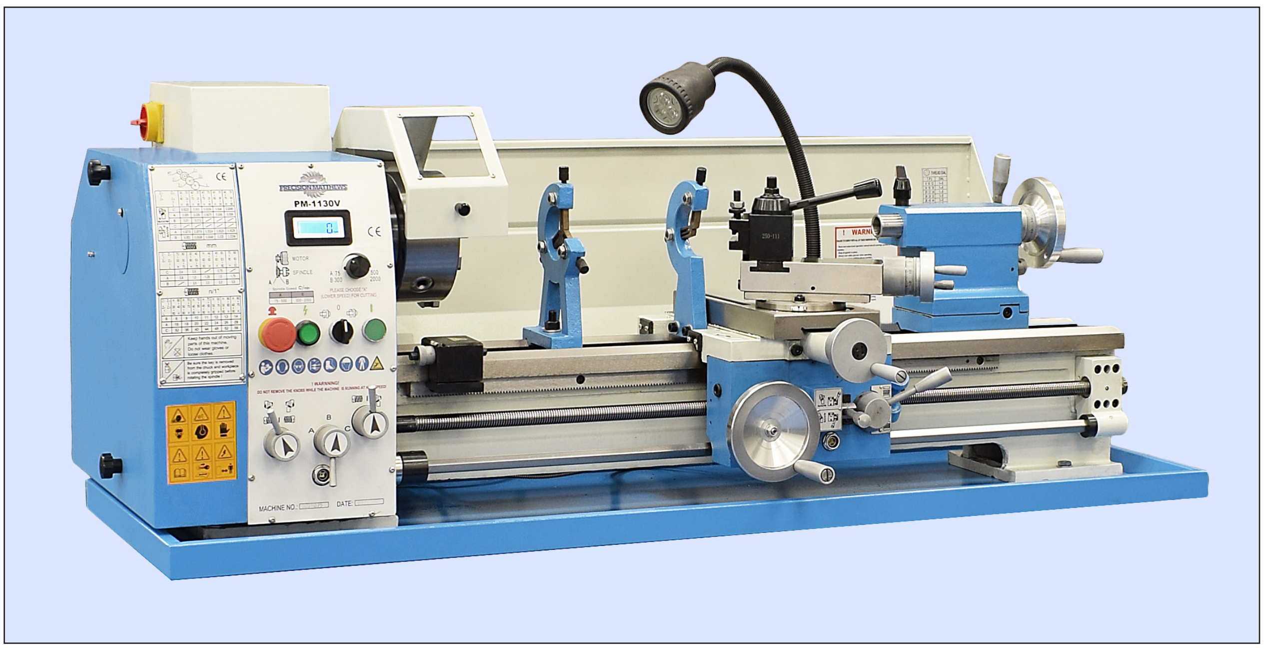
Model PM-1130V Lathe

110 Vac 1.5 HP fully equipped machine
AC motor with variable frequency drive
Spindle speed ranges: 75 to 500 & 300 to 2000 rpm
30 in. between centers, 11 in. swing over bed
Spindle bore 1-1/2"
3-jaw chuck, steady & follower rests
Quick change tool post & tool holders
Gearbox and change gears for full-range screw cutting, U.S. (TPI) & Metric
Bi-directional power feed for saddle & cross-slide
Weight, excluding stand 515 lb



PM-1130V

FAQ

!

Nothing happens when RUN MOTOR button pressed

POWER

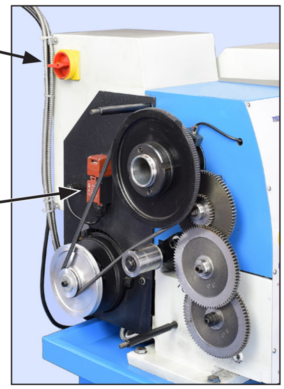
DIRECTION

E-Stop button pressed down?
Twist to release

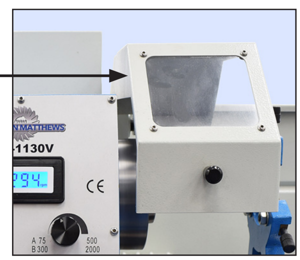
Motor direction switch set to O = OFF?
Set it to CCW (forward, to left) or CW (reverse, to right)

110Vac power connected (power light ON)?
Check power switch & fuse on back panel

Gear cover in place, LH side of headstock?
Replace cover to close safety switch



Chuck guard up?
Swing it down to close



This manual contains essential safety advice on the proper setup, operation, maintenance, and service of the PM-1130V lathe. Failure to read, understand and follow the manual may result in property damage or serious personal injury.

There are many alternative ways to install and use a lathe. As the owner of the lathe, you are solely responsible for its proper installation and safe use. Consider the material contained in this manual to be advisory only. Quality Machine Tools, LLC cannot be held liable for injury or property damage during installation or use, or from negligence, improper training, machine modifications or misuse.

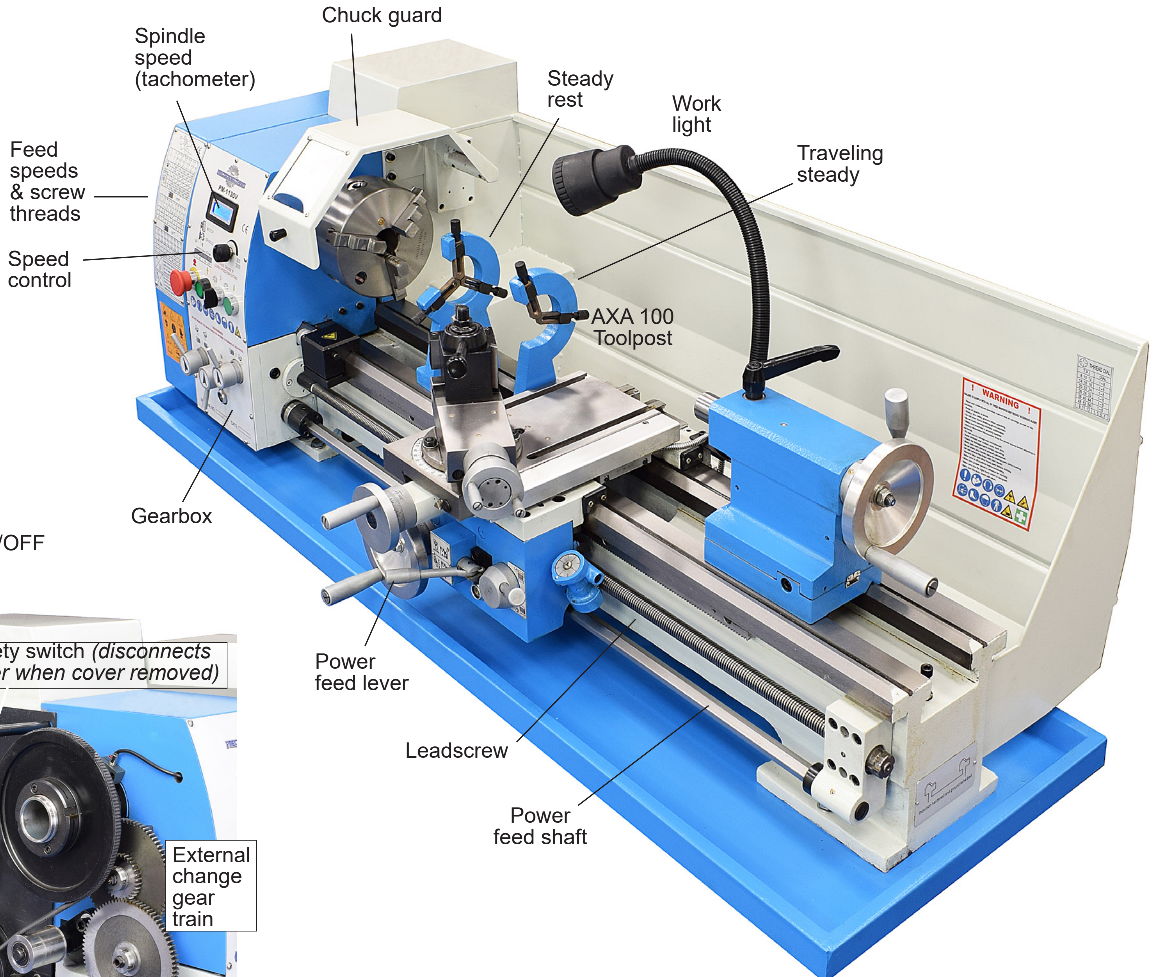
This manual describes PM-1130V machines as shipped from late 2021. There may be detail differences between your specific machine and the information given here (with little or no impact on functionality). If you have questions about any aspect of the manual or your machine, please email us at service@precisionmatthews.com. Your feedback is welcomed!

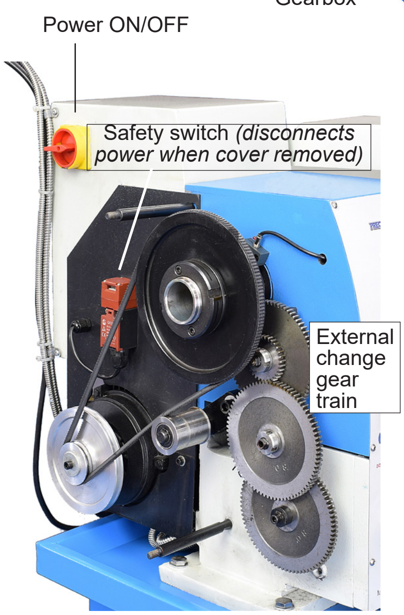
Section 1 INSTALLATION

THESE ARE THE MAIN POINTS TO WATCH OUT FOR!
But read the following pages for more information

! Check oil level in the gearbox and apron before use

- Handling the lathe is at least a two-person job.
- Lifting gear – sling, hoist or forklift – must be rated for at least 1/2 ton.
- Care must taken when lifting to avoid flexing or other damage to any component of the lathe, especially the leadscrew and hex-section feed shaft.
- Working location of the lathe must allow space for opening drive system cover at left; also, access to the electrical box at the back of the headstock.
- Power requirement is 110V, 60Hz, single phase.
- Extension cord not recommended; if no alternative, use 12 AWG not longer than 20 ft.
- Before connecting power be sure that:
  1. The machine is on a firm footing.
  2. Chuck attachment bolts are tight, no wrench left in chuck.
  3. Saddle and cross-slide approx. mid-travel, power feed disengaged.
  4. The speed control knob is set for a low or zero spindle speed, fully counter clockwise.





PM-1130V MAIN COMPONENTS

SETTING UP THE LATHE

The PM-1130V is shipped in two packing cases, one for the lathe, one for the optional stand. When installed on the stand, the machine can be lifted in one piece by an overhead hoist or forklift with slings and/or chains, all items rated for a total weight of at least 1/2 ton. A suggested setup for lifting is shown in Figure 1-1.

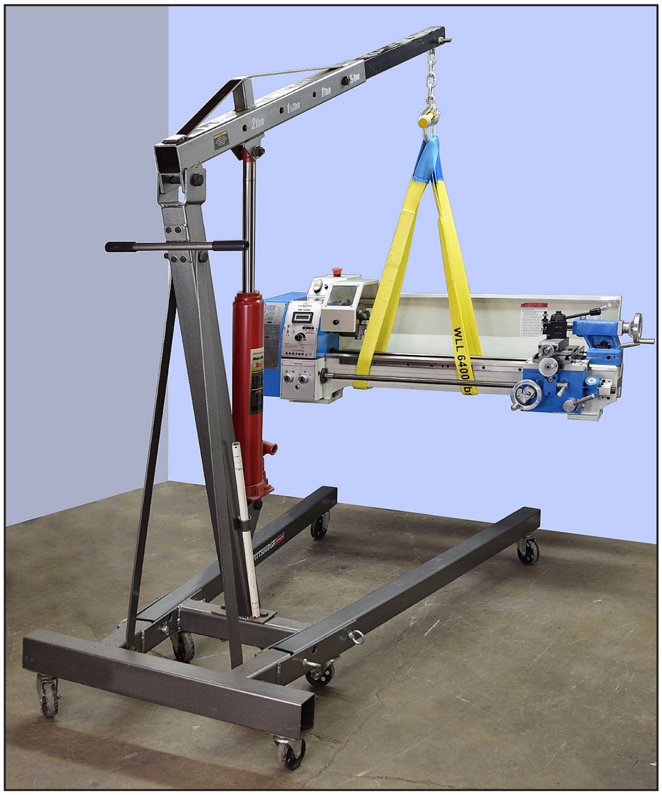


Figure 1-1 **Lifting with slings** (file photo)

When selecting a location for the lathe, allow sufficient room at the right to allow removal/servicing of the leadscrew.

Be sure to keep all lifting gear clear of any part of the lathe, especially the leadscrew at the front. Use spreaders if necessary, at least "2-by" studs.

Before lifting, protect the bed, then remove the chuck if installed. Move the tailstock and saddle as far to the right as possible to balance the machine at the point(s) of suspension.

With the lathe in its permanent location, level it using metal shims under the cabinets, or (preferred), install eight leveling mounts in the mounting holes of the two stand cabinets, 4 to each cabinet.

LEVELING

The following procedure ensures that the lathe bed is in the same state as it was when the lathe was checked for accuracy in manufacture — level from end to end along the bed, and from front to back. In other words, no warping.

Make sure all leveling mounts and/or shims are ***properly weight bearing***, firmly in contact with the floor. Check and adjust level from end to end using a precision machinist's level, if available. If not, use the most reliable level on hand. Check and adjust level front-to-back across the bed using a matched pair of spacer blocks to clear the Vee tenons on the bed ways. The blocks need to be at least 1/4 inch thick, ground or otherwise accurately dimensioned. Alternatively, check for level on the ground surface of the cross-slide as the saddle is traversed from end to end. See also "Aligning the Lathe" in Section 3.

CLEANUP

Metal surfaces may be protected by thick grease and/or paper. Carefully remove these using a plastic paint scraper, disposable rags and a light-oil such as WD-40.

INITIAL CHECKS

Read Section 3 if unsure about any item in the following, which assumes that 110V power has been connected to the terminal strip in the electrical compartment at the back of the machine.

1. Check oil level (sight glasses) in the ***gearbox*** and ***apron***, see Section 4.
2. Remove the belt cover left of the headstock. Make sure the belt is set for the desired speed range — ***low speed suggested*** — and properly tensioned, see Figure 1-2.

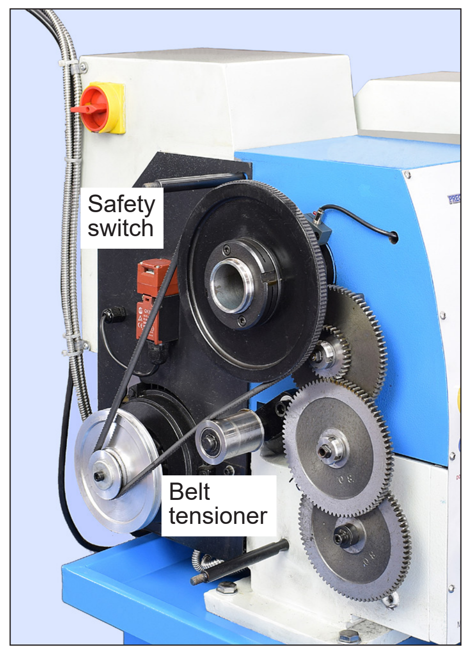


Figure 1-2 **Drive belt adjustment**

3. Replace the belt cover. This closes the safety switch (SQ1), Figure 1-2.
4. If a chuck or faceplate is installed check tightness of the Camlocks on the spindle nose.
5. Lower the chuck guard, closing switch SQ2.
6. Set the spindle speed knob, Figure 1-3, fully counter clockwise, lowest speed, .
7. Check that there are no clamps, locks or other obstructions on moving parts.
8. Set the saddle and cross-slide to approximate mid-travel,
9. Make certain that the power feed and split nut levers are disengaged (neutral), Figure 1-4. ***HINT:*** If the power feeds are disengaged, it will be possible to move the saddle and cross-slide by their handwheels.

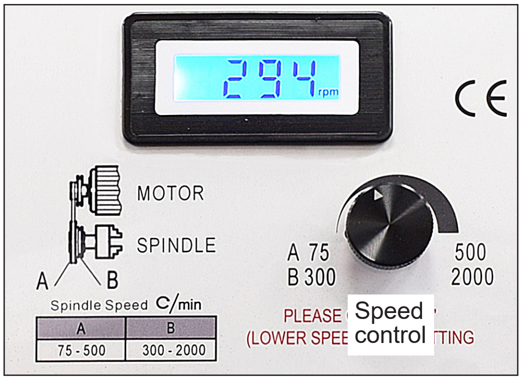


Figure 1-3 **Speed control**

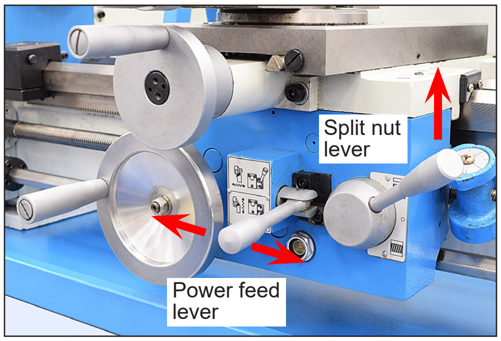


Figure 1-4 **Feed levers neutral**
Split nut lever UP, Power feed lever moves freely from side to side

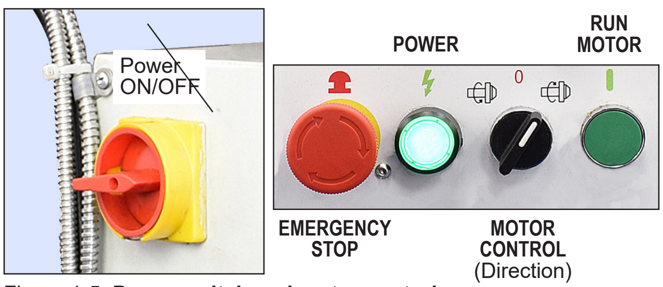


Figure 1-5 **Power switch and motor controls**

10. Be sure the Emergency Stop button, Figure 1-5, has not been pushed in (it should pop out when twisted clockwise). FAQs, page 2.
11. Turn the Motor Control switch to the left, selecting "forward" motion of the spindle.
12. Switch on the power, Figure 1-5, left. The tachometer (speed) display should light, also the POWER light to the right of the emergency stop button.
13. Press the GREEN Motor ON button. The spindle should turn forward, counter clockwise, viewed from the tailstock end. If nothing happens, turn the speed control knob a few degrees clockwise, Figure 1-3.
14. Check the emergency function by pressing the Emergency Stop button. The motor should stop. *If this doesn't happen, the Emergency Stop function is defective, and needs attention.*
15. Reset (twist) the Emergency Stop button to restore power.
16. Check that the chuck guard switch stops the motor when the guard is swung up.
17. Check that the belt cover safety switch stops the motor when the belt cover is removed, Figure 1-2.
18. To ***stop the motor***, turn the Motor Control switch to its mid-point (**0**).

OPTIONAL TEST RUN PROCEDURE

With the spindle stationary, use the handwheel to run the saddle back and forth a few times from headstock to tailstock (if the handwheel cannot be turned, check that the power feed lever and half-nut lever on the apron are in neutral, Figure 1-4). With the power feed lever still in neutral, run the cross-slide front to back a few times.

1. With the power feed and split nut levers in neutral, Figure 1-4, run the spindle for a few minutes, forward and reverse, at various speeds in both speed ranges (transfer the Vee belt from inner to outer pulley grooves to change speed range).
2. The gearbox should also be run at this time, but first make certain that the leadscrew and feed shaft oilers at the tailstock end have been lubricated.
3. With the spindle stationary, and the split nut disengaged, set the power feed lever to "saddle feed", Figure 1-6. Run the lathe to observe saddle motion. Stop the motor.

