

HAFCO **METALMASTER**



Edition : 1
Date: (08/26)

Instruction Manual

TURRET MILLING MACHINE BM-22VE

Order Code: (M592D)

MACHINE DETAILS

MACHINE.	Turret Milling Machine
MODEL NO.	BM-22VE
SERIAL NO.	
DATE OF MANF.	

IMPORTED BY

AUSTRALIA



www.machineryhouse.com.au

NEW ZEALAND



www.machineryhouse.co.nz

NOTE:

This manual is only for your reference. At the time of the compiling of this manual every effort to be exact with the instructions, specifications, drawings, and photographs of the machine was taken. Owing to the continuous improvement of the HAFCO Metalmaster machine, changes may be made at any time without obligation or notice. Please ensure the local voltage is the same as listed on the specification plate before operating any electric machine.

SAFETY SYMBOLS:

The purpose of safety symbols is to attract your attention to possible hazardous conditions



WARNING

Indicates a potentially hazardous situation causing injury or death



CAUTION

Indicates an alert against unsafe practices.

Note: Used to alert the user to useful information



NOTE:

In order to see the type and model of the machine, please see the specification plate. Usually found on the back of the machine. See example (Fig.1)

Fig.1

METALMASTER
PRODUCT SPECIFICATION

MODEL:	
CAPACITY:	
SER. NO:	
MFG DATE:	
WEIGHT:	
VOLTS:	
MOTOR Kw:	

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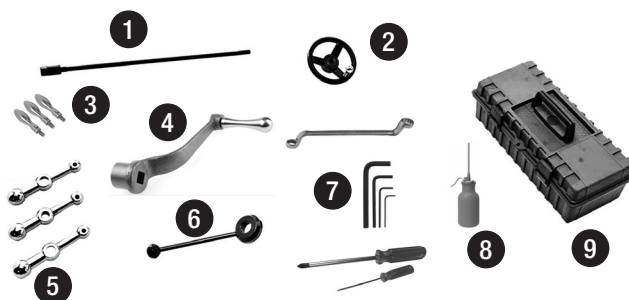
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1.1 SPECIFICATIONS

Product Code	M592D
Model Number:	BM-22VE
Digital Readout	3-Axis Counter X, Y Scales
Table Size (mm)	1067 x 230
Spindle Taper	NT30
Longitudinal Travel X-Axis (mm)	600
Cross Travel Y-Axis (mm)	325
Vertical Travel Z-Axis (mm)	370
Type of Slides	Dovetail (X, Y, Z)
Longitudinal and Cross Travel Type	Lead Screws
Ram Travel (mm)	315
Quill Diameter (mm)	86
Quill Travel (mm)	127
Spindle to Table Max. (mm)	482
Throat Depth Max. (mm)	545
Tilting Head (Left to Right)	$\pm 90^\circ$
Tilting Head (Forward & Back)	$\pm 45^\circ$
Power Feed - Quill (mm/rev)	0.038, 0.076, 0.152
Power Feed - Longitudinal (X-Axis)	20-2000 mm/min
Power Feed - Cross (Y-Axis)	Optional
Power Feed - Vertical (Z-Axis)	Optional
Lubrication System	One Shot
Table T-Slot Size (mm)	16
Work Table Load Capacity (Kgs)	250
Lubrication System	One-Shot
Spindle Speeds Vertical	Variable (50 - 3650) rpm
Motor Power - Vertical	2.2kW/3HP 1Ph
Motor Voltage	240V-15amp
Overall Dimensions (mm./W x D x H)	1500 x 1700 x 2200
Net Weight (kgs.)	1000

1.2 INCLUDED ACCESSORIES

1. Draw bar
2. Hand wheel for quill manual feed
3. Handle for table feed
4. Crank handle for Knee elevating
5. Three ball handle for table feed
6. Lever for quill manual feed
7. Wrench and Hex. Wrench and Screw driver
8. Oil bottle
9. Toolbox



1.3 MACHINE IDENTIFICATION

Become familiar with the names and locations of the controls and features shown below to better understand the instructions when mentioned later in this manual.

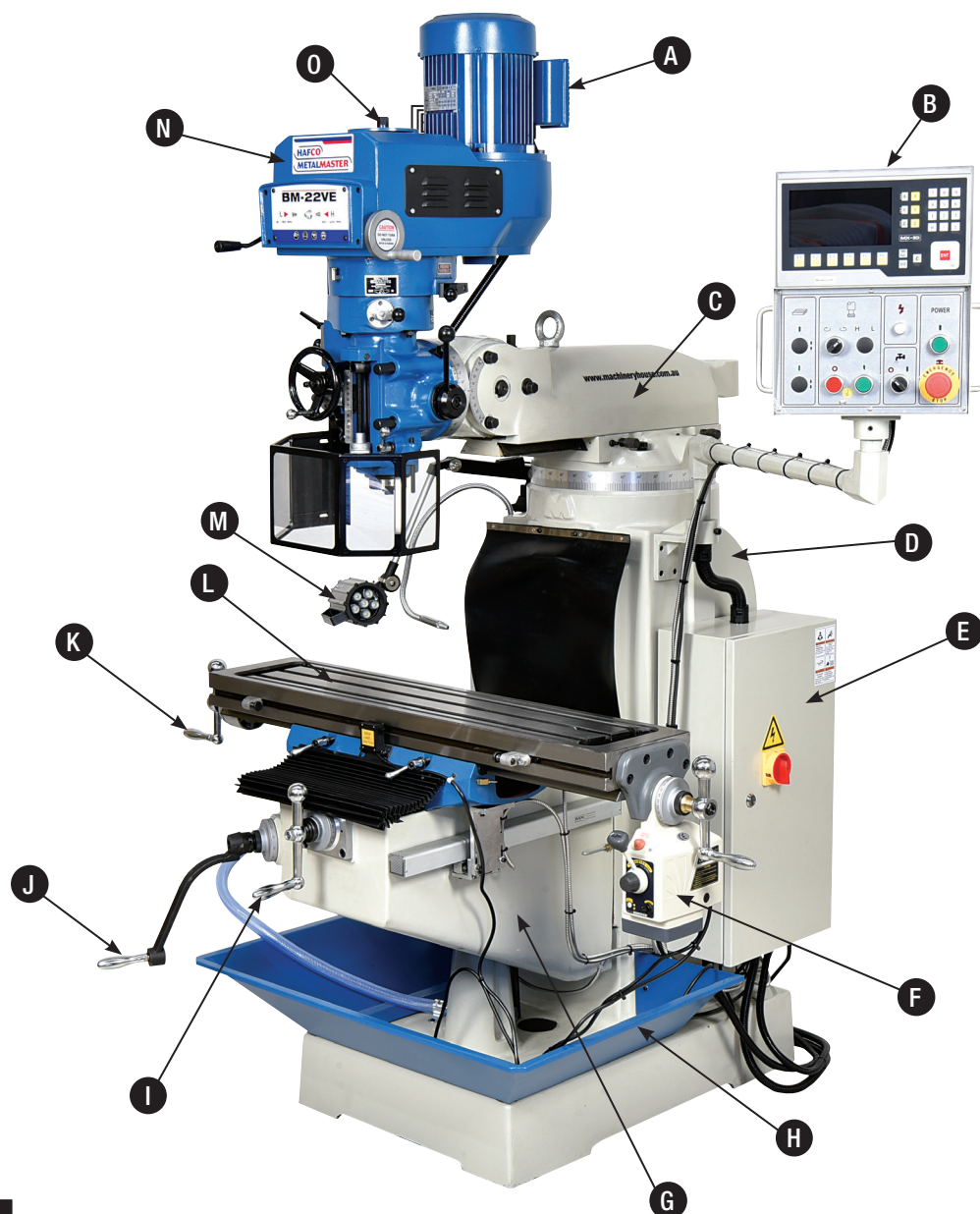


FIG. 1.1

A	Motor	F	Longitudinal Power Feed	K	Longitudinal Handle
B	Digital Readout	G	Knee	L	Slotted Table
C	Ram	H	Splash Tray	M	Halogen Lamp
D	Main Body	I	Cross Handle	N	Headstock
E	Electrical Cabinet	J	Knee Handle	O	Spindle Drawbar

VARIABLE SPEED HEAD IDENTIFICATION

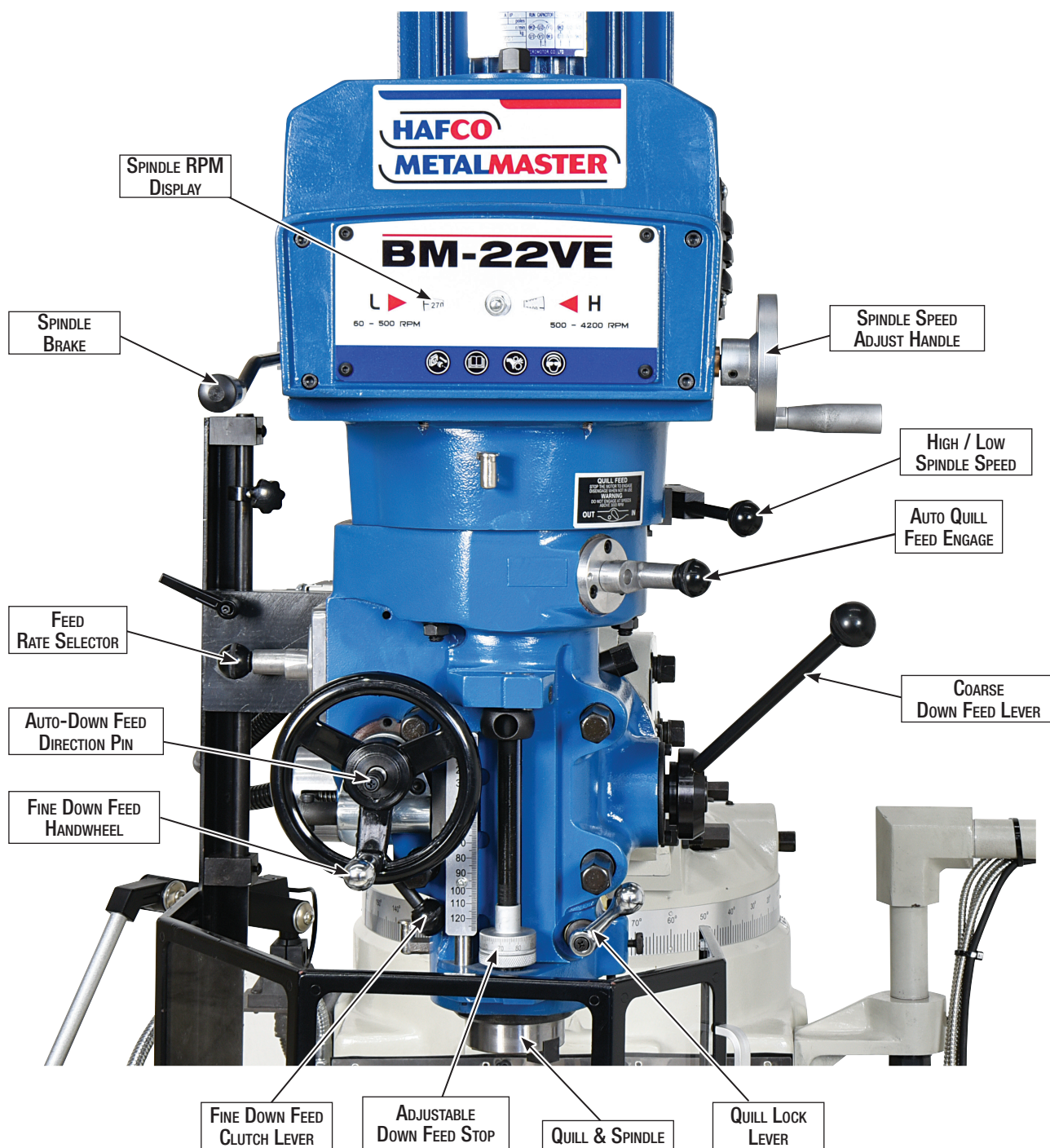


FIG. 1.2

TABLE IDENTIFICATION

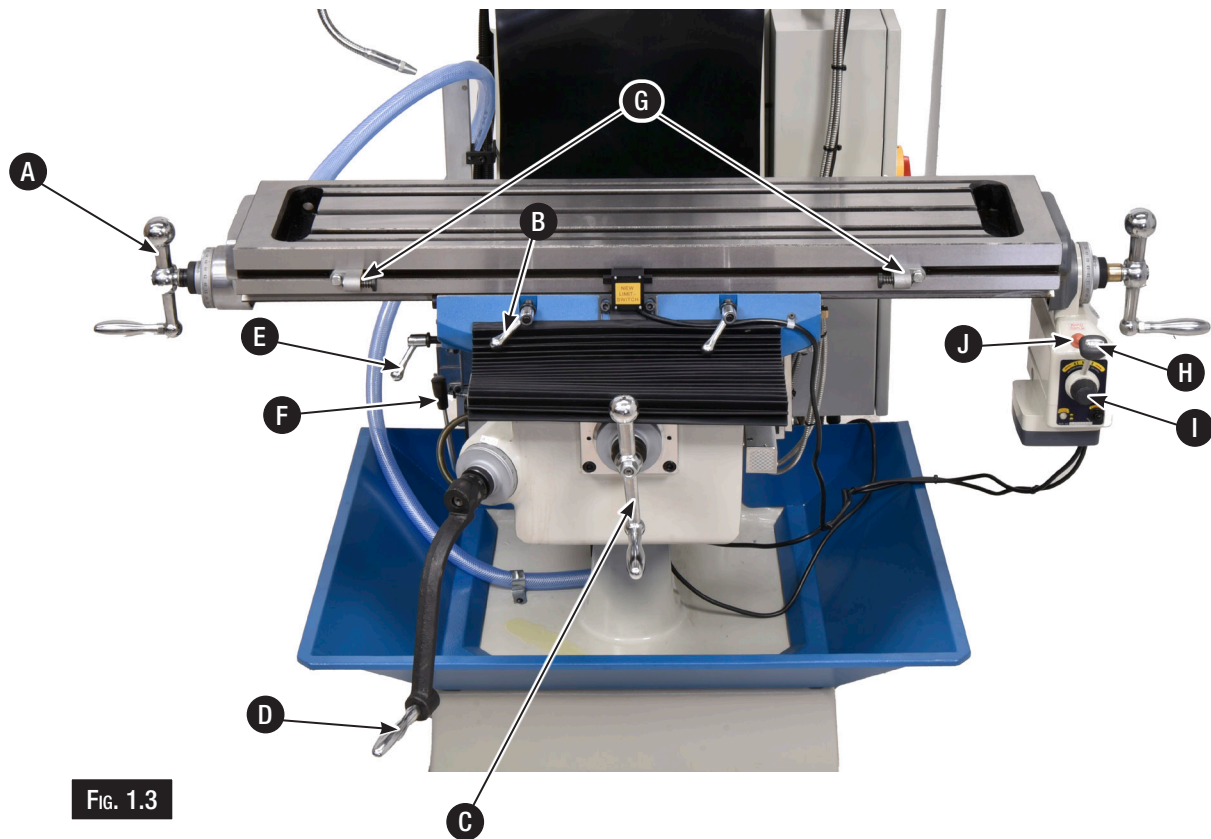
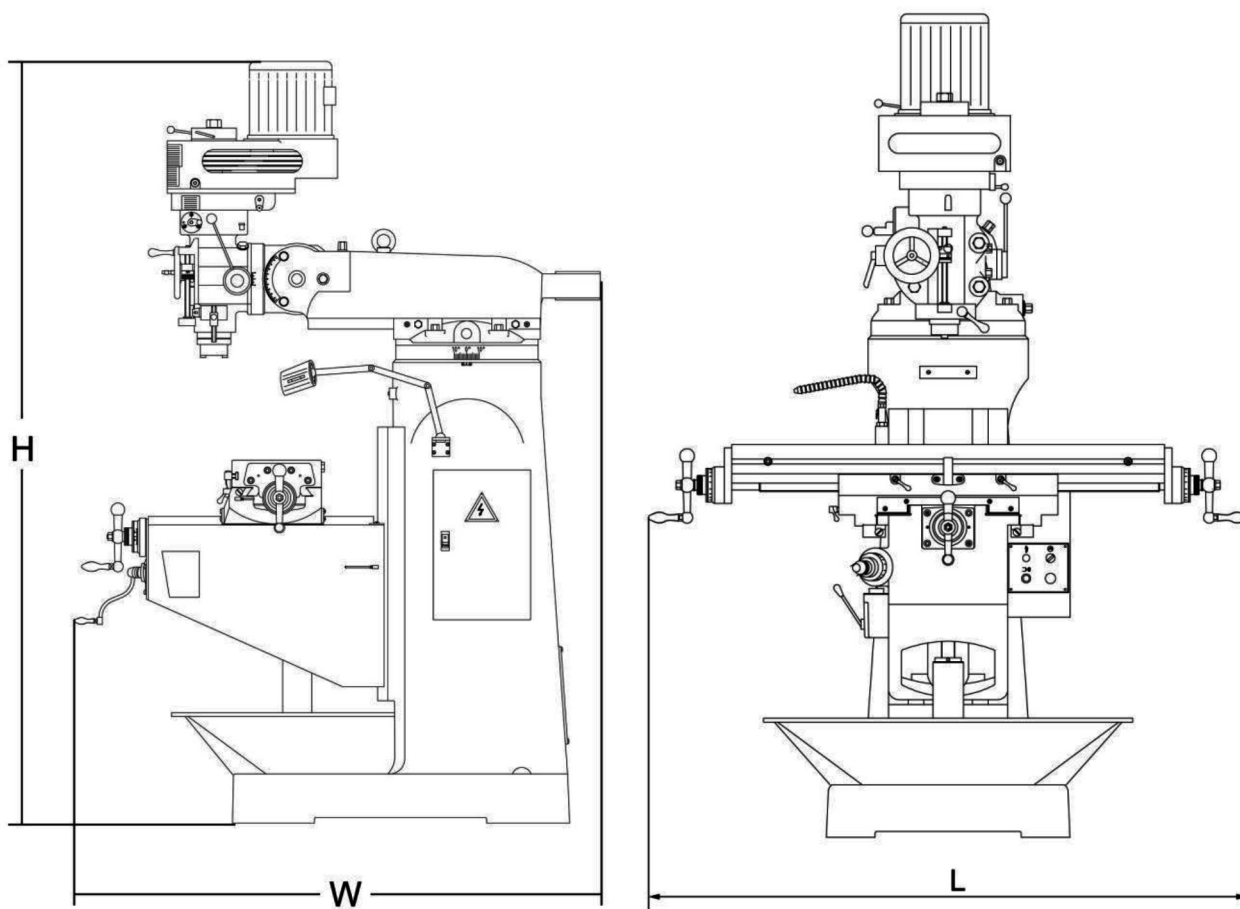


