

INSTRUCTION MANUAL

QLD Schools / TAFE - GHD-38B Geared Head Drill (415V) 40mm



K8702

INSTRUCTION BOOK

MODEL NO

GHD-38A

EXTRA ACCESSORIES

 +

MOTOR POWER

 HP r. p. m v. Hz.

COOLANT PUMP

MACHINE PREPARED FOR CONNECTING TO

 V.

SERIAL NO

MANUFACTURING YEAR

SUPPLIED TO

DELIVERY DATE



When ordering replacement parts, please furnish:
MODEL NO—SERIAL NO—PART NO

MAIN SPECIFICATIONS

Maximum drilling diameter	35mm
Taper of spindle hole	MT4 [#]
Distance from the center of spindle to The surface of the vertical column	350mm
Maximum travel of spindle	180mm
Range of spindle speed	50~1450rpm/100~1450rpm
Maximum distance from spindle nose to Base plate working surface	1320mm
Maximum distance from spindle nose to working table	780mm
Dimensions of working table	560×385/560×560mm
Dimensions of base	730×405mm
Width of T-slot	18mm
Distance of T-slot of base	150mm
Range of feed	0.1, 0.2mm/rev
Power of main motor	1.5kw
Power of coolant pump	60W
Overall dimension (L×W×H)	730×560×2220mm
Packing size (L×W×H)	1150×700×2280mm
Gross weight/Net weight	610/460kg

TRANSPORT

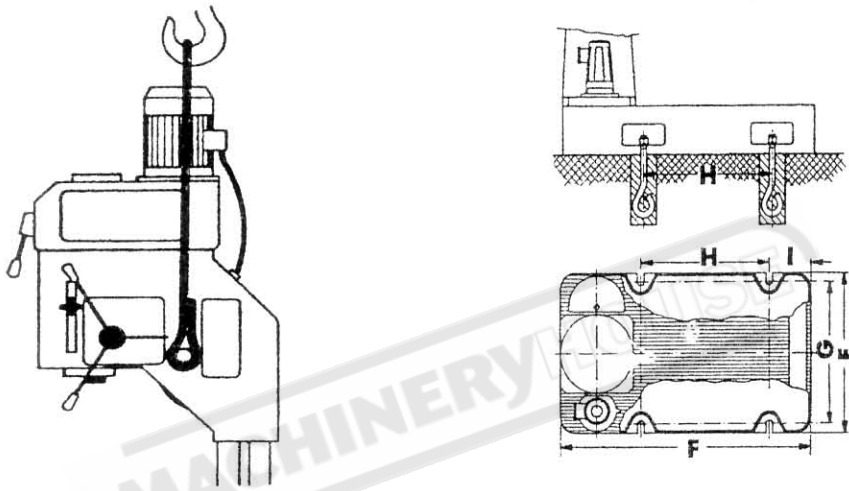
Insert an iron bar through the transversal hole in the machine head which ,with the aid of a rope ,will be used for lifting the machine.

INSPECTION

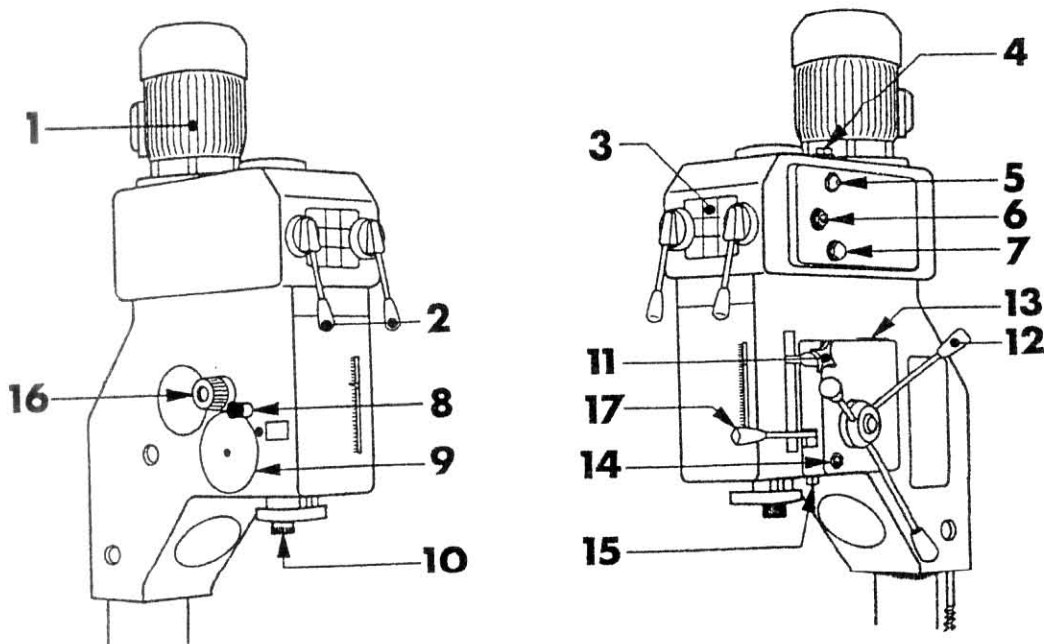
The machine should be carefully examined on arrival, to check that it is complete and in good order , so that claims can be made , if necessary.

CLEANING

Remove all anti-rust compounds. Clean and lubricate all movable parts.