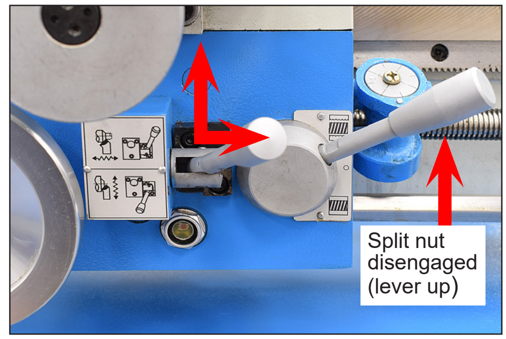


Figure 1-6 **Saddle feed**
Power feed lever RIGHT and UP

4. Test the cross-slide power feed in a similar way, Figure 1-7.
5. After the initial test run, with 20 additional hours of machine time, drain and refill the gearbox and apron with the lubricants specified in Section 4.

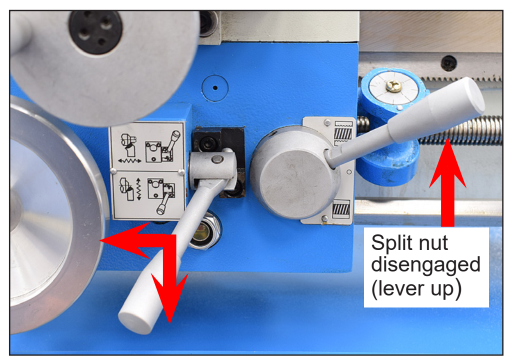


Figure 1-7 **Cross-slide feed**
Power feed lever LEFT and DOWN

ALIGNING THE LATHE

The most important attribute of a properly set up lathe is the ability to "machine parallel", to cut a cylinder of uniform diameter over its entire length. In other words, no taper.

Leveling of the lathe is a part of this, see earlier in this section. Equally important is the alignment of the center-to-center axis with the lathe bed, as seen ***from above***. [Vertical alignment is nowhere near as critical, rarely a cause of taper unless the lathe is damaged or badly worn.] For more information see the final pages of Section 4, Servicing the Lathe.

Section 2 FEATURES & SPECIFICATIONS

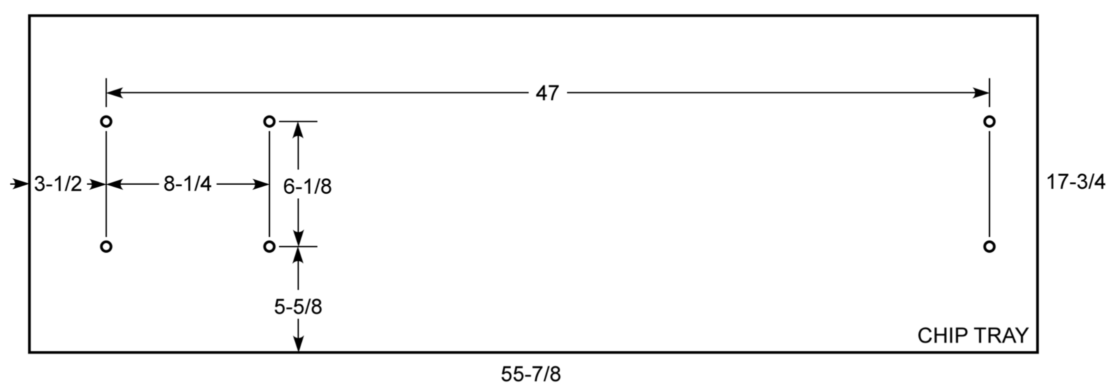
MODEL PM-1130V Lathe

General information

This is a compact, full-featured lathe ideal for the smaller model shop. It features a high-torque 1.5 HP DC motor giving smoothly variable spindle speeds in two ranges, from 75 to 500 rpm and 300 to 2000 rpm. Power requirement is 110 V, 60Hz. The lathe ships fully assembled, approximate net weight 515 lb. A sheet metal stand with two cabinets is available as an option.

The spindle has a 1-1/2 inch bore, and is unusually short — a little over 12 inches, ideal for through-spindle work. Long service life is assured by high precision taper-roller spindle bearings, together with hardened and ground bed ways. All internal gears in the gearbox and apron are continuously splash-lubricated.

Power feed for the saddle and cross-slide is supplied by a three-speed gearbox driving an 8 TPI leadscrew and a separate power feed shaft. External change gears provide for a full range of UNC and UNF threads from 8 to 80 TPI, and metric threads from 0.35 to 3 mm pitch. The gearbox is instantly reversible for left-hand thread cutting, and for reverse motion of saddle and cross-slide.



PM-1130V chip tray approximate dimensions

Everyday precautions

- This machine is intended for use by experienced users familiar with metal-working hazards.
- Untrained or unsupervised operators risk serious injury.
- Wear ANSI-approved full-face or eye protection at all times when using the machine (everyday eyeglasses are not reliable protection against flying particles).
- Wear proper apparel and non-slip footwear – be sure to prevent hair, clothing or jewelry from becoming entangled in moving parts. Gloves – including tight-fitting disposables – can be hazardous!
- Be sure the work area is properly lit.
- Never leave chuck keys, wrenches or other loose tools on the machine.
- Be sure the workpiece, toolholder(s) and machine ways are secure before commencing operations.
- Use moderation: **light** cuts, **low** spindle speeds and **slow** table motion give better, safer results than "hogging".
- Don't try to stop a moving spindle by hand – allow it to stop on its own.
- Disconnect 110 Vac power from the lathe before maintenance operations such as oiling or adjustments.
- Maintain the machine with care – check lubrication and adjustments daily before use.
- Clean the machine routinely – remove chips by brush or vacuum, not compressed air (which can force debris into the ways).

No list of precautions can cover everything.
You cannot be too careful!

PM-1130V SPECIFICATIONS

Dimensions, approximate overall, incl. stand	Width 61 in. x Height 21in. x Depth 28 in. (full range cross-slide motion)
	Bed length, excluding headstock: 42-3/4 in.
	Bed width: 7-1/8 in.
	Spindle centerline to machine tray 13-5/8 in.
	Weight, approximate: 515 lb net, with stand 625 lb net

Power requirement	110 Vac, 60 Hz, 1Ø, 12 A max
Motor	1.5 HP (1125 W) dc

Work envelope

Headstock center to tailstock center	34-1/4 in. max
Swing over bed	11 in. diameter
Swing over cross-slide	6-3/4 in. diameter
Spindle face to tailstock quill face	34-1/4 in. max
Saddle travel along bed	27-1/2 in.
Cross-slide travel	5-7/8 in.
Compound (top slide) travel	3-1/4 in.

Drive system *DC drive with 2-speed Vee pulleys*

Low range, rpm	75 to 500
High range, rpm	300 to 2000

Saddle drive, thread cutting	Leadscrew 8 TPI
Inch threads	From 8 to 56 TPI
Metric threads	From 0.4 mm to 3.5 mm pitch

Saddle / cross-slide drive, turning & facing	Separate feedshaft below leadscrew
Turning operations (saddle feed)	Choice of feed rates from 0.0025 to 0.012 in./spindle rev
Facing operations (cross-slide feed)	Choice of feed rates from 0.0015 to 0.0056 in./spindle rev

Spindle

Chuck/faceplate attachment	Camlock D1-4
Internal taper	MT5
Spindle bore	1-1/2" in.

Tailstock

Internal taper	MT3
Quill	4 in. travel

Work holding

3-jaw chuck, 6 in.	
Faceplate 9-1/2 in.	
Center rest (steady rest) capacity	Up to 2-1/2 in. diameter
Follower rest capacity	Up to 2-1/2 in. diameter

Section 3 USING THE LATHE

The PM-1130V is a conventional engine lathe that requires little explanation except for details specific to this particular model — speed control, thread cutting, and the saddle/cross-slide power feed system. Because the user is assumed to be familiar with general purpose metal lathes, this section contains very little tutorial.

Those unfamiliar with lathe work may find the following helpful: ***HOW TO RUN A LATHE***, published many years ago by the original South Bend Machine Works, with many revisions through the 1960s. This is the classic go-to source for lathe users of every level of experience.

DRIVE SYSTEM

Two-speed pulleys and a Vee belt connect the high-torque dc motor direct to the spindle, Figure 3-1. The high speed coupling illustrated gives spindle speeds from 300 to 2000. To change the coupling for lower speeds, 75 to 500 rpm, transfer the belt from larger to smaller on the motor pulley. Before doing this, relieve tension on the belt by loosening the cap screw securing the tensioner support to the headstock casting. Remove the belt by rolling it off from the Vee pulleys — fingers only, no tools. When re-tensioning, firm finger pressure mid-way between the pulleys should deflect the top run of the belt about 1/4” — no tighter than that.

Many users will find that the low range is suitable for much of their work, so there is rarely a need to reconfigure the drive.

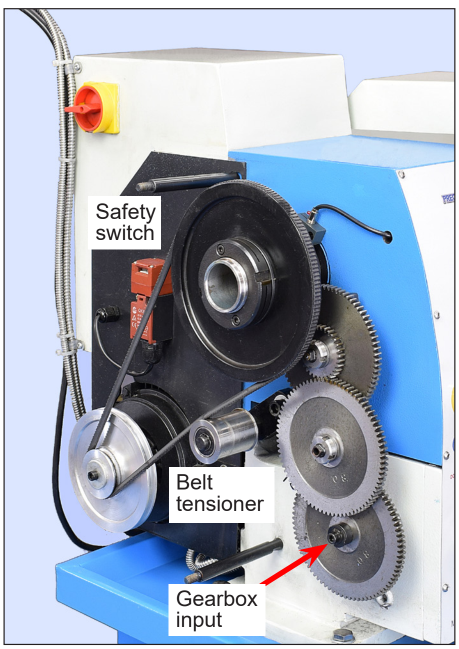


Figure 3-1 **Drive belt adjustment**

Safety switch *Figure 3-1*
The lathe will not function unless the external gear cover is closed.

Emergency Stop button *Figure 3-2*
Slap the E-Stop button with the palm of the hand to disconnect power instantly. The button pops out when twisted clockwise a few degrees. This restores power, but does ***not re-activate*** the motor.

Running the lathe
To operate the lathe, turn on the power, Figure 3-2, left. Turn the **DIRECTION** switch to the left for normal machining operations (spindle runs counter-clockwise, view from the tailstock end). Turn the speed control, Figure 3-3, to a low setting to start with — almost fully counter-clockwise — then press the green **RUN MOTOR** button. Stop the motor by turning the Motor Control switch to its mid-point (**0**).

! *Switching the DIRECTION control from left to right, Forward to Reverse, or vice versa, shuts off the motor.*

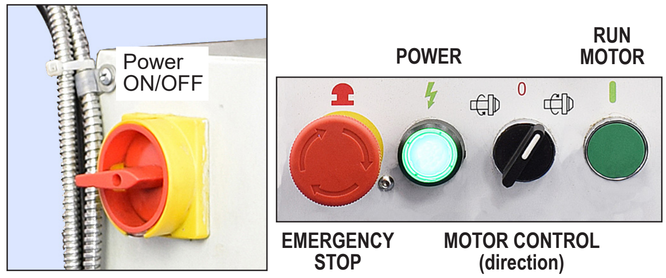


Figure 3-2 **Motor controls**

Speed display (tachometer) *Figure 3-3*
This is a 4-digit LCD that continuously monitors spindle speed in revolutions per minute (rpm). ***The tachometer display should light when power is turned on.***

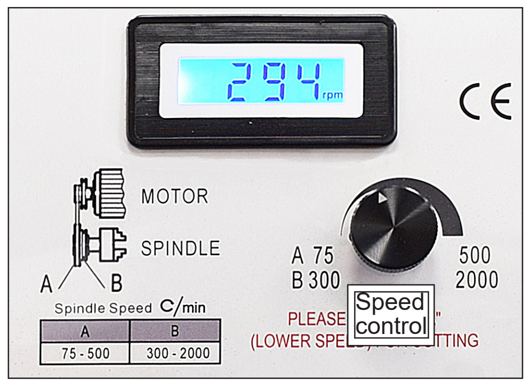


Figure 3-3 **Tachometer & spindle speed control**

Speed control *Figure 3-3*
This is a potentiometer. Set it fully counter-clockwise for minimum speed.

? ***Unexpected problems? Motor doesn't run?***
See FAQs, page 2

Speed sensor
The tachometer is supplied by a sensor mounted on the left hand surface of the headstock, Figure 3-4.

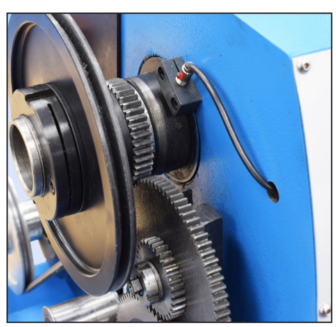


Figure 3-4 **Spindle speed sensor**

POWER FEED

The PM-1130V gearbox is driven by a train of external gears taking power from a 40T gear on the spindle, located behind the black driven pulley in Figure 3-1. It has two outputs, an 8 TPI leadscrew for thread cutting, and a hexagon-shaped rod for power feeding the saddle and cross-slide. For thread-cutting operations, the saddle is driven by a split nut in the apron that closes on the leadscrew thread. The power feed rod provides an independent means of driving the saddle and cross-slide for routine turning and facing operations. An advantage of this arrangement — compared with using the leadscrew for all power feed functions — is reduced wear on the leadscrew.

The gearbox provides three choices (A, B, C) of leadscrew speed relative to spindle speed, Figure 3-5. The combination of gearbox and external gear configurations, Figure 3-6, provides a range of feed speeds, plus the ability to cut U.S. threads from 8 to 56 threads per inch, and metric threads from 0.4 to 3.5 mm pitch.

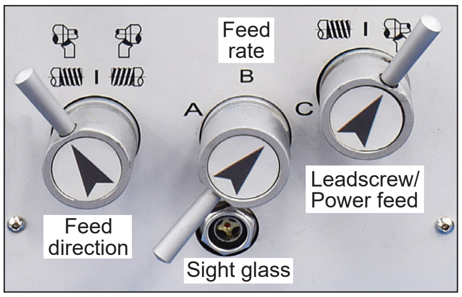


Figure 3-5 **Gearbox front panel**

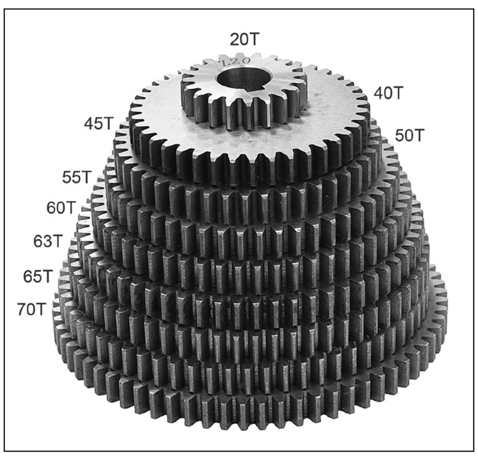


Figure 3-6 **External change gears**
In addition to the gears shown here, the lathe is shipped with the following gears pre-installed: 25T, 30T, 75T, 80T and 80T.

A second knob on the gearbox reverses the power feed, driving the saddle from left to right — and the cross-slide towards the operator. (Reversed spindle motion is also used to cut left-hand threads.) The third knob on the gearbox selects leadscrew for thread cutting, or power feed for regular turning operations.

! ***Before making ANY change in the gearbox settings, STOP the motor. Move the spindle back and forth by hand while easing the gears into mesh.***

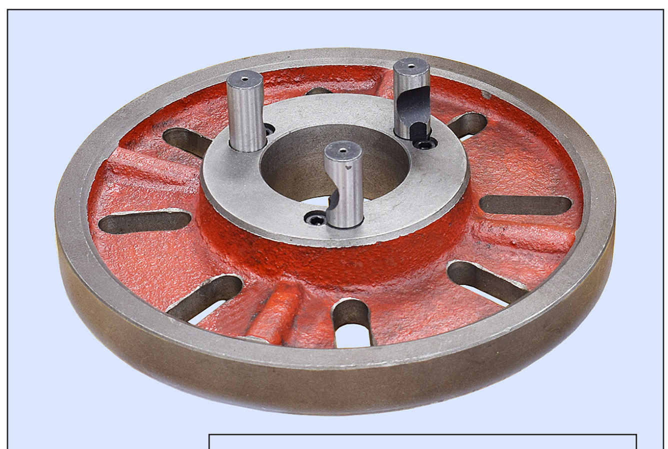
CHUCK REMOVAL & REPLACEMENT

When removing or replacing any workholding accessory, always protect the bed, Figure 3-7.

Figure 3-7 **Protect the bed when removing or replacing a chuck**
Chucks, faceplates and wrenches can seriously damage the bed if dropped.

Chucks and faceplates are secured to the PM-1130V spindle by three D1-4 Camlock studs, Figure 3-8. Each camlock stud has a D-shaped crosscut to engage a corresponding cam within the spindle nose, Figure 3-9. The function of the cams is to pull the chuck backplate inward to locate its internal taper firmly on the spindle nose.

Alongside each stud is a stop screw, the head of which fits closely in a groove at the threaded end of the stud. The function of the stop screw is not to clamp the stud in place, but instead to prevent it from being unscrewed when the chuck is not installed.



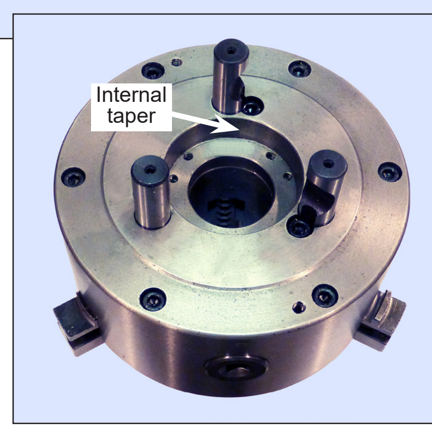


Figure 3-8 **D1-4 mounting studs on the chuck & faceplate**

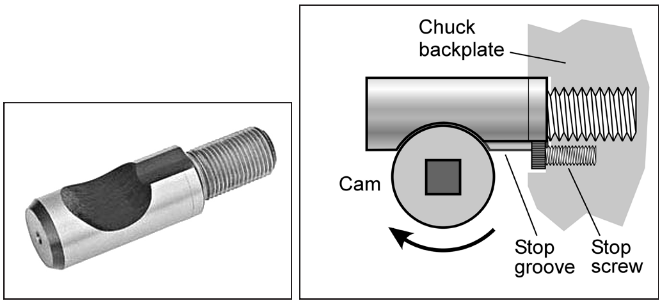


Figure 3-9 **Camlock stud detail**

Chuck removal

! *Disconnect power from the lathe!*

Before doing anything, protect the lathe bed ***AND*** support the full weight of the chuck by hand, or with spacer blocks. Using the T-handled 10 mm (about 3/8") square wrench supplied with the lathe, turn counter-clockwise the three cams on the spindle nose to set the cam markers at 12 o'clock, Figure 3-9 (The supplied T-handled wrench is used to turn the cams and to tighten the 3-jaw chuck on the workpiece.)

When all three markers are at 12 o'clock, it should be possible to remove the chuck — but, often, it may need to be tapped lightly with a dead-blow non-marring mallet.

Chuck replacement

It is good practice when installing a Camlock device to be sure that it is in the same location relative to the lathe spindle as it was when removed. There is usually a character (e.g., "0") stamped on the spindle; this should mate with a corresponding character on the chuck or faceplate. A replacement chuck will not be so marked as supplied, but it can be lightly center punched instead.