FIG. 1.3

- A. X-Axis Ball Handle:** Manually moves table along X-axis (left and right).
- B. X-Axis Locks:** Tightens to prevent X-axis table movement for increased rigidity during operations where the X-axis should not move.
- C. Y-Axis Ball Handle:** Manually moves table along Y-axis (front and back).
- D. Knee Crank:** Manually moves the table along Z-axis (up and down).
- E. Y-Axis Lock:** Tightens to prevent Y-axis table movement for increased rigidity during operations where the Y-axis should not move.
- F. One Shot Oiler:** Lubricates the X, Y, and Z axis table ways.
- G. Limit Stop:** Restricts table movement by its positioning along front of table.
- H. Direction Knob:** Selects direction of the table movement. Middle position is neutral.
- I. Speed Dial:** Controls speed of the power feed. Rotating dial clockwise causes the table to move faster.
- J. Rapid Traverse Button:** When pressed, moves the table at full speed when already in motion.

1.4 MACHINE DIMENSIONS



	(MM)
H	2010
W	1600
L	2000



WARNING!

Before operating any machine, take time to read and understand all safety signs and symbols. If not understood seek explanation from trade magazines or an experienced operator.

2. SAFETY

2.1 GENERAL METALWORKING MACHINE SAFETY

DO NOT use this machine unless you have read this manual or have been instructed in the use of this machine in its safe use and operation.



WARNING!

This manual provides safety instructions on the proper setup, operation, maintenance, and service of this machine. Save this manual, refer to it often, and use it to instruct other operators.

Failure to read, understand and follow the instructions in this manual may result in fire or serious personal injury, including amputation, electrocution, or death.

The owner of this machine is solely responsible for its safe use. This responsibility includes, but is not limited to proper installation in a safe environment, personnel training and authorization to use, proper inspection and maintenance, manual availability and comprehension of the application of the safety devices, integrity, and the use of personal protective equipment.

The manufacturer will not be held liable for injury or property damage from negligence, improper training, machine modifications or misuse.



- ✓ Always wear safety glasses or goggles.
- ✓ Wear appropriate safety footwear.
- ✓ Wear respiratory protection where required.
- ✓ Gloves should never be worn while operating the machine, and only worn when handling the work piece.
- ✓ Wear hearing protection in areas > 85 dBA. If you have trouble hearing someone speak from one metre (three feet) away, the noise level from the machine may be hazardous.
- ✓ DISCONNECT THE MACHINE FROM POWER when making adjustments or servicing.
- ✓ Check and adjust all safety devices before each job.
- ✓ Ensure that guards are in position and in good working condition before operating.
- ✓ Ensure that all stationary equipment is anchored securely to the floor.
- ✓ Ensure all machines have a start/stop button within easy reach of the operator.
- ✓ Each machine should have only one operator at a time. However, everyone should know how to stop the machine in an emergency.

2.1 GENERAL METALWORKING MACHINE SAFETY Cont.

- ✓ Ensure that keys and adjusting wrenches have been removed from the machine before turning on the power. Appropriate storage for tooling should be provided.
- ✓ Ensure that all cutting tools and blades are clean and sharp. They should be able to cut freely without being forced.
- ✓ Stop the machine before measuring, cleaning or making any adjustments.
- ✓ Wait until the machine has stopped running to clear cuttings with a vacuum, brush or rake.
- ✓ Keep hands away from the cutting head and all moving parts.
- ✓ Avoid awkward operations and hand positions. A sudden slip could cause the hand to move into the cutting tool or blade.
- ✓ Return all portable tooling to their proper storage place after use.
- ✓ Clean all tools after use.
- ✓ Keep work area clean. Floors should be level and have a non-slip surface.
- ✓ Use good lighting so that the work piece, cutting blades, and machine controls can be seen clearly. Position any shade lighting sources so that they do not cause any glare or reflections.
- ✓ Ensure there is enough room around the machine to do the job safely.
- ✓ Obtain first aid immediately for all injuries.
- ✓ Understand that the health and fire hazards can vary from material to material. Make sure all appropriate precautions are taken.
- ✓ Clean machines and the surrounding area when the operation is finished.
- ✓ Use proper lock out procedures when servicing or cleaning the machines or power tools.

DO NOT

- × Do not distract an operator. Horseplay can lead to injuries and should be strictly prohibited.
- × Do not wear loose clothing, gloves, neckties, rings, bracelets or other jewellery that can become entangled in moving parts. Confine long hair.
- × Do not handle cuttings by hand because they are very sharp. Do not free a stalled cutter without turning the power off first. Do not clean hands with cutting fluids.
- × Do not use rags or wear gloves near moving parts of machines.
- × Do not use compressed air to blow debris from machines or to clean dirt from clothes.
- × Do not force the machine. It will do the job safer and better at the rate for which it was designed.



CAUTION!

It is impossible to cover all possible hazards Every workshop environment is different. These are designed as a guide to be used to compliment training and as a reminder to users prior to equipment use. Always consider safety first, as it applies to the individual working conditions.

2.1 GENERAL METALWORKING MACHINE SAFETY Cont.

HAZARDS ASSOCIATED WITH MACHINES include, but are not limited to:

- Being struck by ejected parts of the machinery.
- Being struck by material ejected from the machinery.
- Contact or entanglement with the machinery.
- Contact or entanglement with any material in motion.

Health Hazards (other than physical injury caused by moving parts)

- Chemicals hazards that can irritate, burn, or pass through the skin.
- Airborne items that can be inhaled, such as oil mist, metal fumes, solvents, and dust.
- Heat, noise, and vibration.
- Ionizing or non-ionizing radiation. (X-ray, lasers, etc.)
- Biological contamination and waste.
- Soft tissue injuries (for example, to the hands, arms, shoulders, back or neck) resulting from repetitive motion, awkward posture, extended lifting, and pressure grip.

Other Hazards

- Slips and falls from and around machinery during maintenance.
- Unstable equipment that is not secured against falling over.
- Safe access to/from machines. (access, egress)
- Fire or explosion.
- Pressure injection injuries from the release of fluids and gases under high pressure.
- Electrical Hazards, such as electrocution from faulty or ungrounded electrical components.
- Environment in which the machine is used. (in a machine shop, or on a work site)



WARNING!

The machine is the sole responsibility of the owner for its safe use. This responsibility includes but is not limited to proper installation in a safe environment, personnel training, proper inspection and maintenance, manual availability and comprehension. The manufacturer will not be held liable for injury or property damage from negligence, improper training, machine modifications or misuse.



WARNING!

Machines are safeguarded to protect the operator from injury or death with the placement of guards. Machines must not be operated with the guards removed or damaged.

2.2 ADDITIONAL SAFETY FOR MILLING MACHINES

DO NOT use this machine unless you have read the manual or have been trained and assessed to a competent level in its safe use and operation.



Safety glasses must be worn when operating this equipment



Long and loose hair must be contained when operating this equipment.



Safety footwear must be worn when operating this equipment



Close fitting/protective clothing must be worn when operating the machine



Gloves must not be worn when using this machine



Rings and jewellery must not be worn when using this machine

PRE-OPERATIONAL SAFETY CHECKS

- ✓ Locate and ensure you are familiar with all machine operations and controls.
- ✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- ✓ Check workspaces and walkways to ensure no slip/trip hazards are present.
- ✓ Ensure cutter is in good condition and securely mounted.
- ✓ Check coolant delivery system to allow for sufficient flow of coolant.

OPERATIONAL SAFETY CHECKS

- ✓ Keep clear of moving machine parts.
- ✓ Follow correct clamping procedures. Keep overhangs as small as possible and check work piece is secure.
- ✓ Set the correct speed to suit the cutter diameter, the depth of cut and the material.

ENDING OPERATIONS AND CLEANING UP

- ✓ Switch off the machine when work completed.
- ✓ Remove milling cutters and store them safely.
- ✓ Before making adjustments and measurements or cleaning swarf accumulations, switch off and bring the machine to a complete standstill.
- ✓ Leave the machine and work area in a safe, clean and tidy state.

DON'T

- ✗ Do not use faulty equipment. Immediately report suspect machinery.
- ✗ Never leave the machine running unattended.
- ✗ Do not leave equipment on top of the machine.

POTENTIAL HAZARDS AND INJURIES

- | | |
|---|--|
| ☐ Sharp cutters. | ☐ Flying debris. |
| ☐ Eye injuries. | ☐ Metal splinters and burrs. |
| ☐ Skin irritation. | ☐ Hair/clothing getting caught in moving machine parts. |



CAUTION!

It is impossible to cover all possible hazards. All workshop environments are different. These are designed as a guide to be used to compliment training and as a reminder to users prior to equipment use. Always consider safety first, as it applies to the individual working conditions.

3. POWER SUPPLY

3.1 ELECTRICAL REQUIREMENTS

Place the machine near an existing power source. Make sure all power cords are protected from traffic, material handling, moisture, chemicals, or other hazards. Make sure there is access to a means of disconnecting the power source. The electrical circuit must meet the requirements for the power of the machine. To minimize the risk of electrocution, fire, or equipment damage, these machines should be hard wired with installation work and electrical wiring done by a qualified electrician.

NOTE : The use of an extension cord is not recommended as it may decrease the life of electrical components on your machine.

ELECTRICAL REQUIREMENTS

Model.....	BM-22VE
Nominal Voltage	240V
Cycle	50 Hz
Phase.....	Single Phase
Power Supply Circuit...	15 Amps
Full Load Current.....	10.5 Amps

(Full load current rating is also on the specification plate on the motor.)

3.2 FULL-LOAD CURRENT RATING

The full-load current rating is the amperage a machine draws when running at 100% of the output power. Where machines have more than one motor, the full load current is the amperage drawn by the largest motor or a total of all the motors and electrical devices that might operate at one time during normal operations.

Full-Load Current Rating for these machine can be found on the motor nameplate.

It should be noted that the full-load current is not the maximum amount of amps that the machine will draw. If the machine is overloaded, it will draw additional amps beyond the full-load rating and if the machine is overloaded for a long period of time, damage, overheating, or fire may be caused to the motor and circuitry.

This is especially true if connected to an undersized circuit or a long extension lead. To reduce the risk of these hazards, avoid overloading the machine during operation and make sure it is connected to a power supply circuit that meets the requirements.



4 SET-UP

4.1 UNPACKING

This machine was carefully packaged for safe transport. When unpacking, separate all enclosed items from packaging materials and inspect them for shipping damage. If items are damaged, please contact your distributor.

NOTE: Save all the packaging materials until you are completely satisfied with the machine and have resolved any issues with the distributor, or the shipping agent.

When unpacking, check the packing list to make sure that all parts shown are included. If any parts are missing or broken, please contact your distributor.

4.2 CLEAN - UP

The unpainted surfaces of the machine have been coated with a waxy oil to protect them from corrosion during shipment. Remove the protective coating with a solvent cleaner or a citrus based degreaser.

Optimum performance from your machine will be achieved when you clean all moving parts or sliding contact surfaces that are coated with rust preventive products.

It is advised to avoid chlorine based solvents, such as acetone or brake parts cleaner, as they will damage painted surfaces and strip metal should they come in contact. Always follow the manufacturer's instructions when using any type of cleaning product.

4.3 SITE PREPARATION

When selecting the site for the machine, consider the largest size of work-piece that will be processed through the machine and provide enough space around the machine for operating the machine safely. Consideration should be given to the installation of auxiliary equipment. Leave enough space around the machine to open or remove doors/covers as required for the maintenance and service as described in this manual.

It is recommended that the machine is anchored to the floor to prevent tipping or shifting. It also reduces vibration that may occur during operation.

4.4 LIFTING INSTRUCTIONS

On the day that the machine arrives, make sure that a forklift or lifting device, with sufficient capacity is available to unload the machine from the vehicle. Ensure access to the chosen site is clear and that doors and ceilings are sufficiently high and wide enough to receive the machine.



WARNING

This machine is extremely heavy.

Serious personal injury may occur if safe moving methods are not followed. To be safe, you will need assistance and power equipment when moving the shipping crate and removing the machine from the crate.



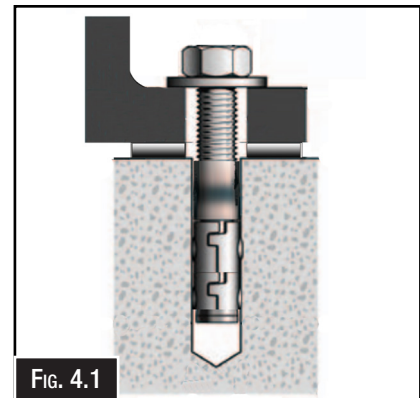
WARNING!

Make sure everyone is away from the load before hoisting. The load must be under control when lowering loads suspended. Rigging and crane operation must be carried out by persons with approved qualifications.

4.5 ANCHORING TO THE FLOOR

The machine is best mounted on a concrete slab.