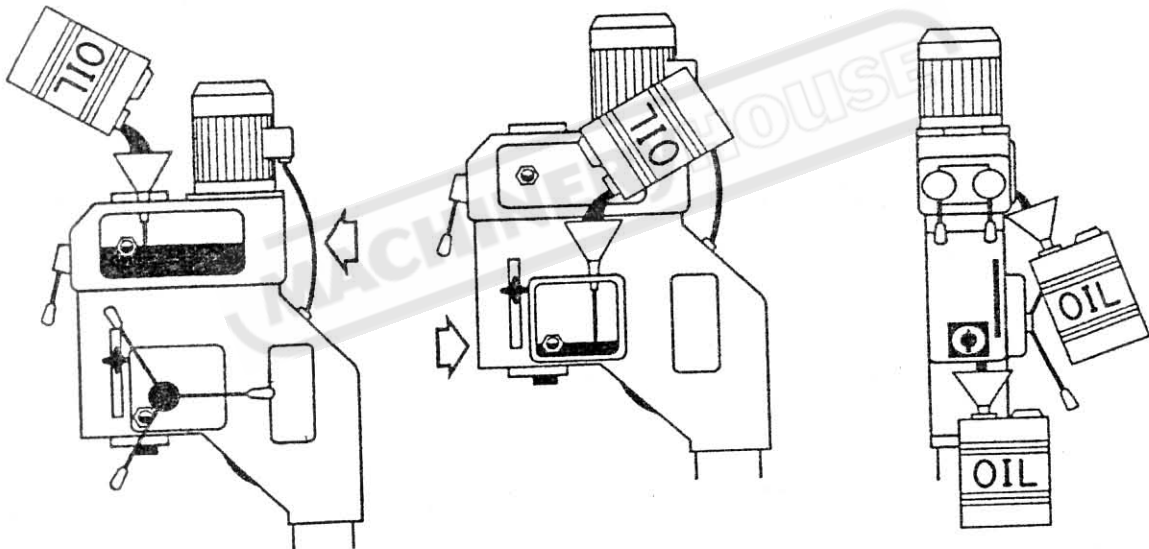
	E	F	G	H	I
mm.	410	730	360	410	115
inch	16 1/8"	28 3/4"	14 1/8"	16 1/8"	4 1/2"



GENERAL DESCRIPTION

- | | |
|-------------------------------|--------------------------------|
| 1 Driving motor | 10 Manual control for gear box |
| 2 Speed selectors | 11 Deep stop |
| 3 Speed plate | 12 Rapid manual feed control |
| 4 Oil filling opening | 13 Oil filling opening |
| 5 Oil pump control sight gage | 14 Oil level window |
| 6 Oil level window | 15 Oil draining plug |
| 7 Oil draining plug | 16 Feed selector |
| 8 Tool ejector | 17 Automatic feed lever |
| 9 Spiral spring housing | |
- 2 automatic feeds. Mechanical engaging—disengaging ,through lever.

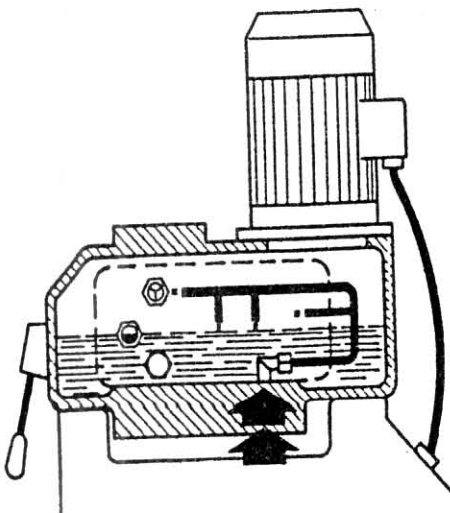
FILLING WITH OIL



4,5 lts.

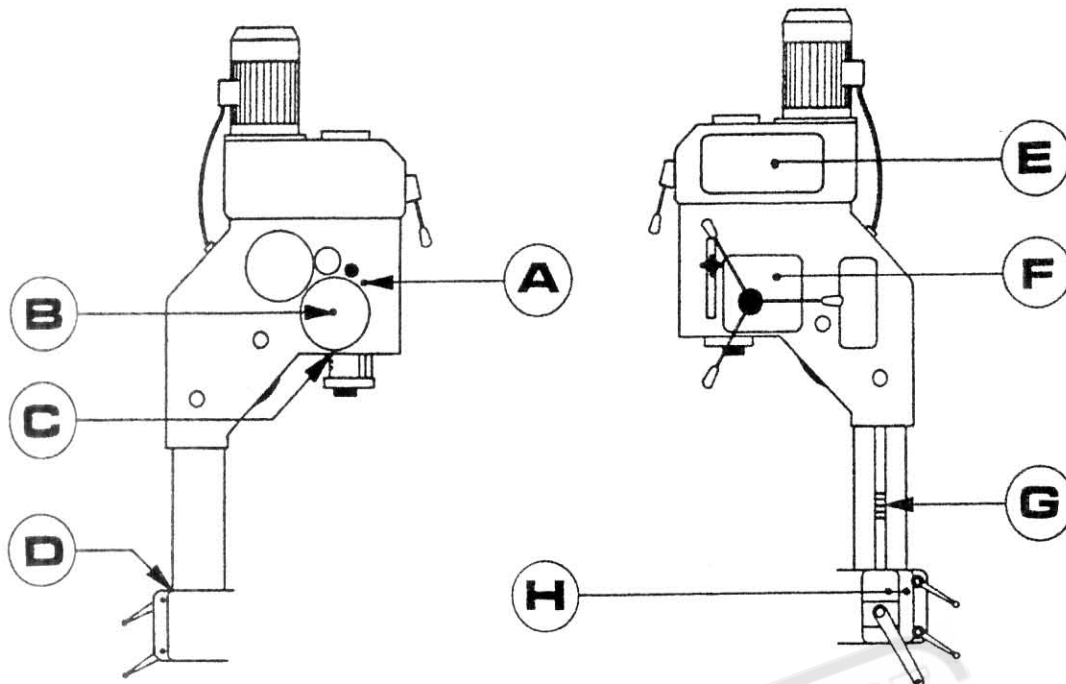
0,5 lts.

Empty



The speed box incorporates an oil pump to lubricate the gears.