Install as follows:

1. Turn the spindle by hand, checking that all three cam markers are at 12 o'clock.
2. While ***supporting its full weight***, install the chuck without tilting, Figure 3-9, then gently turn each of the cams ***clockwise*** — snug, firm, but not locked in this first pass.
3. Check that each of the cam markers lies between 3 and 6 o'clock, between the two Vees stamped on the spindle, Figure 3-10. If so, fully tighten the cams.
4. If any cam marker is ***not*** within the Vees, first be sure that there is ***no gap*** between chuck backplate and spindle flange. Also, remove the chuck to inspect the studs — burrs can be a problem, hone if necessary. ***If there are no visible problems, the stud in question may need adjustment as follows:***

- Remove the stop screw from the stud.
- If the cam marker in question can't get to the first Vee (3 o'clock), back the stud **OUT** one full turn, then replace the stop screw.
- If the cam marker goes beyond the second Vee (6 o'clock), screw the stud **IN** one more turn, then replace the stop screw.
- If the markers are correctly aligned, repeat the tightening sequence as step 3, light force. Repeat the sequence two more times, first with moderate force, then fully tighten.

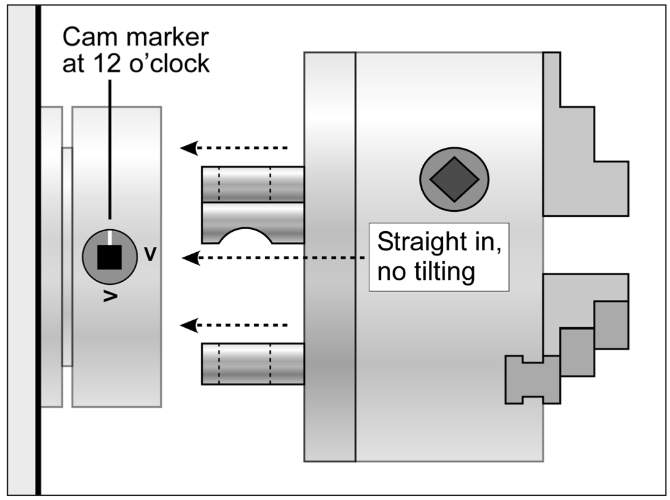


Figure 3-10 A **Camlock chuck removal & replacement**

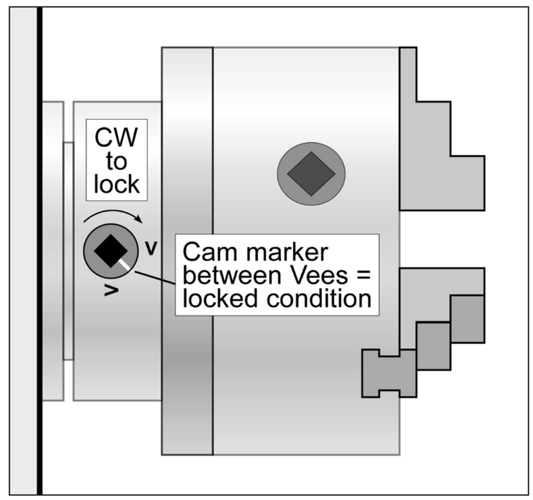


Figure 3-10 B **Camlock chuck secured**

SADDLE

For manual turning operations, the saddle is traversed left to right along the bed by a handwheel, Figure 3-11.The saddle may be locked in place by an M8 socket head cap screw adjacent to the cross-slide, Figure 3-12. Because the saddle is frequently locked to prevent movement in facing operations, some users replace the standard screw with a ratcheting lever screw that can be turned quickly without tools.

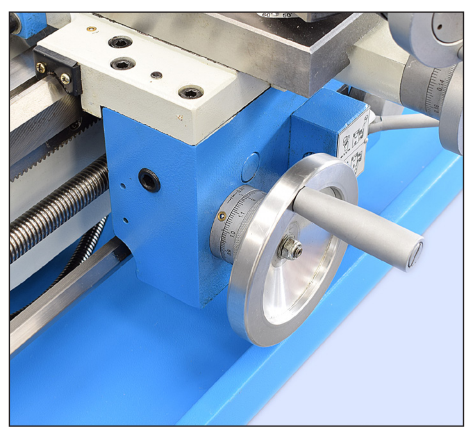


Figure 3-11 **Saddle handwheel**

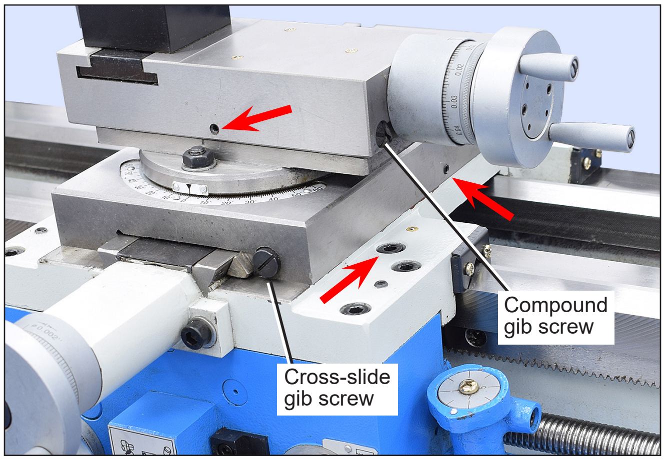


Figure 3-12 **Saddle, cross-slide and compound clamp screws** *(RED arrows) Also shown here are the front adjusting screws for the tapered gibs on the cross-slide and compound. Similar screws are located at the opposite ends of the two gibs.*

CROSS SLIDE & COMPOUND

The cross slide and compound, Figure 3-13, both have 10 TPI leadscrews, with 100-division graduated collars. Each division represents a true motion of 0.001". On the cross-slide dial, only, this shows as 0.002" per division, meaning that a 0.001" depth of cut reduces the diameter of the workpiece by 0.002".

The compound can be rotated through 360 degrees. It rests on a turntable casting with a ± 60 degree graduated scale. The compound is secured to the cross-slide by two M8 T-screws with lock nuts.

The cross-slide and compound each have a clamp screw that presses the gib against its mating dovetail, Figure 3-12. Clamping provided by these screws is more of a stiffening action than a rigid lock.

Figure 3-13 **Cross-slide and compound dials** *Both collars are friction-coupled to their leadscrews by leaf springs. To zero a dial, or set it to any desired number, hold the handwheel firmly, then rotate the knurled rim.*

! *Be sure to release clamp screws before moving compound, cross-slide or saddle, especially under power*

USING CUTTING TOOLS

In most turning operations, the cutting tool is firmly mounted on the compound, and is moved relative to the workpiece by a combination of saddle, cross-slide and compound motions. The AXA (100-Series) QCTP (Quick-change toolpost) typically used with the PM-1130V is shown in Figure 3-14. It can be used with any number of interchangeable toolholders, most of which are intended for square-section tool shanks up to 1/2". A key feature of the QCTP is its ***repeatability***, meaning that a toolholder can be removed, then later re-installed, without further attention. This is because each toolholder has its own micrometer-style height adjustment — set it once and forget it — a great time-saver compared with other tool-holding systems.

Like other toolholding systems, the QCTP can be freely rotated about its vertical axis, then locked in position. This can be used to change the side cutting edge angle of (say) a knife tool, converting it quickly from diameter turning to face cutting.

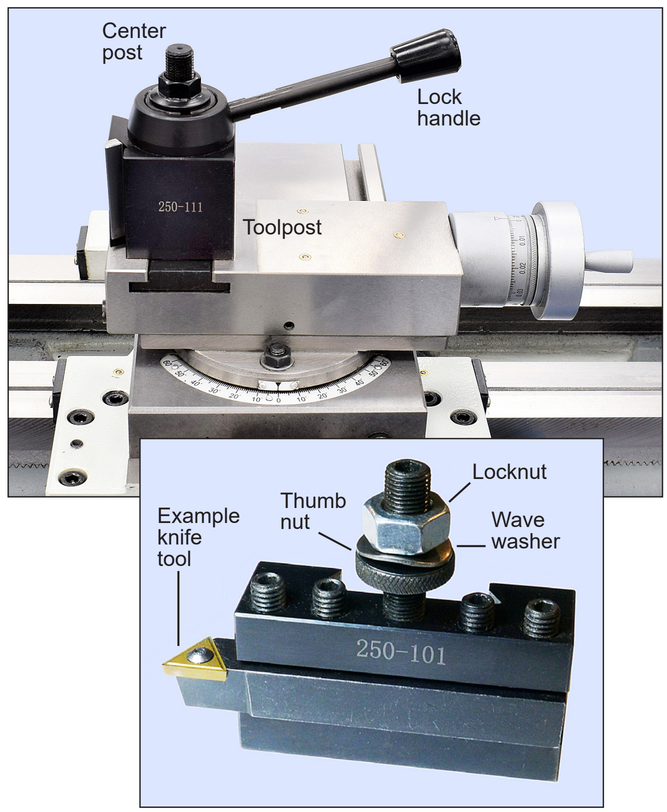


Figure 3-14 **QCTP with toolholder** *This style of toolholder is used for rectangular-shank tools up to 1/2" x 1/2". Its height is set by the thumb nut resting on the top surface of the toolpost. The wave washer and hex locknut prevent accidental rotation of the thumb nut. To rotate the QCTP, loosen the center post.*

TAILSTOCK

The tailstock leadscrew has a 10 TPI thread, with 3-1/4 inch travel. A graduated collar on the tailstock handwheel reads 0.001" per division. To remove tooling from the tailstock taper (MT2) turn the handwheel counter-clockwise (handle-end view) until resistance is felt, then turn the handle a little more to eject the tool. Conversely, to install a taper tool make certain that the quill is out far enough to allow firm seating.

To offset the tailstock for taper turning, loosen the tailstock clamp lever, Figure 3-15, then loosen the clamp screws (M5 set screw) at the tail end of the tailstock. The tailstock can now be moved forward or backward by adjusting the M8 socket head cap screws on either side. To move the tailstock to the back, for instance, the screw on the clamp lever side would be unscrewed, then the opposing screw would be screwed in to move the upper assembly. Re-tighten the clamp screw when the offset is done.

Offsetting the tailstock for a specific taper is not a straight-forward job; it is a lengthy, iterative process. The same goes for re-zeroing for normal operations.

A visual indication of the offset is provided by a scale on the back surface, but this is not a reliable measure for precise work. In practice, the only way to determine the offset precisely is to "cut and try' on the workpiece, or scrap stock, homing in on the correct degree of offset in small increments.

The same issues arise when re-establishing "true zero" of the tailstock — in other words, returning it to the normal axis for routine operations. One way to avoid cutting-and-trying is to prepare in advance a bar of (say) 1" diameter quality ground stock, with ***precise center drillings*** at both ends (do this by indicating for zero TIR in a 4-jaw chuck, not in a 3-jaw unless known to be predictably accurate). The prepared bar can then be installed between centers and indicated along its length.

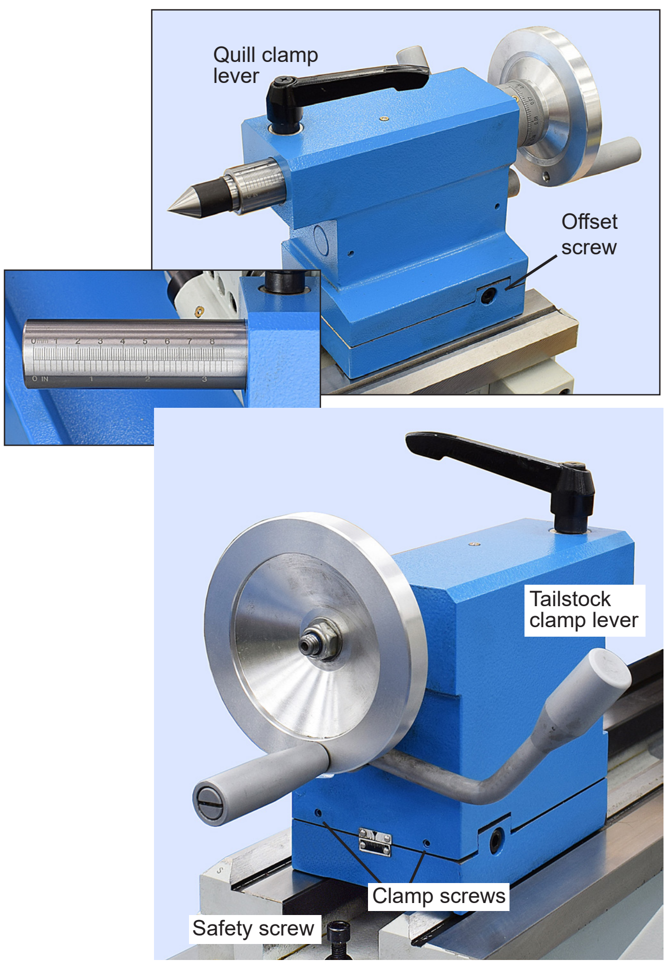


Figure 3-15 **Tailstock**
The safety screw prevents accidental dropping

POWER FEED (Turning & Facing operations)

The PM-1130V gearbox, Figure 3-17, is driven by a train of external gears taking power from the 40T spindle gear, Figure 3-16.

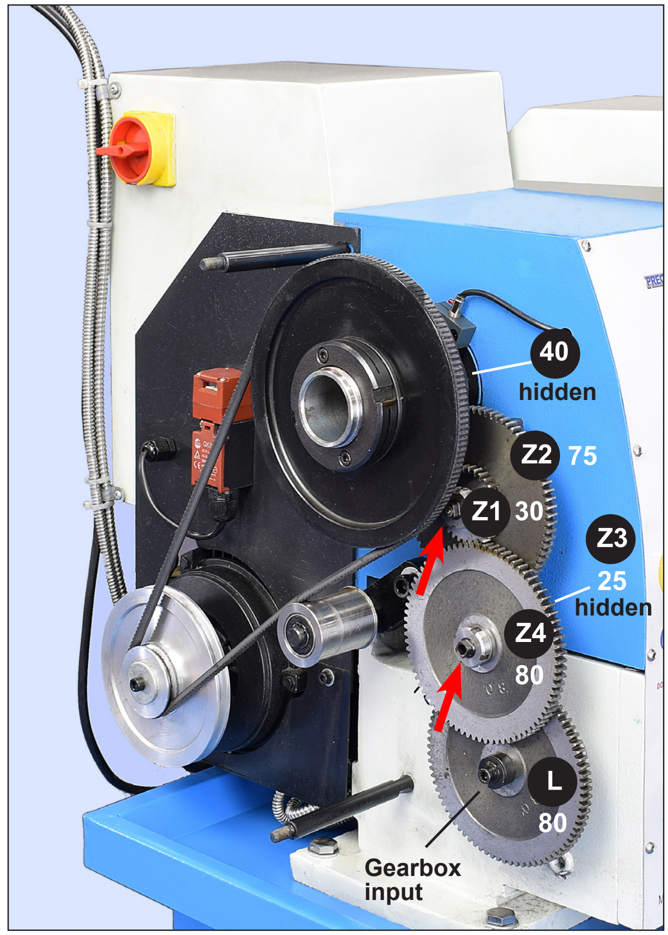


Figure 3-16 **External change gears**
The numbers in white are the tooth counts of the gears as usually shipped. This configuration is for slow-speed power feeding (not thread cutting).The red arrows show oil nipple locations.

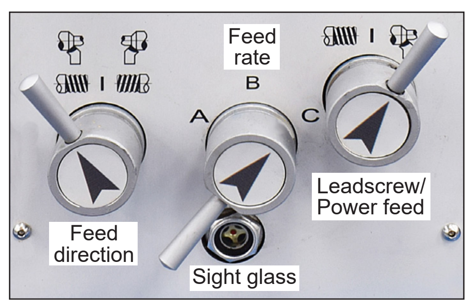


Figure 3-17 **Gearbox controls**

The right-hand lever directs the gearbox output to either the ***leadscrew*** for thread cutting, or the ***power-feed shaft*** for routine turning and facing. The feed rate lever (A-B-C) provides a choice of input-to-output ratios: A 1:1, 0.5:1 C, and 2:1 B. This 4:1 overall speed range of means that the as-shipped external gear configuration will usually satisfy most power feed requirements without further attention. Other choices are given in the table accompanying the gear diagram in Figure 3-18.

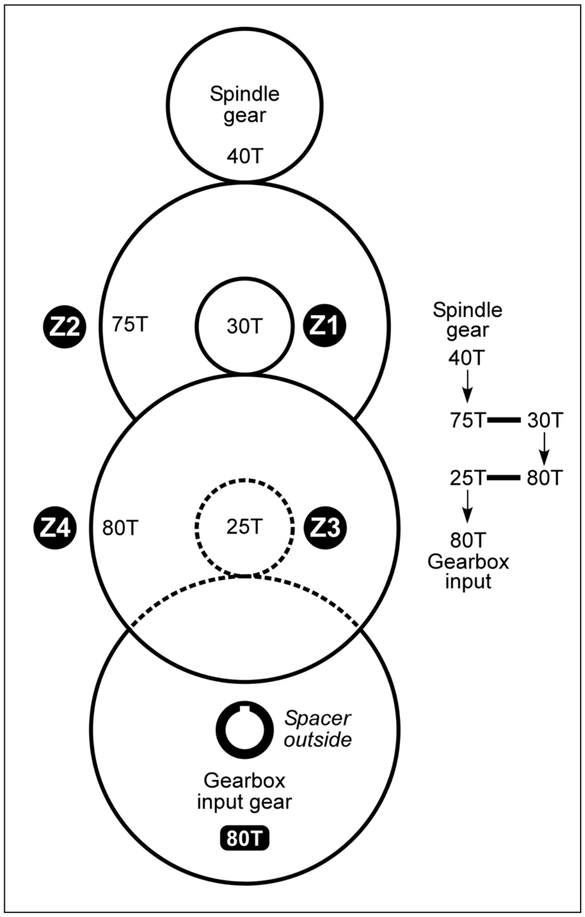


Figure 3-18 **Example power feed setup**
With this gear configuration, the gearbox A-B-C lever selects feed rates of (C) 0.0025", (A) 0.005", and (B) 0.01" per revolution of the spindle.

Feed rate (inches/rev)			External change gears				
Saddle	**Cross-slide**	**A-B-C lever**	**Z2**	**Z1**	**Z4**	**Z3**	**Gearbox input gear**
0.0025	**—**	C	75	30	80	25	80
0.005	**0.0015**	A					
0.01	**0.003**	B					
0.003	**—**	C	75	40	70	20	80
0.006	**0.0019**	A					
0.012	**0.0038**	B					
0.0038	**—**	C	70	40	70	25	80
0.0075	**0.0024**	A					
—	**0.0048**	B					
0.004	**—**	C	75	40	80	30	80
0.008	**0.0025**	A					
—	**0.005**	B					
0.0045	**—**	C	75	40	70	30	80
0.009	**0.0028**	A					
—	**0.0056**	B					

Table of power feed selections
Feed rates in inches per spindle revolution

External change gear swapping

The general procedure for this is:

1. Loosen the M8 socket head screw securing the change gear support bar; swing the support bar down. ***In the following steps, note the position and type of all bushings and washers.***
2. Remove the upper and lower gear axles; tap free the externally keyed bushings.
3. Remove the M6 socket head screw from the gearbox input shaft.
4. Install the selected gear pairs on the upper and lower keyed bushings; install the selected lower gear on the gearbox input shaft, bearing in mind the ***location of the internally keyed bushings***, above or below the gears, see Figures 3-20, 3-21 and 3-22.
5. Re-install the upper and lower gear axles, loosely threading them into the T-nuts at the back of the support bar.
6. Bring the lower gear pair into mesh with the gearbox input gear; tighten the lower gear axle in its T-nut.
7. Bring the upper gear (or gear pair) into mesh with the lower; tighten the upper gear axle in its T-nut.
8. Check, making minor adjustments to, the mesh of all gears in the train (see note below).
9. Swing the gear support bar up to mesh the upper gear with the spindle gear; tighten the M8 socket head screw securing the support bar.
10. Lubricate the gears using (say) lithium grease.