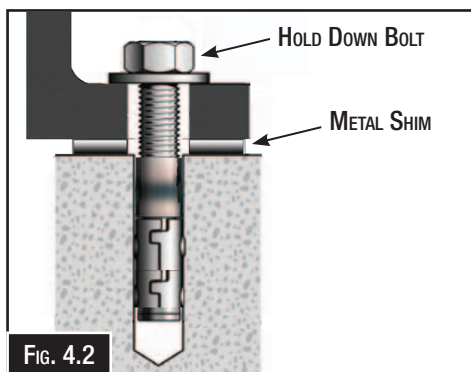
Masonry anchors with bolts are the best way to anchor machinery, because the anchors sit flush with the floor surface, making it easy to unbolt and move the machine later if needed. (Fig. 4.1)



4.6 MACHINE LEVELLING

To set your machine up so that it operates to optimum performance, apply the following procedure.

After your machine has been anchored to a concrete slab floor, it then needs to be levelled. Loosen the hold down bolts and place a level on the surface of the working table. Metal shims need to be placed under the corner of the base of the machine until level. Once level then tighten the hold down bolts. (Fig. 4.2).



CAUTION!

The machine must not rest on supports other than those defined in Fig. 4.2

4.7 ASSEMBLY

The machine must be fully assembled before it can be operated. First clean any parts that are coated in rust preventative to ensure the assembly process can proceed smoothly.

To assemble machine:

1. Remove the nuts and flat washers from X and Y-axis leadscrews, slide ball handles onto the leadscrew shaft, and secure with flat washers and the nuts. (Fig. 4.3)

Note: Tighten acorn nuts until they are snug. Over tightening could increase wear on moving parts.

2. Slide the knee crank off of the Z-axis leadscrew, turn around so handle is facing forward, and slide crank back onto Z-axis leadscrew. (Fig.4.3)



4.8 TEST RUN

Once assembly is complete, test run the machine to ensure it is properly connected to the power and safety components are functioning correctly. Check that the direction of the motor is correct and make sure that the machine rotates in the correct direction.

If the direction is incorrect, isolate the machine and have the electrician make changes to the wiring.

If you find an unusual problem during the test run, immediately stop the machine, disconnect it from power, and fix the problem BEFORE operating the machine again. The Troubleshooting table in the Maintenance section of this manual may be able to help. If the problem persists then contact your dealers service technician.

To test run the machine:

1. Connect the machine to the power supply.
2. Make sure that the manual has been read and that the safety instructions at the beginning of the manual are understood. Make sure the machine has been setup correctly.
3. Make sure all tools and objects used during set up have been cleared away from the machine.
4. Turn the machine ON.
5. Make sure that the machine is travelling in the correct direction.
6. Listen to and watch for abnormal noises or actions. The machine should run smoothly with little or no vibration or rubbing noises.
7. Any strange or unusual noises should be investigated and corrected before operating the machine again. Always disconnect the machine from power supply when investigating or correcting potential problems. The troubleshooting chart in the maintenance section may be helpful in rectifying a problem.

Testing The Emergency Stop Button

Make sure that the emergency button is working correctly

1. Twist the top of the Emergency Stop button to ensure that it is in the raised position.
2. Start the machine and then press the emergency stop button. The machine should stop and the power should be cut off. If the machine cannot be started then the emergency stop is working correctly.
3. To reset the Emergency Stop twist the red top until it pops up. The machine should now work again.



WARNING!

The machine is the sole responsibility of the owner for its safe use. This responsibility includes but is not limited to proper installation in a safe environment, personnel training, proper inspection and maintenance, manual availability and comprehension. The manufacturer will not be held liable for injury or property damage from negligence, improper training, machine modifications or misuse.

5. OPERATION

This machine may perform many types of operations that are beyond the scope of this manual. Many of these operations may be dangerous or deadly if performed incorrectly.

The instructions in this section are written with the understanding that the operator has the necessary knowledge and skills to operate this machine. If at any time you are experiencing difficulties performing any operation, stop using the machine! **Above all, your safety should come first!**

5.1 OPERATION OVERVIEW

This overview purpose is to provide a novice machine operator with a basic understanding of how the machine is used during operation, and so that if the machine controls or components are mentioned later in this manual, it will be easy to understand. The overview is not intended to be an instructional guide and is only generic in nature. To learn more about the specific operation, read this entire manual and seek additional training from an experienced machine operator. Another source of information may be found in video's on websites or by reading trade magazines.

To complete a typical operation,

1. Examine the workpiece to make sure it is within the capacity of the machine and is suitable for an operation.
2. Firmly clamp the workpiece to the table or in a milling vice securely mounted to the table.
3. Install the correct cutting tool for the operation.
4. Use the down feed and table controls to correctly position the cutting tool and workpiece for the operation. If the X-axis power feed is to be used during the operation, confirm the speed and length of the table movement required.
5. Check that any setup tools have been removed and check that the cutting path is clear.
6. Configure the machine for correct spindle speed for the operation.
7. Put on personal protective equipment, and makes sure the workpiece and table are clear of all items.
8. Turn the machine ON, then start the spindle rotation and perform the operation.
9. When finished the cut, turn the machine OFF.

5.2 PRIMARY MACHINING PROCESSES

Face Milling: Using the flat face of a cutter to remove material from the top surface of the workpiece, creating a smooth, flat finish.

End Milling: Using an end mill to cut flat surfaces, create pockets (recesses), and carve out complex contours.

Drilling & Boring: Utilizing the quill to move the rotating spindle vertically, allowing operators to drill precise holes or bore existing ones to exact diameters.

Slotting & Keyway Cutting: Using an optional slotting attachment connected to the ram or a specialized cutter to create grooves, keyways, or internal splines.

Chamfering & Beveling: The milling head can be swivelled and tilted (up to $\pm 45^\circ$ forward/backward and $\pm 90^\circ$ left/right) to cut angled edges without repositioning the work piece

5.3 VARIABLE SPEED HEAD CONTROLS

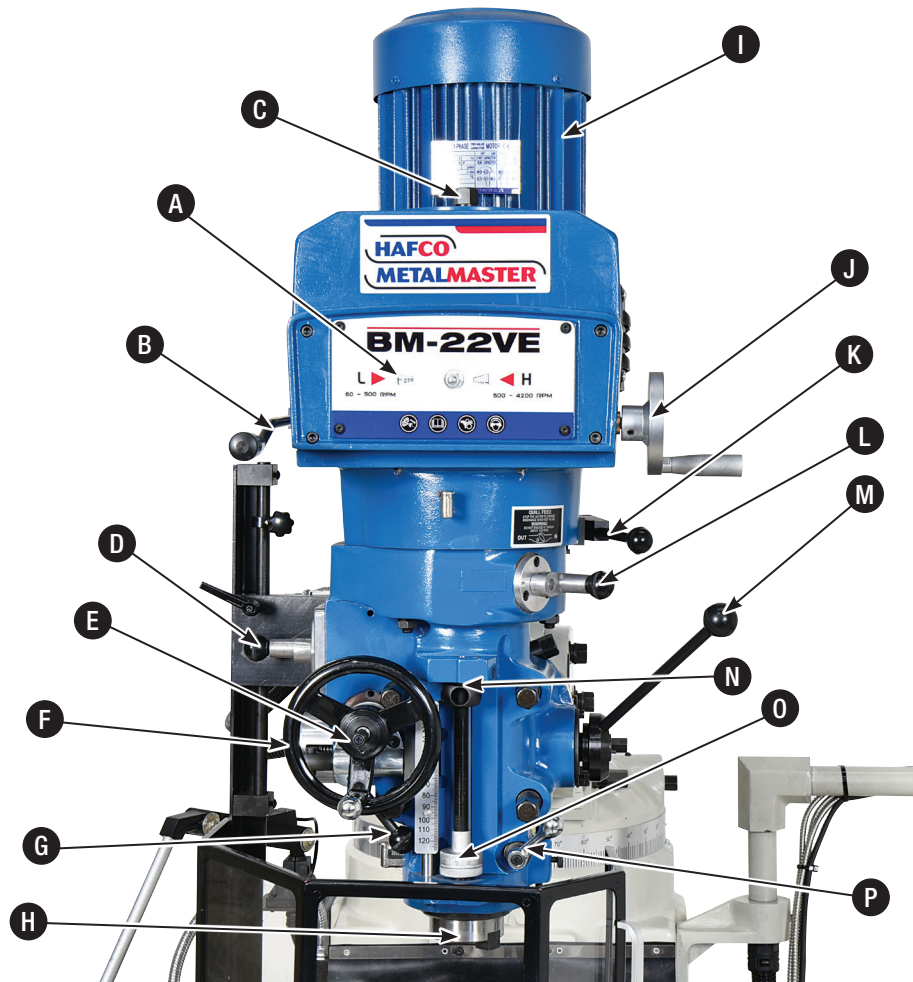


FIG. 5.1

No,	Name	Function	No,	Name	Function
A	Spindle speed Indicator	Shows the speed of spindle	I	Motor	Drives the spindle
B	Spindle brake handle	Makes the spindle stop fast	J	Speed select wheel	Rotate the wheel to change the spindle speed
C	Draw Bar	Secures the tool in the spindle	K	H/L speed control lever	Cooperate with clutch to realize spindle H/L speed change
D	Feed rate control lever	Sets quill auto feed rate	L	Auto quill feed engage	Make the quill auto feed gear set engage or dis-engage
E	Feed reverse Knob	Pull it out or push in to control quill feed direction	M	Quill feed handle	Turn the handle to make the quill manual down feed
F	Fine feed hand wheel	Realize fine manual feed by the wheel	N	Quill feed dog	When the dog touches the adjust nut, the quill auto feed stops.
G	Auto. feed engage lever	Pull the lever out, auto. feed engaged, push it in, Auto feed stop	O	Quill feed adjust nut	Rotate to set quill feed depth. When dog touches it the auto feed stops.
H	Spindle	NT30 / NT40	P	Quill clamping lever	Tighten the quill

5.3 HEAD CONTROLS Cont.

Control Panel.

The Control Panel is on the upper right-hand side of the mill. The panel controls all the spindle and coolant functions. The table power feed is controlled by switches on the unit.

The purpose of this control overview is to provide the machine operator with a basic understanding of the machine controls and what they do. It also helps the operator to understand if they are discussed later in this manual.

NOTE: DO NOT start the machine until all of the setup instructions have been performed.

Operating a machine that is not setup may result in malfunction or unexpected results that can lead to serious injury, death or damage to the machine or property.



No.	SWITCH	FUNCTION
1	BLANK	NOT USED ON THIS MODEL.
2	FWD / REV	CONTROLS THE DIRECTION OF THE SPINDLE ROTATION
3	BLANK	NOT USED FOR THIS MODEL
4	SPINDLE OFF	STOPS THE SPINDLE ROTATION
5	SPINDLE ON	STARTS THE SPINDLE ROTATION.
6	POWER LIGHT	WHEN ILLUMINATED INDICATES POWER HAS BEEN CONNECTED TO THE CONTROL PANEL
7	COOLANT PUMP	SWITCHES THE COOLANT PUMP ON OR OFF
8	POWER ON	CONNECTS POWER TO THE CONTROL PANEL
9	EMERGENCY STOP	WHEN PRESSED STOPS ALL OPERATIONS ON THE MACHINE



WARNING!

Loose hair, clothing, or jewellery could get caught in machinery and cause serious injury or death. Keep these items away from moving parts at all times to reduce this risk.

5.4 CHANGING THE SPINDLE SPEED



CAUTION

With the variable speed head change the speed only when the spindle is turning.

The variable speed hand wheel is used to control the spindle speed. The hand wheel is located on the right side of the mill head. The speeds for high and low speed ranges are displayed on the panel on the front of the mill head (A, Fig. 5.2). The spindle RPM is displayed on the scale. (B in Fig. 5.2)

All speed changes must be made while the motor is running. Attempting speed changes with the motor not running can result in damage to the drive mechanism.

Variable Speed Control

HI SPEED: move the handle (C in Fig. 5.3) on the side of the head. Move the handle to the IN position. Rotate the spindle nose by hand until the gears mesh with the clutch. Then rotate handle (D in Fig. 5.3) to set the speed

LOW-SPEED: move the handle (C in Fig. 5.3) lever on the side of the head, to the OUT position, then rotate handle (D in Fig. 5.3) to set the speed

5.5 ALIGNING THE MILLING HEAD

The milling head has been turned down against the work table before delivery. So the head must be turned up and re-aligned again.

To Align The Head Right to Left (Fig. 5.4)

1. Loosen the 4 bolts on the milling head.
2. Place a dial indicator with an 100mm arm in the spindle. Rotate the milling head spindle by hand and adjust the head until the dial displays that the milling head is square to the table.
3. Tighten the 4 lock bolts again.

Note: The lock bolts are threaded into T-nuts that travel in a circular slot during head rotation. When rotating head, it is possible for these T-nuts to jam in the slot preventing movement of head. If this happens, gently rotate each lock bolt, starting with the lower right, until you free up the jammed T-nut. Then continue to rotate head to desired position.



FIG. 5.2



FIG. 5.3

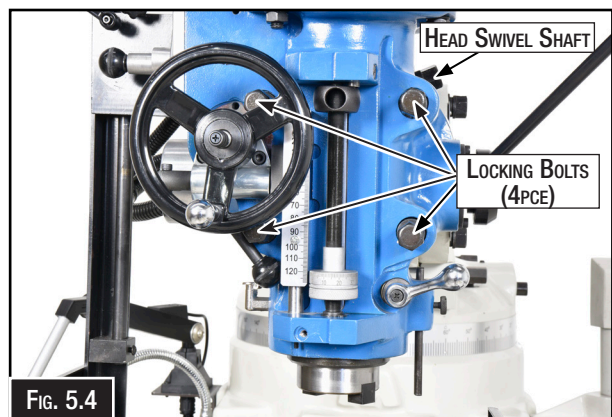


FIG. 5.4



WARNING!

Loosen the four locking bolts only one turn. DO NOT remove the bolts. Always lock the head firmly in place after tilting or rotating it. Unexpected movement of head during operations could cause injury to the operator or damage to the machine.

5.6 LOCKING THE TABLE, SADDLE, & KNEE

While processing the work table, saddle and knee need to be locked for good rigidity.

• Locking The Work Table (Fig. 5.5)

The lock levers are located on the front of the work table. Turn the lever clockwise to tighten the table and anticlockwise to loosen.

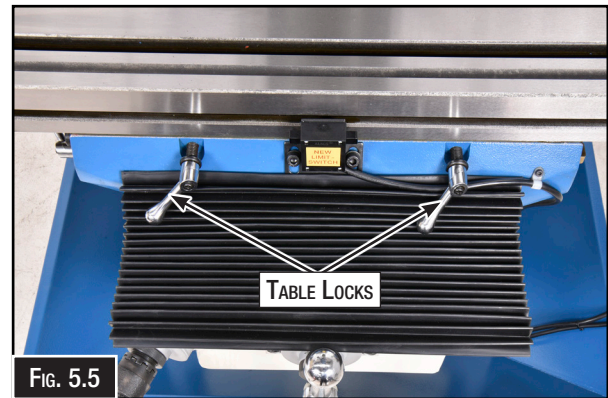


FIG. 5.5

• Locking The Saddle (Fig. 5.6)

The saddle lock levers are located on the left side of the saddle. Turn the lever clockwise to tighten the saddle and anticlockwise to loosen.

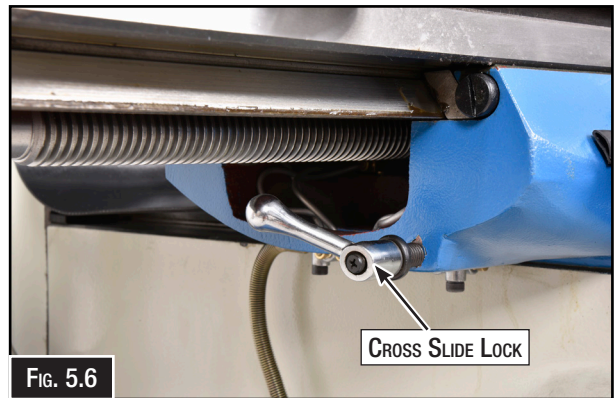


FIG. 5.6

• Locking The Knee (Fig. 5.7)

The knee lock levers are located on left side of the Knee. Turn the lever clockwise to tighten the saddle and anticlockwise to loosen.

