

# INSTRUCTION MANUAL

**NSW Schools / TAFE - HM-46  
Mill Drill Machine - Includes Tooling  
Package (240V)  
(X) 475mm (Y)195mm (Z) 450mm**



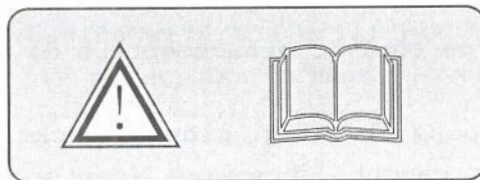
**K8242**

M122 HM-36 (ROUND COLUMN)

M123 HM-46 (DOVETAIL COLUMN)

21/7/09

# GEARED HEAD DRILLING AND MILLING MACHINE



MODEL: HM-36      HM-46

## INSTRUCTION MANUAL

## **WARNING: FAILURE TO FOLLOW THESE RULES MAY RESULT IN SERIOUS PERSONAL INJURY**

As with all machine there are certain hazards involved with operation and use of the machine. Using the machine with respect and caution will considerably lessen the possibility of personal injury. However, if normal safety precautions are overlooked or ignored, personal injury to the operator may result.

This machine was designed for certain applications only. We strongly recommends that this machine NOT be modified and /or used for any application other than for which it was designed. If you have any questions relative to its application DO NOT use the machine until you have had detail instruction from dealer.

### **SAFETY RULES FOR ALL TOOLS**

1. **For your own safety, read instruction manual before operating the tool.** Learn the tool's application and limitations as well as the specific hazards peculiar to it.
2. **Keep guards in place** and in working order.
3. **Ground all tools.** If tool is equipped with three-prong plug, it should be plugged into a three-hole electrical receptacle. If an adapter is used to accommodate a two-prong receptacle, the adapter lug must be attached o a known ground. Never remove the third prong.
4. **Remove adjusting keys and wrenches.** From habit of checking to see that keys and adjusting wrenches are removed from tool before turning it "on".
5. **Keep work area clean.** cluttered areas and benches invite accidents.
6. **Don't use in dangerous environment.** Don't use power tools in damp or wet locations, or expose them to rain. Keep work area well-lighted.
7. **keep children and visitors away.** All children an visitors should be kept a safe distance from work area.
8. **Make workshop childproof** with padlocks, master switches, or by removing starter keys.
9. **Don't force tool.** It will do the job better and be safer at the rate for which it was designed.
10. **Use right tool.** Don't force tool or attachment to do a job for which it was designed.
11. **Wear proper apparel.** No loose clothing, gloves, neckties, rings, bracelets, or other jewelry to get caught in moving [parts. Nonslip foot wear is recommended. Wear protective hair covering to contain long hair.
12. **Always wear eye protection.** Refer to standard for appropriate recommendations. Also use face if dust mask of cutting operation is dusty.
13. **Secure work.** Use clamps or a vise to hold work when practical. It's safer than using your hand and frees both hands to operate tool.



14. **Don't overreach.** Keep proper footing and balance at all times.
15. **Maintain tools in top condition.** Keep tools sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.
16. **Disconnect tools** before servicing and when changing accessories such as blades, bits, cutters, etc.
17. **Use recommended accessories.** Consult the owner's manual for recommended accessories. The use of improper accessories may cause hazards.
18. **Avoid accidental starting.** Make sure switch is in "OFF" position before plugging in power cord.
19. **Never stand on tool.** Serious injury could occur if the tool is tipped or if the cutting tool is accidentally contacted.
20. **Check damaged parts.** Before further use of the tool, a guard or other part that is damaged should be carefully checked to ensure that it will operate properly and perform its intended function check for alignment of moving parts, breakage of parts, mounting, and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.
21. **Direction of feed.** Feed work into a blade or cutter against the direction of rotation of the blade or cutter only.
22. **Never leave tool running unattended. Turn power off.** Don't leave tool until it comes to a complete stop.
23. **Drugs, alcohol, medication.** Do not operate tool while under the influence of drug, alcohol or any medication.
24. **Make sure tool is disconnected from power supply** while motor is being mounted, connected or reconnected.

#### **ADDITIONAL SAFETY RULES FOR MILL/DRILL**

1. **Be sure** drill bit or cutting tool is securely locked in the chuck.
2. **Be sure** chuck key is removed from the chuck before turning on power.
3. **Adjust** the table or depth stop to avoid drilling into the table.
4. **Shut off** the power, remove the drill bit or cutting tool, and clean the table before leaving the machine.
5. **Caution.** When practical, use clamps or a vise to secure workpiece to keep the workpiece from rotating with the drill bit or cutting tool.
6. **Warning:** For you own safety, Don't wear gloves when operating a mill/drill.

Thank you for purchasing our **GEARED HEAD DRILLING AND MILLING MACHINE**. If you hope to keep machine in good condition or best performance over a long period of time, you should operate and maintain accurately, acquaint yourself with the construction of machine, the functions of all operating controls, the driving and the lubricating system.