How to gauge "correct mesh" Some users go by feel and intuition, others use a paper feeler gauge. The mesh is good if a scrap of 0.004" printer paper can be run between the gears with definite resistance.

?

Difficulty re-installing gears?
When new, the gears may be a tight fit on the externally keyed bushings. Check for burrs on the bushings, dressing with a fine file if necessary. The gear bores may also need de-burring with Scotch-Brite, or other fine-grit abrasive (or using a rod-shape diamond hone). Aim for an easy push fit of all gears on both bushings.

ENGAGING THE POWER FEED

First check for obstructions — Locks OFF?
Do not engage at high leadscrew speeds!

Engage the saddle feed by shifting the power feed lever to the right, then up, Figure 3-19. Engage the cross-slide feed by shifting the power feed lever to the left, then down, Figure 3-20. Disengage by shifting the lever to its mid-position,

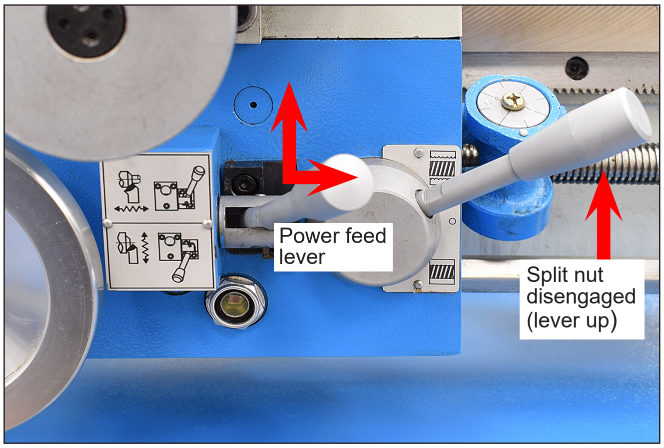


Figure 3-19 **Saddle feed** *Lever RIGHT and UP*

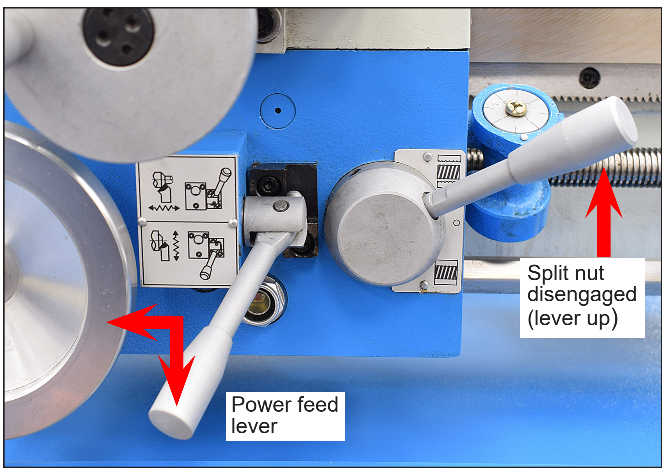


Figure 3-20 **Cross-slide feed** *Lever LEFT and DOWN*

POWER FEED (Thread cutting operations)

For thread cutting, the saddle is driven by the threads on the leadscrew in combination with a split nut in the apron, Figure 3-21.

Before engaging the split nut be sure there are no obstacles to saddle movement, and that the power feed lever is in its neutral, mid-position.

The power feed doesn't stop by itself! Other than intervention by the operator, there is nothing to stop (for instance) the saddle running into the tailstock.

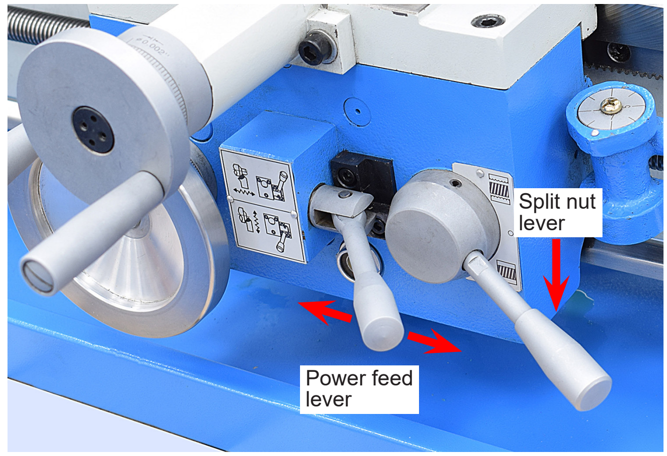


Figure 3-21 **Split nut engaged** Split nut lever DOWN, Power feed lever neutral (moves freely side to side)

THREAD CUTTING SETUP

U.S. threads in TPI *(threads per inch)*

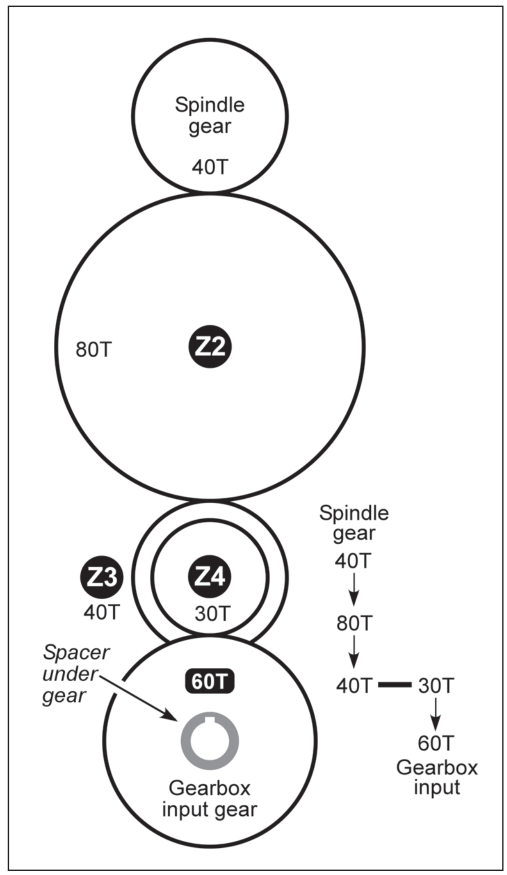


Figure 3-22 **Example setup for U.S. threads**
With this gear configuration, the gearbox A-B-C lever selects (B) 8TPI, (A) 16TPI, and (C) 32 TPI

See the table on the following page for other U.S. thread options.

U.S. thread selections

		External change gears			
TPI	**A-B-C lever**	**Z2**	**Z3**	**Z4**	**Gearbox input gear**
8	B	80	40	30	60
16	A				
32	C				
9	B	70	75	50	60
18	A				
36	C				
10	B	70	50	40	80
20	A				
40	C				
11	B	70	55	40	80
22	A				
44	C				
12	B	55	75	50	80
24	A				
48	C				
13	B	80	60	30	65
26	A				
52	C				
14	B	60	70	40	80
28	A				
56	C				

THREAD CUTTING SETUP

Metric threads *(pitch in mm)*

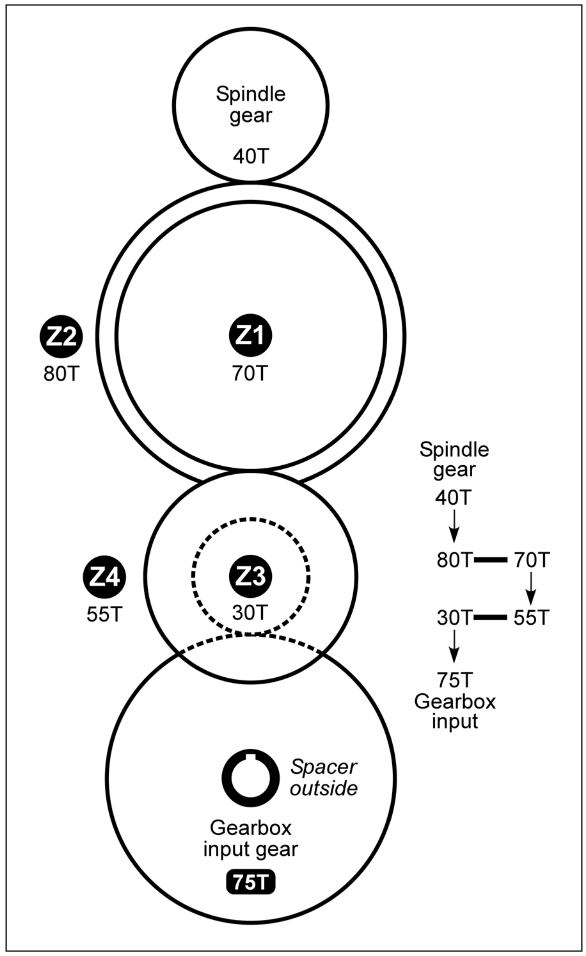
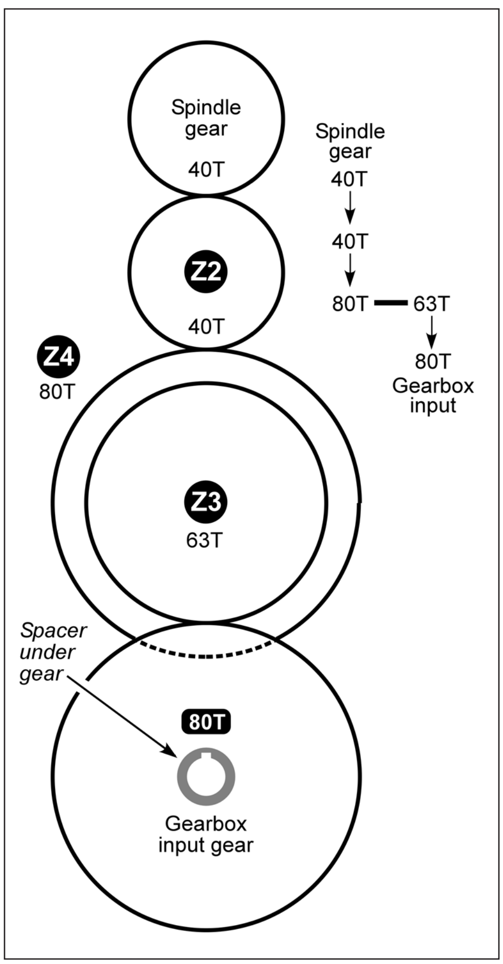


Figure 3-23 **Example setup for Metric threads**
With this gear configuration, the gearbox A-B-C lever selects metric thread pitches of (C) 0.4 mm, (A) 0.8 mm, and (B) 1.6 mm

! ***For metric threads the split nut in the apron must remain engaged throughout the entire process.***

Metric thread selections

		External change gears				
PITCH (mm)	**A-B-C lever**	**Z2**	**Z1**	**Z4**	**Z3**	**Gearbox input gear**
0.4	B					
0.8	A	80	70	55	30	75
1.6	C					
0.5	B					
1.0	A	40	30	80	63	75
2.0	C					
—	B					
1.25	A	40	—	80	63	80
2.5	C	*Special case - see diagram below*				
0.75	B					
1.5	A	50	45	80	63	60
3.0	C					
0.875	B					
1.75	A	80	70	80	63	50
3.5	C					



THREAD CUTTING

A key fact to remember ...

! ***For metric threads the split-nut in the apron must remain engaged throughout the entire process.***

COMPOUND SETUP FOR THREAD CUTTING

Thread cutting on the lathe is unlike most other turning operations, for two reasons: 1. The cutting tool must be precisely ground with an included angle of 60 degrees for most American and metric threads, and; 2. It is preferable to feed the tool into the workpiece at an angle so it cuts mostly on the left flank of the thread, Figure 3-24. The correct angle relative to the cross-slide (zero degrees) is debatable — should it be 29, 29-1/2 or 30 degrees? Many machinists prefer 29 degrees because it holds the cutting tool marginally clear of the right flank of the thread, close enough for cleanup of the flank while at the same time avoiding appreciable rubbing.

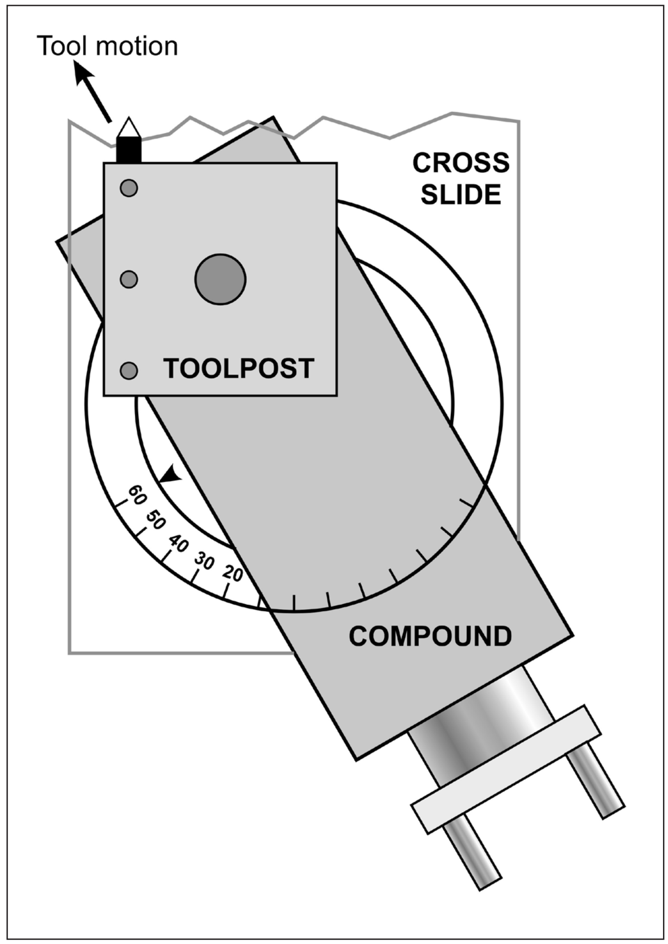


Figure 3-24 **Setting the compound for 30° infeed**

CUTTING PROCEDURE FOR TPI THREADS

This procedure assumes that a single point thread cutting tool will be used, and that the threading dial is reliably driven by the leadscrew, Figure 3-25.

The threading dial cannot be used for metric threads! The split-nut on the apron must not be disengaged until the threading operation is completed.

For metric and UNC/UNF (U.S.) threads the tool is ground to

60° (included angle). It is installed so that its flanks are exactly 30° either side of the cross axis, ideally with the compound offset as Figure 3-24. Single-point threads are cut in as many as 10 successive passes, sometimes more, each shaving a little more material off the workpiece.

To make the first thread-cutting pass, the leadscrew is run at the selected setting (tables on following two pages), and the saddle is moved by hand to set the cutting tool at the starting point of the thread. With the tool just grazing the workpiece, the split nut lever (Figure 3-21) is lowered to engage the leadscrew. This can be done at any point, ***provided*** the split-nut remains engaged throughout the ***entire multi-pass thread cutting process***.

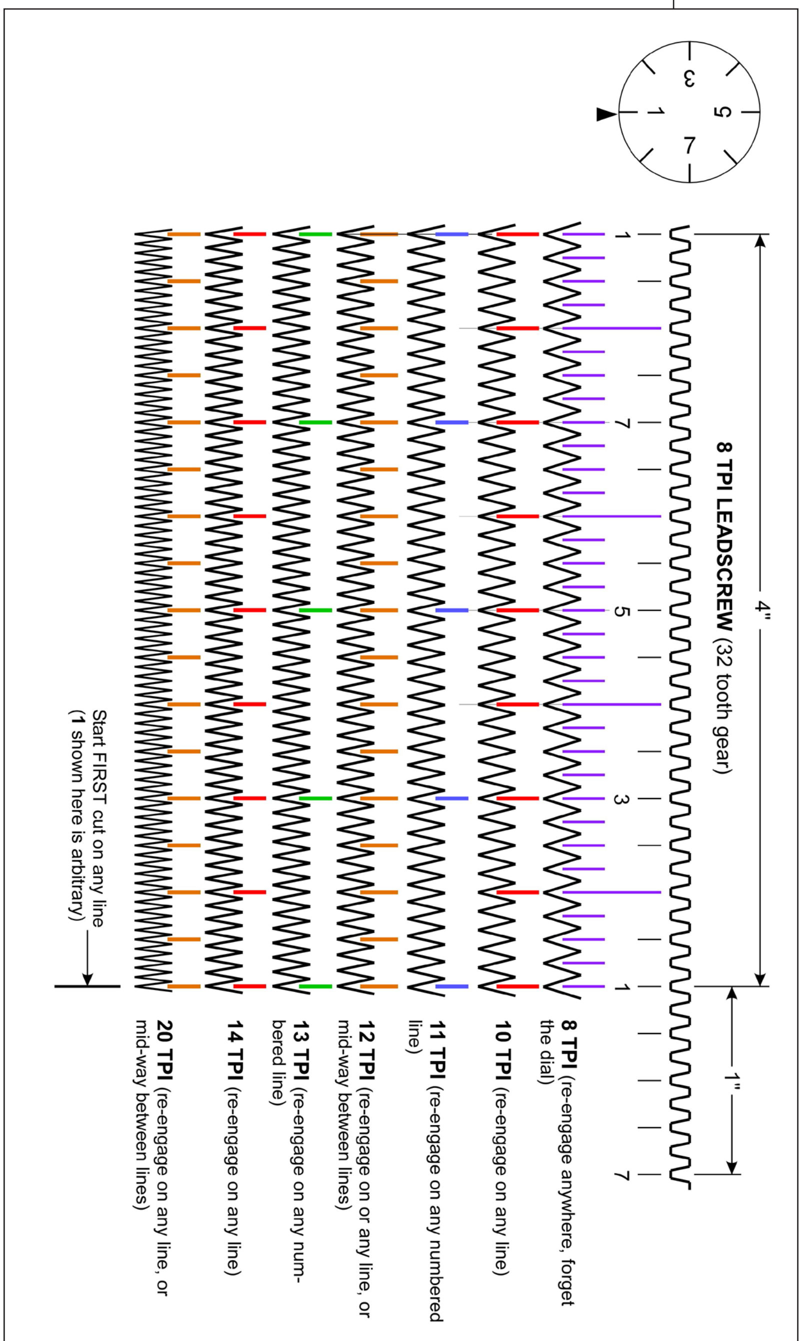


Figure 3-26 A **Threading dial visualization for selected U.S. threads**

When the first pass is completed, the tool is backed out clear the workpiece (using the cross-slide), and the spindle is reversed to bring the saddle back to the starting point. The cross-slide is returned to its former setting, then the tool is advanced a few thousandths by the compound for the next pass. Each successive pass is done in the same way, each with a slightly increased infeed setting of the compound.

Many users working on U.S. threads save time by disengaging the split-nut at the end of each cutting pass, reversing the saddle quickly by hand, then re-engaging, usually by reference to the threading dial, Figure 3-26 B.

For most TPI numbers every engagement, ***including the first***, must at the point where a ***specific line*** on the threading dial comes into alignment with the datum mark. If not, the second and subsequent passes will be out of sync. In some cases, see the "visualization" Figure 3-25, there is a choice of lines for re-engagement, but in every case the process calls for careful timing.

[NOTE: Disengagement and re-engagement of the split-nut is not applicable to metric threads — leave the split-nut engaged throughout the entire process]

Typical depths of cut per pass vary from an initial 0.005" or so, to as little as 0.001", even less. A finishing pass or two with increments of only 0.0005" — or none at all, to deal with the spring-back effect, can make all the difference between a too-tight thread and one that runs perfectly.

Assuming that the compound is set over at between 29 and 30 degrees, the total depth of cut is approximately 0.69 times the thread pitch, P (this equates to a straight-in thread depth of 0.6 times P). There may be a need for a few thousandths more in-feed than 0.69P, almost certainly not less.

