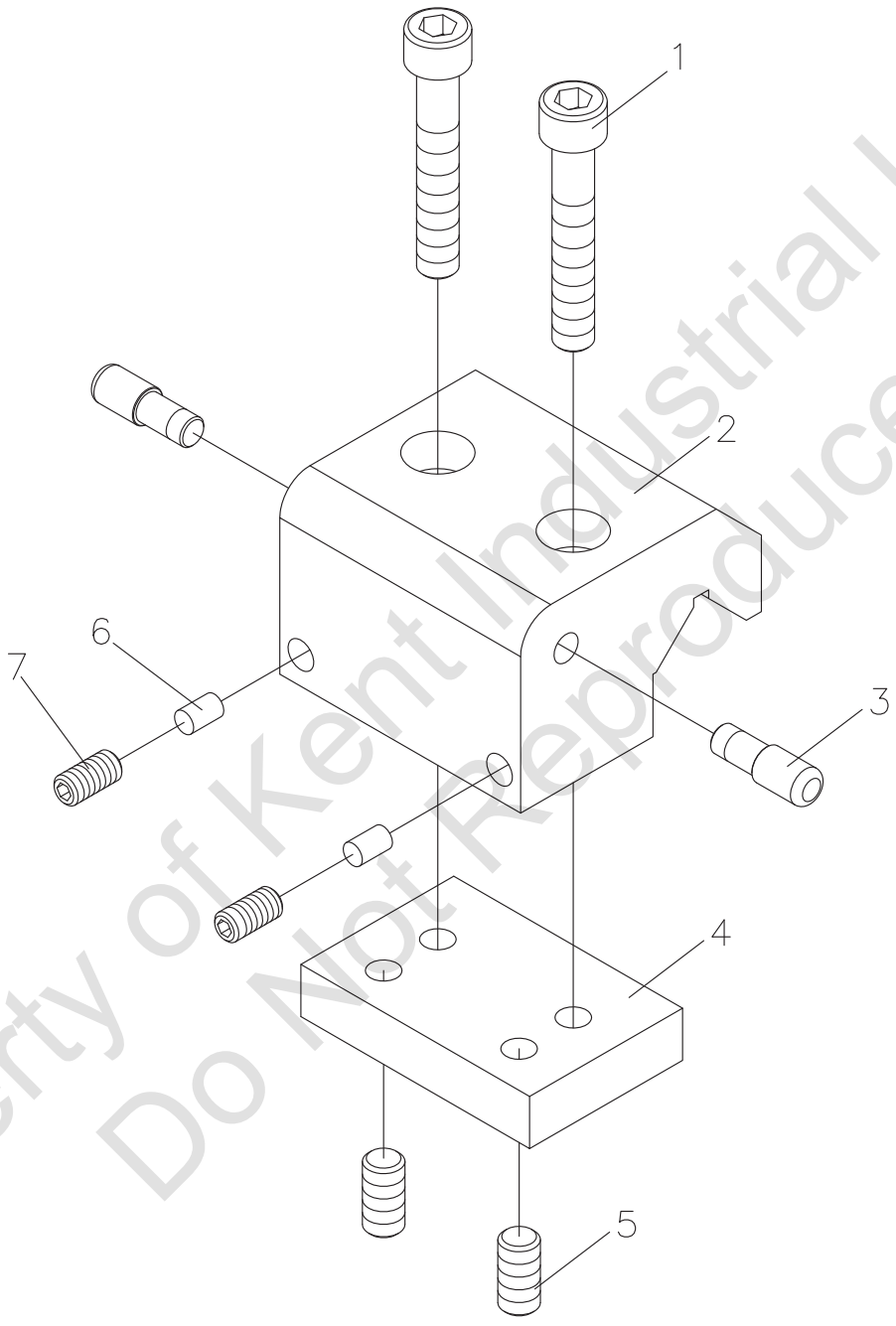
Bed Stop



No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1		Hex. socket head bolt	2	CAP 10x60	5		Set screw	2	M10x20
2	18-70085	Body	1		6	18-70083	Copper pin	2	
3	18-70084	Pad	2		7		Set Screw	2	M8x16
4	18-70059	Clamp plate	1						