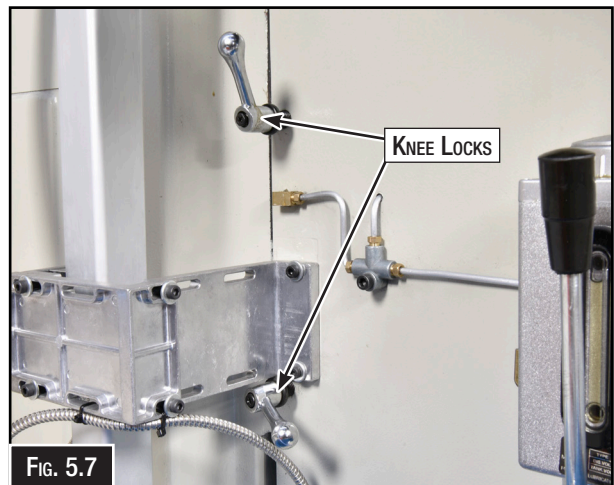


FIG. 5.7



WARNING!

Before using the feed or rapid travel operations on the mill, make sure that the Table locks or Knee locks have been released. Failure to do so may cause damage to the feed system



WARNING!

Keep hands and fingers away from the cutter. Stop the cutter before opening the hand protection shield. Moving milling cutter hazard can cause serious injury or amputation.

5.7 HEAD STOCK FEED

Quill Feed Lever

CAUTION *Do not use the quill power feed at speeds above 2700 R.P.M. It is recommended to disengage the power feed worm gear whenever the power feed is not required. Do not move the Quill Feed Lever unless the motor is at a complete stop. When changing the lever position, do it gently.*

The quill feed lever is located on the right front side of the mill head (Fig. 5.8). It is used to engage and disengage the quill power feed mechanism.

The quill feed is engaged by pulling out the knob and rotating the handle to a new locked position. When engaged, the power feed mechanism will drive the spindle upward or downward. The power feed mechanism will not drive the spindle when the handle is in the disengage position.



FIG. 5.8

Feed Rate Lever

The Feed Rate Lever (Fig. 5.9) is used to set the quill feed per-revolution rate. Three feed rates are available: 0.04mm, 0.08mm, and 0.15mm per revolution. The positions are shown on an indicator plate under the feed rate lever.

The rate is selected by pulling out the knob on the feed rate lever and moving the handle to the detent of the desired feed rate.

NOTE: *The knob is spring loaded – pull out to rotate to new position. Unlike other controls on the machine, the lever shifts into engagement more easily with the motor running, and the quill feed lever engaged*

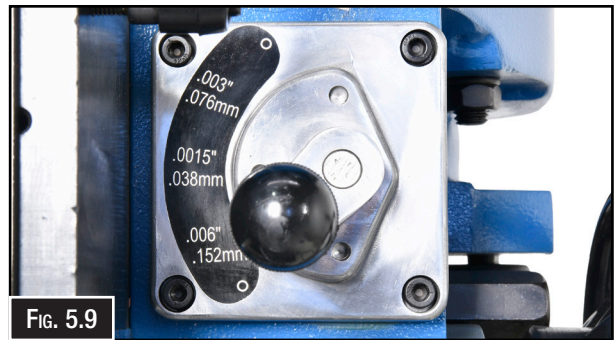


FIG. 5.9

Feed Clutch Lever

The Feed clutch Lever (A in Fig. 5.10) is located on the left side of the head behind the Manual Fine Feed hand wheel (B in Fig. 5.10). It engages the overload clutch on the pinion shaft when positioned to the left. The Feed Clutch Lever stays engaged until Quill Stop (C, Fig. 11) comes in contact with Micrometer Adjusting Nut, forcing it to drop out automatically, or until the operator releases it manually by moving the lever to the right.

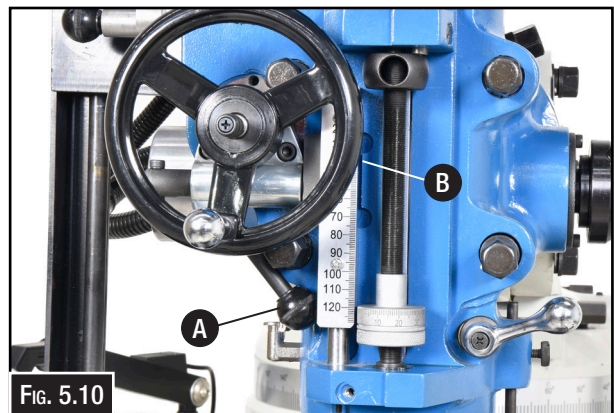


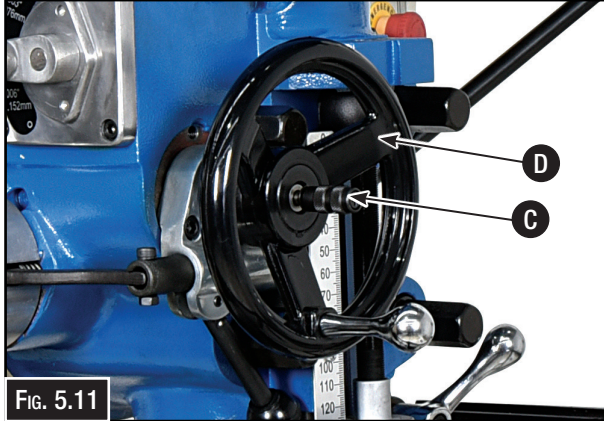
FIG. 5.10

Feed Direction Control

The Feed Direction Control (C in Fig. 5.11) determines whether the power feed will move up, down, or not move at all. The position of the knob depends upon the direction of spindle rotation (see the Motor Switch section). The position of the control may be changed with either the motor stopped or running. If the control does not engage easily, move the fine feed handle (D in Fig. 5.11) back and forth to aid engagement. If the spindle is rotating clockwise, the IN position is down-feed, the OUT position is up-feed. When the spindle is reversed the feed will also reverse. The neutral position is between the IN and OUT position.

CAUTION

It is recommended that the Feed Direction Knob be left in the neutral position when not in use.



Coarse Feed Handle

The Coarse Feed Handle (E in Fig. 5.12) is located on the right hand side of the head. The Coarse Feed Handle is used for non-precision drilling operations, or for moving the quill to a specific depth, against the quill stop knob.

Quill Lock Lever

The Quill Lock Lever (F in Fig. 5.12) is located on the right side of the head. Rotate the handle clockwise to lock the quill in a desired position. Rotate the handle counter-clockwise to release.

The Quill Lock Lever (F in Fig. 5.13) is used to lock the quill at a specific depth.



Micrometer Adjusting Nut

The Micrometer Adjusting Nut (A in Fig. 5.13) is located on the front of the head and is used for setting specific spindle depths. It is secured with the lock nut (B in Fig. 5.13).

Fine Feed Wheel

When the control position is set for the Fine Feed using the hand wheel (D in Fig. 5.11), the Fine Feed hand wheel can be used to manually control the upward or downward direction of the quill.

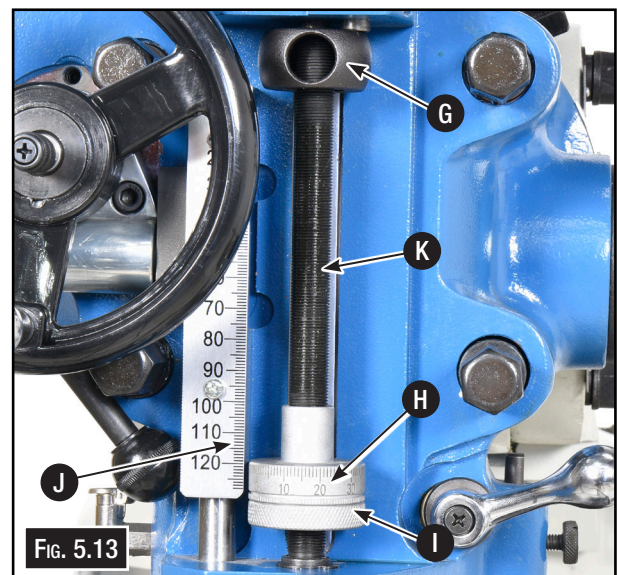
WARNING

Remove the Manual Fine Feed Hand wheel when not in use. Failure to comply may cause serious injury.

Depth Scale and Stop

The Depth Scale and Stop are used during the drilling operations to set the depth of the drilled hole. The depth scale is located on the front of the mill head. The scale consists of a Micrometer Adjusting Nut (H), Lock Nut (I), Quill Stop (G), Quill Stop Screw (K), and Scale (J).

The Micrometer Adjusting Nut is set to the desired dimension and locked in place using the Lock Nut. The quill stop provides a positive stop for quill travel. The graduations on the micrometer nut are in 0.01mm increments. Adjustment of quill travel is made by rotating the micrometer nut. (Refer Fig. 5.13)



Spindle Down Feed Operation

The Feed Trip Adjustment sets the point at which the quill will reset during Power Feed operations. (See Fig. 5.14)

The Manual Fine Feed Hand wheel can be removed, but if not removed care should be taken when the auto feed is used so as not to make contact with the wheel while it is turning.

1. Loosen the Locknut (J).
2. Using the Quill Feed Handle (K), advance the quill to the point where the feed should stop.
3. Engage the Feed Trip Cam Lever (D) by pulling it away from the head assembly.
4. Adjust Micrometer Adjusting Nut (I) against Quill Stop (H).
5. Continue turning the Micrometer Adjusting Nut (I) until the Feed Trip Cam Lever (D) trips.
6. Tighten the Locknut (J).
7. Ensure the Quill Lock (L) is off by rotating counter clockwise.
8. Turn the spindle on. FWD rotates the spindle counterclockwise. REV rotates the spindle clockwise.
9. Select the speed rate with the Variable Speed Control hand wheel (F).
10. Set the Feed Rate Lever (B in Fig. 5.15) to the feed rate required for the tooling and material required.
11. Position the auto-down feed direction pin (C in Fig. 5.14) in the center of hand wheel for spindle travel that is correct for your operation. If necessary, rock the fine down feed hand wheel back-and-forth to move the pin all the way in or out.
12. Select the feed direction by setting the Feed Direction Knob (C) in position per the table:

NOTE: The direction pin has three positions. IN for one down feed direction, MIDDLE for neutral or no movement, and OUT for the reverse direction. The direction of spindle travel for the in and out positions is relative to the direction of spindle rotation. Keep in mind that spindle rotation and down feed direction will reverse when the spindle speed range is changed.

13. Engage the Feed Trip Cam Lever (D) by pulling away from the head assembly.

NOTE: Due to variables in tool diameter, coatings, coolant, and materials, no specific spindle speed or feed rate recommendations are provided. Refer to Fitting and Machining manual (Hafco Code L341)



FIG. 5.14

SPINDLE DIRECTION	FEED DIRECTION	KNOB POSITION
CLOCKWISE	Down	IN
	Up	OUT
COUNTER CLOCKWISE	Down	OUT
	Up	IN

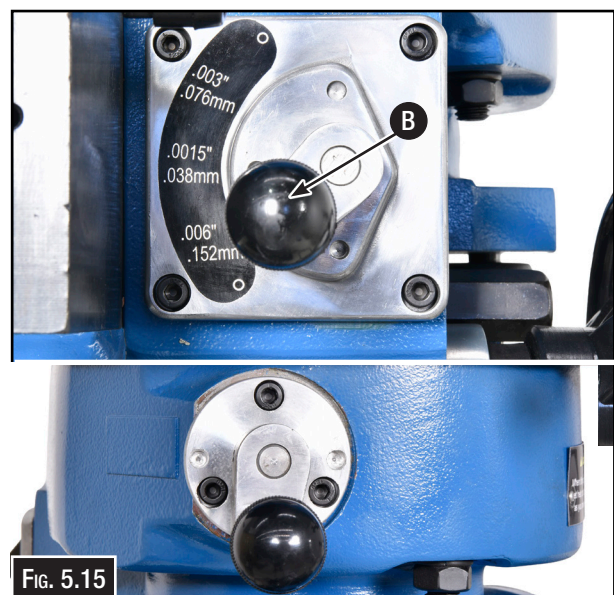


FIG. 5.15

5.8 LOADING & UNLOADING TOOLING

These mills are equipped with a NT-30 spindle taper (BM-22A) with a 12mm draw bar and a NT-40 spindle taper (BM-52VE, BM-62VE) with a M16 spindle draw bar (Fig. 5.16)



FIG. 5.16

Loading Tooling

1. DISCONNECT MILL FROM POWER!
2. Clean any debris or surface substances from inside the spindle taper and the mating surface of the tooling.

NOTE: Debris or oily substances can prevent the tooling and spindle from properly mating. This condition can cause excessive vibration, poor cutting results, or tool/work piece damage.

3. Place the mill in the low spindle speed range to keep the spindle from turning or use the spindle brake in the next steps. (B in Fig. 5.17)
4. With one hand holding the tool in place, insert the draw bar into the spindle from the top of the head, then thread it into the tool. (A in Fig. 5.17)



FIG. 5.17

5. Tighten the drawbar until it is snug. Avoid over-tightening, as this could make removing the tool difficult.

NOTE: Make sure that the drawbar has at least three threads engaged with the tooling in the next step to avoid damaging the threads of the drawbar or tool.



FIG. 5.18

UNLOADING TOOLING

1. DISCONNECT THE MILL FROM POWER!
2. Place the mill in the low spindle speed range to keep the spindle from turning in the next step.
3. Loosen the drawbar a couple of turns, then tap the top of it with a brass hammer to knock the tool loose at the bottom of the spindle.
4. Support the tool with one hand, then completely un-thread the drawbar from the tool.



WARNING!

Cutting tools are sharp. Take care when handling them. Failure could cause deep cut injury

5.9 HEADSTOCK ADJUSTMENTS

Positioning Headstock

The head tilts 45° forward or backward and rotates 90° left or right (see Fig. 5.19, 20).

Any time the head has been tilted or rotated, you must square the spindle with the table when setting the headstock back to the 90° position. This is the only way to ensure precision milling results later.

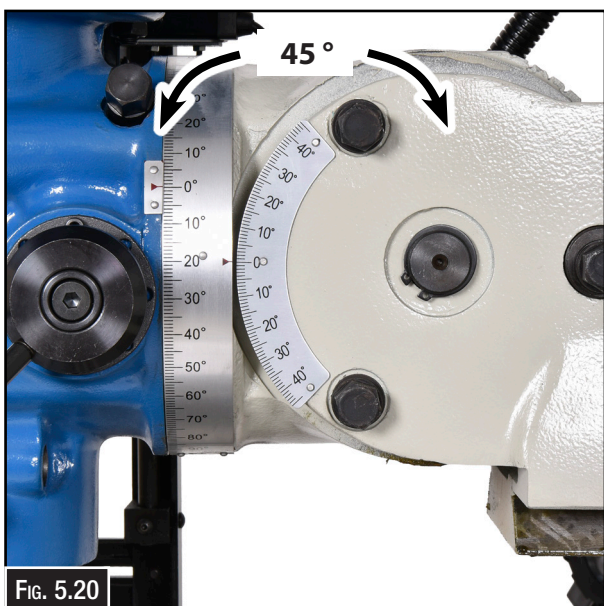
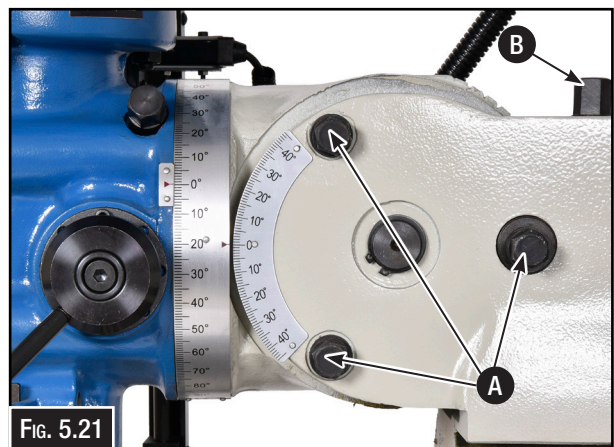


Tilting Head Forward/Backward

1. DISCONNECT MACHINE FROM POWER!
2. Loosen three lock bolts “A” shown in Fig. 5.21
3. Use one hand to apply pressure to the head in the direction of tilt, then slowly rotate the tilt-bolt (“B” in Fig. 5.21)

NOTE: Rotate tilt-bolt clockwise to tilt head backward and counter-clockwise to tilt it forward.