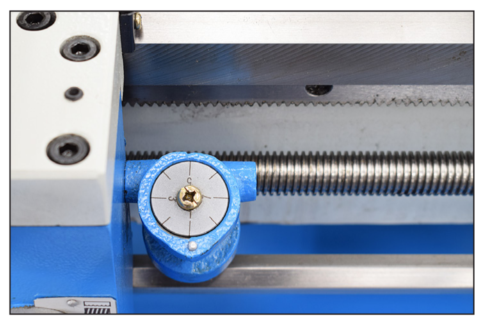


Figure 3-26 B **Threading dial (US threads only)**

General rule for the threading dial

If the TPI value gives a ***whole number*** when divided by two, you can re-engage the split nut on any line, also ***mid-way between*** the numbered lines on the dial. ***If in doubt, re-engage on the start line!***

STEADY & FOLLOWER RESTS

Short, rigid workpieces mounted in a chuck can typically be machined without additional support. Long, slender workpieces need support near the cutting tool. There are two options for this: 1. A tailstock center (usually a live center), or; 2. A steady rest, Figure 3-27. This is often used in combination with the saddle-mounted follower rest, Figure 3-28.

The tailstock center can be used with any size and shape of workpiece (such as non-symmetrical castings), but it may obstruct the turning tool for facing operations, and it also may disallow drilling or tapping with a tailstock chuck.

On the other hand, the steady rest does allow face turning and tailstock chuck operations; however, it can only be used if the outboard end of the workpiece is circular and centered on the lathe axis with practically zero runout.

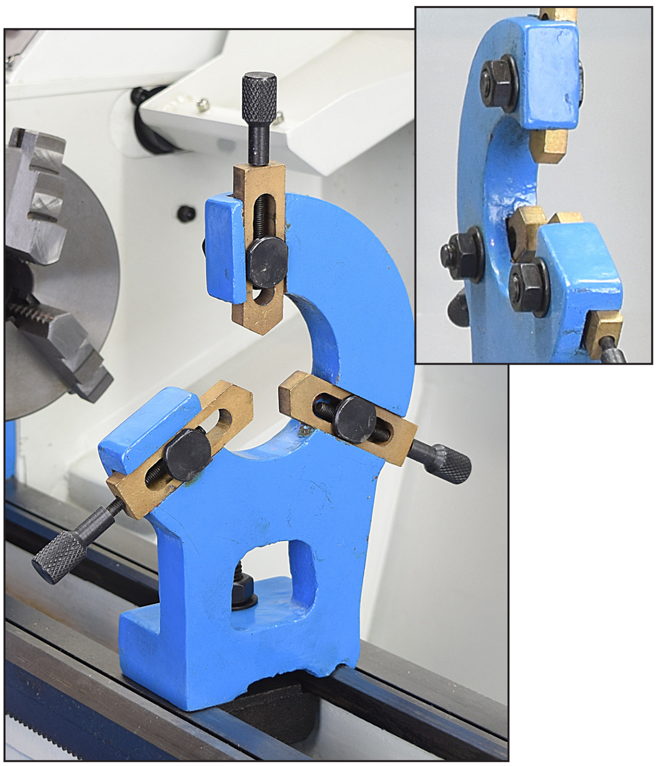


Figure 3-27 **Steady rest** *Maximum diameter 2-1/2 in.*

The step-by-step procedure for setting up the steady rest depends on personal preferences. Some users start by fixing the steady rest casting on the bed, then mounting the workpiece in a chuck (or between centers); others set up the workpiece first, then install the steady rest on the lathe bed. Either way, the region of the workpiece under the steady rest fingers must run true, and the fingers must not apply any off-axis loading.

To set up the steady rest, loosen the three hex nuts, inset photo, Figure 3-27, then back out the thumbscrews to spread the fingers beyond the workpiece diameter. Tighten the nuts just enough to allow the thumbscrews to push the fingers inward. Fully tighten the nuts when the fingers are gently touching — but not deflecting — the workpiece. Apply oil frequently at the contact points while machining.

The follower rest helps prevent flexing of the workpiece by providing support directly ahead of the cutting tool, Figure 3-28. It is secured to the saddle with two socket head screws.

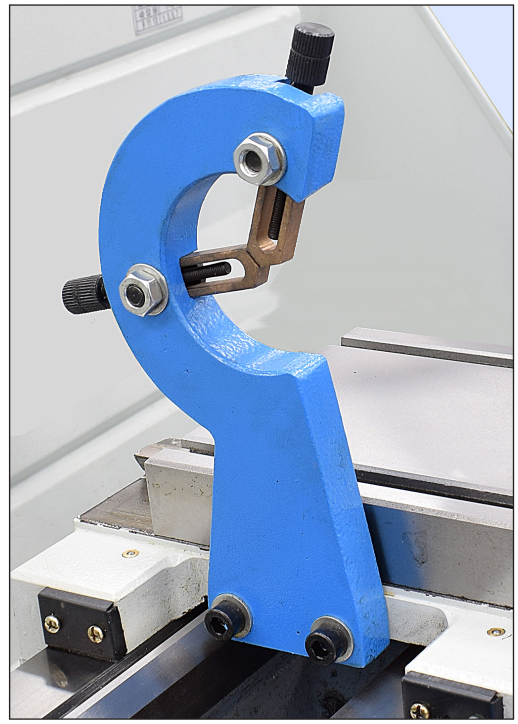


Figure 3-28 **Follower rest** *Maximum diameter 2-1/2 in.*

SADDLE STOP

The PM-1130V comes with a saddle stop that can be clamped at any point on the lathe bed, Figure 3-29. The stop includes a micrometer-style thimble calibrated in 0.025" intervals. When using the stop, move the saddle ***slowly*** to make gentle contact with the micrometer rod. ***DO NOT POWER FEED*** the saddle: this will likely shift the stop assembly, possibly causing other damage.

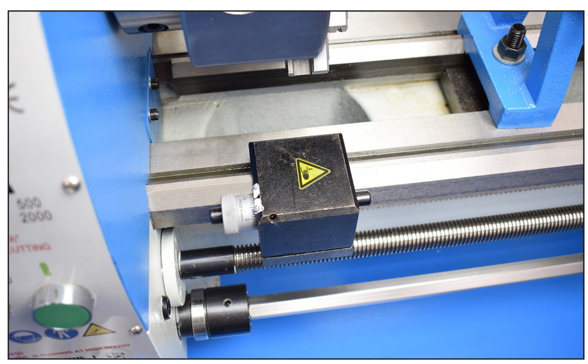


Figure 3-29 **Saddle stop**

Section 4 SERVICING THE LATHE

Disconnect power before any maintenance operation!

Remove all machining debris and foreign objects before lubricating ANYTHING! Use the recommended lubricants or similar. Any oil is better than no oil – but only as a stop gap.

GENERAL

Aside from abrasive particles and machining debris, lack of proper lubrication is the main cause of premature wear. Rotating parts are easy to lubricate, sliding parts are not. Gibs are tightened for the best compromise between rigidity and slideability, which means practically zero gap between the ways. It is not obvious which are the bearing surfaces on the various dovetail surfaces — some of the interfaces look like bearing surfaces, but are simply narrow gaps.

Every few hours of operation: 1. Apply the recommended way-oil with a dedicated short-bristle brush such as the type used for applying flux; 2. Use a similar brush to apply oil or grease to the leadscrews; 3. Apply oil to the ball oilers, see below.

The spindle runs on sealed, pre-lubricated roller bearings requiring no routine attention.

Recommended lubricants

Gearboxes: 75W80 gear oil. Approximate quantities required:

Gearbox 14 oz
Apron 2 oz

Ball oilers: ISO 68 way oil, such as Mobil Vactra No. 2, or equivalent.

Machine ways (dovetails): ISO 68 way oil, such as Mobil Vactra No. 2, or equivalent.

External change gears: light general purpose grease, NLGI No. 2, or equivalent.

Leadscrews: ISO 68 way oil, such as Mobil Vactra No. 2, or equivalent.

BALL OILERS

Use a pump-type oil can, preferably with a flexible spout tipped with a soft tube. The ID of the tip should be large enough to seat on the oiler's brass flange, more than spanning the spring-loaded steel ball. When the oil can tip is firmly pressed onto the brass surface oil pressure must displace the ball, allowing oil to flow into the bearing. Before oiling, check that the ball is not stuck – press it lightly with a probe.

LUBRICATION — GEARBOX DRAIN & REFILL

Take time to prepare. A pint of oil is a lot to clean up!

1. Run the lathe for a few minutes to warm the oil if necessary.
2. Remove the fill plug on the top surface of the headstock, Figure 4-2.
3. Remove the external change gears if necessary for access to the drain plug, Figure 4-1.
4. Place a drain pan under the drain plug.
5. Fold a sheet of card stock to make a Vee-shape drain channel. Trim the Vee to seal against the gearbox.
6. With the drain channel in place, remove the drain plug.
7. Allow the oil to drain completely, then replace the drain plug.
8. Attach a short length of 3/8" OD clear PVC tubing to a small funnel.
9. Insert the tube into the fill hole, then add just an ounce or two of oil.
10. When satisfied that the gearbox is oil-tight, add oil to the halfway mark on the sight glass (about 1 pint).
11. Replace the fill plug.

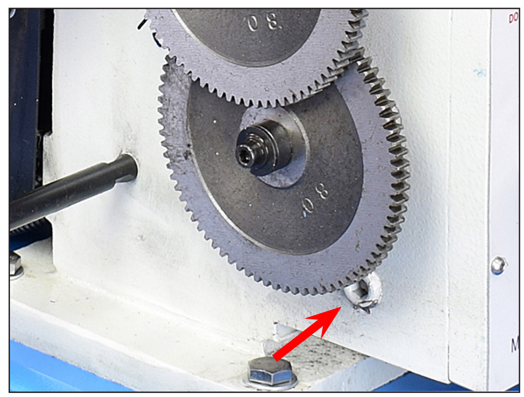


Figure 4-1 **Gearbox drain plug (1) & sight glass (2)**

Figure 4-2 **Gearbox sight glass & fill plug**

LUBRICATION — APRON DRAIN & REFILL

1. Remove the apron fill plug, Figure 4-3.
2. Locate the drain plug on the underside of the apron casting, Figure 4-4.
3. Place a drain pan below the drain plug, then remove the plug.
4. Allow the oil to drain completely, then replace the drain plug.
5. Using a funnel and tubing assembly as described above for the gearbox, add an ounce or two of oil.
6. When satisfied that the apron is oil-tight, add oil to the halfway mark on the sight glass.
7. Replace the fill plug.

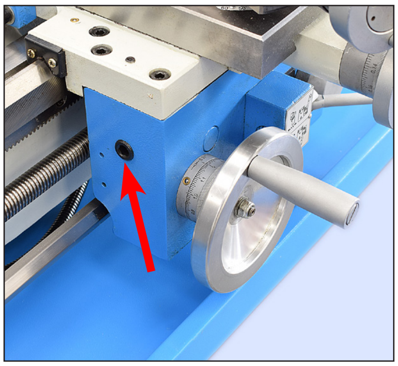


Figure 4-3 **Apron fill plug**

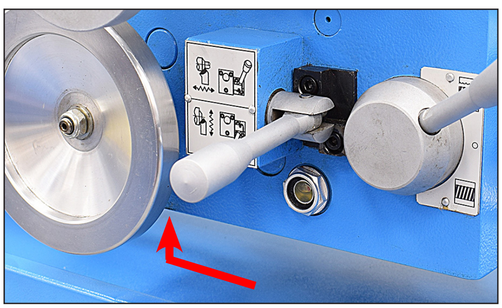


Figure 4-4 **Apron sight glass & drain plug** *(underneath apron)*

LUBRICATION — OILERS

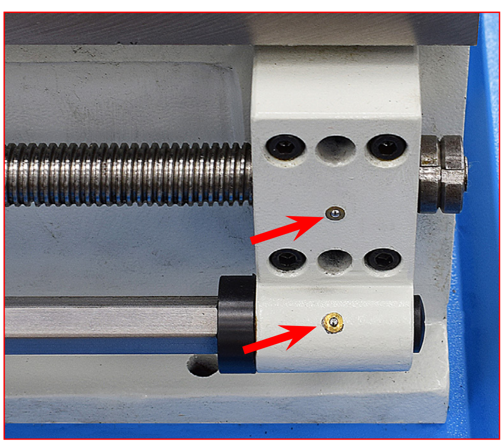


Figure 4-5 **Leadscrew & feedshaft oilers**

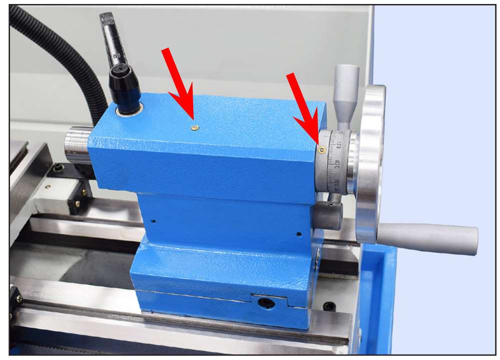


Figure 4-6 **Tailstock oilers**

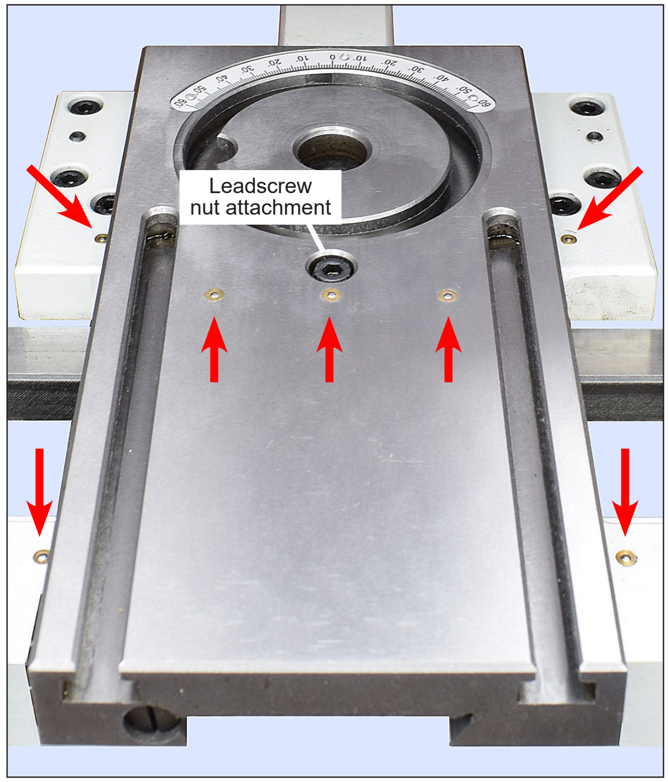


Figure 4-7 **Saddle & cross-slide oilers**

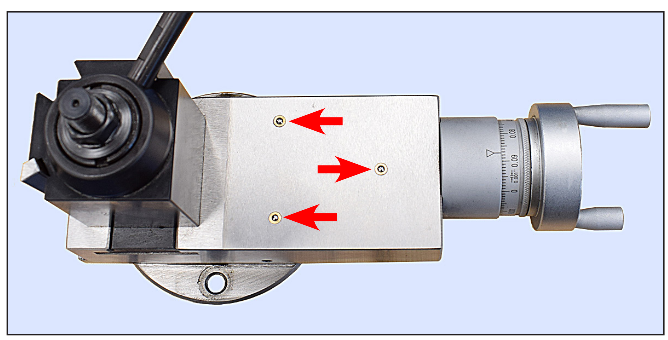


Figure 4-8 **Compound oilers**

External gear oilers *See Figure 3-16*

ADJUSTMENT — GIB SCREWS

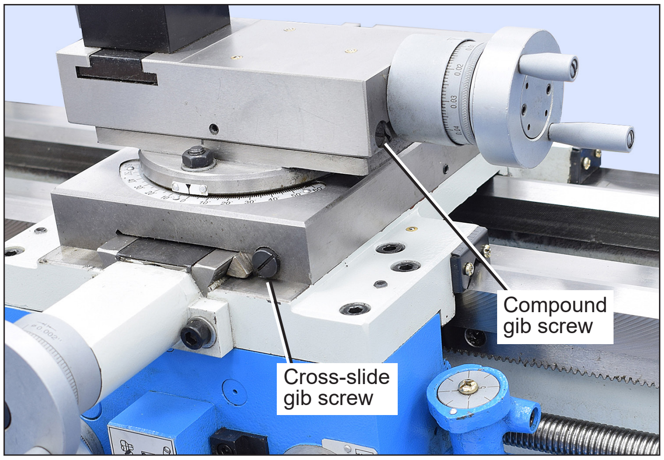


Figure 4-9 **Gib screws**

The cross-slide and the compound slide are on dovetail ways. On one side of the dovetails, in the gap between inner and outer surfaces, is a ***tapered*** strip of iron — the ***gib strip***. On the sliding component are two special large-diameter screws, one at each end, to hold the tapered gib in position. The screws are in opposition, meaning that if one of them is backed out, the other must be moved in to prevent end-to-end motion of the gib. Adjusting the gib screws is a trial and error process that takes time and patience. Aim for the best compromise of rigidity and reasonably free slide motion. Too tight means accelerated wear on the ways and leadscrews. Too free means instability of the cutting tool, inaccuracies and chatter.

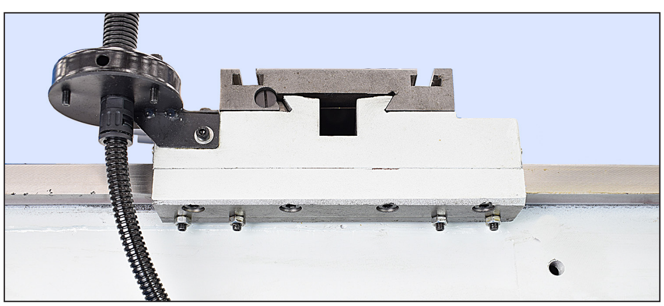


Figure 4-10 **Saddle gib support**
The saddle gib pressure is adjusted by four set screws.

ADJUSTMENT — CROSS-SLIDE BACKLASH

When alternating between clockwise and counter clockwise rotation, the cross-slide handwheel may move freely a few degrees, but the cross-slide table stays put.

Cross-slide lost motion is due to two factors: 1. Too-loose attachment of the handwheel attached to the leadscrew, and; 2. Wear in the leadscrew nut, item #32 in the parts diagram, page 31. This is a split nut that is adjustable by M4 screws, item #33.

ADJUSTMENT — SPINDLE BEARINGS

The spindle runs on two grease-packed tapered roller bearings. They are factory adjusted, and should need no attention. If end play becomes evident (workpiece chatter, poor finish, etc.), this can be corrected by tightening the slotted nut securing the Vee pulley, Figure 4-11. To do this, loosen the two clamp screws, then gently tighten the slotted nut using a soft metal drift and hammer. Don't overdo this! Over-tightening can damage the bearings. Re-tighten the clamp screws.

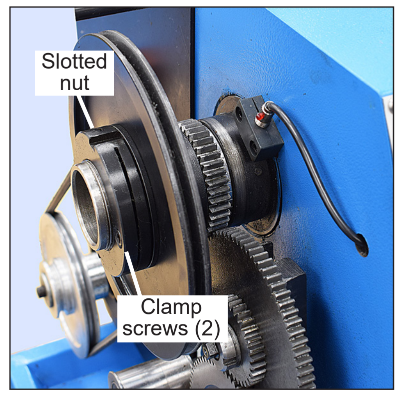


Figure 4-11 **Spindle nut**

ALIGNING THE LATHE

The most important attribute of a properly set up lathe is its ability to “machine parallel”, to cut a cylinder of uniform diameter over its entire length. In other words, no taper.

Leveling of the lathe is a part of this, see Section 1. Equally important is the alignment of the center-to-center axis with the lathe bed, as seen ***from above***. [Vertical alignment is nowhere near as critical, rarely a cause of taper unless the lathe is damaged or badly worn.]