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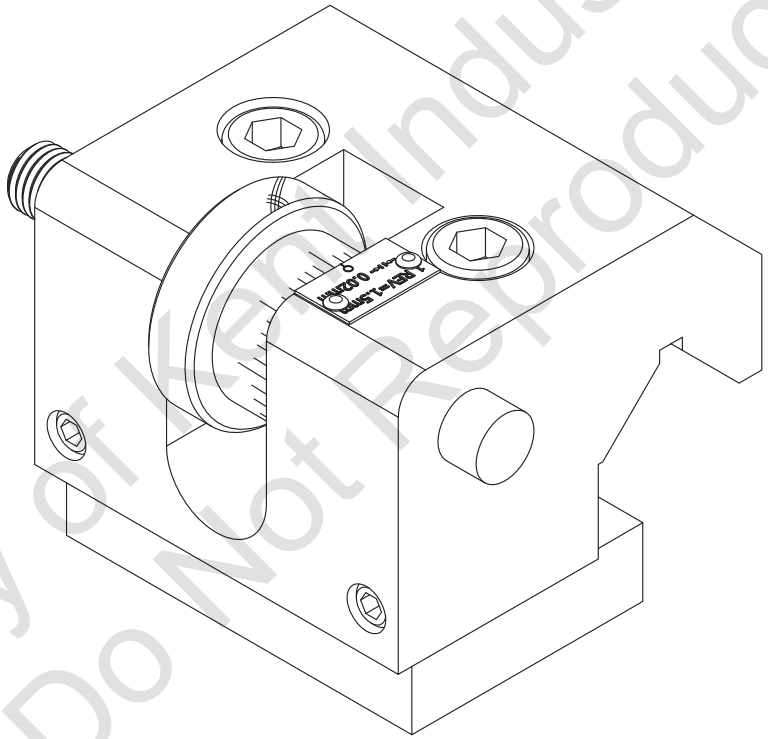
Bed Stop - Micrometer



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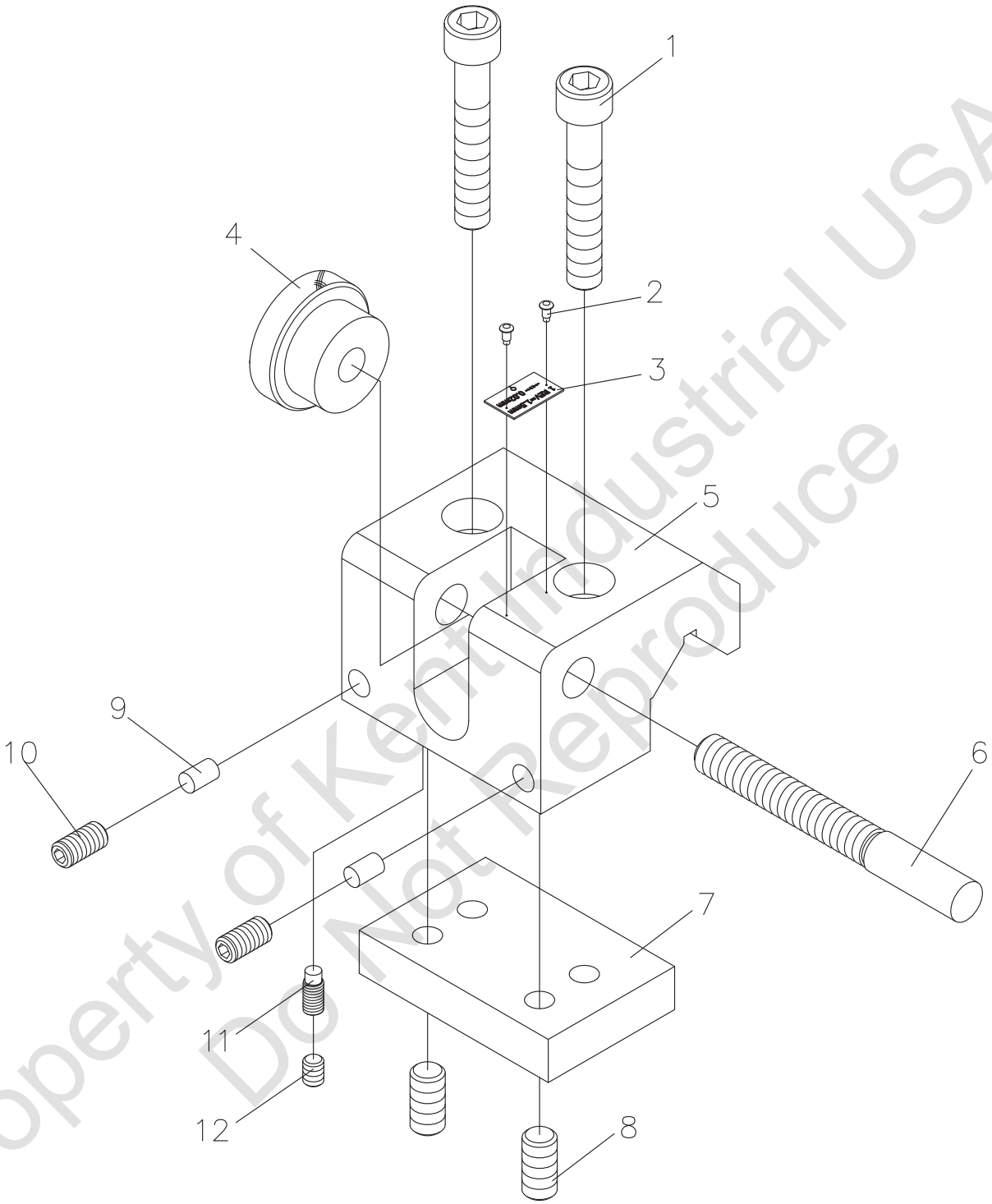
Bed Stop - Micrometer