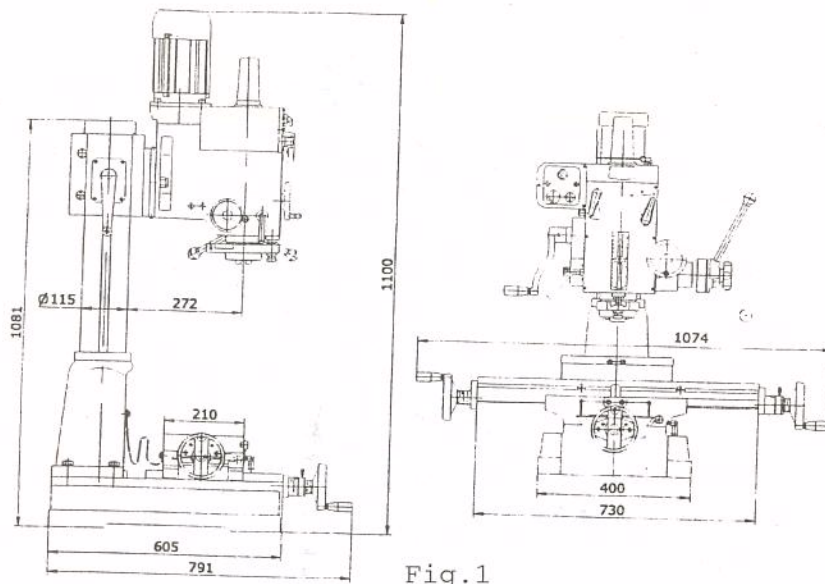
### SPECIFICATION

MODEL	HM-36	ZX7040A	ZX7045
Max. drilling capacity	31.5		45mm
Max. tapping capacity	12mm		
Max. face milling capacity	80mm		
Max. end milling capacity	28mm		
Distance spindle axis to column surface	272.5mm	261mm	
Max. distance spindle nose to table	450mm		475mm
Spindle taper	MT.3 or R8		MT.4
Max. spindle stroke	120mm		
Spindle speeds range (motor 1400r/min)	95 170 280 540 960 1600		
Working area of table (L×W) mm	730×210		820×240
Travel of table (L×C) mm	500×175		550×200
Motor	750w, 1400r/min		
Overall dimension(L×W×H) cm	80×105×110	80×114×104	
Net weight	255kg	267kg	278kg

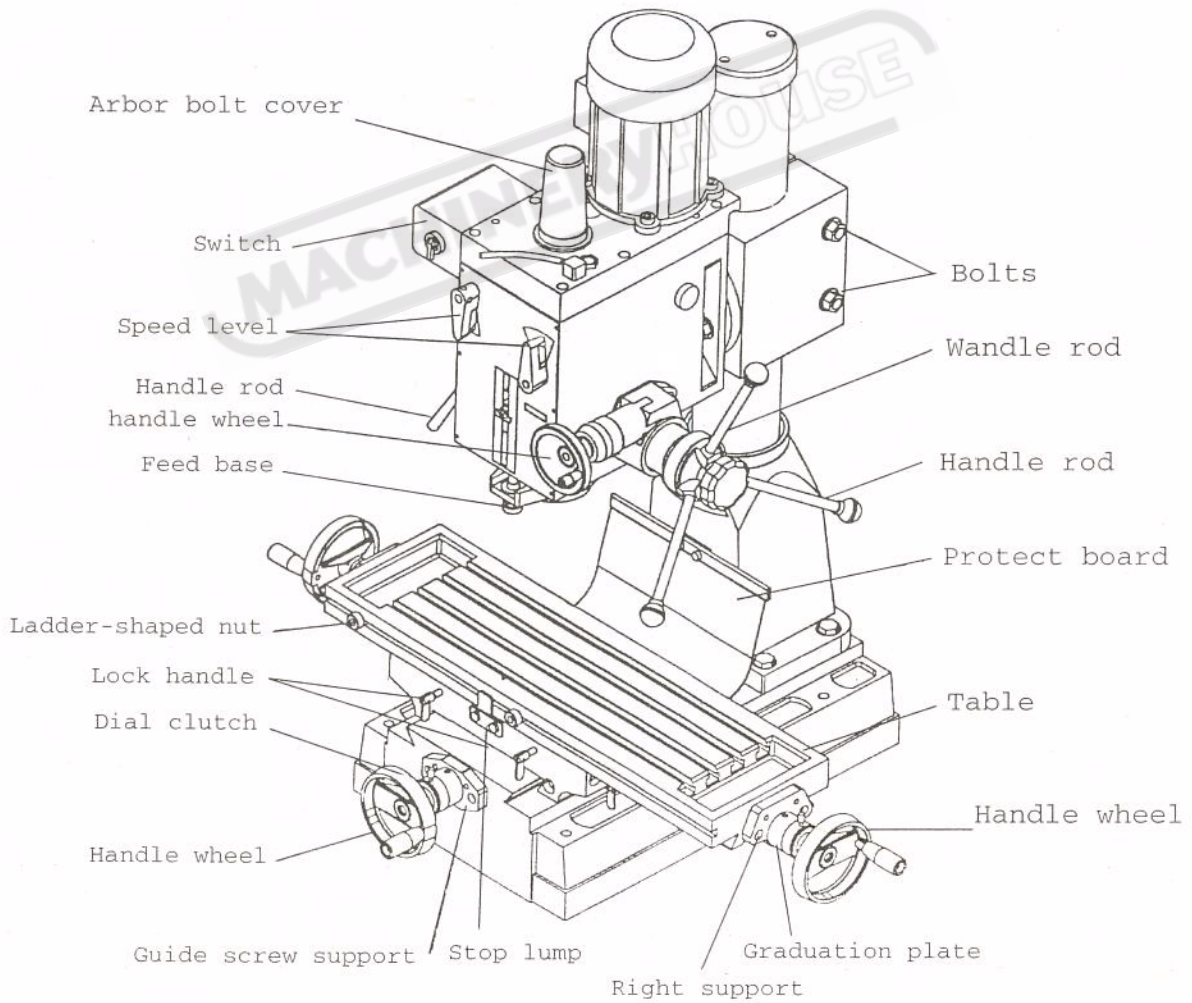
### ACCESSORIES:

Tapered bar	MT.3-B18/R8-JT3	1
Drill chuck	16mm	1
Face milling cutter	80mm	1
Handle of spindle head	24mm	1
Lock wrench		1
Inner hex wrench	4, 5, 6mm	each 1
Arbor bolt		1(in the table)
Tapered sleeve*	MT.3-MT.2    MT.4-MT.3	1 (MT.4-MT.3only for MT.4spindle)
Slotted tapered sleeve		Only for MT.4 spindle
Wedge*		1

Note: When R8 is selected, there is no tapered sleeve and no wedge.



### HM-36





# HM-46

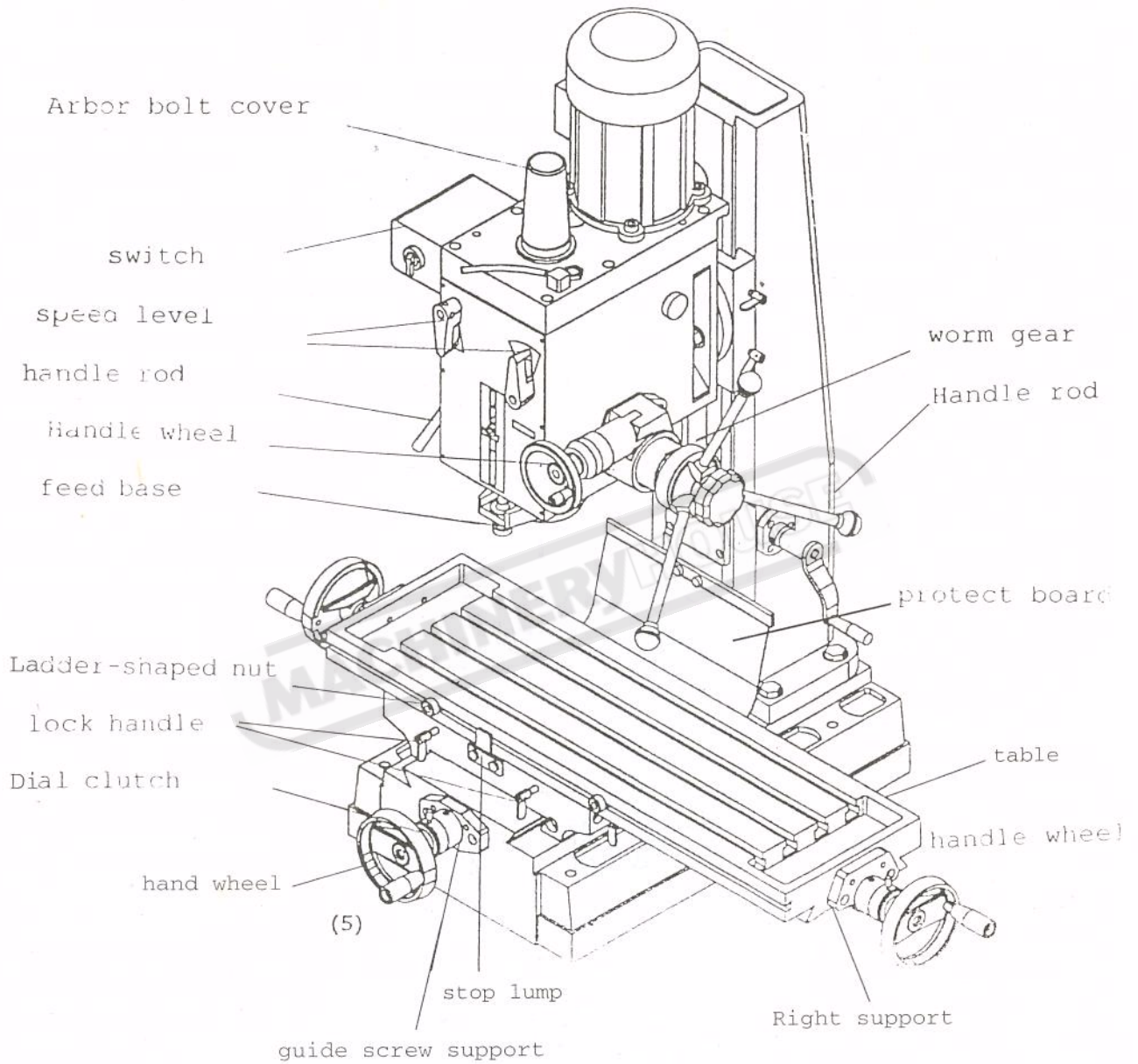


Fig.3

## Speed changing

The main driving route of the machine is as follows: motor ---three groups of gears----splined sleeve ---spindle , when using a motor with a 1400r/min as power, 6 spindle speeds from 95 r/min to 1600 r/min can be obtained by shifting the position of sliding gears. If it is needed to change the spindle speed. **Please turn off the power at first**, then turn the changing -speed handle to the required position.