How to align lathe centers

The PM-1130V tailstock may be offset for taper turning and other operations. For routine operations, the offset must be ***precisely*** zero, Figure 4-12.

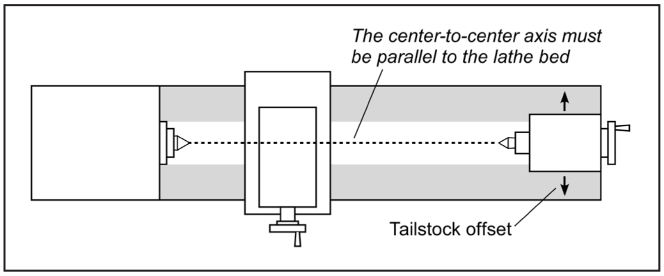


Figure 4-12 **Center-to-center axis**

The scale provided on the tailstock is not reliable for precision work — think of it as only a starting point. What follows are two methods for aligning centers, one quick and easy, the other more precise.

Quick method

This method works only if the centers are in new condition, sharp and clean.

1. Carefully clean the taper sockets and the tapers themselves. Install the tapers.
2. Move the saddle left as far as it will go, then slide the tailstock left to touch the saddle.
3. Lock the tailstock (this is important — unlocked to locked can mean an offset of several thousandths). Try to use the same locking force every time you move the tailstock.
4. Advance the tailstock quill to bring the centers together.
5. Place a scrap of hard shim stock or an old-style double-edge razor blade between the centers, Figure 4-13.
6. Advance the tailstock quill to trap the blade, then lock the quill. If the centers are aligned, the blade will point squarely front to back. If not, adjust the tailstock offset by a series of very small adjustments.
7. If the range of quill motion permits, check the blade alignment at various extensions of the quill. There should be no appreciable variation.

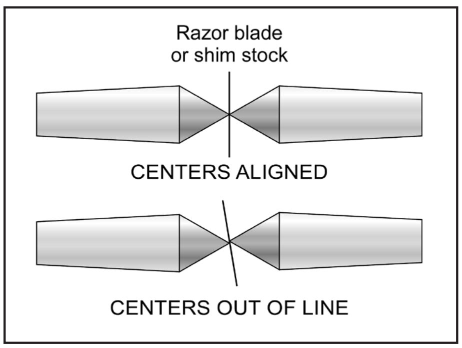


Figure 4-13 **Quick alignment check**

Precise method

This method uses a precision ground steel rod at least 10" long. Look for 3/4 or 1 inch "drill rod" with a diameter tolerance of ± 0.001" or less.

Straightness and uniform diameter are both important (absolute diameter is not).

1. Set the rod in a collet chuck, or independent 4-jaw chuck, with the outer end about 1/2 inch clear of the chuck.
2. Use a dial indicator to check for runout. If using a 4-jaw adjust as necessary for minimum TIR (aim for 0.0005" or less).
3. Center-drill the end of the ground rod.
4. Reverse the rod, re-adjust for minimum TIR, then drill the other end.
5. Set the drill rod snugly between centers, as Figure 4-14. Lock the tailstock.
6. Set a dial indicator on the cross-slide (to eliminate vertical error use a flat disc contact, not the usual spherical type — if a disc contact is not available, machine a cap to fit over the spherical point).
7. Starting at location (1), note which way the pointer rotates when the cross-slide is moved inward. (In this diagram the pointer is shown turning clockwise.)
8. Pre-load the indicator by a few thousandths, then traverse the saddle from (1) to (2).

If the pointer turns clockwise as you go toward the tailstock, as Figure C, the tailstock is biased to the front. This will cause the lathe to cut a tapered workpiece with the larger diameter at the headstock end. Correct this by a series of ***very small*** adjustments to the tailstock offset, aiming for the perfect result — no pointer movement from (1) to (2), Figure 4-15.

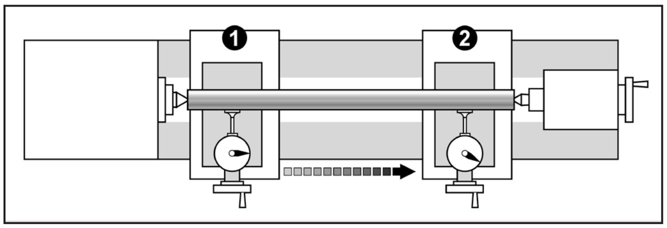


Figure 4-14 **Drill rod between misaligned centers**

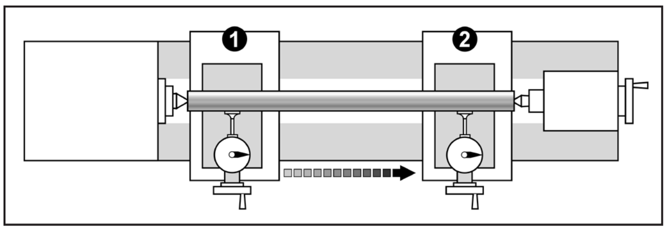
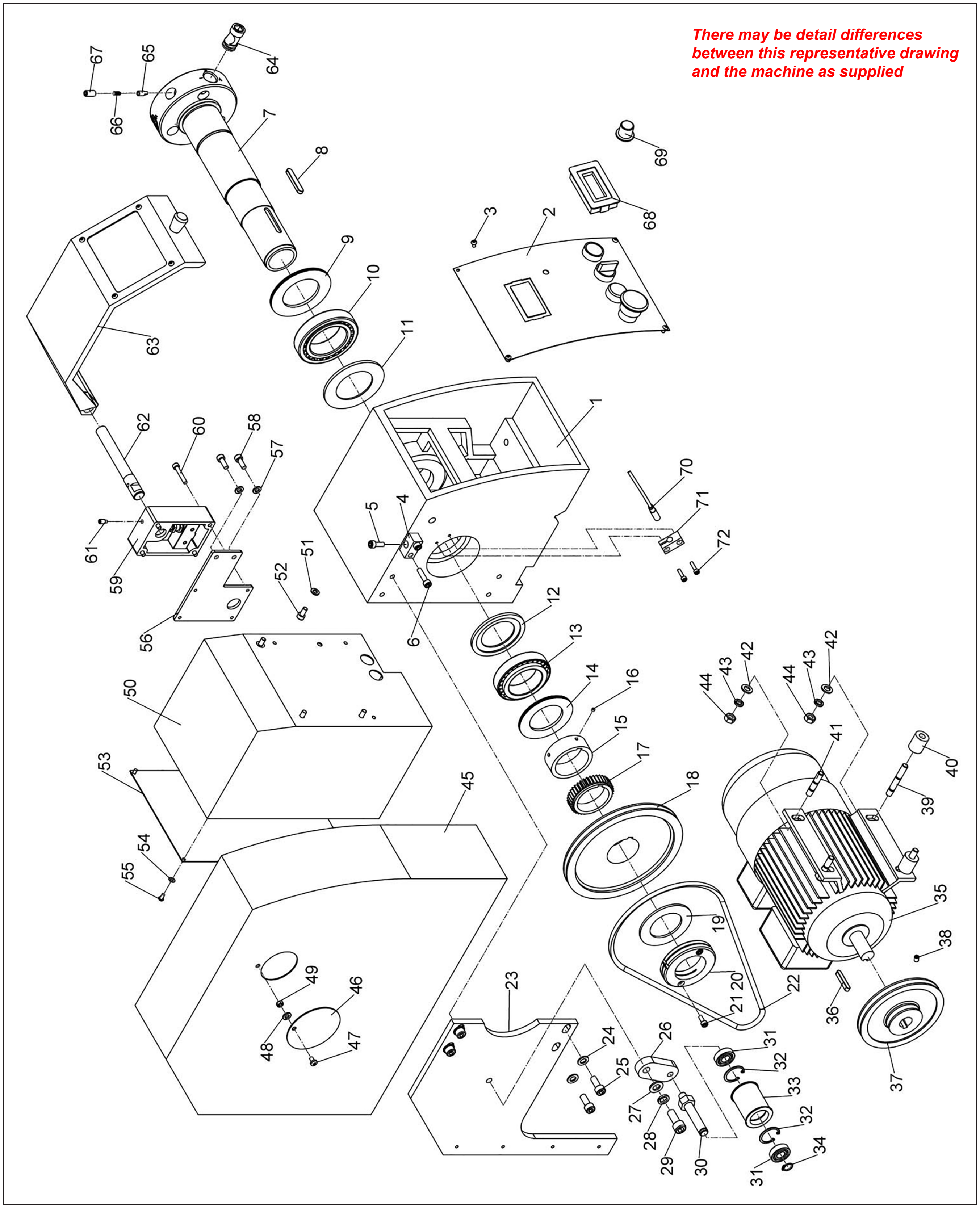


Figure 4-15 **Perfect alignment: zero indicator change between locations 1 and 2**

Section 5 PARTS

HEADSTOCK & DRIVE ASSEMBLY Fig 1



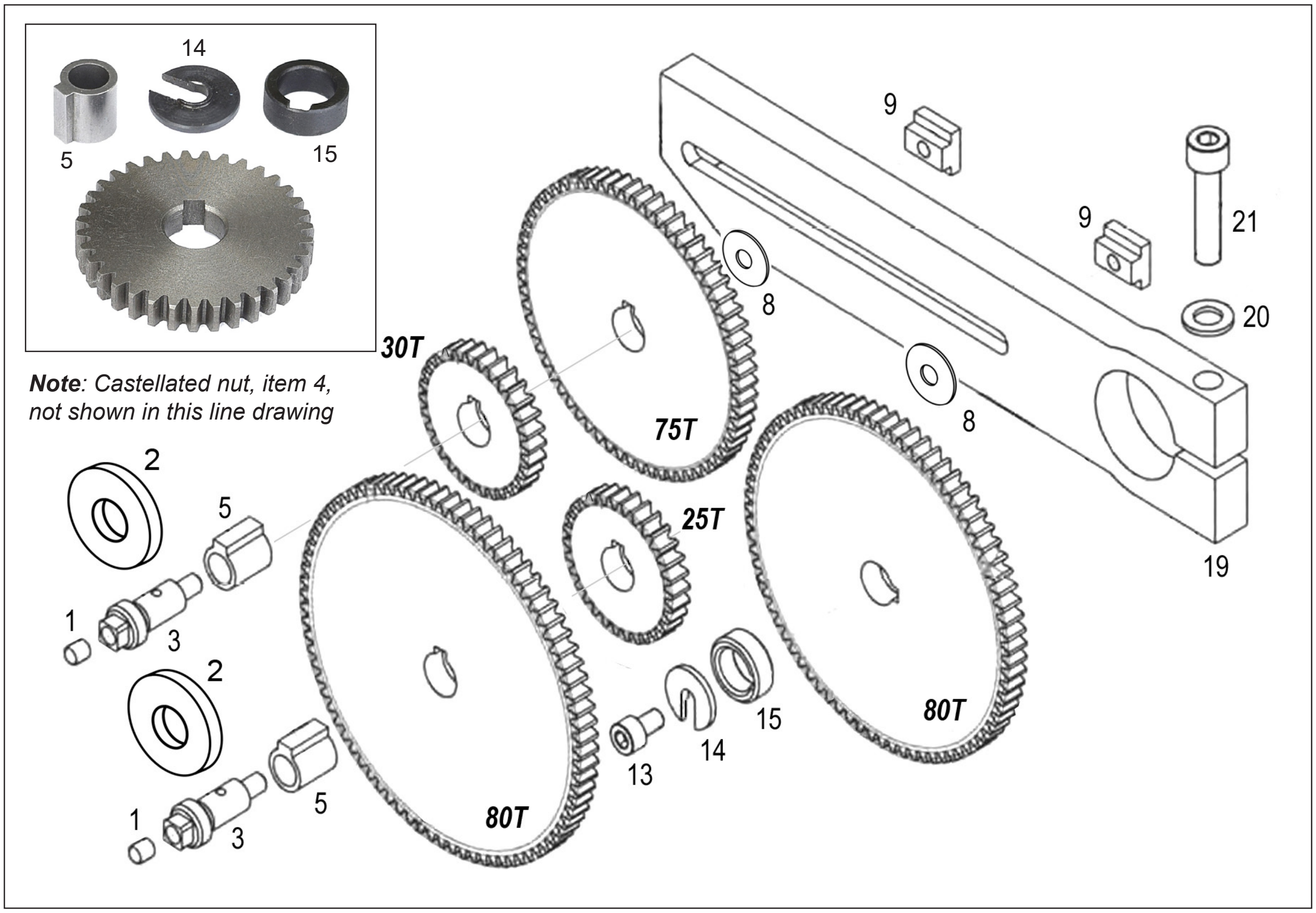
HEADSTOCK & DRIVE ASSEMBLY Fig 1

Ref	Description	Part
1	Headstock casting	Z9133
2	Headstock front panel	Z9134
3	Screw M4x8	Z1277
4	Fixed block	Z9136
5	Screw M6x16	Z9137
6	Screw M6x25	Z9138
7	Spindle	Z9139
8	Key 8x45	Z9140
9	Gasket	Z9141
10	Bearing 32011/P5	Z9142
11	Gasket	Z9143
12	Gasket	Z9144
13	Bearing 32010/P5	Z9145
14	Gasket	Z9146
15	Bead sleeve	Z9147
16	Bead	Z9148
17	Gear	Z9149
18	Spindle pulley	Z9150
19	Gasket	Z9151
20	Spindle lock nut	Z9152
21	Screw M5x10	Z1061
22	Belt GATES-07M-925	Z9154
23	Bracket plate	Z9155
24	Washer ø8	Z9156
25	Screw M8x20	Z9157
26	Tension arm	Z9158
27	Washer	Z9159
28	Washer	Z9160
29	Screw M10x25	Z9161
30	Tension wheel shaft	Z9162
31	Bearing 51101	Z9163
32	Retaining clip ø28	Z9164
33	Tension idler	Z9165
34	Shaft collar	Z9166
35	Motor	Z9167
36	Flat key	Z9168

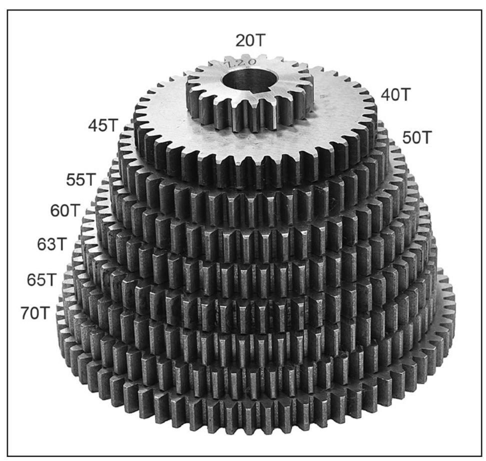
Ref	Description	Part
37	Motor pulley	Z9169
38	Screw M6x10	Z9170
39	Special screw M10x55	Z9171
40	Spacer bush	Z9172
41	Special screw M10x55	Z9173
42	Spring washer ø8	Z9174
43	Washer ø8	Z9175
44	Nut M8	Z9176
45	Protection cover	Z9177
46	Round cover	Z9178
47	Screw M5x10	Z1061
48	Flat washer ø5	Z9180
49	Nut M5	Z9181
50	Electrical box	Z9182
51	Washer ø6	Z9183
52	Screw M6x12	Z9184
53	Electrical box cover	Z9185
54	Flat washer ø4	Z9186
55	Screw M4x8	Z1277
56	Bearing plate	Z9188
57	Washer ø6	Z9189
58	Screw M6x16	Z9190
59	Chuck cover support	Z9191
60	Screw M5x25	Z1250
61	Screw M6x5	Z5947
62	Shaft	Z9194
63	Chuck cover	Z9195
64	Lock cam	Z9196
65	Pin	Z9197
66	Spring	Z9198
67	Screw M8x16	Z9199
68	Speed display	Z9200
69	Speed knob	Z9201
70	Speed sensor	Z9202
71	Sensor bracket	Z9203
72	Screw M4x16	Z1217

Dimensions in millimeters

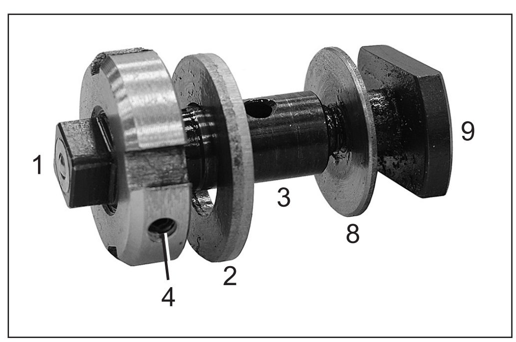
EXTERNAL CHANGE GEARS Fig 2



Ref	Description	Part
1	Oiler Φ6	Z1074
2	Thick spacer washer	Z7412
3	Gear axle	Z1075
4	Castellated nut	Z1023
5	Externally keyed bushing	Z1077
8	Thin spacer washer	Z1078
9	T-nut	Z1079
13	Skt hd cap screw M6 x 10	Z1066
14	C-washer	Z1081
15	Internally keyed bushing	Z1082
19	Change gear support bar	Z1083
20	Washer Φ8	Z1084
21	Skt hd cap screw M8 x 35	Z1085

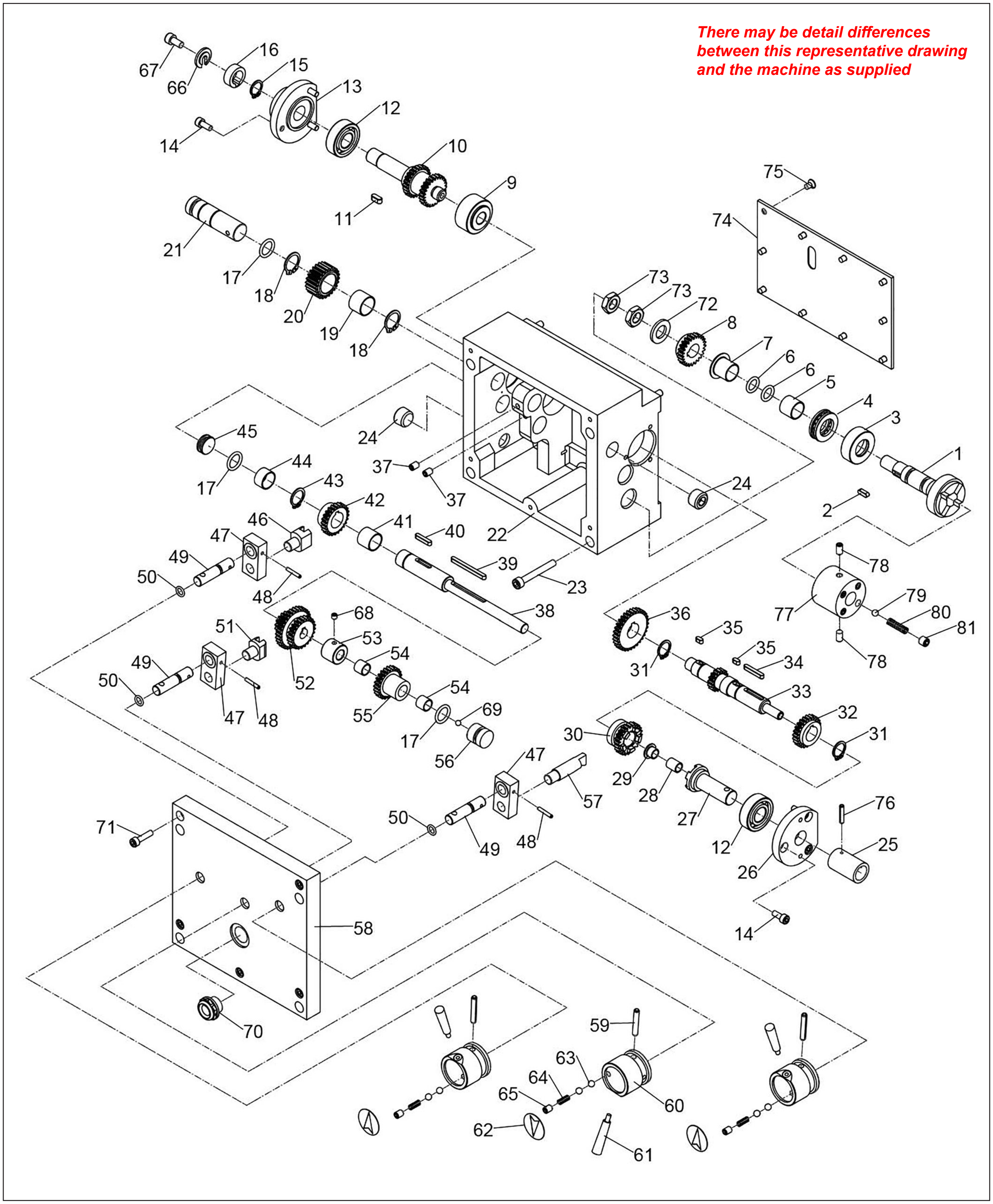


Dimensions in millimeters



Adjustable gear axle *(right)*
Screw the axle into the T-nut (9), then tighten with an 8 mm wrench. Install the gear(s) on the axle. Loosen the lock screw (6), then rotate the special castellated nut (4) to take up end-float. Re-tighten the lock screw. This is typically a one-time adjustment; thereafter the axle can be treated as a one-piece shoulder bolt.