No.	Part No.	Part's name	QTY	REMARK
1		Hex. socket head bolt	2	CAP 10x60
2		Rivet	2	Ø2
3	18-70060-I	Name plate	1	
	18-70060-M			
4	18-70057-I	Micro dial	1	
	18-70057-M			
5	18-70048	Body	1	

No.	Part No.	Part's name	QTY	REMARK
6	18-70056-I	Rod	1	
	18-70056-M			
7	18-70059	Clamp plate	1	
8		Set screw	2	M10x20
9	18-70083	Coopper pin	2	
10		Set screw	2	M8x16
11		Set screw	1	M8x12
12		Set screw	1	M8x12

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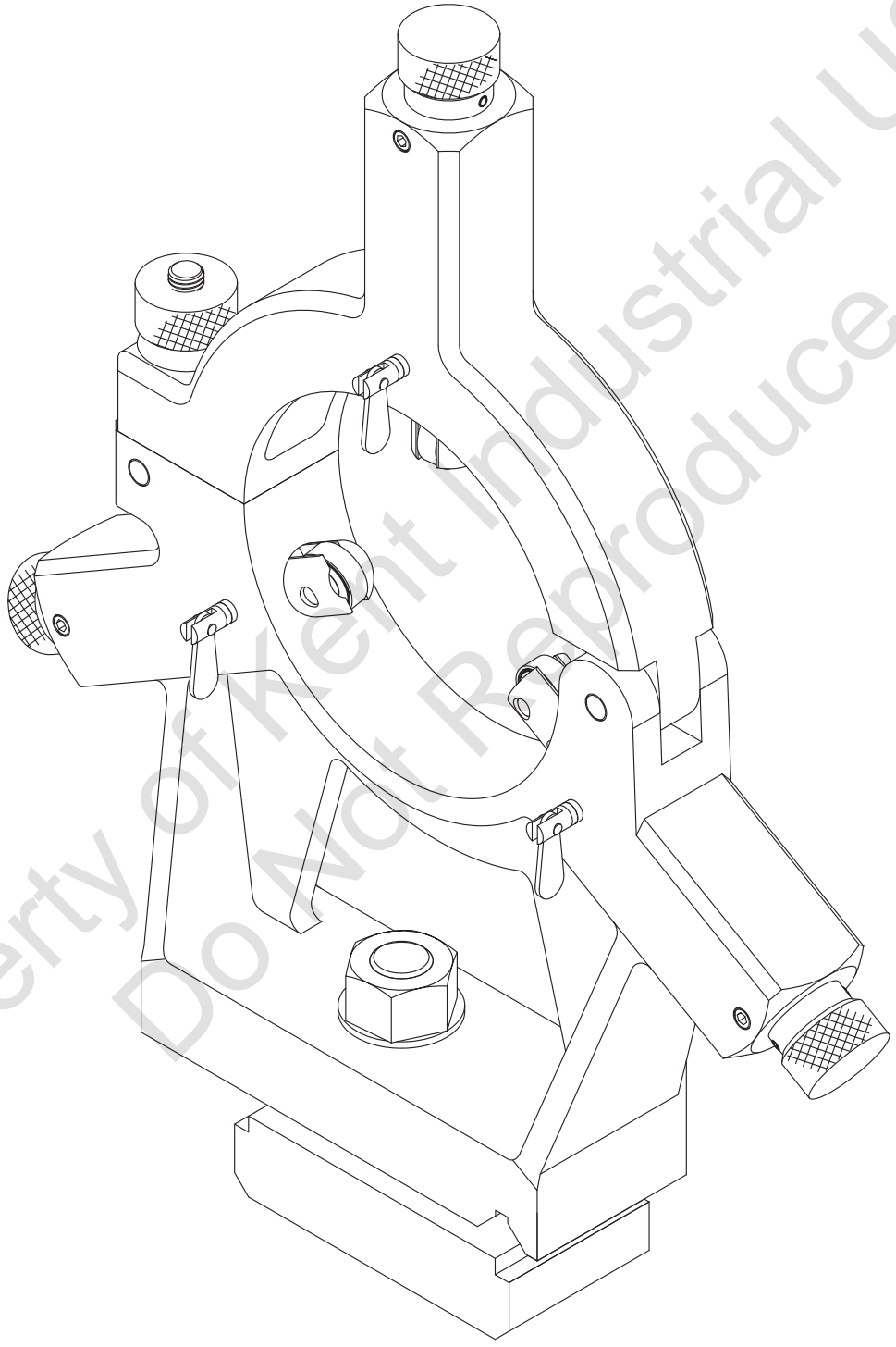
Steady Rest