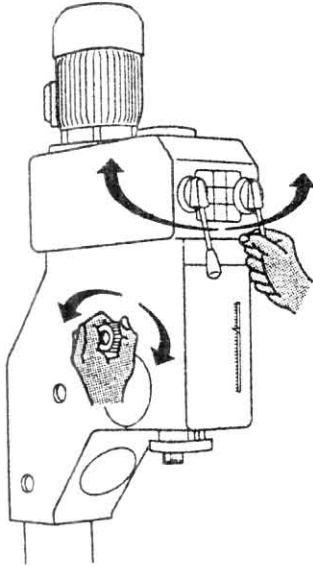
Attention! The machine is supplied without oil for transport reasons .Please ,follow the following instructions for filling the machine with oil:
Remove upper plug .Fill oil by using a funnel. Stop filling oil when oil level reaches the red mark on level window .This red mark must be never exceeded ,as otherwise ,the oil will overflow out the machine .
If this occurs , remove plug and drain oil until oil level goes down to red mark on level window .

LUBRICATION

- A** Quill Spindle Daily lubricate with oil the greaser located next the spiral spring cover .
- B** Quill gearing shaft Daily lubricate with oil the lubrication port on the spiral spring cover.
- C** Quill Clean and lubricate with grease the rack for upward and downward displacement of quill—spindle .
- D** Column Clean and grease with oil every 50 hours.
- E** Speed box Fill the box with oil until reaching the indicated level. Change oil every 2000 hours.
- F** Feed box Fill the box with oil until reaching the indicated level . Change oil every 2000 hours.
- G** Rack Clean and lubricate with grease every 50 hours.
- H** Table Daily lubricate with oil the two lubrication points.

SPEED SELECTOR

By means of levers spindle speeds are selected . Left lever selects a colour . Depending on the color selected ,right lever selects a spindle speed value . For moving these levers , slightly pull them and the rotate.



FEEDS SELECTOR

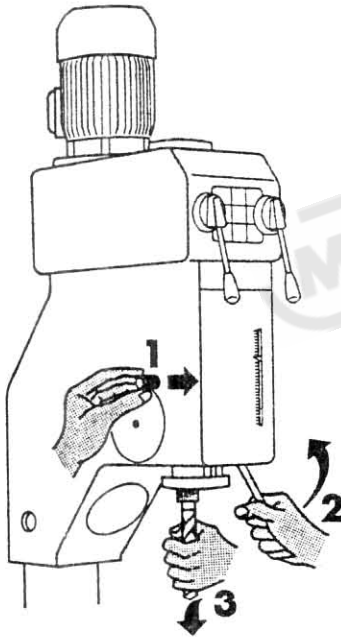
To select the feed speed , turn the side selector until the required point (value).

AUTOMATIC TOOL EJECTOR

To remove the tool from the spindle , perform the following operations:

- 1.—Lower the spindle from the reels a little bit and introduce the extractor bolt .
- 2.—Raise the spindle from the reels.
- 3.—Hold the too with the hand when raising the spindle or it will fall on to the table.

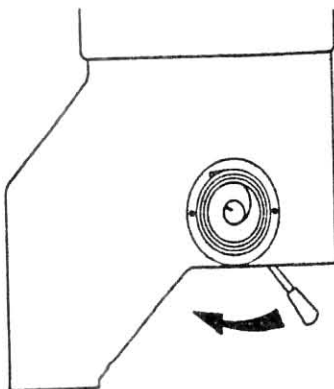
ATTENTION: Do not leave the extractor bolt introduced .

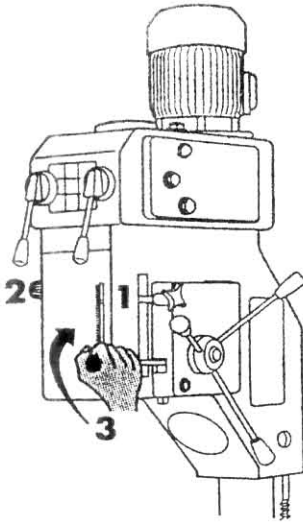


RETURN SPRING

To tauten the return spring in model extract the quill until the teeth of the working gear can move freely .Then move the reels in the arrow direction and introduce the quill again.

Unfasten the screws in the plastic cover and turn this cover in positive direction , once it is tautened , fasten the screws again.





AUTOMATIC FEED

Models incorporate mechanical automatic feed.

The way to proceed is the following:

- 1.— Regulate the stroke at the depth top.
- 2.— Select the feed.
- 3.— Place the lever of the automatic feed.

At the end of the stroke, the depth top displaces the lever of the automatic feed.

The lever can also be displaced manually.

TORQUE LIMITER

The gearbox is fitted with a stopping device which works in the event of overload.

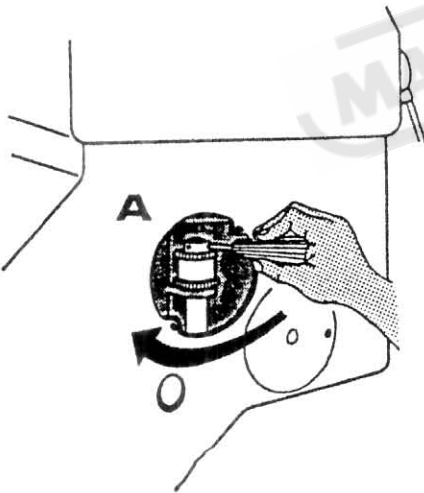
If the feed stops during drilling and the tool continues to revolve, it is a sign that it is overloaded.

When the load is reduced, the feed starts up again.