GEARBOX Fig 3



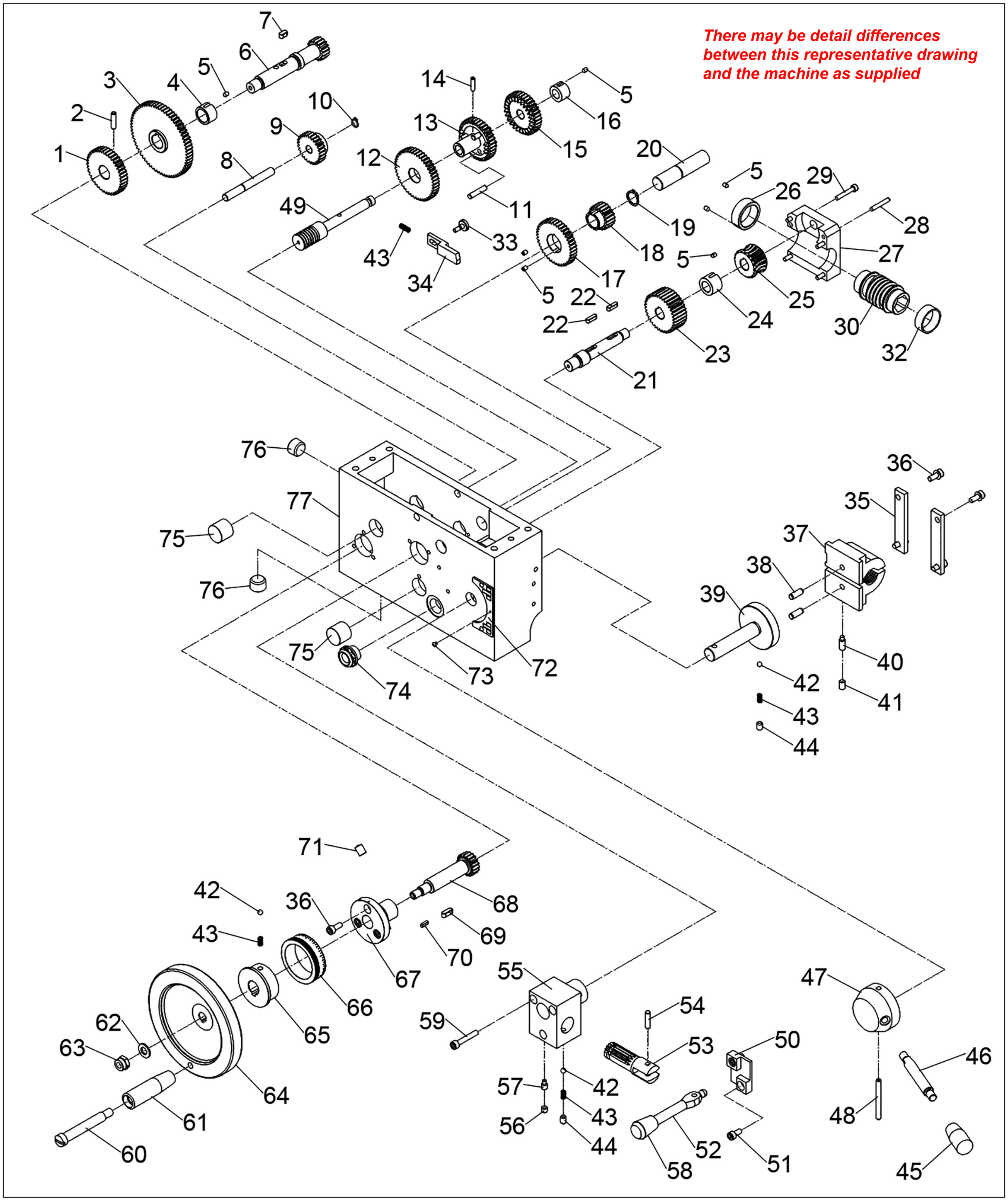
Dimensions in millimeters

GEARBOX Fig 3

Ref	Description	Part
1	Output shaft	Z9219
2	Key 4 x 12	Z9220
3	Bearing sheath	Z9221
4	Bearing 51103	Z9222
5	Bearing SF-1-1615	Z9223
6	O-Ring 16 x 2.4	Z9224
7	Bearing SF-1F16170	Z9225
8	Gear T24	Z9226
9	Collar	Z9227
10	Gear Shaft T24	Z9228
11	Key 5 x 12	Z9229
12	Bearing 6202	Z9230
13	Cap, left	Z9231
14	Skt hd cap screw M5 x 12	Z1146
15	Retaining ring Φ14	Z9233
16	Collar	Z9234
17	O-Ring 18 x 2.4	Z9235
18	Retaining ring Φ18	Z9236
19	Bearing SF-1-1815	Z9237
20	Gear T24	Z9238
21	Shaft	Z9239
22	Gearbox casting	Z9240
23	Skt hd cap screw M6 x 50	Z9241
24	Set screw M16 x 1.5 x 12	Z9242
25	Collar	Z9243
26	Cap, right	Z9244
27	Shaft	Z9245
28	Bearing SF-1-0812	Z9246
29	Bearing SF-1F08075	Z9247
30	Gear	Z9248
31	Retaining ring Φ15	Z9249
32	Gear T24	Z9250
33	Shaft	Z9251
34	Key 4x25	Z9252
35	Key 4x8	Z9253
36	Gear T32	Z9254
37	Set Screw M6 x 10	Z9255
38	Shaft Φ6 x 18	Z9256
39	Key 4 x 45	Z9257
40	Key 4 x 20	Z9258

Ref	Description	Part
41	Bearing SF-1-1615	Z9259
42	Gear T24	Z9260
43	Retaining ring Φ16	Z9261
44	Bearing 1610	Z9262
45	Plug, left	Z9263
46	Fork	Z9264
47	Bracket	Z9265
48	Pin Φ3 x 20	Z9266
49	Shaft	Z9267
50	O-Ring 6.7 x 1.8	Z9268
51	Fork	Z9269
52	Gear T16/T32/T24	Z9270
53	Collar	Z9271
54	Bearing SF-1-1210	Z9272
55	Gear T24	Z9273
56	Plug, right	Z9274
57	Dials Block	Z9275
58	Gearbox front cover	Z9276
59	Pin Φ5 x 40	Z9277
60	Knob	Z9278
61	Lever	Z9279
62	Label	Z9280
63	Ball Φ5	Z9281
64	Spring 0.8 x 4 x16	Z9282
65	Screw M6 x 12	Z9283
66	Washer Φ6	Z9284
67	Skt hd cap screw M6 x 12	Z9285
68	Set screw M5 x 5	Z9286
69	Ball Φ6.5	Z9287
70	Sight glass M18 x 1.5	Z9288
71	Skt hd cap screw M5 x 16	Z1126
72	Washer Φ12	Z9290
73	Special nut M12	Z9291
74	Gearbox back cover	Z9292
75	Screw M5 x 8	Z1093
76	Pin Φ5 x 20	Z9294
77	Overload shaft sleeve	Z9295
78	Set screw M6 x 12	Z9296
79	Ball Φ6	Z9297
80	Spring 1.2 x5 x23	Z9298
81	Screw M8 x 8	Z9299

APRON Fig 4


There may be detail differences between this representative drawing and the machine as supplied
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77

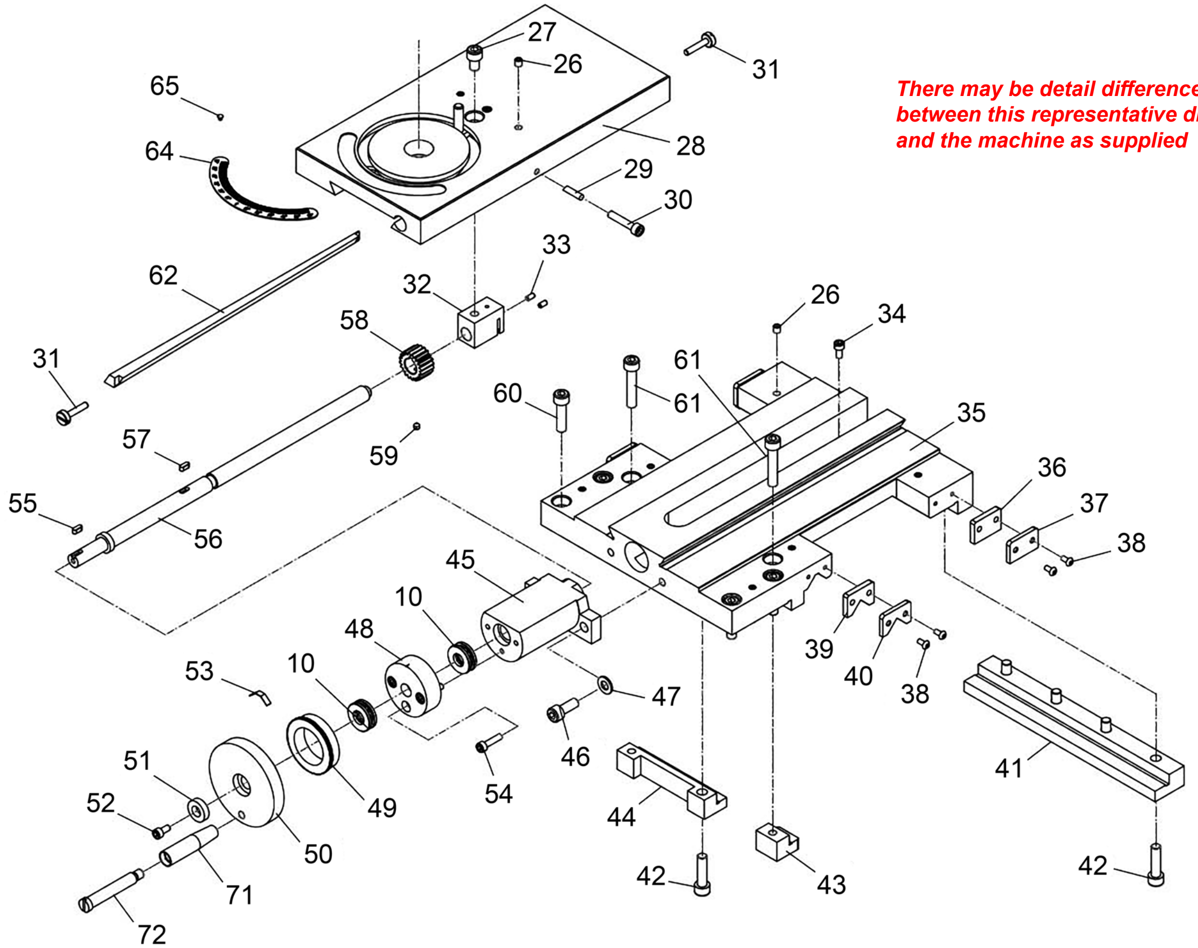
APRON Fig 4

Ref	Description	Part
1	Gear	Z9300
2	Pin Φ5 x 24	Z9301
3	Gear	Z9302
4	Washer	Z9303
5	Set screw M4 x 8	Z9304
6	Gear shaft	Z9305
7	Key	Z9306
8	Shaft	Z9307
9	Retaining ring Φ8	Z9308
10	Gear	Z9309
11	Shaft	Z9310
12	Gear	Z9311
13	Gear	Z9312
14	Pin Φ4 x 16	Z9313
15	Gear	Z9314
16	Washer	Z9315
17	Gear	Z9316
18	Gear	Z9317
19	Retaining ring Φ15	Z9318
20	Shaft	Z9319
21	Worm	Z9320
22	Key 5 x 14	Z9321
23	Gear	Z9322
24	Washer	Z9323
25	Worm gear	Z9324
26	Bearing 2501	Z9325
27	Worm housing	Z9326
28	Pin Φ4 x 20	Z9327
29	Skt hd cap screw M4 x 30	Z2270
30	Worm	Z9329
31	—	Z9330
32	Washer	Z9331
33	Set screw	Z9332
34	Plate	Z9333
35	Plate	Z9334
36	Skt hd cap screw M5 x 12	Z1146
37	Split nut	Z9336
38	Pin Φ6 x 18	Z9337
39	Cam shaft	Z9338

Ref	Description	Part
40	Screw M6 x 20	Z9339
41	Screw M6 x 8	Z1645
42	Ball Φ5	Z9341
43	Spring 0.7 x 4 x 10	Z9342
44	Set screw M6 x 6	Z1186
45	Knob	Z9344
46	Lever, split nut	Z9345
47	Hub, split nut	Z9346
48	Pin Φ5 x 45	Z9347
49	Shaft	Z9348
50	Catch plate	Z9349
51	Skt hd cap screw M5 x 10	Z1061
52	Feed lever	Z9351
53	Forked shaft	Z9352
54	Pin Φ5 x 20	Z9353
55	Base, feed control	Z9354
56	Set screw	Z9355
57	Nut M6	Z9356
58	Knob	Z9357
59	Skt hd cap screw M5 x 35	Z1164
60	Shoulder screw	Z9359
61	Handle sleeve	Z9360
62	Washer Φ8	Z9361
63	Nut M8	Z9362
64	Handwheel, saddle feed	Z9363
65	Collar hub	Z9364
66	Graduated collar	Z9365
67	Bushing	Z9366
68	Pinion shaft	Z9367
69	Key 5 x 14	Z9368
70	Key 3 x 10	Z9369
71	Oiler ball Φ6	Z9370
72	Indicator plate	Z9371
73	Rivet Φ2.5 x 3	Z9372
74	Sight Glass M18 x 1.5	Z9373
75	Collar	Z9374
76	Oil plug ZG 3/8”	Z9375
77	Apron body	Z9376

Dimensions in millimeters

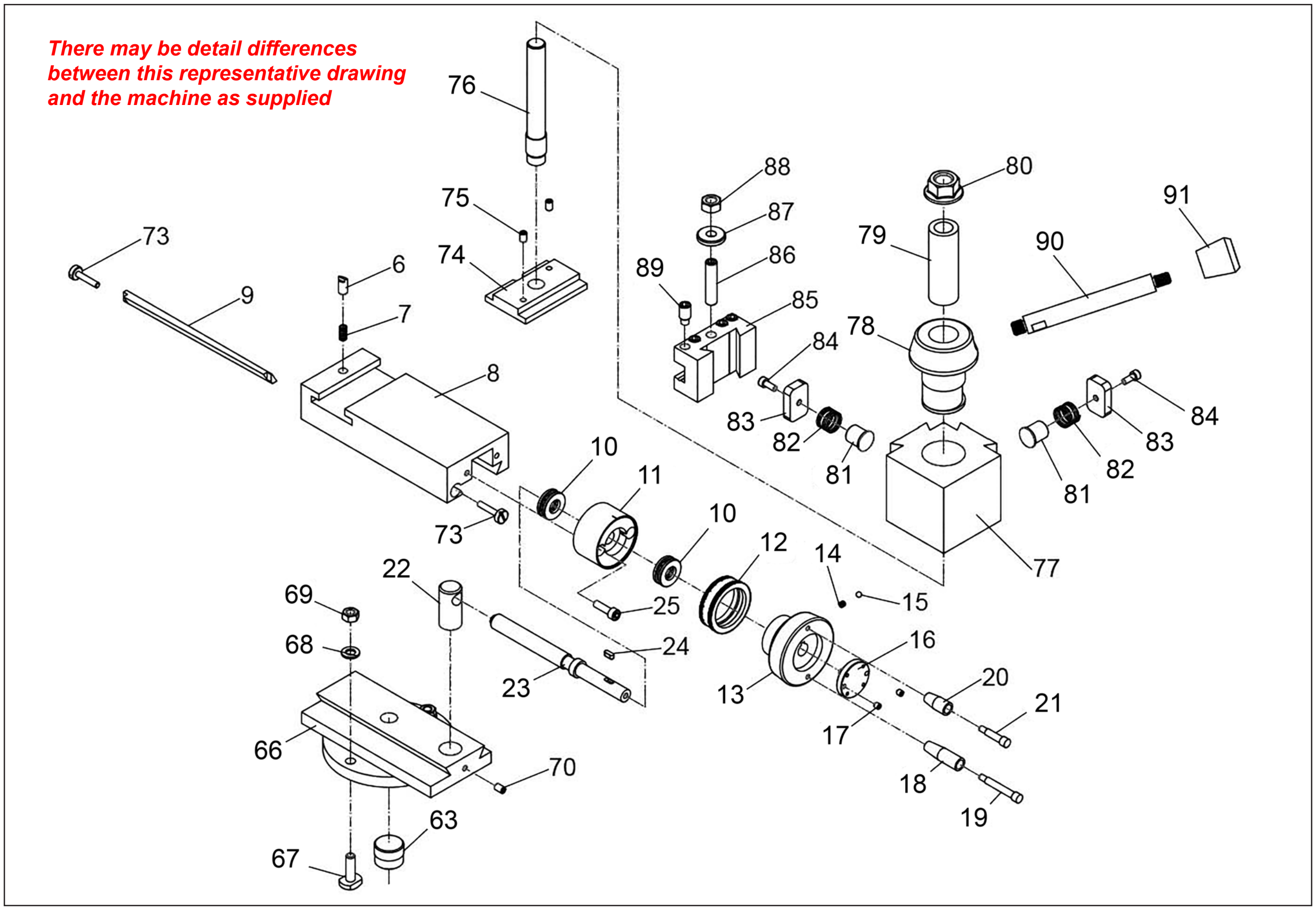
SADDLE & CROSS-SLIDE Fig 5



There may be detail differences between this representative drawing and the machine as supplied