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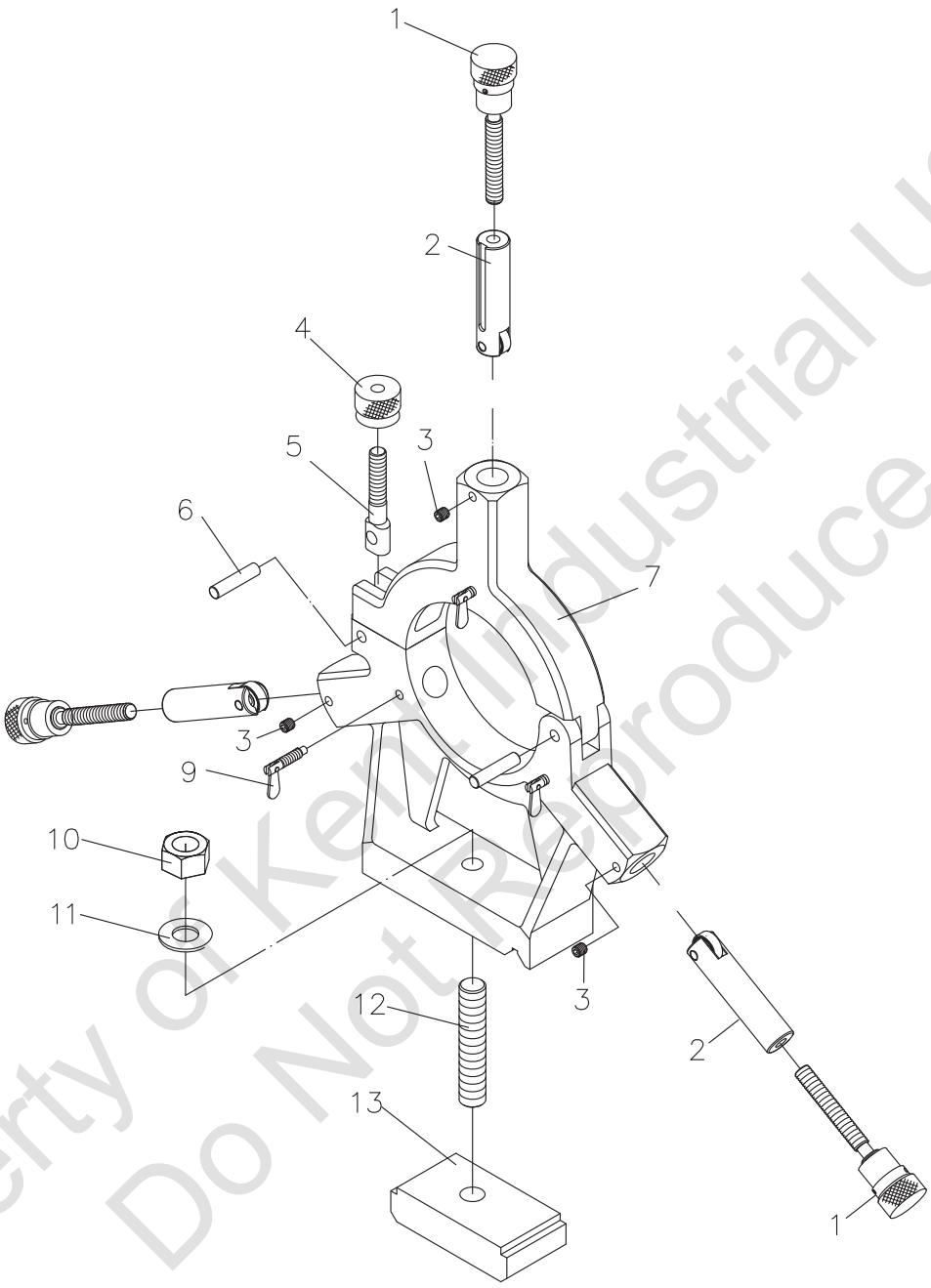
Steady Rest