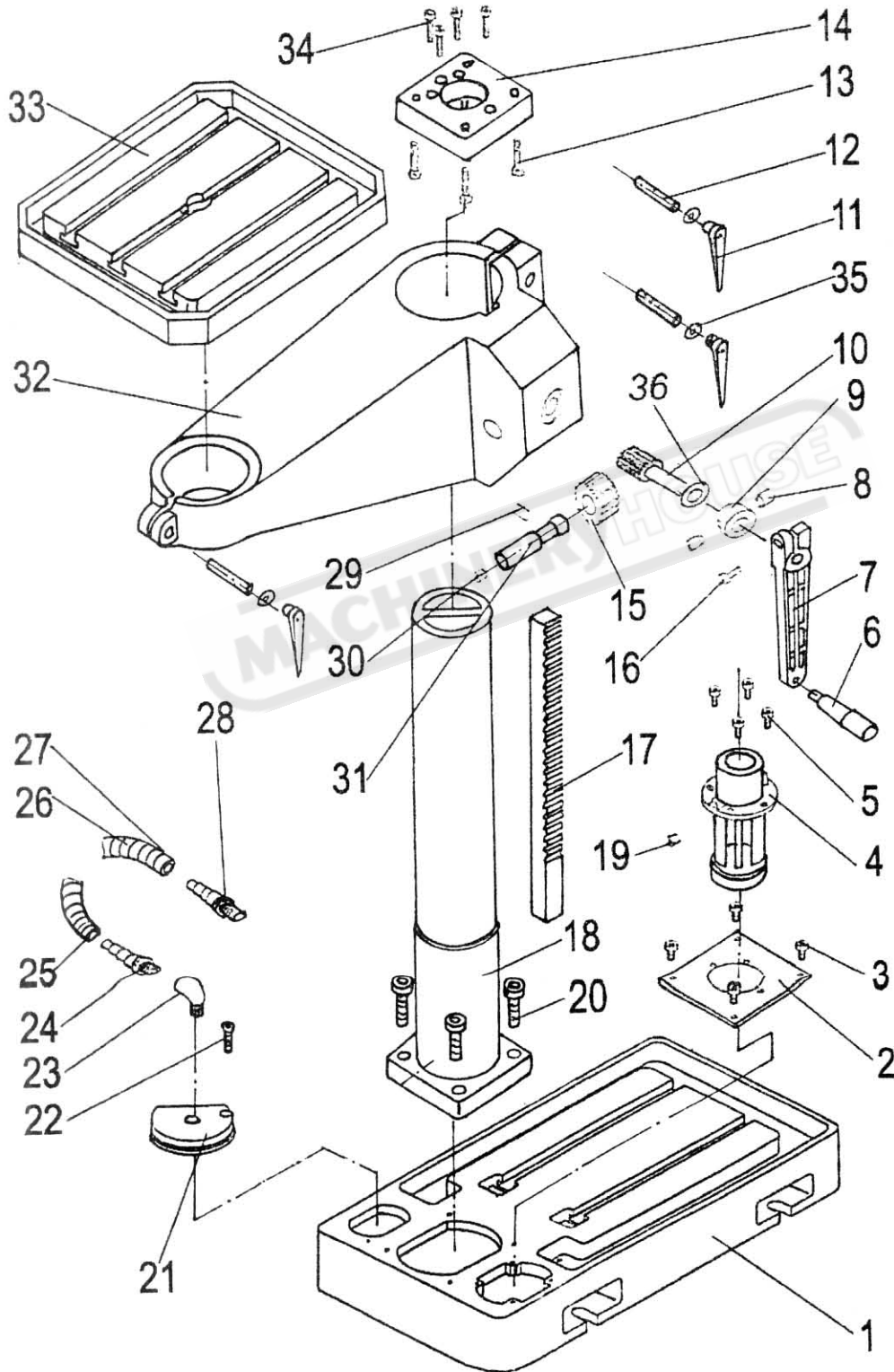
If for any reason, such as due to wear of the limiter discs or the need for a higher working load, it is required to readjust it, we recommend the following action.

—From the inspection hole and guided by the limiter assembly shown on page 17 tighten the nut Z5035-03-21.(Index No.79)

This mechanism has been adjusted in our works, by measuring the maximum admissible axial load, with a tensometer. Therefore, do not tighten the nut too much, so as to avoid the risk of breaking the mechanism.