4. Re-tighten lock bolts



WARNING!

Loosen the four locking bolts only one turn. DO NOT remove the bolts. Always lock the head firmly in place after tilting or rotating it. Unexpected movement of head during operations could cause injury to the operator or damage to the machine.

Rotating Head Left & Right

1. DISCONNECT MACHINE FROM POWER!
2. Loosen four lock bolts "A" shown in Fig 22, 23 half a turn only.

NOTE: Do not completely remove the four lock bolts as the head will fall off and may cause injury. Check your model number for the position of the 4 bolts.

3. Use one hand to apply pressure to head in the direction of rotation, then slowly turn rotation bolt "B" shown in Fig. 5.22 or 23.

Turn rotation bolt clockwise to rotate the head left and counter-clockwise to rotate the head right.

NOTE: The lock bolts shown in Fig. 5.22, 24 are threaded into T-nuts that travel in a circular slot during head rotation. When rotating the head, it is possible for these T-nuts to jam in the slot preventing movement of head. If this happens, gently rotate each lock bolt, starting with the lower right, until you free up the jammed T-nut. Then continue to rotate head to desired position.

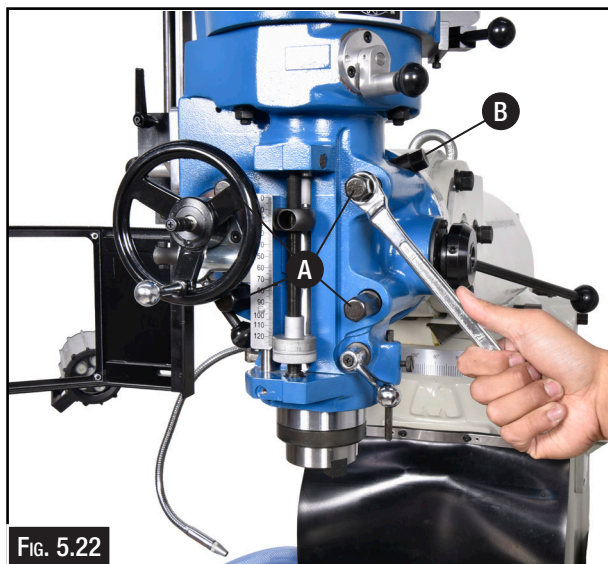


FIG. 5.22

NOTE: Be sure to apply torque in two steps using a crossing pattern. Failure to do so could distort the face of the ram adapter.

4. Tighten the four hex nuts (A). Tighten in two steps using a calibrated torque wrench. Tighten initially to 25 foot-pounds, then tighten the four hex nuts to a final torque of 50 foot-pound

Returning to Upright Position:

1. Check to make sure the mill head is square to the worktable, by setting up a dial indicator in a collet or with a magnetic base on the spindle
2. Put the spindle drive in neutral and rotate the spindle 180 degrees. When rotating, raise the indicator plunger to prevent it from dropping into the table T-slots (Fig. 5.23)
3. The indicator should read the same in position "C" and "D" (Fig. 5.23) of the table. If not, loosen the four hex nuts (A of Fig. 5.23) and reposition the mill head.

If the indicator does not read the same in "E" and "F" (Fig. 5.23) loosen the nuts "A" in Fig. 5.25 and reposition the mill head.

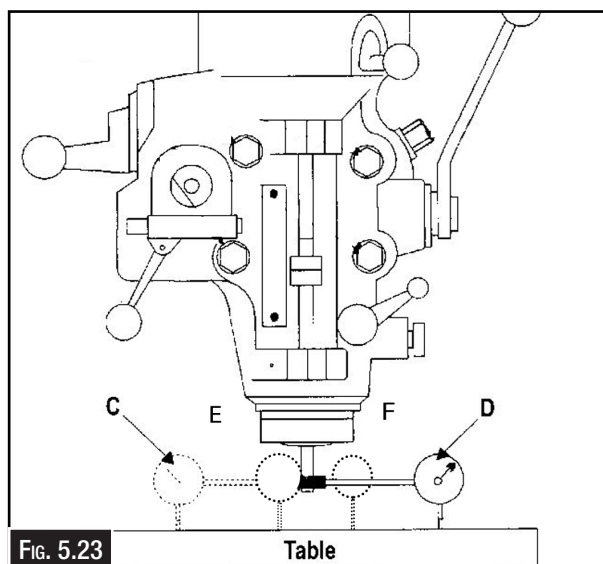


FIG. 5.23



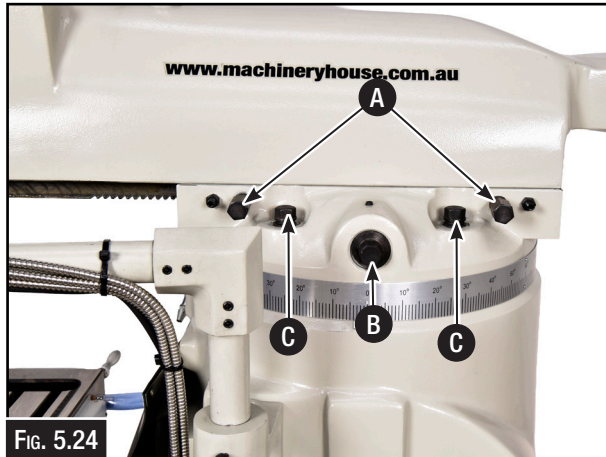
WARNING

Loosen the four locking bolts only one turn. DO NOT remove the bolts. Always lock the head firmly in place after tilting or rotating it. Unexpected movement of head during operations could cause injury to the operator or damage to the machine.

5.10 POSITIONING THE RAM

Positioning the Ram Forward and Backward

1. DISCONNECT MACHINE FROM POWER
2. Loosen the two bolts (A in Fig. 5.24) that lock the ram to its ways.



3. Make sure there are no obstructions to ram travel, especially any tooling around work piece, then slowly rotate the adjustment bolt (B in Fig. 5.24) to move ram.

NOTE: Rotate bolt clockwise to move ram away from table and counter-clockwise to move the ram toward table.

4. When the desired position is reached, lock the bolts (A in Fig. 5.24) securely.

CAUTION Always lock head firmly in place after tilting or rotating it. Unexpected movement of head during operations could cause damage to cutter or work piece.

Rotating the Ram on its Turret

The ram rotates 360° around the turret, as well as travelling forward or backward. To rotate the ram on the turret see the following.

Make sure the machine base is secured to the floor before repositioning the ram.

1. DISCONNECT MACHINE FROM THE POWER!
2. Loosen four turret lock bolts (C, Fig. 24) that clamp the ram to the top of the base. A half a turn should be sufficient to allow the ram to move.

NOTE: There are two lock bolts on each side of the ram. Use gentle hand pressure to avoid rapid movement.

3. Push head to manually rotate ram. Use the rotation scale (D in Fig. 5.25) to determine correct position for your operation, then re-tighten the two lock bolts to secure ram in place.

NOTE: In step 3, take care not to entangle or stretch electrical cabling as you move ram around turret.



WARNING!

Always check the capacity of the machine. Exceeding the capacity of the machine may result in sudden breakage that ejects dangerous metal debris at the operator or bystanders.

5.11 TABLE POWER FEED

The power feed on this turret milling machine uses a dedicated electric motor and a mechanical gear or clutch system to drive the table at a steady, controlled rate, removing the need for manual cranking.

A compact motorized gear-reduction unit is mounted to the end of the table's lead screw, alongside the manual hand wheel.

Operating

The power feed is operated when the direction lever (B in Fig. 5.26) is selected in the direction that the table is required to move. The speed of the table is controlled by the knob (C in Fig. 5.26)

Once the direction lever has been selected the table can be moved quickly by pressing button "A" in Fig. 5.26.

Adjustable mechanical stops (limit stops) on each end at the front of the table physically nudge a lever in the limit switch pushing a micro switch to disengage the feed automatically when the cut finishes, preventing a crash.

The limit stops (Fig. 5.28) can be set by loosening the clamp screw and sliding the limit stop along the table.

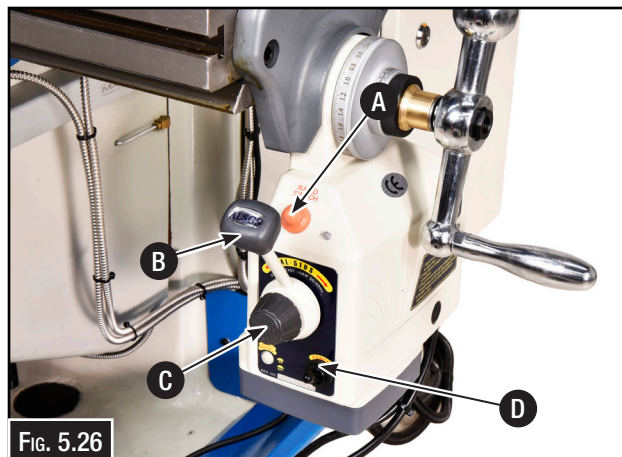


FIG. 5.26

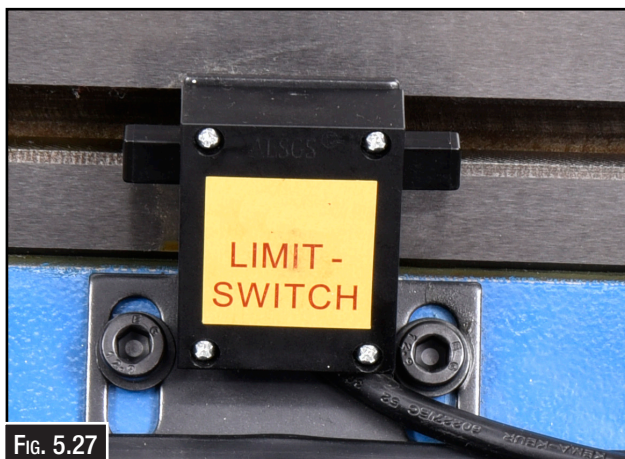


FIG. 5.27



FIG. 5.28



WARNING!

Before using the feed or rapid travel operations on the mill, make sure that the Table locks or Knee locks have been released. Failure to do so may cause damage to the feed system

6. MAINTENANCE

It is very important that regular maintenance of the equipment is carried out. The operators need to follow the daily maintenance procedures.

For optimum performance from this machine, the maintenance schedule listed below and in this section must be followed.

To reduce the risk of injury and for proper machine operation, if any of the items below are observed, switch the machine OFF and immediately disconnect it from power, and fix the problem before continuing operations.

- ☐ Loose mounting bolts or fasteners.
- ☐ Check/adjust lubrication.
- ☐ Worn, frayed, cracked, or damaged wires.
- ☐ Emergency STOP button not correctly working.
- ☐ Missing belt guards.
- ☐ Reduction in braking speed or efficiency.
- ☐ Coolant not flowing or flowing incorrectly.
- ☐ Any other unsafe condition.

6.1 LUBRICATION

The machine has numerous moving metal-to-metal contacts that require regular and proper lubrication to ensure efficient and long-lasting operation. Other than the lubrication points covered in this section, all other bearings are internally lubricated and sealed at the factory. They will only need attention if they need to be replaced.

Before performing any lubrication task, **DISCONNECT MACHINE FROM THE POWER!**

Important: Before adding lubricant, clean the debris and grime from the oil cup or grease fitting and the immediate area to prevent contamination of the new lubricant. Use the schedule and information in table below as a daily guide for lubrication tasks. Follow the referenced sections on the following pages for detailed instructions.

NOTE: *The following recommended lubrication schedule is based on light to medium mill usage. Lubrication helps to protect the value and operation of the machine.*

More frequent lubrication may need to be performed depending on the usage.

Description	Method	Lubricant	Action	Frequency
Slide Way Lubrication	One-shot lube system	Model SB1365 or ISO 68 Equivalent Oil	One Pull of Pump Handle	Every 4–8 Hrs. of Operation
Milling Head Quill	Oil Cup	Model SB1365 or ISO 68 Equivalent Oil	5~10 drops of lubricant	Every 4–8 Hrs. of Operation
Milling Head Quill Gear	Oil Cup	Model SB1365 or ISO 68 Equivalent Oil	5~10 drops of lubricant	Every 4–8 Hrs. of Operation
Milling Head up Gearbox	Grease Nipple	NLGI #2 or Equivalent	Two pumps of Grease gun	Every 40 Hrs. of Operation
Rack of Ram slide way	Direct to slide ways	ISO68 or Equivalent	Apply Thin coat	Every 40 Hrs. of Operation
Elevating lead screw	Direct to Lead Screw	NLGI #2 or Equivalent	Apply Thin coat	Every 40 Hrs. of Operation

6.2 GIB ADJUSTMENT

Gibs are tapered lengths of metal that are sandwiched between two moving surfaces. Gibs control the gap between these surfaces and how they slide past one another. Correctly adjusting the gibs is critical to producing good milling results.

Tight gibs make table movement more accurate but stiff. Loose gibs make moving the table sloppy but easier to do. The goal of gib adjustment is to remove unnecessary sloppiness without causing the ways to bind.

Gibs are adjusted with a screw on each end of the gib, that move the tapered gib back-and-forth to increase or decrease the friction pressure between the sliding surfaces. The process of properly adjusting the gibs requires trial-and-error and patience.

Refer to Fig. 6.1-3 to identify the locations of the table, saddle, and knee gibs, and one of the two adjustment screws for each.

NOTE: It will be necessary to remove small parts, such as way wipers and covers, to access the gib adjustment screws.

The following is the method used to adjust the gibs.

1. DISCONNECT MACHINE FROM POWER!
2. Make sure all table/knee locks are loose.
3. Loosen one gib adjustment screw, then tighten the other the same amount to move the gib.
4. Use ball handles/crank to move table/knee until you feel a slight drag in the path of movement. Repeat Steps 3–4 as necessary.

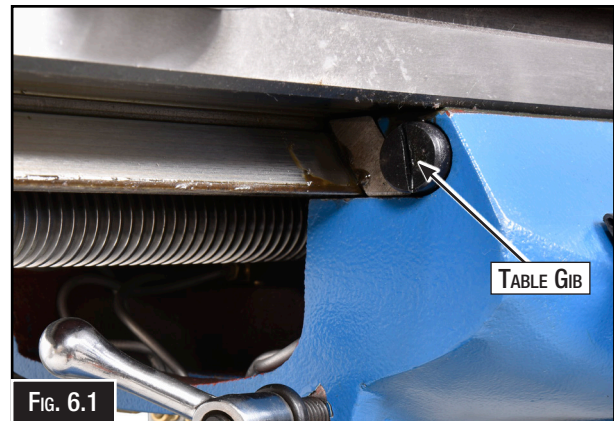


FIG. 6.1

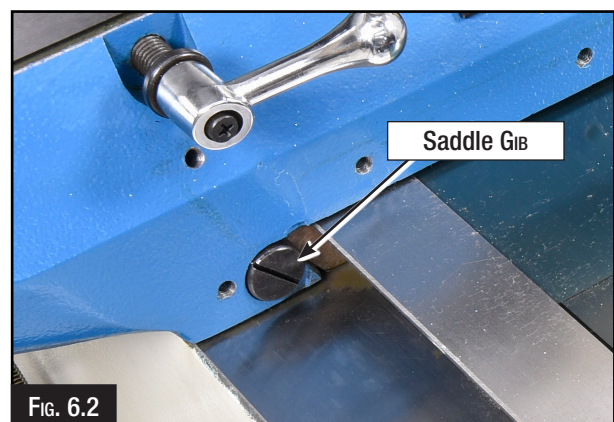


FIG. 6.2



FIG. 6.3



WARNING!