**Note: Before changing the speed, the power must be turned off at first.**

r/min	L1	L2	L3	H1	H2	H3
50Hz	95	170	280	540	960	1600
60Hz	120	210	345	670	1180	1970

There are two forms of the spindle feeding mechanism. One is the direct feeding form: The spindle feeding is performed by the drilling handle on the gear shaft directly. Under this condition, the spindle feeds 88mm as the gear shaft turns one time. The other form is micro-feeding form: when the hand feeding wheel drives the worm gear through the cone clutch driving the gear shaft to feed the spindle. The spindle feed 2.5mm as the hand feeding wheel turns one time

## CLEANING

- 1) Your machine has been coated with a heavy grease to protect it in shipping. This coating should be completely removed before operating the machine. Commercial degreaser, kerosene or similar solvent may be used to remove the grease from the machine, but avoid getting solvent on belts or other rubber parts.
- 2) After cleaning, coat all bright work with a light lubrication. Lubricate all points with a medium consistency machine oil.

## Lubrication

All ball bearings in your mill/drill are sealed for life, requiring no lubrication. Points requiring lubrication are:

- 1) Internal spline drive assembly. Keep this area well lubricated with a good grade non-hardening grease. Insert grease in the hole at the top of spindle pulley spline driver. lube twice yearly.
- 2) A light film of oil applied to the quill and column will reduce wear, prevent rust, and assure ease of operation.
- 3) Quill return spring should receive oil (SAE 20) once yearly. Remove cover plate and apply oil with squirt can or small brush.
- 4) **IMPORTANT:** The gear box should be oiled with a lubricant such as SAE 68 oil in level. CHANGE OIL EVERY ONE YEAR.

**CHANGE THE GEAR BOX OIL:** Tilt the head stock over as shown in Fig 2. Open the



oil drain plug to allow the oil to drain from the opening completely. Then lock the oil drain plug and turn the head to be upright position. Remove the oil filler plug fill the oil to the gear box until the oil level reach the middle of oil fluid level indicator. Then lock the plug.

5) Apply Lubriplate to quill pinion every 90 days.

**Note:** use extreme care when performing this operation and keep hands clear of pinch points. When using paraffin bar, do this only by turning the sheaves by hand. Do not apply with motor running.

## PRECAUTION FOR OPERATION

Check all parts for proper condition before operation; if normal safety precautions are noticed carefully, this machine can provide you with standing of accurate service.

1) Before operation

a) Fill the lubricant.

b) In order to keep the accurate precision, the table must be free from dust and oil deposits.

c) Check to see that the tools are correctly set and the workpiece is set firmly.

d) Be sure the speed is not set too fast.

e) Be sure everything is ready before use.

2) After operation

a) Turn off the electric switch.

b) Turn down the tools.

c) Clean the machine and coat it with lubricant.

d) Cover the machine with cloth to keep out the dust.

3) Adjustment of head

a) To raise and lower the head, loosen the two heavy duty head lock nuts shown in Fig.4. Use the left side head handle to raise and lower the head on its rack and pinion mechanism. When the desired height is reached, tighten the bolts to avoid vibration.

b) Head may be rotated 360° by loosening the same bolts mentioned above. Adjust the head to the desired angle, then fix the heavy duty head locknuts. It is tighten the same time to fix the head if drilling & milling too much.

c) Unscrew 3 nuts while the workpiece needs to be bevel drilled. Turn to the degrees you wish on the scale, then screw the 3.

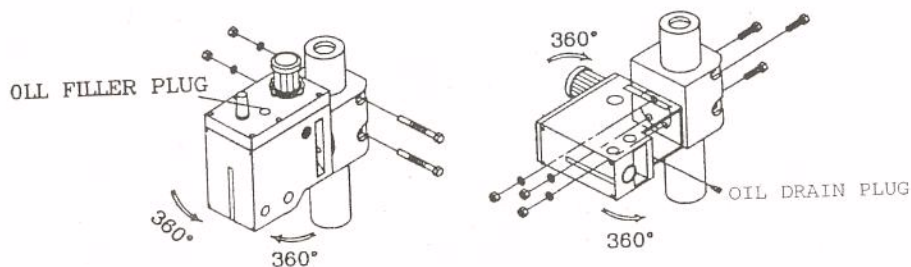


Fig.4

4) Preparing for drilling (see Fig.5).

Turn off the knob make loose the taper body of worm gear and spring base. Then we decide spindle stroke setting the positive depth stop gauge for drilling blind hole or free state for pass hole.

5) Preparing for milling (see Fig.5).

a) Adjust the positive depth stop gauge to highest point position.

b) Turn tight of the knob be use to taper friction force coupling the worm gear and spring base. Then turning the handle wheel by micro set the spindle of workpiece machining height.

c) Lock the rack sleeve at the desired height with fixed bolt.