Ref	Description	Part
26	Oiler 6	Z9377
27	Skt hd cap scw M8 x 12	Z9378
28	Cross slide	Z9379
29	Pin	Z9380
30	Skt hd cap scw M6 x 20	Z9381
31	Gib screw	Z9382
32	Leadscrew nut	Z9383
33	Set screw M4 x 8	Z9304
34	Skt hd cap scw M5 x 6	Z9385
35	Saddle	Z9386
36	Felt scraper, rear	Z9387
37	Scraper plate, rear	Z9388
38	Screw M4 x 10	Z2306
39	Felt scraper, front	Z9390
40	Scraper plate, front	Z9391
41	Saddle clamp, rear	Z9392
42	Skt hd cap scw M8 x 30	Z9393
43	Saddle clamp, front right	Z9394
44	Saddle clamp, front left	Z9395
45	Leadscrew support	Z9396
46	Skt hd cap scw M8 x 20	Z9397
47	Washer 8	Z9398
48	Bushing	Z9399
49	Graduated dial	Z9400
50	Handwheel	Z9401
51	Washer	Z9402
52	Skt hd cap scw M5 x 10	Z1061
53	Spring	Z9404
54	Skt hd cap scw M5 x 20	Z1262
55	Key 4 x 10	Z9406
56	Leadscrew	Z9407
57	Key 4 x 10	Z9408
58	Gear	Z9409
59	Set screw M5 x 6	Z1150
60	Skt hd cap scw M8 x 30	Z9411
61	Skt hd cap scw M8 x 40	Z9412
62	Gib	Z9413
64	Graduated scale	Z9414
65	Rivet 2.5 x 4	Z9415
71	Handle sleeve	Z9416
72	Shoulder screw	Z9417

COMPOUND & QCTP Fig 6



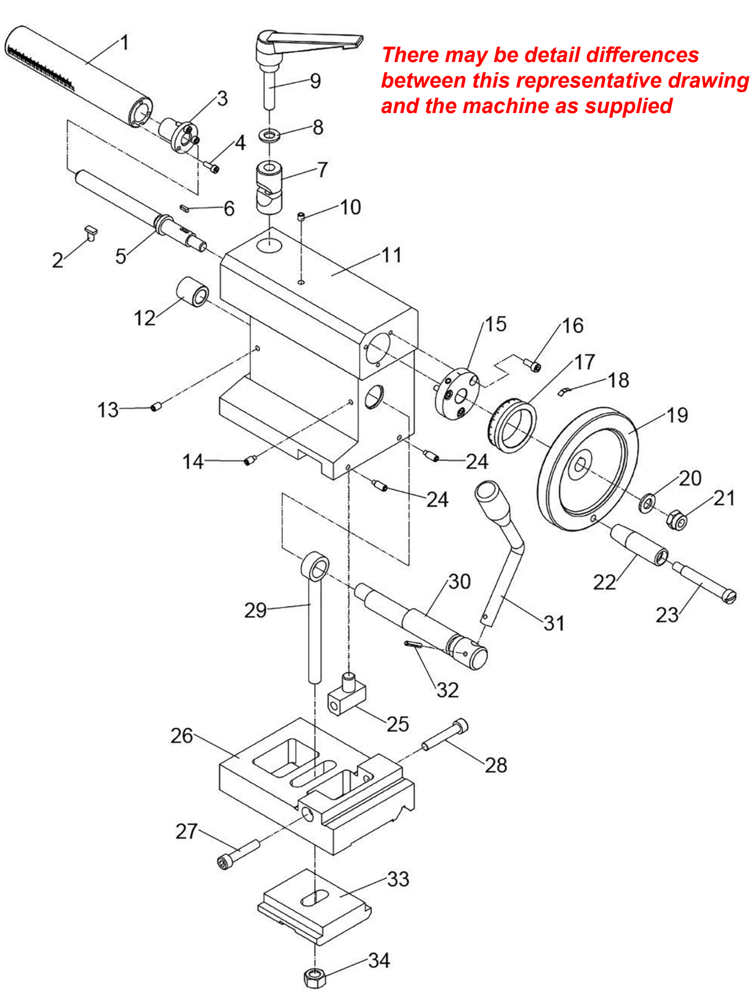
Ref	Description	Part
6	QCTP detent	Z9418
7	Detent spring	Z9419
8	Compound slide	Z9420
9	Gib	Z9421
10	Bearing 51101	Z9422
11	Leadscrew hub	Z9423
12	Graduated dial	Z9424
13	Handwheel	Z9425
14	Spring	Z9426
15	Steel ball 6	Z9427
16	Set screw	Z9428
17	Screw M6 x 8	Z1645
18	Handle sleeve	Z9430
19	Shoulder screw	Z9431
20	Handle sleeve	Z9432
21	Shoulder screw	Z9433

Ref	Description	Part
22	Leadscrew nut	Z9434
23	Leadscrew	Z9435
24	Key 4 x 10	Z9436
25	Skt hd cap scw M6 x 25	Z9437
63	Compound pivot	Z9438
66	Compound rotary base	Z9439
67	T-screw	Z9440
68	Washer Φ8	Z9441
69	Nut M8	Z9442
70	Screw M6 x 10	Z9443
73	Gib screw	Z9444
74	QCTP base plate	Z9445
75	Screw M6 x 8	Z1645
76	QCTP main shaft	Z9447
77	QCTP block	Z9448
78	QCTP cam	Z9449

Ref	Description	Part
79	QCTP sleeve	Z9450
80	QCTP anchor nut	Z9451
81	Plunger	Z9452
82	Spring	Z9453
83	Pressure plate	Z9454
84	Skt hd cap scw M5 x 10	Z1061
85	QCTP tool holder	Z9456
86	Screw M10 x 1 X 45	Z9457
87	Knurled nut	Z9458
88	Lock nut M10 x 1	Z9459
89	Set screw M8 x 20	Z9460
90	Lever	Z9461
91	Knob	Z9462

Dimensions in millimeters

TAILSTOCK Fig 7

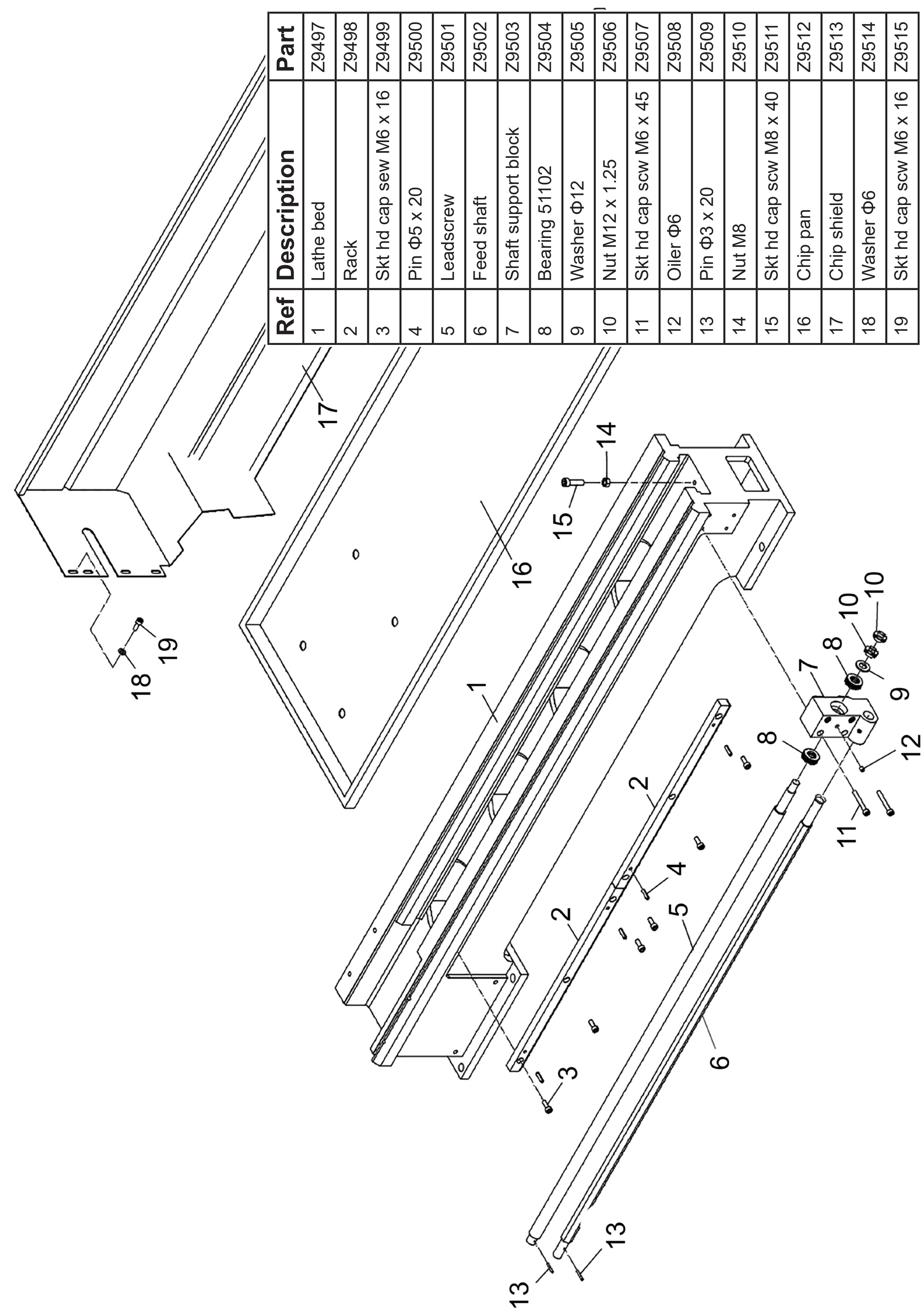


Dimensions in millimeters

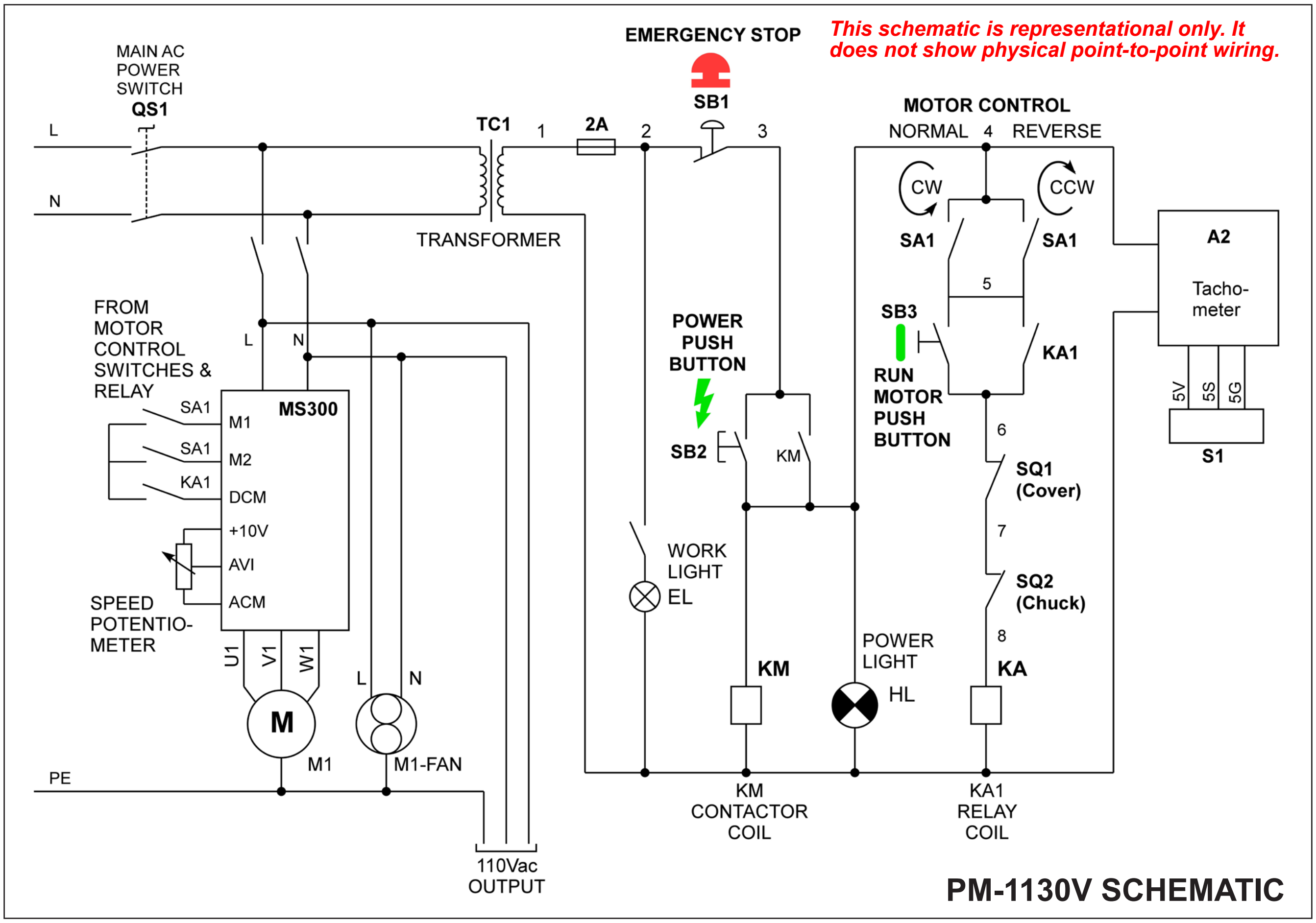
Ref	Description	Part
1	Tailstock quill	Z9463
2	Key	Z9464
3	Flange nut	Z9465
4	Skt hd cap screw M4 x 10	Z2306
5	Leadscrew	Z9467
6	Key 3 x 10	Z9468
7	Quill clamp block	Z9469
8	Washer Φ10	Z9470
9	Lever M10-95 x 50	Z9471
10	Oiler Φ6	Z9472
11	Tailstock body	Z9473
12	Collar	Z9474
13	Set screw M6 x 10	Z9475
14	Limit screw M6 x 10	Z9476
15	Flange	Z9477
16	Skt hd cap screw M5x12	Z1146
17	Graduated dial	Z9479

Ref	Description	Part
18	Spring	Z9480
19	Handwheel	Z9481
20	Washer Φ8	Z9482
21	Nut M8	Z9483
22	Handle sleeve	Z9484
23	Shoulder screw	Z9485
24	Set screw M6 x 16	Z9486
25	Offset block	Z9487
26	Base	Z9488
27	Skt hd cap screw M8 x 40	Z9489
28	Skt hd cap screw M8 x 45	Z9490
29	Clamp screw M12	Z9491
30	Clamp shaft	Z9492
31	Clamp handle	Z9493
32	Pin Φ4 x 24	Z9494
33	Clamp base	Z9495
34	Nut M12	Z9496

BED ASSEMBLY Fig 8



Ref	Description	Part
1	Lathe bed	Z9497
2	Rack	Z9498
3	Skt hd cap sew M6 x 16	Z9499
4	Pin Φ5 x 20	Z9500
5	Leadscrew	Z9501
6	Feed shaft	Z9502
7	Shaft support block	Z9503
8	Bearing 51102	Z9504
9	Washer Φ12	Z9505
10	Nut M12 x 1.25	Z9506
11	Skt hd cap scw M6 x 45	Z9507
12	Oiler Φ6	Z9508
13	Pin Φ3 x 20	Z9509
14	Nut M8	Z9510
15	Skt hd cap scw M8 x 40	Z9511
16	Chip pan	Z9512
17	Chip shield	Z9513
18	Washer Φ6	Z9514
19	Skt hd cap scw M6 x 16	Z9515



NOTES

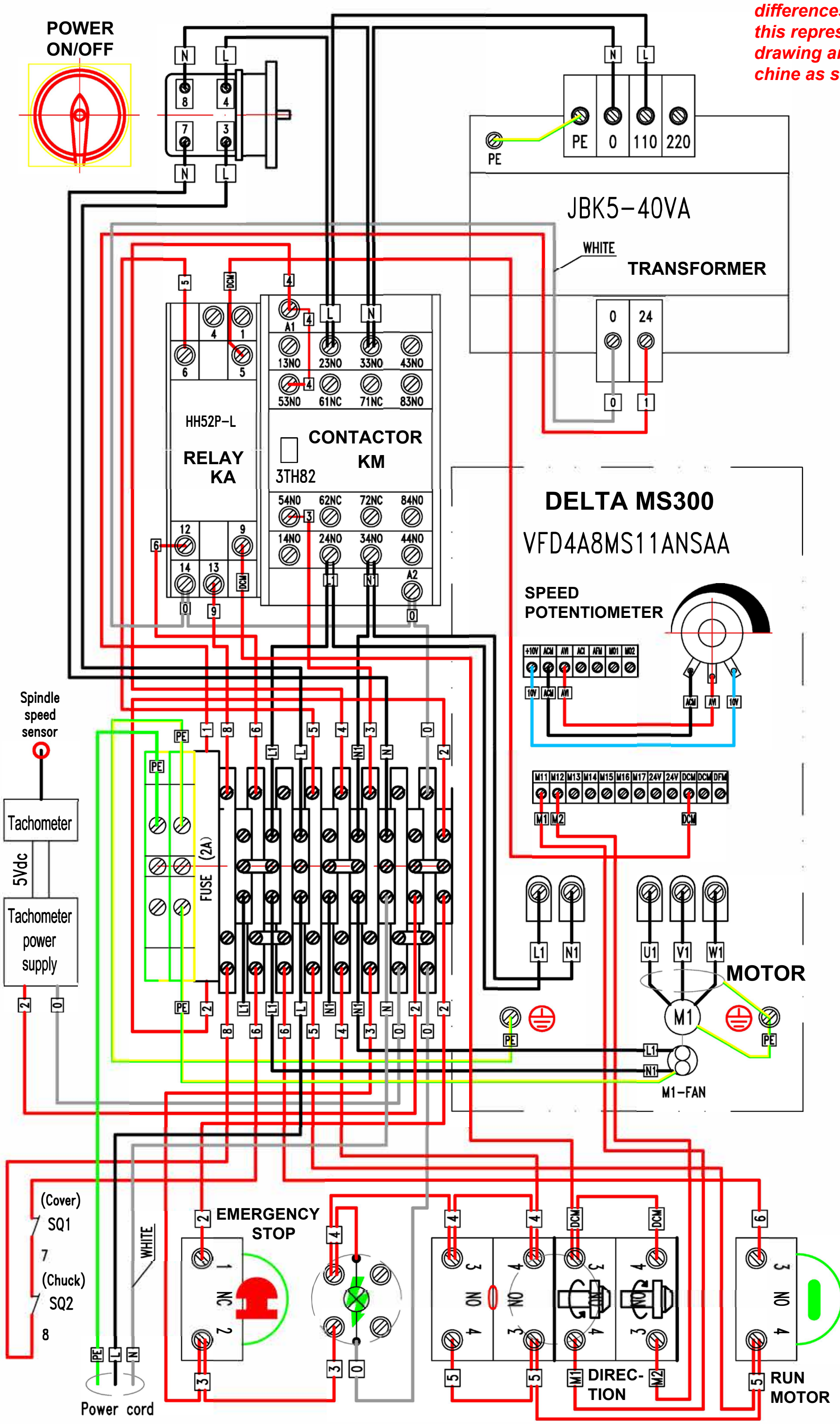
1. The motor control unit is a Delta MS300 VFD.
2. When pushed, the E-STOP button remains in, disconnecting power (by de-energizing contactor KM), until reset by twisting action.
3. For electrical continuity the Chuck Guard SQ2 and Gear Cover SQ1 must be closed at all times.

HOW THE CIRCUIT WORKS ...

If the Main AC power switch is turned ON, the main contactor KM will be energized when the POWER push button is operated, energizing the power light, and connecting 110 vac power to the Delta MS300 VFD; also connecting 24 vac power to the motor control switches SA (via E-STOP SB1, and a contact of the now-energized KM). This puts the motor control circuit into standby mode, meaning that nothing is activated until the RUN MOTOR button is pressed. This will energize relay KA if—and only if—the following conditions apply: 1. The Motor Control Switch has been set to either LEFT (CW) or RIGHT (CCW), and; 2. The Chuck Guard SQ2 and Gear Cover SQ1 microswitches are closed.

When energized, KA signals the VFD to apply power to the motor.

The motor stops when the Motor Control Switch is turned to its mid-point (0), or when either of the safety switches SQ1, SQ2 opens. Any one of these three actions de-energizes relay KA, which signals the VFD to disconnect motor power.



There may be detail differences between this representative drawing and the machine as supplied