Disconnect all power from the machine before servicing. There may be multiple power sources present. Remove the plug from the power point or remove the fuse if hardwired. Failure to do so may cause death or injury.

6.3 TROUBLESHOOTING

Read the troubleshooting section if a problem develops with the machine. If you need any assistance or additional help with a problem, call the Hafco Service Department. For spare parts go to www.machineryhouse.com.au/contactus & fill out the enquiry form attaching a copy of scanned parts list.

SYMPTOMS	POSSIBLE CAUSE	POSSIBLE SOLUTION
Machine does not start or a breaker trips.	1. Plug/receptacle at fault/wired wrong. 2. Incorrect power supply voltage/circuit size. 3. Power supply circuit breaker tripped or fuse blown. 4. Motor wires connected incorrectly. 5. Wiring open/has high resistance. 6. Spindle rotation switch at fault. 7. Start capacitor at fault . 8. Centrifugal switch at fault . 9. Motor at fault.	1. Test for good contacts; correct the wiring. 2. Ensure correct power supply voltage/circuit size. 3. Ensure circuit is sized correctly and free of shorts. Reset the circuit breaker or replace fuse. 4. Correct motor wiring connections. 5. Check/fix broken, disconnected, or corroded wires. 6. Replace switch. 7. Test/replace. 8. Adjust/replace centrifugal switch if available. 9. Test/repair/replace.
Machine stalls or is underpowered	1. Machine undersized for task. 2. Feed rate/cutting speed too fast. 3. Wrong work piece material. 4. Belt(s) slipping. 5. Oil/grease on belt(s). 6. Motor wired incorrectly. 7. Spindle rotation switch at fault. 8. Gearbox at fault. 9. Motor overheated. 10. Pulley/sprocket slipping on shaft. 11. Centrifugal switch at fault. 12. Motor bearings at fault.	1. Use correct cutter/bit; reduce feed rate; reduce spindle RPM; use coolant if possible. 2. Decrease feed rate/cutting speed. 3. Use correct type/size of metal. 4. Tension/replace belt(s); ensure pulleys are aligned. 5. Clean belt(s). 6. Wire motor correctly. 7. Test/replace switch. 8. Select appropriate gear ratio; replace broken or slipping gears. 9. Clean motor, let cool, and reduce workload. 10. Replace loose pulley/shaft. 11. Adjust/replace centrifugal switch if available. 12. Test/repair/replace.
Machine has vibration or noisy operation.	1. Workpiece loose. 2. Belt(s) worn or loose. 3. Motor or component loose. 4. Chuck or cutter at fault. 5. Belt(s) slapping headstock casting/guard. 6. Motor fan rubbing on fan cover. 7. Pulley loose. 8. Machine incorrectly mounted. 9. Motor bearings at fault. 10. Centrifugal switch is at fault .	1. Use the correct holding fixture/re-clamp work piece. 2. Inspect/replace belts with a new matched set. 3. Inspect/replace damaged bolts/nuts, and re-tighten with thread locking fluid. 4. Replace unbalanced chuck; replace/resharpen cutter; use correct feed rate. 5. Replace/realign belts with a matched set. 6. Fix/replace fan cover; replace loose/damaged fan. 7. Re-align/replace shaft, pulley set screw, and key. 8. Tighten mounting bolts; relocate/shim machine. 9. Test by rotating shaft; rotational grinding/loose shaft requires bearing replacement. 10. Replace the switch
Tool loose in the spindle.	1. Tool is not fully drawn up into spindle taper. 2. Debris on tool or in spindle taper 3. Taking too big of a cut.	1. Tighten drawbar. 2. Clean tool and spindle taper. 3. Lessen depth of cut and allow chips to clear.
Breaking tools or cutters.	1. Spindle speed/feed rate is too fast. 2. Cutting tool is too small. 3. Cutting tool getting too hot. 4. Taking too big of a cut. 5. Spindle extended too far down.	1. Set spindle speed correctly or use slower feed rate 2. Use larger cutting tool and slower feed rate. 3. Use coolant or oil for appropriate application. 4. Lessen depth of cut and allow chips to clear. 5. Fully retract spindle and raise table. This increases rigidity.
Work piece or tool vibrates or chatters during operation	1. Table locks not tight. 2. Work piece not secure. 3. Spindle speed/feed rate is too fast. 4. Spindle extended too far down 5. Quill lock lever not tight. 6. Gibs too loose in table.	1. Tighten table locks (Page 10). 2. Properly clamp work piece on table or in vice. 3. Set spindle speed correctly or use slower feed rate (Page 15,16). 4. Fully retract spindle and raise table This increases rigidity. 5. Tighten quill lock lever (Page 8.9). 6. Tighten gibs (Page 26).
Table is hard to move.	1. Table locks are tightened down. 2. Chips have loaded up on ways. 3. Ways are dry and need lubrication. 4. Table limit stops are interfering. 5. Gibs are too tight.	1. Fully release table locks (Page 10). 2. Frequently clean away chips or debris. 3. Lubricate ways (Page 25). 4. Make sure that table limit stops are not in the way 5. Adjust gibs (Page 26).

6.3 TROUBLESHOOTING Cont.

SYMPTOMS	POSSIBLE CAUSE	POSSIBLE SOLUTION
Headstock is hard to raise.	1. Headstock lock(s) or gib is at fault. 2. Headstock leadscrew is binding. 3. Gib is too tight	1. Loosen/replace lock lever and adjust gib. 2. Clean and relubricate headstock leadscrew and gears 3. Adjust gib (Page 26).
Bad surface finish	1. Spindle speed/feed rate is too fast. 2. Dull or incorrect cutting tool. 3. Wrong rotation of cutting tool 4. Workpiece not secure. 5. Spindle extended too far down.	1. Set spindle speed correctly or use slower feed rate (Page 16). 2. Sharpen cutting tool or select one that better suits the operation. 3. Check for proper cutting tool rotation. 4. Properly clamp work piece on table or in vice. 5. Fully retract spindle and raise table. This increases rigidity.
Cutting results not square.	1. Table and spindle are not at 90° to each other. 2. Table travel is inconsistent	1. Square the spindle (Page 23). 2. Adjust gibs (Page 26).
Spindle overheats.	1. Poor spindle bearing lubrication. 2. Spindle bearings too tight. 3. Mill operated at high speeds for extended period.	1. Replace spindle bearings. 2. Properly adjust spindle bearing preload. 3. Allow mill to cool.
Lack of power at spindle.	1. Belts are loose. 2. Wrong voltage	1. Properly tension belts. 2. Correct voltage.
Spindle does not fully retract.	1. Poorly adjusted return spring. 2. Worn return spring.	1. Increase return spring tension. 2. Replace return spring
POWER FEED		
Power feed does not move table or is slipping.	1. Table locked. 2. Drive selector not engaged. 3. Sheared pin. 4. Gears not meshing or teeth missing. 5. Motor shaft and gear shaft not engaged	1. Unlock table locks. 2. Select speed, engage drive selector. 3. Replace pin. 4. Check gears and adjust/replace. 5. Replace clutch.
Operates at high speed only or is inconsistent.	1. Rapid micro switch is stuck. 2. V.R. does not work properly. 3. Wiring harness unplugged from circuit board	1. Lightly tap on it to lower it. 2. Test/repair/replace 3. Reconnect wiring harness.
DIGITAL READOUT UNIT (DRO)		
DRO does not give reading.	1. DRO is not turned on/plugged in. 2. Shorted/disconnected wiring/plugs.	1. Press DRO ON/Power button/plug in. 2. Inspect circuit boards, sensors, plugs, and wiring connections . Replace/repair as necessary.
DRO reading is incorrect	1. Initial reading is incorrect. 2. Sensor has gone bad. 3. Spacing between sensor & scale is incorrect.	1. Zero/reset DRO at beginning point. 2. Test/replace sensor as necessary. 3. Adjust spacing between sensor and scale
LAMP		
Lamp will not light	1. Power not turned on. 2. Bulb is burned out. 3. Short in wiring or wired incorrectly	1. Press switch/button on lamp or control panel. 2. Replace bulb. 3. Trace and test wiring. Fix any errors.



CAUTION!

Before attempting this feature, disconnect the machine from the power supply to avoid injury to the operator from accidental startup or damage to the machine.

TURRET MILLING MACHINE

BM-22VE,

Order Code: (M592D)

The following section covers the spare parts diagrams and lists that were current at the time this manual was originally printed. Due to continuous improvements of the machine, changes may be made at anytime without notification.

HOW TO ORDER SPARE PARTS

1. Have your machines model number, serial number & date of manufacture on hand, these can be found on the specification plate mounted on the machine.
2. A scanned copy of your parts list/diagram with required spare part/s identified.

NOTE: SOME PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

3. Go to www.machineryhouse.com.au/contactus and fill out the inquiry form attaching a copy of scanned parts list.



WARNING!

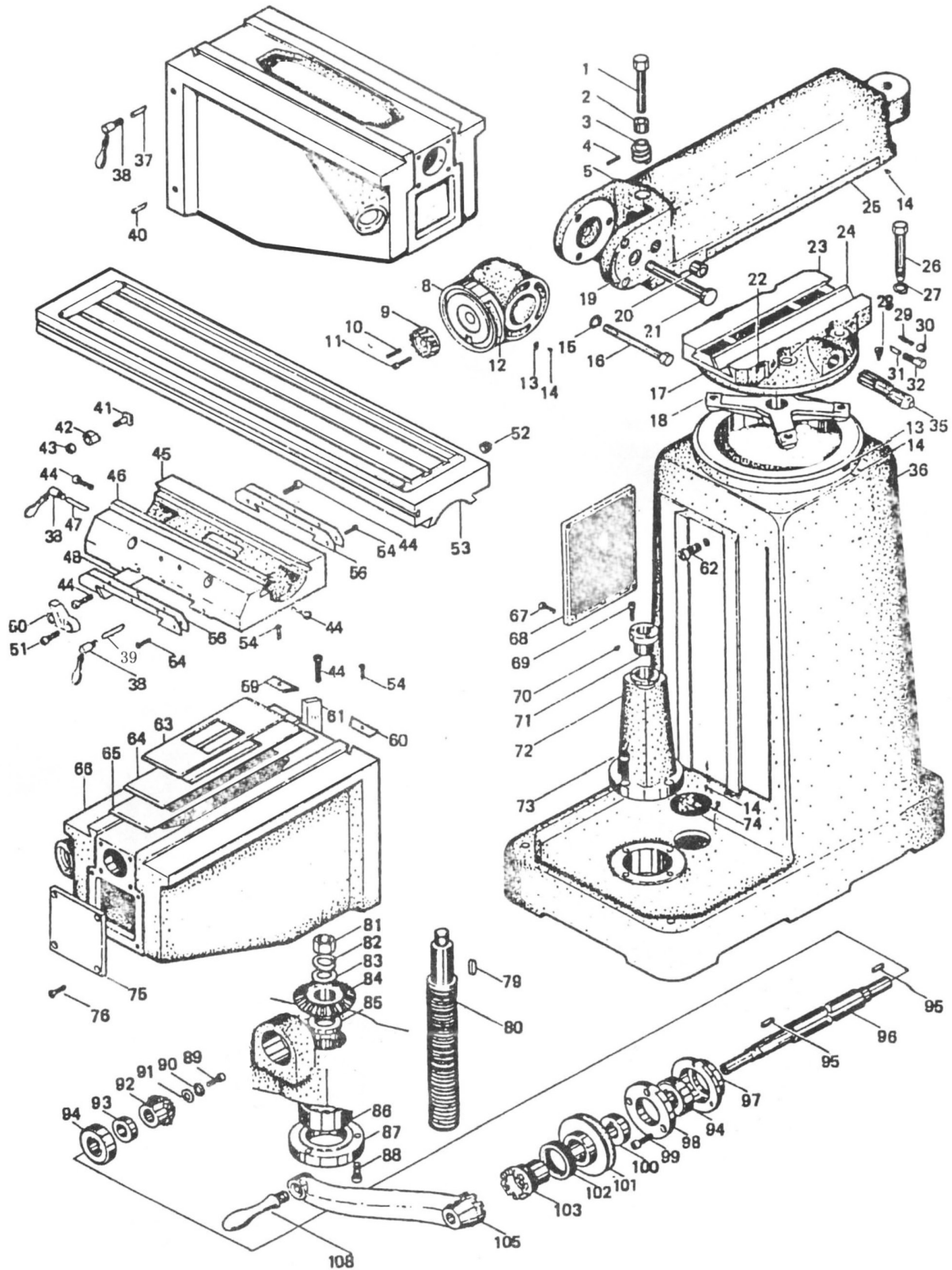
*Electricity is dangerous and could cause death.
All electrical work must be carried out by a qualified electrician.*



CAUTION!

It is impossible to cover all possible hazards Every workshop environment is different. These are designed as a guide to be used to compliment training and as a reminder to users prior to equipment use. Always consider safety first, as it applies to the individual working conditions.