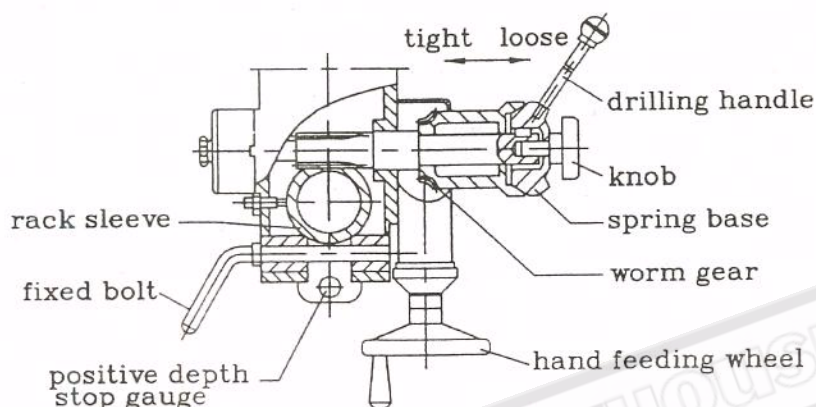


Fig.5

**Quill return spring adjustment:**

Spring tension for return of spindle, after hole drilling, has been pre-set at the factory. No further adjustment should be attempted unless absolutely necessary. Adjustment will probably be required if a multiple spindle drilling or tapping head is used. If adjustment is necessary, loosen lock screw while holding quill spring housing. Do not allow the housing to turn in your hand, or spring will unwind. Turn entire housing assembly clockwise the number of turns necessary to cause the quill to return to its up position. (**Note:** The flat of the spring housing pilot is lined up with the spring loading hole on the body of the spring housing.)

Reset lockscrew make sure point of screw mates to flat on the housing journal.

**Adjusting table slack and compensate for wear (see Fig.6)**

- 1) Your machine is equipped with jib strip adjustment to compensate for wear and excess slack on cross and longitudinal travel.
- 2) Clockwise rotation the job strip bolt with a big screw for excess slack otherwise a little counter clockwise if too tight.
- 3) Adjust the jib strip bolt until feel a slight drag when shifting the table.

**Clamping, table base, and machine base (see Fig.6)**



- 1) When milling longitudinal feed, it is advisable to lock the cross feed table travel to insure the accuracy of your work. To do this, tighten the small leaf screw on the right side of the table base.
- 2) To tighten the longitudinal feed travel of the table for cross feed milling, tighten the two small leaf screw on the front of the table base.
- 3) Adjustable travel stops are provided on the front of the table for control of cross travel and the desired milling length.