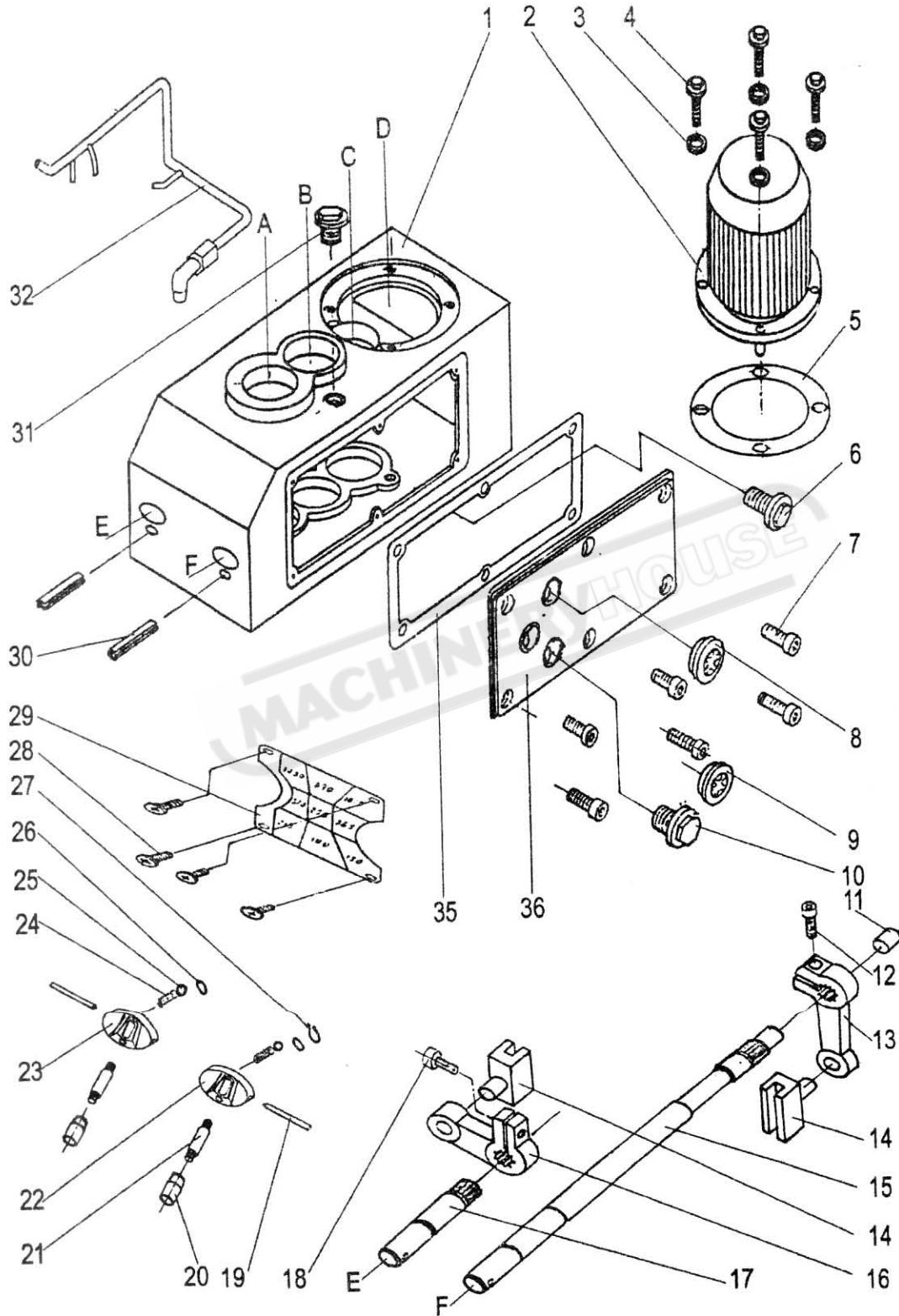
I . Table Support and Coolant



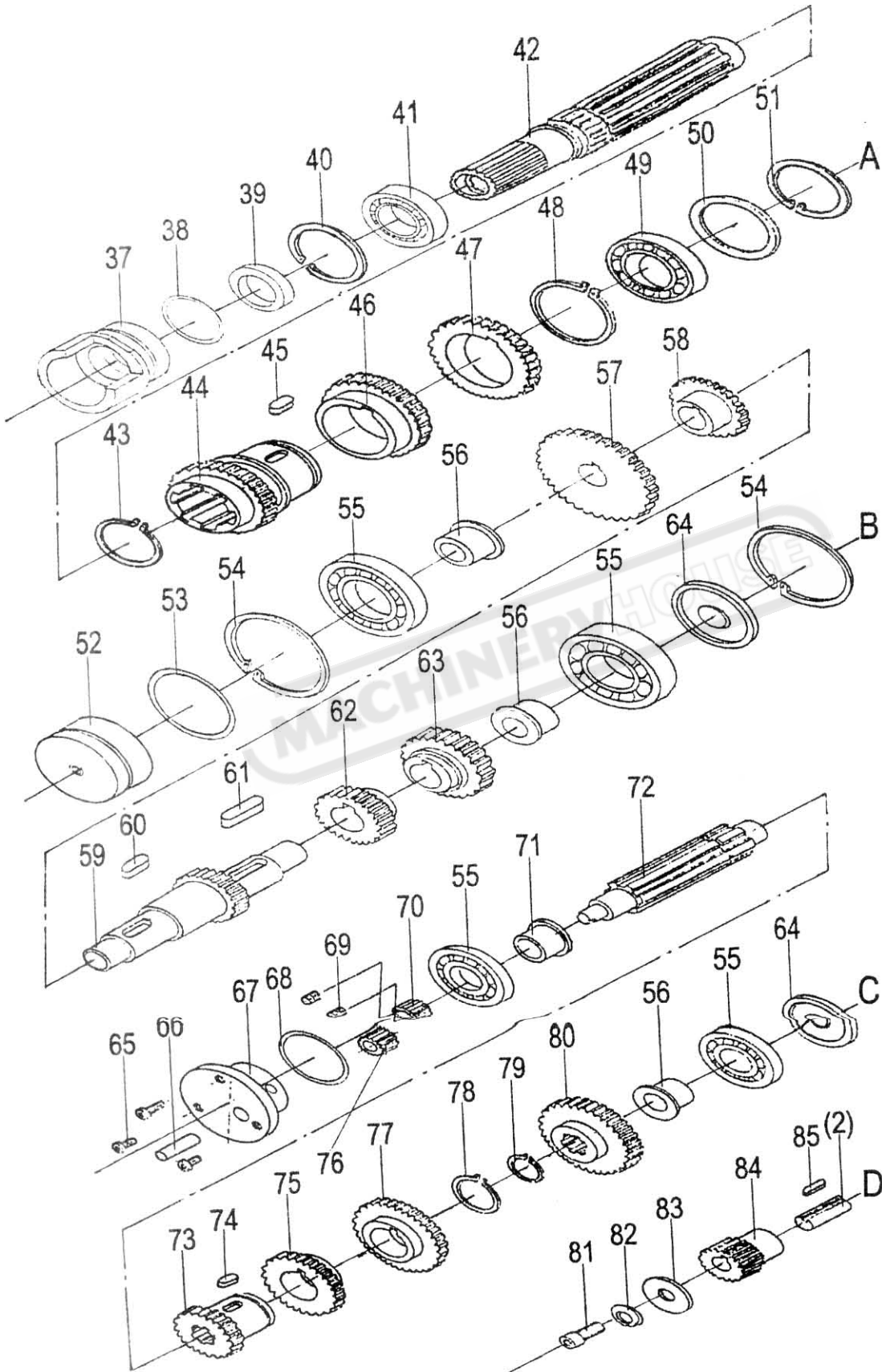
*Drilling Machine Instruction Book***I . Table Support and Coolant**