No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	70038	Adjusting knob	3		6	70032	Hinge pin	2	
		Spring pin	3	Ø4x40L	7	70029	Top casting	1	
	70062	Collar	3			17-70030	Base casting	1	
	70035	Screw	3			70029	Top casting	1	
2	70037	Finger	3			20-70030	Base casting	1	
		Pin	3	Ø8x23L	9	70063	Single wing bolt	3	
		Ball bearing	3	627	10		Nut	1	M12
3		Set screw	3	M8x8L	11		Spring washer	1	M12
4	70064	Knob nut	1		12		Hexagon head bolt	1	M12x75
5	70033	Clamp screw	1		13	70039	Clamp plate	1	

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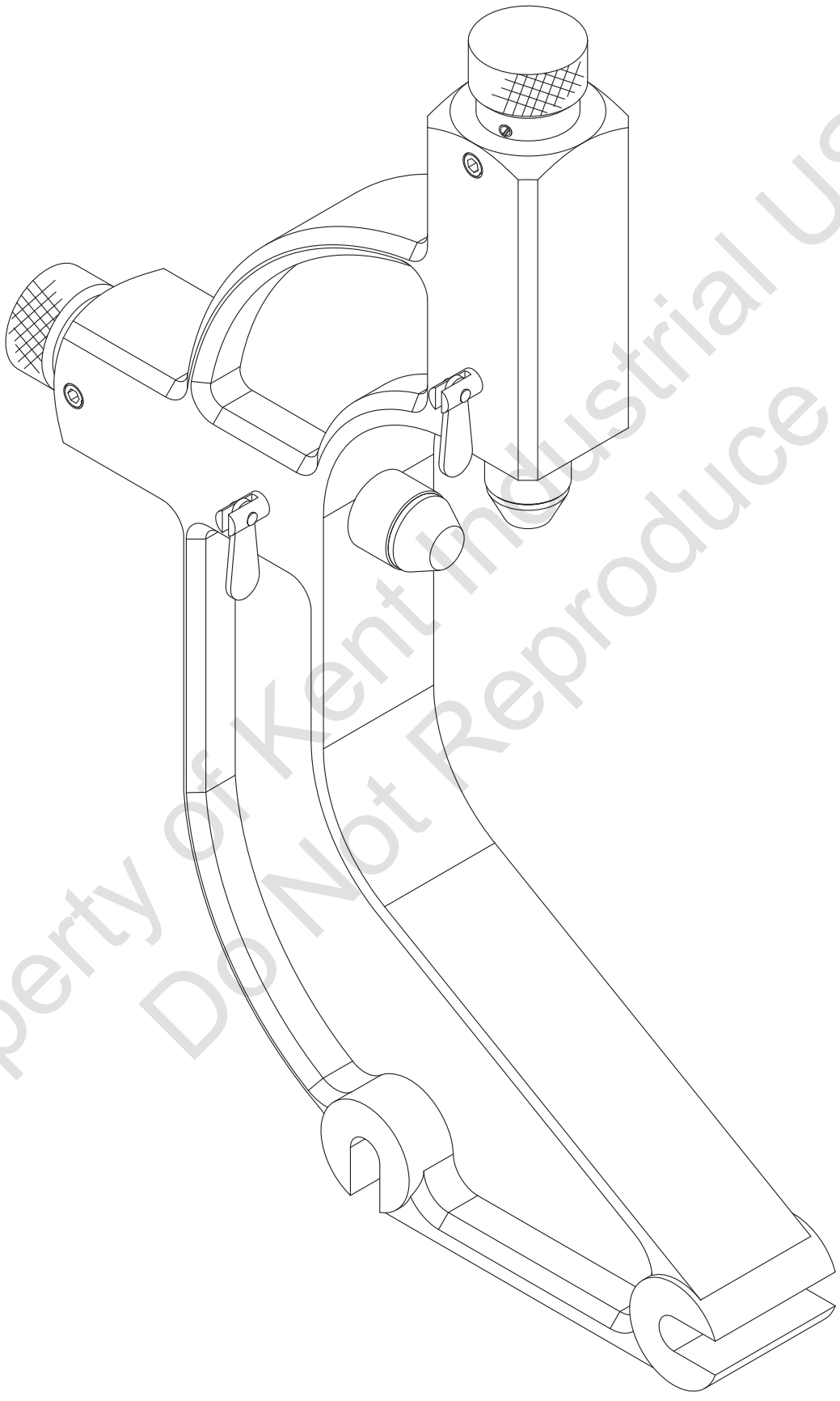
Follow Rest