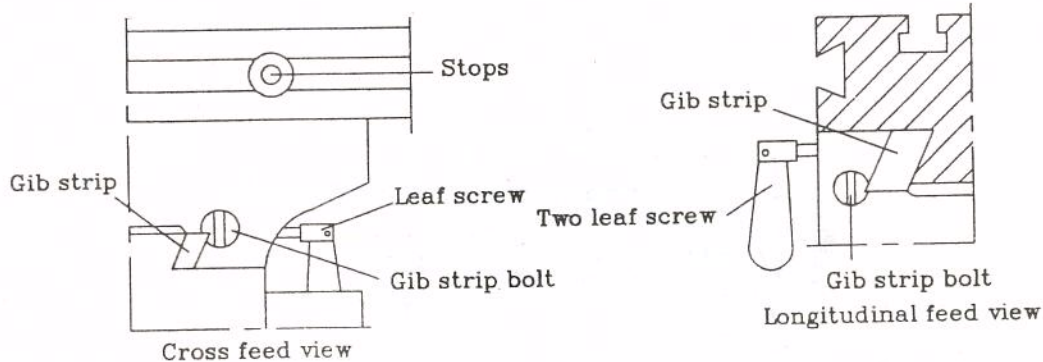


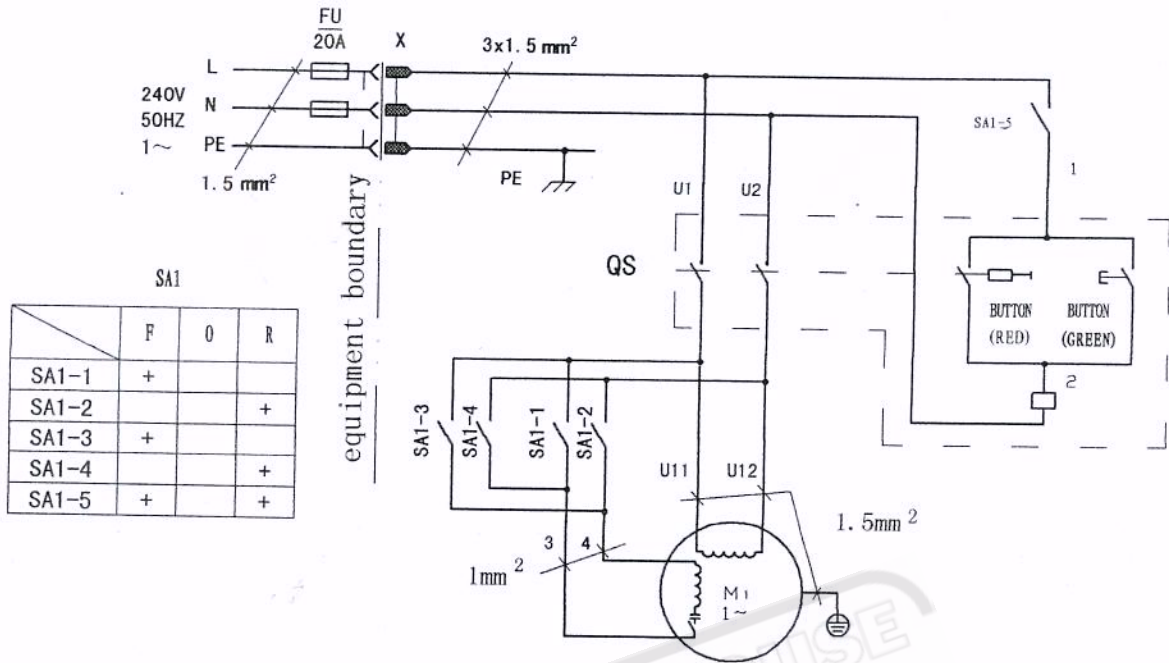
Fig.6

### To change tool

- 1) Removing face mill or drill chuck arbor.  
Loosen the arbor bolt at the top of the spindle shaft approximately 2 turns with a wrench. Rap the top of the arbor bolt with a mallet. After taper has been broken loose, holding chuck arbor on hand and turn detach the arbor bolt with the other hand.
- 2) To install face mill or cutter arbor.  
Insert cutter and cutter arbor into the taper of spindle. Tighten arbor bolt detach securely, but do not over-tighten.
- 3) Removing taper drills.
  - a) Turn down the arbor bolt insert the taper drill into the spindle shaft.
  - b) Turn the rapid down handle rod down until the oblong hole in the rack sleeve appears. Line up this hole with the hole in the spindle. Insert key punch key through holes and strike lightly with a mallet. This will force the taper drill out.



Electric system



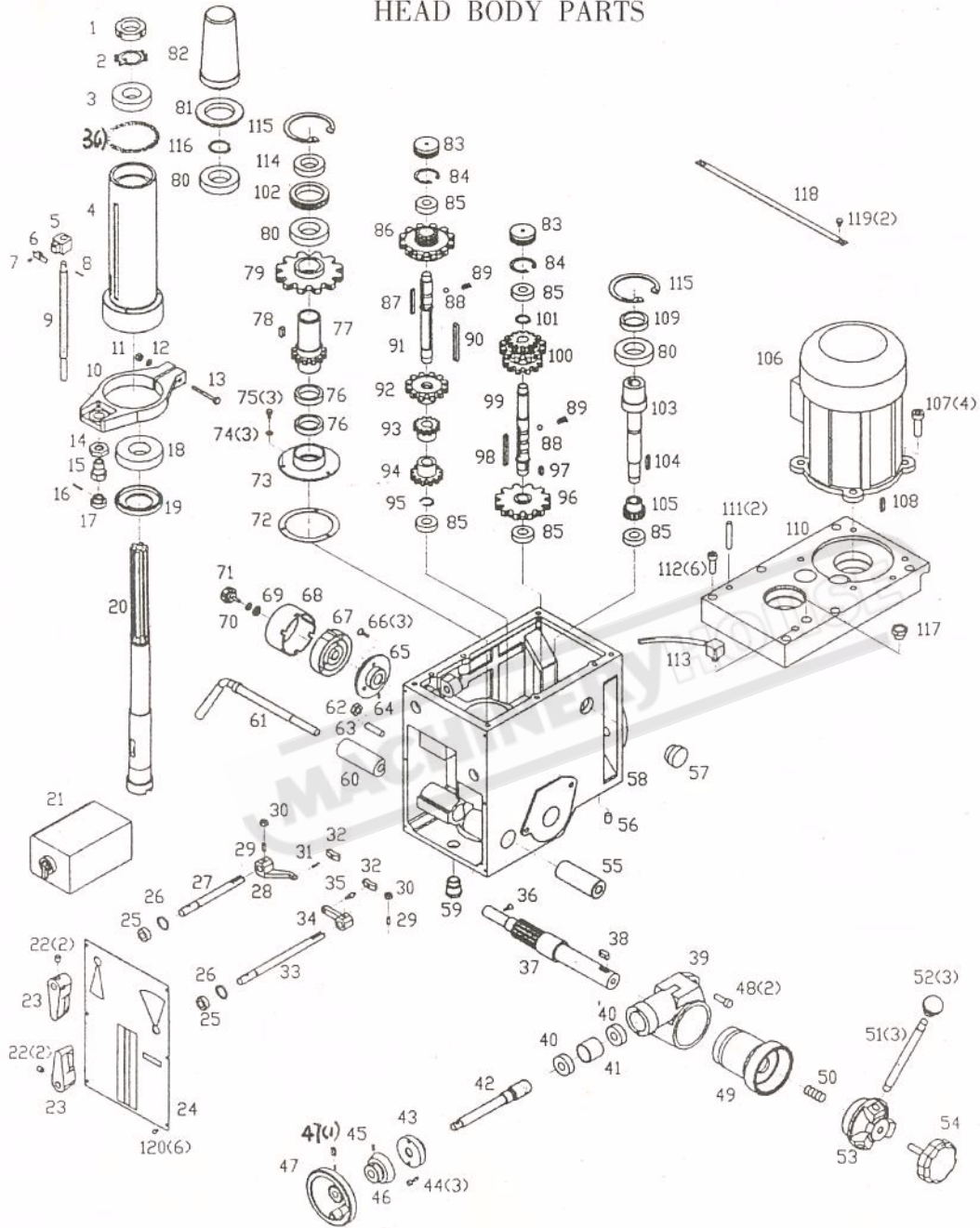
SA1			
	F	O	R
SA1-1	+		
SA1-2			+
SA1-3	+		
SA1-4			+
SA1-5	+		+