Index No.	Parts No.	Description	Qty.
1	Z5035-01-01	Base	1
2	Z5035-07-06	Plate	1
3	GB70/M6×12	Screw	4
4	AYB-12-GD	Coolant Pump	1
5	GB70/M6×12	Screw	4
6	GB4141.5/M10	Knob	1
7	Z5035-01-04	Handle	1
8	GB79/M10×10	Screw	2
9	Z5035-01-08	Clamp Collar	1
10	Z5035-01-07	Worm	1
11	Z52-2/A-M16×114	Knob	3
12	M16×90-C	Handle Shaft	3
13	GB70/M6×60	Screw	4
14	Z5035-01-12	Plate	1
15	Z5035-01-06	Gear	1
16	GB70/M8×30	Screw	1
17	Z5035-01-10	Rack	1
18	Z5035-01-02	Column	1
19	G38-3A/Z 3/8"	Plug	1
20	GB70/M14×60	Screw	3
21	Z5035-07-04	Cover Plate	1
22	GB70/M8×25	Screw	1
23	G32894/1/2"-3/8"	Reducing Nipple	1
24	Z5035-07-05	Elbow	1
25	φ16×1.5×1300	Flexible Tube	1
26	DN23×1.520.2100.14	Flexible Tube	1
27	ZBJ51002/32	Coupling	4
28	Z5035-07-02	Tee	1
29	GB77/M8×10	Screw	1
30	GB1155/8	Oil Cup	1
31	Z5035-01-05	Gear Shaft	1
32	Z5035-01-09	Table Support	1
33	Z5035-01-11	Table	1
34	GB70/M16×50	Screw	4
35	GB97/16	Washer	3
36	Z5035-01-13	Washer	1

II. Speed Box(1/2)



II. Speed Box(2/2)



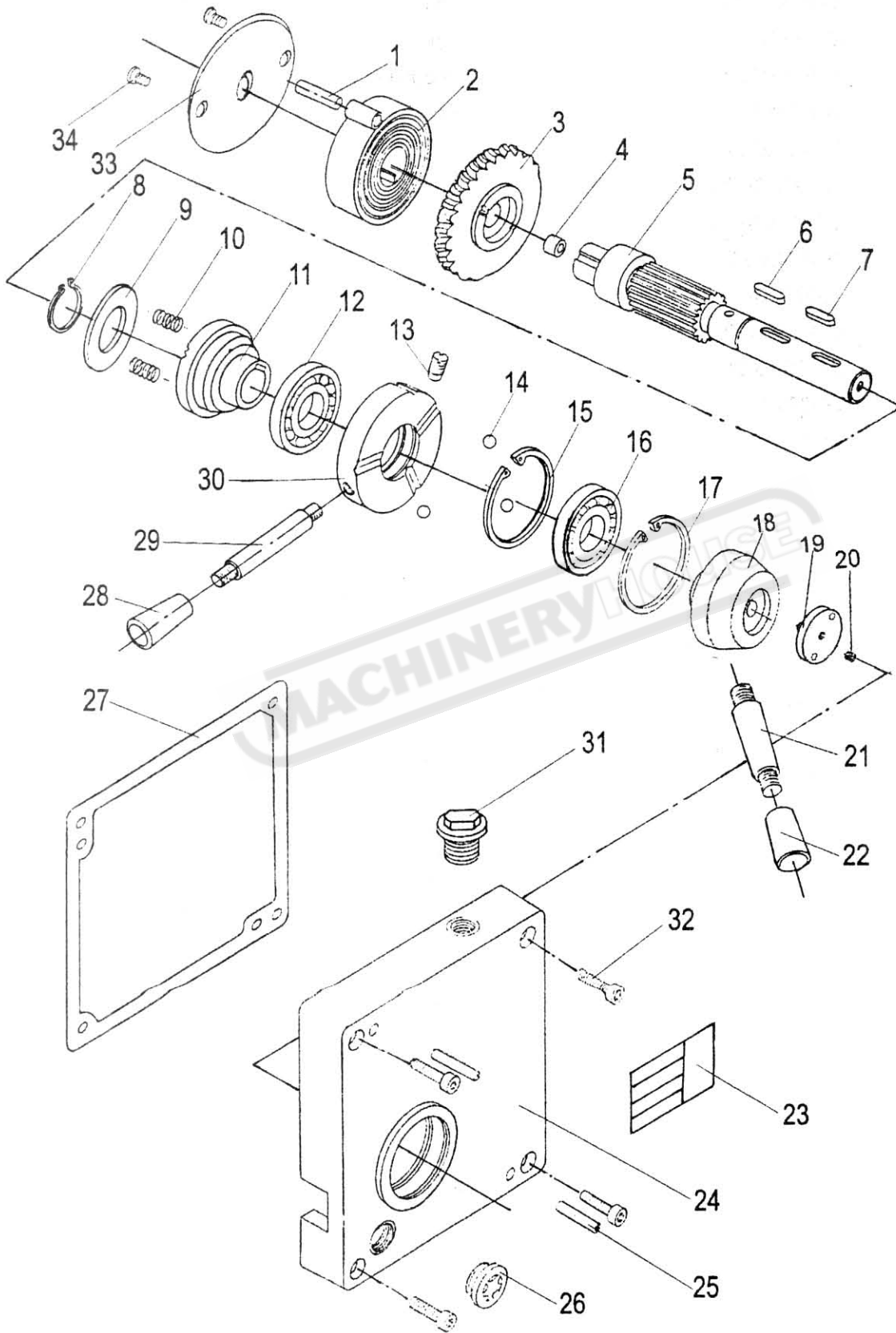
*Drilling Machine Instruction Book***II . Speed Box**