PARTS DIAGRAM - MACHINE BODY

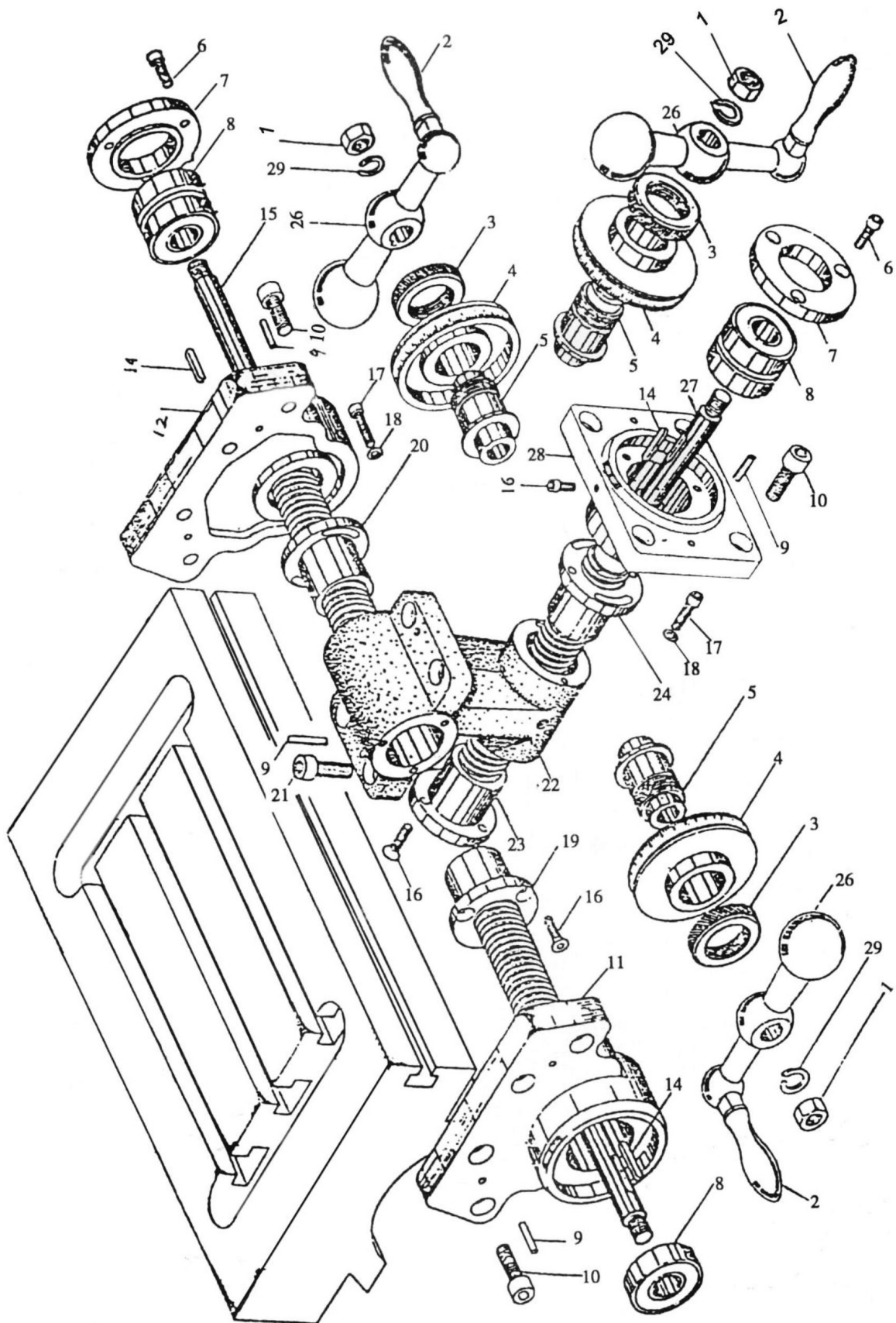


PARTS LIST - MACHINE BODY

ITEM	DESCRIPTION	ITEM	DESCRIPTION
C001	Worm shaft	C059	Right oil scraper
C002	Sleeve of worm shaft	C060	Left oil scraper
C003	Worm	C061	Gib of knee
C004	Spring pin	C062	Travel set screw
C005	Ram	C063	Chip guard
C008	Adapter	C064	Chip guard
C009	Worm	C065	Chip guard
C010	Spring pin	C066	Knee
C011	Hex. Socket screw	C067	Hex. Socket screw
C012	Mark	C068	Side cover plate
C013	Zero indicator	C069	Hex. Socket screw
C014	Rivet	C070	Oil nozzle
C015	Spring lock washer	C071	Elevating nut
C016	Lock screw	C072	Lead screw bracket
C017	Mark	C073	Hex. Socket screw
C018	Bracket	C074	Filter screen
C019	Ruler	C075	Front cover
C020	Sleeve	C076	Hex. Socket screw
C021	Axle of adapter	C077	Hex. Socket screw
C022	Zero indicator	C079	Key
C023	Turret	C080	Elevating lead screw
C024	Gib	C081	Hex. Head nut
C025	Ruler	C083	Washer
C026	Bracket screw	C084	Bevel gear
C027	Spring lock washer	C085	Washer
C028	Set screw	C086	Bearing
C029	Lock screw	C087	Bearing shield
C030	Hex. Head screw	C088	Hex. Socket screw
C031	Lock pin	C089	Hex. Socket screw
C032	Lock screw	C092	Pinion bevel gear
C035	Gear shaft	C093	Adjusting spacer
C036	Body	C094	Bearing
C037	Lock pin	C095	Key
C038	Lock handle	C096	Elevating shaft
C039	Lock pin	C097	Bearing bracket
C040	Lock pin	C098	Bearing shield
C041	Travel set handle	C099	Hex. Socket screw
C042	Travel set block	C100	Washer
C043	Nut	C101	Dial plate
C044	Adjusting screw for gib	C102	Nut
C045	Saddle	C103	Clutch sleeve
C046	Gib of table	C105	Elevating crank handle
C047	Lock pin	C106	Washer
C048	Gib of saddle	C108	Handle
C050	Travel stop block		
C051	Hex. Socket screw		
C052	Screw plug		
C053	Work table		
C054	Round head screw		
C056	Oil scraper		

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

PARTS DIAGRAM - WORK TABLE



PARTS LIST - WORK TABLE

ITEM	DESCRIPTION
D001	Hex. Head nut
D002	Handle
D003	Dial plate lock nut
D004	Dial plate
D005	Dial plate holder
D006	Screw
D007	Bearing shield
D008	Bearing
D009	Pin
D010	Screw
D011	Left bearing bracket
D012	Right bearing bracket
D013	Bearing
D014	Key
D015	Longitudinal feed screw
D016	Screw
D017	Screw
D018	Washer
D019	Longitudinal feed nut
D020	Longitudinal feed nut
D021	Screw
D022	Feed nut bracket
D023	Cross lead feed nut
D024	Cross lead feed nut
D026	Crank handle
D027	Cross feed screw
D028	Bearing bracket
D029	Lock washer

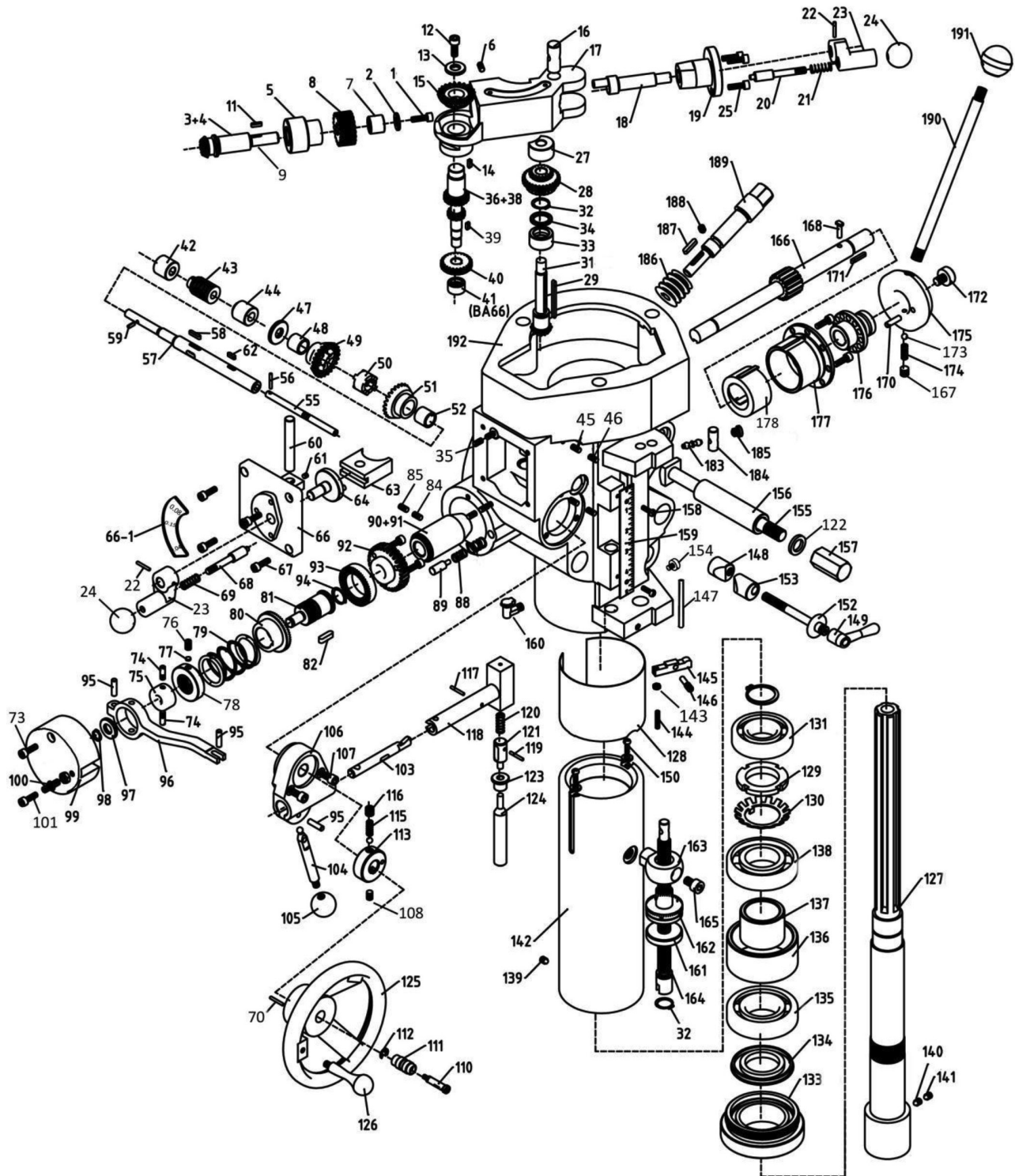
NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

PARTS LIST - VARIABLE SPEED HEAD (PART A)

ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
VS-1	Belt housing assembly	VS-53	Brake shaft	VS-105	Spacer washer
VS-2	Motor fixed pulley	VS-54	Brake handle joint base	VS-106	Draw bar
VS-3	Screw M8*8	VS-55	Lock pin	VS-107	Washer
VS-4	Variable speed timing belt	VS-56	Brake handle	VS-108	Motor (2P)
VS-5	Moveable motor pulley	VS-57	Black plastic ball 3/8"	VS-109	Screw
VS-5/1	Sleeve	VS-58	Brake turning shaft	VS-110	Spring washer 3/8"
VS-8	Spring	VS-59	Brake pad finger block	VS-111	Screw
VS-9	Spring cover	VS-60	Retaining ring	VS-112	Key 7*7*25
VS-10	Retainer ring	VS-61	Nut	VS-113	Key 7*7*30
VS-11	Motor pulley rear cover	VS-62	Timing belt pulley	VS-114	Set screw M4*10
VS-12	Screw M6*16	VS-63	Timing belt 225L	VS-116	Retaining ring 40
VS-13	Bearing cover	VS-64	Bearing housing	VS-117	Screw
VS-14	Screw M6*25	VS-65	Bearing 6203 ZZ	VS-118	Bearing 6010ZZ
VS-15	Bearing 6007ZZ	VS-66	Small gear	VS-119	Screw
VS-16	Speed change box	VS-67	Gear shaft	VS-120	Screw M6*25
VS-17	Screw M6*30	VS-68	Key 5*5*15	VS-121	Retaining ring
VS-18	Screw M6*6	VS-69	Key 5*5*18	VS-122	Nut 3/8"
VS-19	Bushing	VS-70	Input clutch gear shaft	VS-123	Washer
VS-20	Screw	VS-71	Key 8*8*16	VS-124	Set screw M6*36
VS-21	Worm	VS-72	Key 8*8*12	VS-125	Nut 3/8"
VS-22	Worm wheel	VS-73	Output clutch gear shaft	VS-126	Spring washer 3/8"
VS-23	Pin 5*10	VS-74	Big gear	VS-127	Set screw M4*6
VS-24	Brass bushing	VS-75	Gear quill(bearing housing)	VS-128	Chain ring
VS-25	Speed change shaft	VS-76	Spring washer	VS-129	Chain side block
VS-26	Pin 3*12	VS-77	Bearing 6908 ZZ	VS-130	Lock ring
VS-27	Speed change handwheel	VS-78	Inner spacer	VS-131	Black plastic ball 1/4"
VS-28	Handle	VS-79	Out spacer	VS-132	Logo label
VS-29	Worm holder	VS-80	Retaining ring 62	VS-133	Speed shift turning round label
VS-30	Pin 3*18	VS-81	Gear shaft locknut M40*1.0	VS-134	Washer 5/16"
VS-31	Pin 3*24	VS-82	Rear gear box	VS-135	Nut 5/16"
VS-32	Speed change chain 35#	VS-84	Spring	VS-136	Speed shift fixed label
VS-33	Bolt	VS-85	Bolt	VS-137	Screw M4*6
VS-34	Adjust screw sleeve	VS-86	Screw M8*25	VS-138	Spring washer 5/8"
VS-35	Adjust screw	VS-87	H/L speed change gear shaft	VS-139	Screw M5*20
VS-36	Speed change plate	VS-88	Pin 3*18	VS-140	Set screw 1/4"
VS-37	Washer	VS-89	H/L speed change adjust block	VS-141	H/L speed shift indicator label
VS-38	Screw M5*20	VS-90	Alignment Pin	VS-142	Quill feed plate
VS-39	Adjust screw	VS-91	Spring	VS-143	Logo label
VS-41	Washer	VS-92	H/L speed control lever base	VS-144	Screw
VS-42	Speed change shaft cover	VS-93	Screw M5*12	VS-145	Screw M6
VS-43	Bearing 6012ZZ	VS-94	H/L speed control lever	VS-146	Power switch cover
VS-44	Moveable spindle pulley	VS-95	Screw M6*16	VS-147	Power switch
VS-44-1	Housing	VS-96	Spring washer 7/16"	VS-149	Retaining ring
VS-45	Fixed spindle pulley	VS-97	Nut 7/16"	VS-152	Screw M4*16
VS-46	Brake bearing base	VS-98	Washer 3/16"	VS-153	Nut
VS-47	Brake pad assembly	VS-99	Screw	VS-154	Screw M4*25
VS-48	Lock nut	VS-100	Clutch ring	VS-155	Screw M6*12
VS-49	Brake spring	VS-101	Cover		
VS-50	Brake base	VS-102	Pin		
VS-51	Screw M6*16	VS-103	Pin 4*30		
VS-52	Brake shaft bushing	VS-104	Nut		

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

PARTS DIAGRAM - VARIABLE SPEED HEAD (PART B)

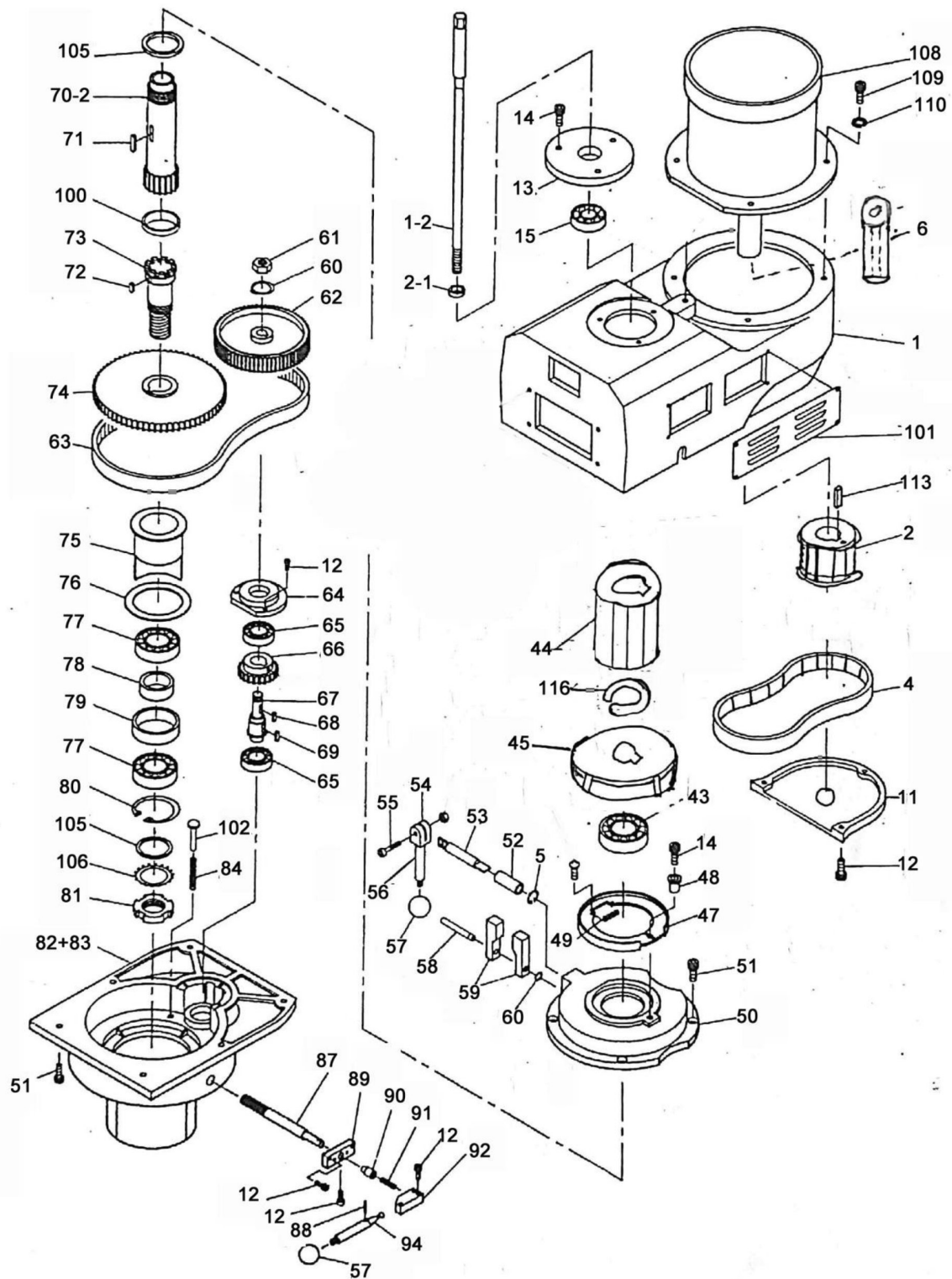


PARTS LIST - VARIABLE SPEED HEAD (PART B)

ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
B1	Screw M5*10	B68	Alignment bar	B136	(Bearing Spacer - Large)
B2	Washer	B69	Spring	B137	(Bearing Spacer - Small)
B3	Bevel pinion shaft	B70	Pin 3*15	B138	Bearing 7207
B5	Bushing	B73	Screw M5*35	B139	Screw M5*5
B6	Pin	B74	Screw	B140	Special Socket Set Screw
B7	Worm spacer	B75	Clutch ring	B141	Collet Alignment Screw
B8	Feed worm	B76	Screw M6*6	B142	Quill
B9	Worm shaft	B77	Brass plug	B143	Lock nut M4
B11	Key	B78	Overload clutch nut	B144	Socket Set Screw M4*16
B12	Screw M8*12	B79	Spring	B145	Feed Trip Lever
B13	Washer	B80	Overload clutch	B146	Trip Lever Pin
B14	Key	B81	Shaft sleeve	B147	Side indicator bar
B15	Reversing gear	B82	Key 5*8*13	B148	Quill lock Sleeve
B16	Dowel pin	B84	Screw M6*8	B149	Lock Handle
B17	Worm bracket	B85	Screw M6*8	B152	Washer
B18	Eccentric shaft	B88	Spring	B153	Quill Lock Sleeve Tapped
B19	Shaft sleeve	B89	Bar	B154	Lock screw
B20	Bar	B90+91	Bushing	B155	T - Blot Assy
B21	Spring	B92	Feed worm wheel	B156	Lower Clamping Blot Spacer(2 req)
B22	Pin 3*20	B93	Teethed clutch ring	B157	Locknut
B23	Crank	B94	Retaining ring	B158	Chem Blacked RD. HD. Screws(2Req.)
B24	Plastic ball 1/4"	B95	Pin 5*14	B159	Micrometer Scale
B25	Screw M5*12	B96	Feed control lever	B160	Oil cup
B27	Copper sleeve	B97	Washer	B161	Quill Micro - stop Nut
B28	Multi-gear	B98	Retaining ring	B162	Micrometer Nut
B29	Key 3*3*45	B99	Clutch plate	B163	Quill Stop Knob
B31	Multi-gear shaft	B100	Setscrew M6*16	B164	Quill Stop Micro - screw
B32	Retaining ring	B101	Locknut	B165	Screw
B33	Copper sleeve	B103	Slide shaft	B166	Quill Pinion Shaft
B34	Washer	B104	Feed control lever	B168	Spring Pin
B35	Screw M6*25	B105	Plastic ball	B169	RD. Head Screw(2 Req.) M5*12
B36	Feed gear	B106	Feed trip bracket	B170	Roll Pin
B38	Multi-gear shaft	B107	Screw M6*20	B171	Key 3*3*20
B39	Key 3*3*8	B108	Screw M6*20	B172	Pinion shaft Hub Screw
B40	Cooper worm wheel	B110-112	Pull lever	B173	Steel Ball 3/16"
B41	Bearing BA66	B113	Hand wheel clutch	B174	Compression Spring
B42	Copper sleeve	B114	Steel Ball 3/16"	B175	Rack Feed Handle Hub
B43	Auto. Feed worm	B115	Spring	B176	Pinion Shaft Hub Sleeve
B44	Copper sleeve	B116	Screw M8*8	B177	Spring cover
B45	Screw M8*8	B117	Long Pin 3*14	B178	Clock Spring(Clock Spring Assy.)
B46	Screw M6*8	B118	Slide block	B183	Reverse Trip Ball Lever
B47	Thrust Washer	B119	Pin 3*12	B184	Feed Reverse Trip Plunger
B48	Bushing	B120	Spring	B185	Reverse/Trip Ball Lever Screw
B49	Bevel Pinion	B121	Stop plunger	B186	Worm Gear
B50	Clutch	B122	Spring Washer 1/2"	B187	Key 4*4*18
B51	Bevel pinion	B123	Plunger pushing	B188	Socket Set Screw
B52	Copper sleeve	B124	Push bar	B189	ADJ Worm Shaft
B55	Feed control pull bar	B125	Hand wheel	B190	Quill feed Handle
B56	Pin Ø3×20	B126	Handle	B191	Black Plastic Ball Handles 3/8"
B57	Feed worm shaft	B127	Spindle	B192	Quill Housing
B59	Pin Ø3×16	B128	Quill Skirt		
B60	Sliding shaft	B129	Locknut		
B61	Screw M5*5	B130	Toothed washer		
B62	Key 3*3*15	B131	Bearing 6206 ZZ		
B63	Feed changing fork	B132	Sleeve		
B64	Eccentric shaft	B133	Quill end nut		
B66	Clutch plate	B134	Spindle Dirt Shield		
B67	Screw	B135	Bearing 7207		

NOTE: SOME INDIVIDUAL PARTS MAY ONLY BE AVAILABLE AS AN ASSEMBLY

PARTS DIAGRAM - INVERTER HEAD

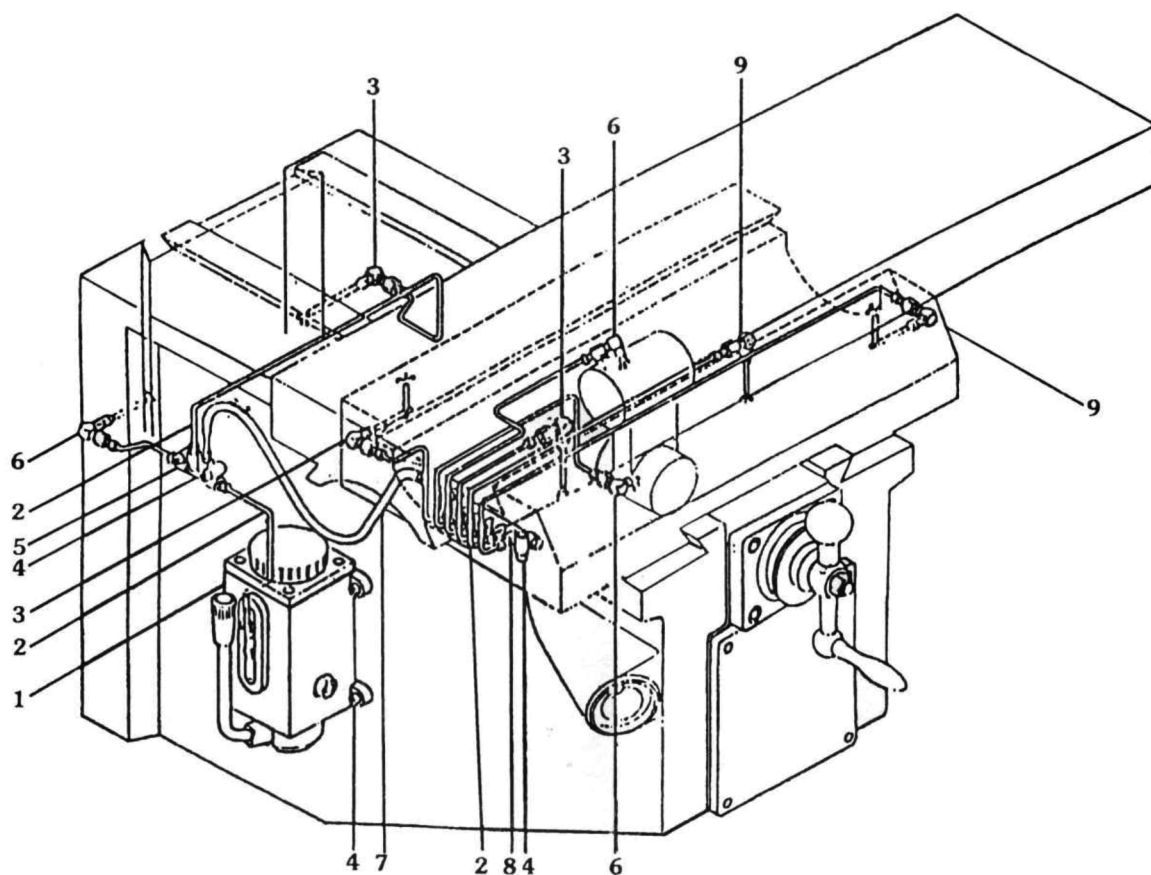


PARTS LIST - INVERTER HEAD

ITEM	DESCRIPTION	SPEC	ITEM	DESCRIPTION	SPEC
IVS1-2	DRAW BAR		IVS-15	BEARING	6007 ZZ
IVS2-1	WASHER		IVS-108	MOTOR	
IVS-70-2	PULLEY SHAFT		IVS-109	SCREW	
IVS-71	KEY	6*25L	IVS-110	SPRING WASHER	
IVS-100	COLLAR	Ø54*Ø 48*6.5t	IVS-06	MOTOR SHAFT	
IVS-63	TIMING BELT	225L-25W	IVS-01	BELT HOUSING	
IVS-72	KEY	8*12L	IVS-02	MOTOR PULLEY	
IVS-73	CLUTCH GEAR SHAFT		IVS-03	PIN	
IVS-74	LARGE DRIVE GEAR		IVS-04	V-BELT	3V-300
IVS-75	BEARING BUSHING		IVS-11	MOTOR PULLEY REAR COVER	
IVS-76	COLLAR		IVS-44	SPINDLE MOVABLE PULLEY	
IVS-102	SPRING PLUNGER		IVS-116	CIRCLIP	
IVS-84	SPRING		IVS-45	SPINDLE FIXED PULLEY	
IVS-77	BEARING	6908 ZZ	IVS-46	BEARING	6010/6012
IVS-78	BEARING SPACER HOUSING		IVS-47	BRAKE PAD ASSEMBLY	
IVS-79	CIRCLIP	R62	IVS-48	LOCK NUT	
IVS-105	SPACER WASHER		IVS-49	BRAKE SPRING	
IVS-106	SPRING WASHER	M40	IVS-50	BRAKE BASE	
IVS-81	LOCK NUT		IVS-51	SCREW	M6*16
IVS-82+83	GEAR HOUSING		IVS-52	BRAKE SHAFT BUSHING	
IVS-51	ROUND HEAD ALLEN SCREW	M8*20L	IVS-53	BRAKE SHAFT	
IVS-61	HEXAGON NUT	5/8"*18NF*23	IVS-54	BRAKE HANDLE JOINT BASE	
IVS-60	SPRING WASHER	5/8"	IVS-55	LOCK PIN	
IVS-62	TOOTHED PULLEY		IVS-56	BRAKE HANDLE	
IVS-12	ROUND HEAD ALLEN SCREW	M5*16L	IVS-57	BLACK PLASTIC BALL	3/8"
IVS-64	BEARING HOUSING		IVS-58	BRAKE TURNING SHAFT	
IVS-65	BEARING	6203 ZZ	IVS-59	BRAKE PAD FINGER BLOCK	
IVS-66	WORM		IVS-60	RETAINING RING	
IVS-67	GEAR SHAFT				
IVS-68	KEY	5*15L			
IVS-69	KEY				
IVS-87	CLUTCH RING Control SHAFT				
IVS-88	POSITIONING PIN				
IVS-89	HIGH/LOW SPEED PLATE				
IVS-90	POSITIONING PIN				
IVS-91	SPRING				
IVS-12	ROUND HEAD ALLEN SCREW	M6*12L			
IVS-92	CHANGE GEAR HANDLE BLOCK				
IVS-94	CLUTCH HANDLE				
IVS-57	PLASTIC KNOB	1/4"			
IVS-14	ROUND HEAD ALLEN SCREW	M6*20L			
IVS-13	TOP BEARING COVER				

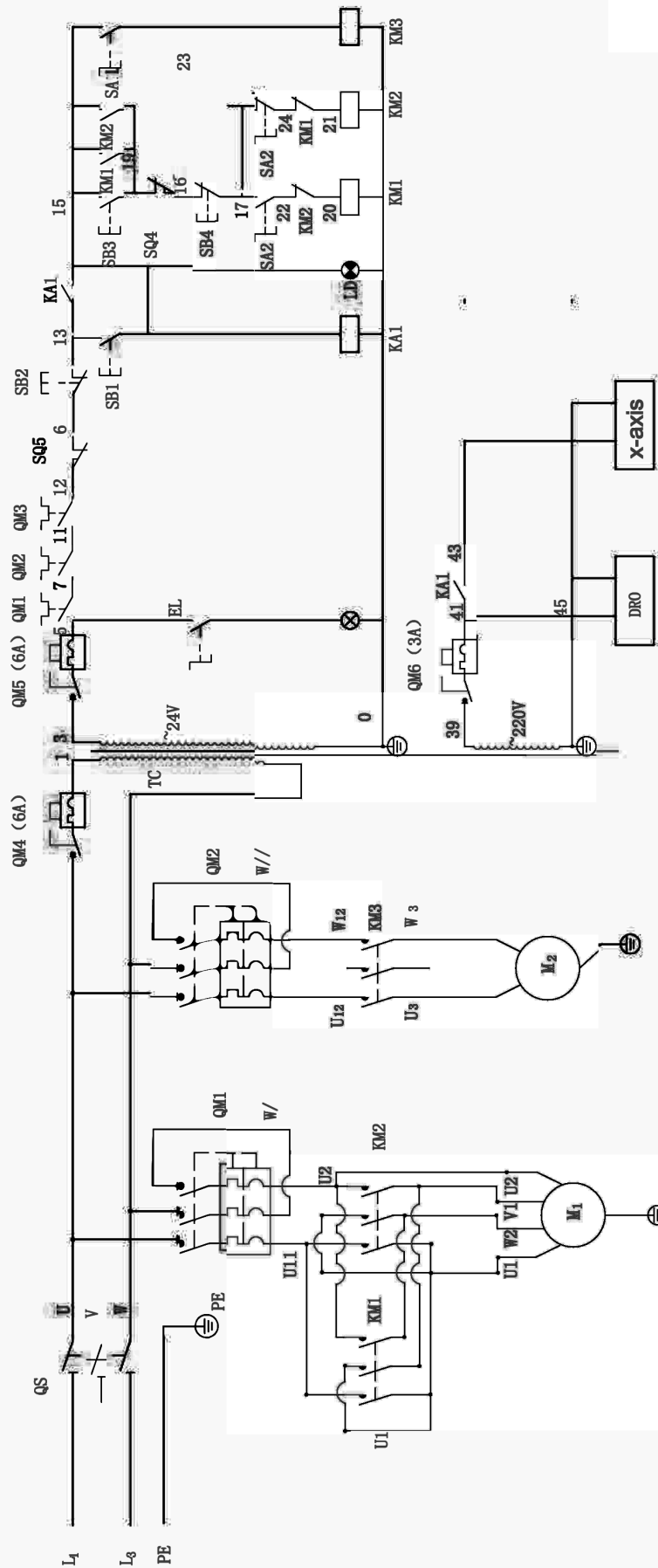
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TABLE LUBRICATION



ITEM NO	DESCRIPTION	ITEM NO	DESCRIPTION
B001	Hand oil pump	E006	Ratio oil distributor
B002	Pipe Ø4	E007	Steel flexible tube
B003	Ratio oil distributor	E008	A type oil distributor
B004	screws	E009	Ratio oil distributor
B005	A type oil distributor		

WIRING DIAGRAM



coolant pump

AC spindle motor

47



ENVIRONMENT PROTECTION

Recycle unwanted materials instead of disposing of them as waste. All tools, accessories and packaging should be sorted, taken to a recycling centre and disposed of in a manner which is compatible with the environment. When the product becomes completely unserviceable and requires disposal, drain any fluids (if applicable) into approved containers and dispose of the product and fluids according to local regulations.

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