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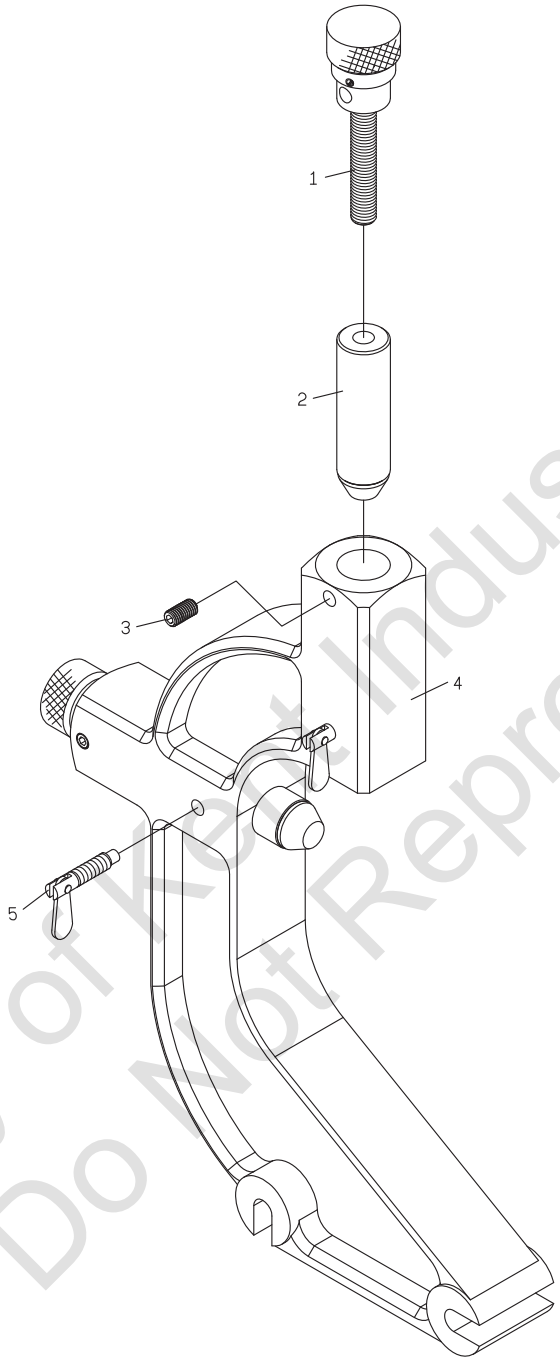
Follow Rest