Index No.	Parts No.	Description	Qty.
1	Z5035-02-01	Gear Box	1
2	90L	Driving Motor	1
3	GB97.2/10	Washer	4
4	GB5781/M10×35	Screw	4
5	Z5035-02-28	Gasket	1
6	G38-3A/ Z3/8"	Drain Plug	1
7	GB70/M8×25	Screw	6
8	M27×1.5	Sight Glass	1
9	GB1160.2/B20	Sight Hub	1
10	G38-2A/M27×2	Screw	1
11	Z5035-02-43	Plug	1
12	GB70/M8×25	Screw	1
13	Z5035-02-34	Shift Lever	1
14	Z5035-02-31	Shift Fork	2
15	Z5035-02-32	Shaft	1
16	Z5035-02-30	Shift Lever	1
17	Z5035-02-29	Shaft	1
18	GB70/M8×20	Screw	1
19	Z5035-02-39	Pin	2
20	GB4141.14/BM10×50	Knob	2
21	Z5035-02-42	Handle	2
22	Z5035-02-37	Handle	1
23	Z5035-02-36	Handle	1
24	GB2089/1×9×18-2	Spring	2
25	GB308/10	Steel Ball	2
26	GB3452.1/17×1.8	O-Ring	2
27	GB894.1/20	Retainer Ring	1
28	GB818/M5×12	Screw	4
29	Z5035-02-28	Plate	4
30	GB879/5×12	Pin	2
31	G38-3A/ Z3/8"	Drain Plug	2
32	Z5035-02-40	Lubrication Tube	1
35	Z5035-02-35	Gasket	1
36	Z5035-02-33	Speed Box Lover	1
37	Z5035-02-27	Flange	1
38	GB3452.1/61.5×3.55	O-Ring	1
39	GB9877.1/FB405508	Spacer	1
40	GB893.1/68	Retainer Ring	1

Drilling Machine Instruction Book

41	GB279/160108	Bearing	1
42	Z5035-02-02	Shaft	1
43	GB894.1/48	Retainer Ring	1
44	Z5035-02-03	Gear	1
45	GB1567/8×5×32	Key	1
46	Z5035-02-04	Gear	1
47	Z5035-02-05	Gear	1
48	GB894.1/48	Retainer Ring	1
49	GB276/108	Bearing	1
50	Z5035-02-06	Plug	1
51	GB893.1/62	Retainer Ring	1
52	Z5035-02-24	Plug	1
53	GB3452.1/58×2.65	O-Ring	1
54	GB893.1/62	Retainer Ring	2
55	GB276/206	Bearing	4
56	Z5035-02-07	Sleeve	3
57	Z5035-02-25	Gear	1
58	Z5035-02-26	Gear	1
59	Z5035-02-09	Gear Shaft	1
60	GB1567/8×5×32	Key	1
61	GB1567/8×5×40	Key	1
62	Z5035-02-11	Gear	1
63	Z5035-02-10	Gear	1
64	Z5035-02-08	Pulg	2
65	GB70/M6×16	Screw	3
66	GB119/B10×40	Pin	1
67	Z5035-02-23	Flange	1
68	GB3452.1/58×2.65	O-Ring	1
69	GB71/M3×6	Screw	3
70	Z5035-02-21	Gear	1
71	Z5035-02-22	Sleeve	1
72	Z5035-02-13	Shaft	1
73	Z5035-02-18	Gear	1
74	GB1567/6×4×36	Key	1
75	Z5035-02-17	Gear	1
76	Z5035-02-20	Gear	1
77	Z5035-02-16	Gear	1
78	GB894.1/35	Retainer Ring	1
79	GB894.1/25	Retainer Ring	1
80	Z5035-02-14	Gear	1
81	GB70/M8×20	Screw	1
82	GB93/8	Washer	1
83	GB96/8	Washer	1
84	Z5035-02-15	Gear Shaft	1
85	GB1567/C6×4×28	Key	1