MACHINERYHOUSE

## TROUBLE SHOOTING HINTS

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive vibration	<ol style="list-style-type: none"> <li>1 Motor out-of-balance</li> <li>2 Bad motor</li> </ol>	<ol style="list-style-type: none"> <li>1 Balance or replace problem motor</li> <li>2 Replace motor</li> </ol>
Motor stalls	<ol style="list-style-type: none"> <li>1 Over feeding</li> <li>2 Dull drill</li> <li>3 Motor not building up to running speed</li> <li>4 Bad motor</li> </ol>	<ol style="list-style-type: none"> <li>1 Reduce feed rate</li> <li>2 Sharpen drill and keep sharp</li> <li>3 Replace or repair motor. Check fuses in all three legs on three phase motors and replace if necessary</li> <li>4 Replace motor</li> </ol>
Noisy operation	<ol style="list-style-type: none"> <li>1 Excessive vibration</li> <li>2 Improper quill adjustment</li> <li>3 Noisy spline</li> <li>4 Noisy motor</li> </ol>	<ol style="list-style-type: none"> <li>1 Check remedy under excessive vibration</li> <li>2 Adjust quill</li> <li>3 Lubricate spline</li> <li>4 Check motor bearings or for loose motor fan</li> </ol>
Drill or tool heats up or burns work	<ol style="list-style-type: none"> <li>1 Excessive speed</li> <li>2 Chips not clearing</li> <li>3 Dull tool</li> <li>4 Feed rotate too slow</li> <li>5 Rotation of drill incorrect</li> <li>6 Failure to use cutting oil or coolant (on steel)</li> </ol>	<ol style="list-style-type: none"> <li>1 Reduce speed</li> <li>2 Use pecking operation to clear chips</li> <li>3 Sharpen tool or replace</li> <li>4 Increase feed enough to clear chips</li> <li>5 Reverse motor rotation</li> <li>6 Use cutting oil or coolant on steel</li> </ol>
Drill leads off	<ol style="list-style-type: none"> <li>1 No drill spot</li> <li>2 Cutting lips on drill off center</li> <li>3 Quill loose in head</li> <li>4 Bearing play</li> </ol>	<ol style="list-style-type: none"> <li>1 Center punch or center drill workpiece</li> <li>2 Regrind drill</li> <li>3 Tighten quill</li> <li>4 Check bearings and reseal or replace if necessary</li> </ol>
Excessive drill runout or wobble	<ol style="list-style-type: none"> <li>1 Bent drill</li> <li>2 Bearing play</li> <li>3 Drill not seated properly in chucks</li> </ol>	<ol style="list-style-type: none"> <li>1 Replace drill .do not attempt to straighten</li> <li>2 Replace or reseal bearings</li> <li>3 Loosen, reseal and tighten chuck</li> </ol>
Work or fixture comes loose or spins	Failure to clamp workpiece or work holding device to table	Clamp workpiece or work holding device to table surface