No.	Part No.	Part's name	QTY	REMARK	No.	Part No.	Part's name	QTY	REMARK
1	70038	Adjusting screw	2		3		Set screw	2	M8x8
		Spring pin	2	Ø4x40L	4	17-70041	Casting	1	
	70062	Collar	2			20-70041			
	70045	Screw	2		5	70063	Single wing bolt	2	
2	70044	Finger	2						
		Bracket	2						

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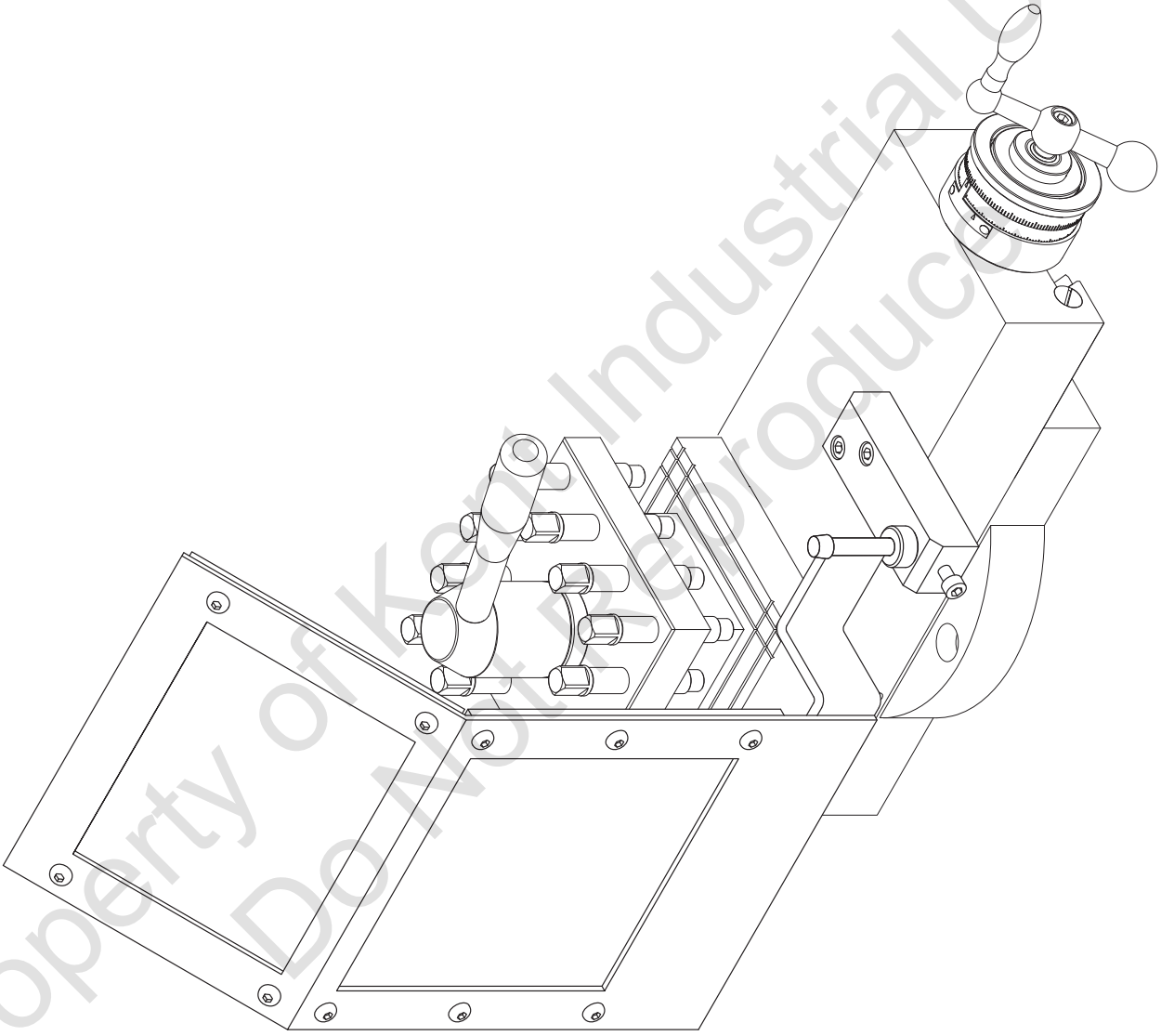
Tool Post Safety Guard