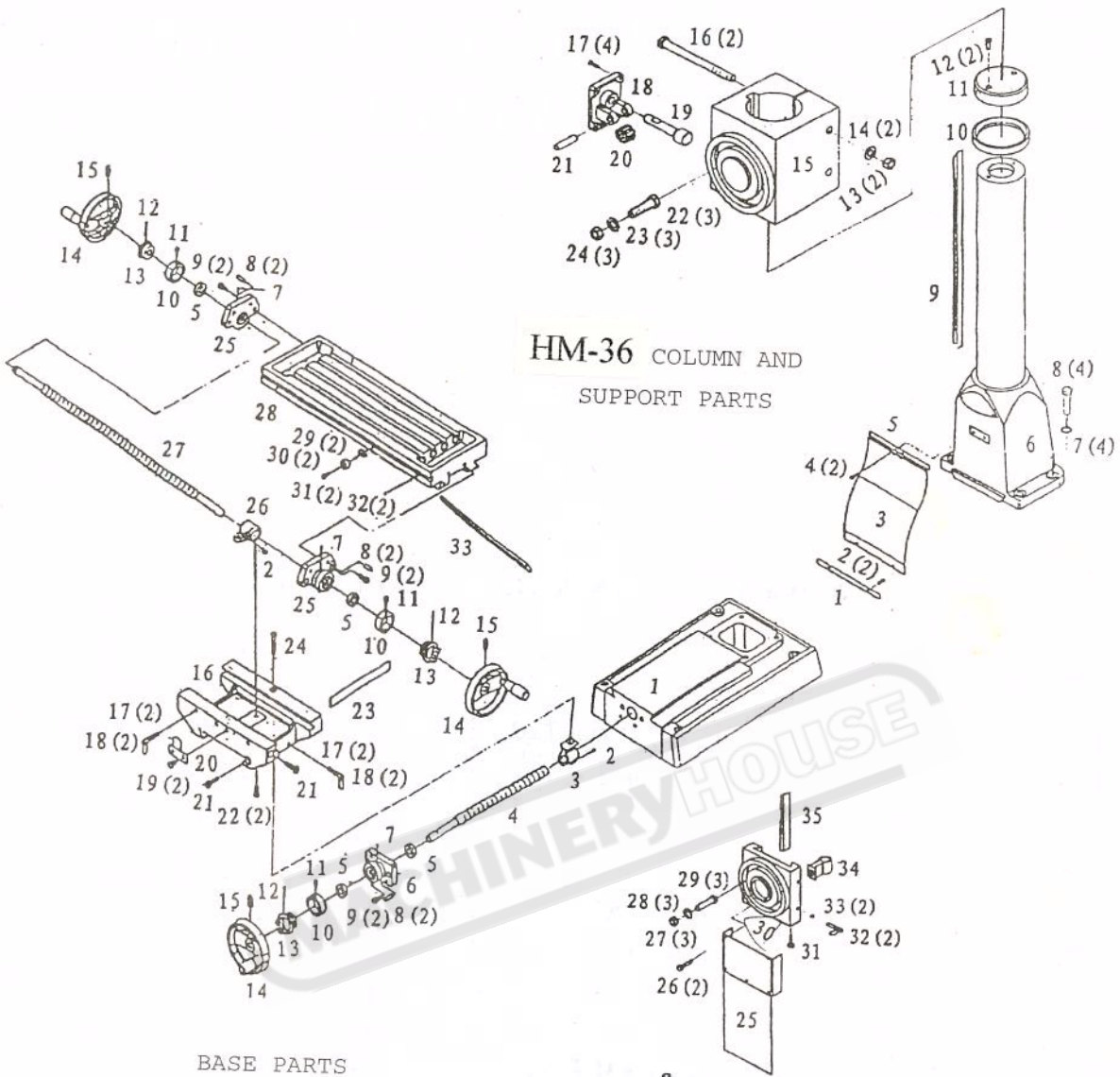
### HEAD BODY PARTS



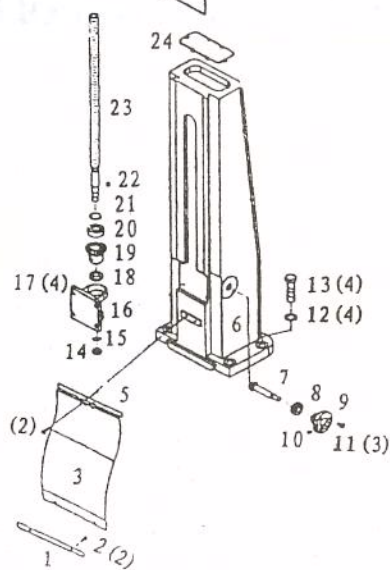


## HM-36 ), ZX7040. HM-46 HEAD BODY

1	lock nut	41	separating ring	81	arbor bolt cover base
2	lock washer	42	worm shaft	82	arbor bolt cover
3	ball bearing	43	worm cover	83	cap
3(1)	washer	44	screw	84	retainging ring
4	sleeve	45	screw	85	ball bearing
5	fixed bolt	46	graduation plate	86	gear
6	scale-board	47	handle wheel	87	key
7	screw	47(1)	screw	88	steel ball
8	pin	48	screw	89	spring
9	graduated rod	49	worm gear	90	key
10	feed base	50	spring	91	shaftIII
11	nut	51	handle rod	92	gear
12	washer	52	handle ball	93	gear
13	screw	53	handle body	94	gear
14	nut	54	big ripple handle	95	retainging ring
15	support	55	fixed tight collar	96	gear
16	pin	56	oil cover	97	key
17	knob	57	oil pointer	98	key
18	ball bearing	58	head body	99	shaft II
19	bearing cup	59	fixed nut	100	gear
20	spindle	60	fixed tight collar	101	retainging ring
21	electric box	61	handle rod	102	separating ring
22	screw	62	nut	103	motor shaft
23	speed lever	63	screw	104	key
24	name plate	64	pin	105	gear
25	oil seal	65	spring base	106	motor
26	retainging ring	66	washer	107	screw
27	lever shaft(left)	67	spring plate	108	key
28	lever(left)	68	spring cap	109	oil seal
29	screw	69	washer	110	head body cover
30	nut	70	washer	111	pin
31	pin	71	small ripple handle	112	screw
32	lever bracket	72	airtight ring	113	pipe radiator
33	lever shaft(right)	73	airtight base	114	oil seal
34	lever(right)	74	washer	115	retainging ring
35	pin	75	screw	116	retainging ring
36	screw	76	oil seal	117	oil cap
37	pinion shaft	77	gear	118	degree-meter
38	key	78	key	119	screw
39	feed cover	79	gear	120	screw
40	ball bearing	80	ball bearing		



**HM-46**  
COLUMN AND SUPPORT



## BASE PARTS

1 base	12 pin	23 gib strip
2 screw	13 dial clutch	24 screw
3 guide screw nut	14 handwheel	25 right support
4 protect board	15 screw	26 guide screw nut
5 ball bearing	16 slip saddle	27 guide screw
6 guide screw support	17 steel ball	28 table
7 oil cup	18 lock handle	29 ladder-shaped nut
8 pin	19 screw	30 stop lump
9 screw	20 stop lump	31 screw
10 graduation plate	21 gib screw nut	32 oil cup
11 screw	22 bolt	33 gib strip screw

### HM-36 COLUMN AND SUPPORT PARTS

1 protect board slice	9 rack	17 screw
2 bolt	10 link	18 bracket
3 protect board	11 column lid	19 worm shaft
4 bolt	12 washer	20 gear
5 protect board fixed	13 nut	21 shaft
6 column	14 washer	22 bolt
7 washer	15 toraise and lower	23 washer
8 bolt	16 bolt	24 nut

### HM-46 ZX7045 COLUMN AND SUPPORT PARTS

1 protect board slice	13 bolt	24 column nut
2 bolt	14 round nut	25 antidust plate
3 protect board	15 tab washer for round nut	26 screw
4 bolt		27 nut
5 protect board fixed	16 head raise bracket	28 washer
6 column	17 screw	29 boit
7 gear shaft	18 ball bearing	30 toruise and lower
8 ball bearing	19 gear	31 screw
9 head raise bracket	20 ball bearing	32 lock handle
10 oil cup	21 retainger ring	33 steel ball
11 screw	22 key	34 column nut
12 washer	23 guide screw	35 grib strip