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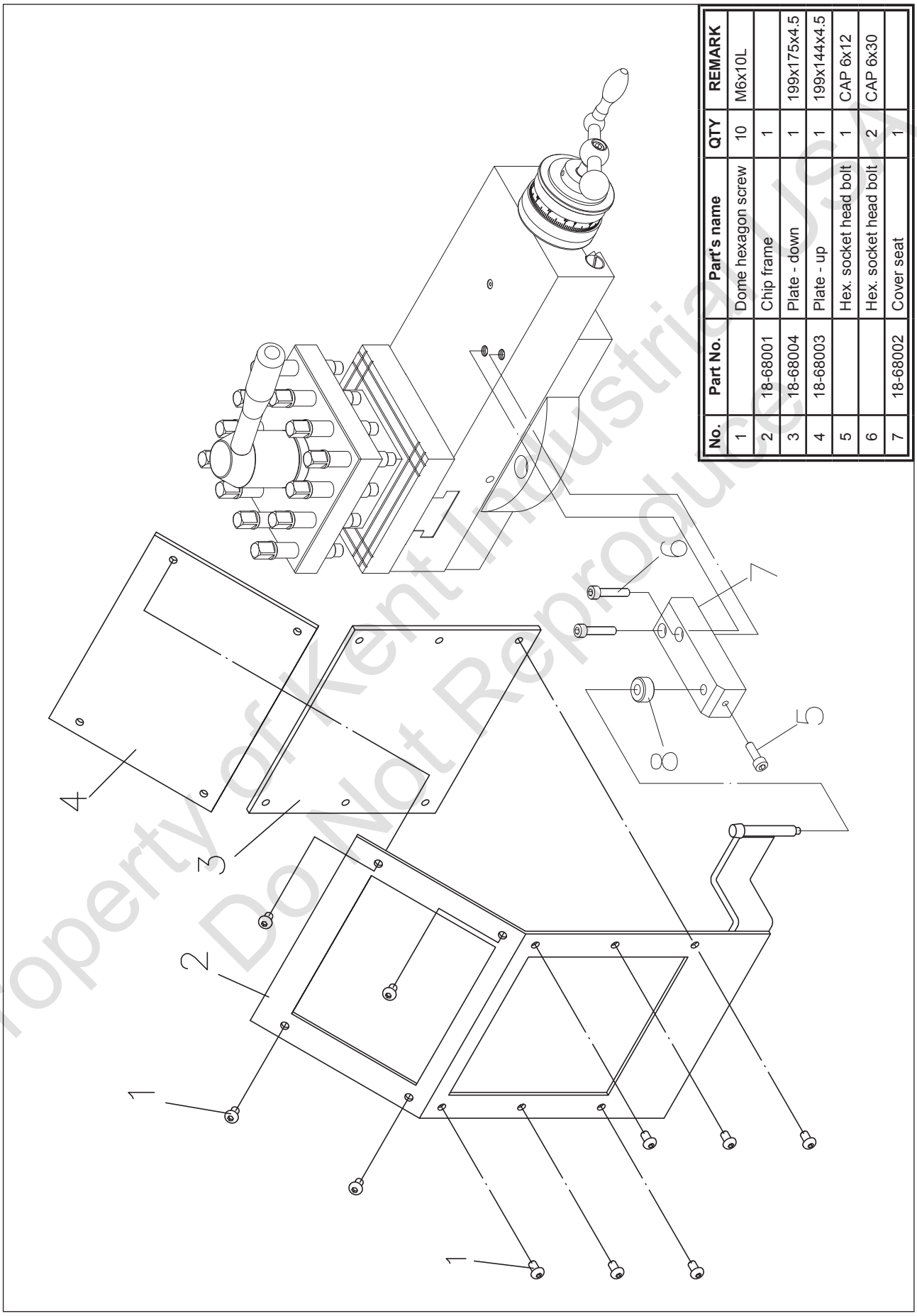
Tool Post Safety Guard



No.	Part No.	Part's name	QTY	REMARK
1		Dome hexagon screw	10	M6x10L
2	18-68001	Chip frame	1	
3	18-68004	Plate - down	1	199x175x4.5
4	18-68003	Plate - up	1	199x144x4.5
5		Hex. socket head bolt	1	CAP 6x12
6		Hex. socket head bolt	2	CAP 6x30
7	18-68002	Cover seat	1	

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