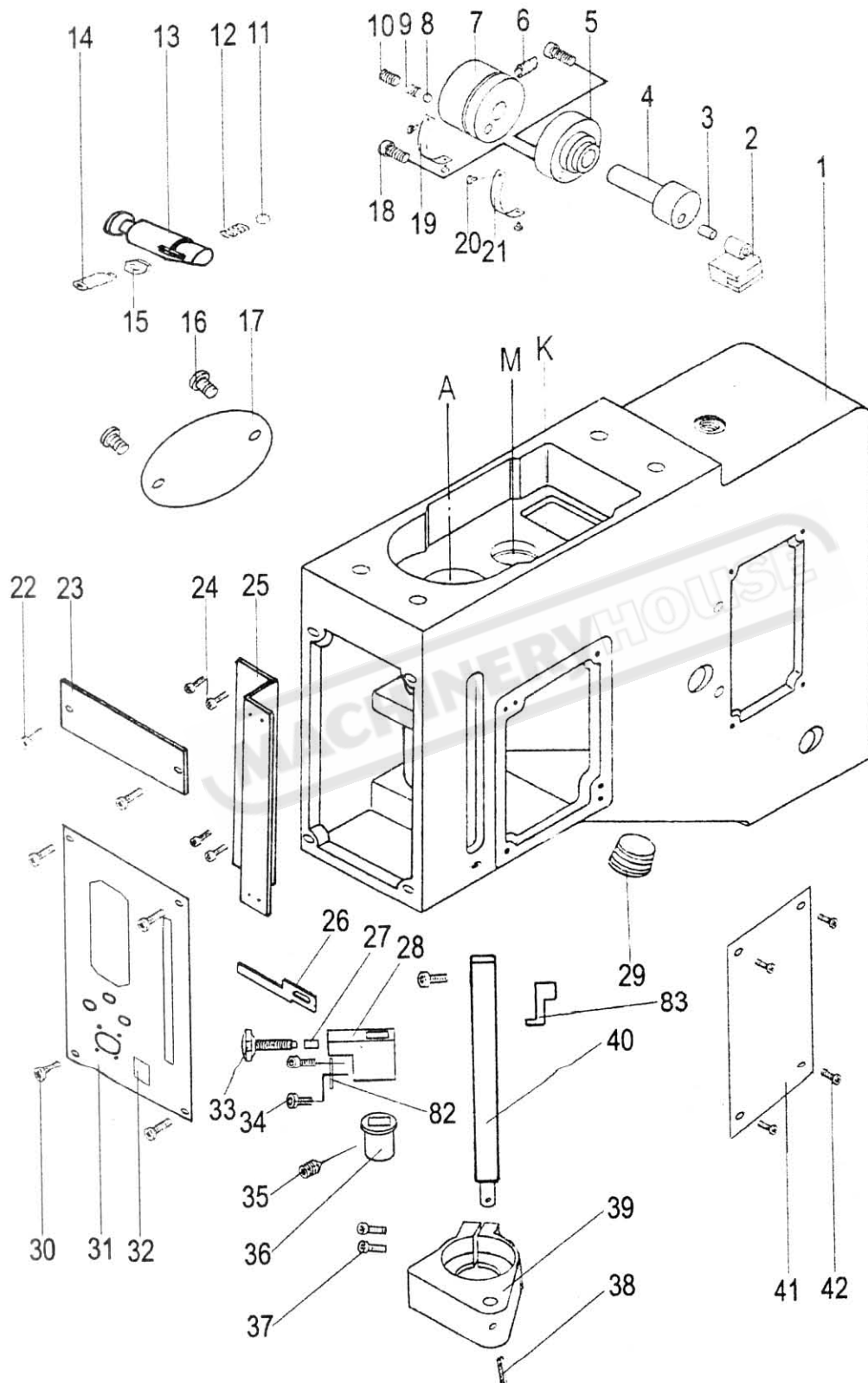
III. Feed Box



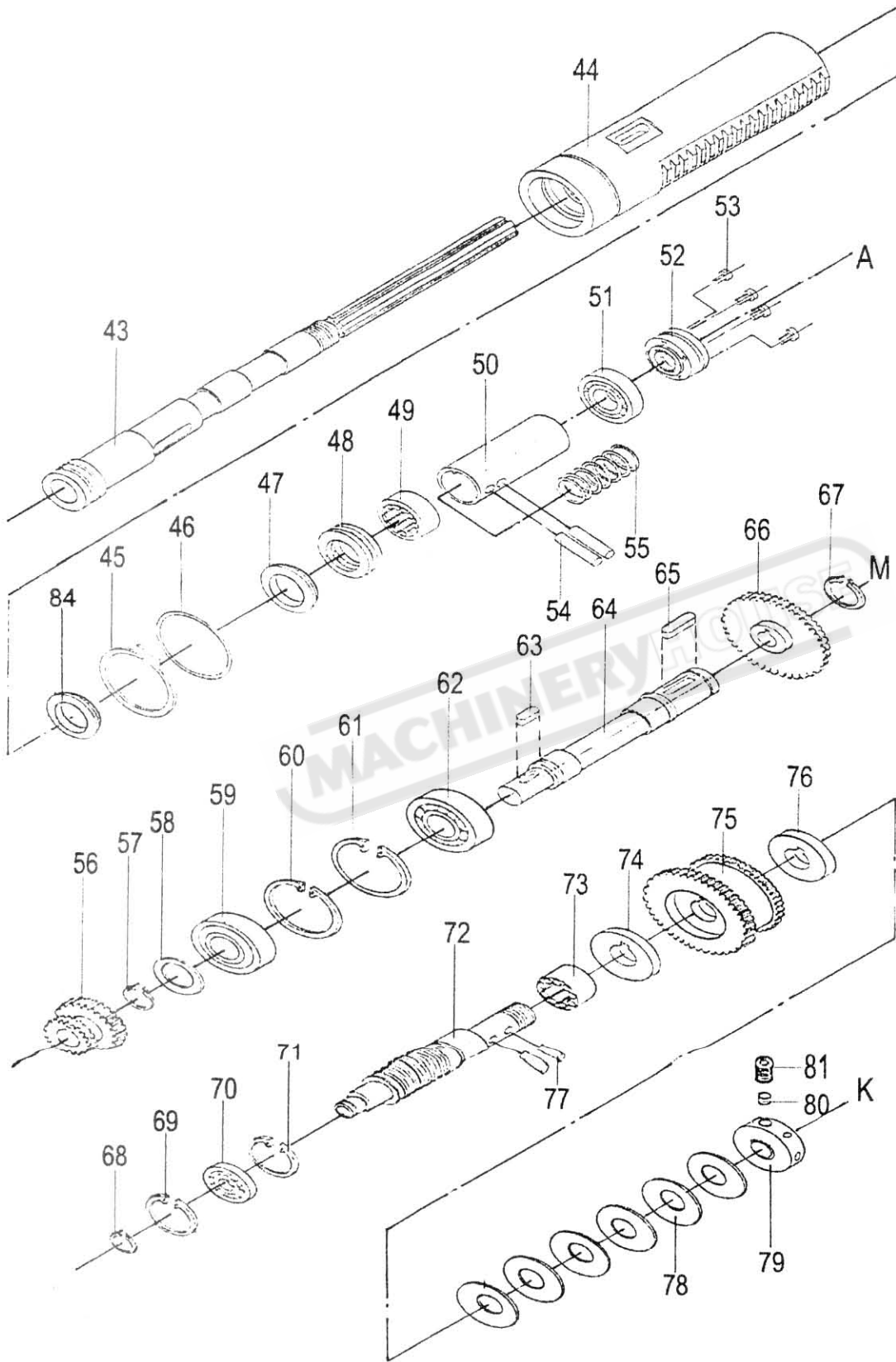
*Drilling Machine Instruction Book***III. Feed Box**

Index No.	Parts No.	Description	Qty.
1	GB879/6×45	Pin	1
2	Z5035-03-35	Spring	1
3	Z5035-03-25	Worm Gear	1
4	GB1155/8	Oil Cup	1
5	Z5035-03-24	Gear Shaft	1
6	GB1096/8×25	Key	1
7	GB1096/8×25	Key	1
8	GB894.1/24	Retainer Ring	1
9	Z5035-03-54	Washer	1
10	GB2089/1×7×32	Spring	2
11	Z5035-03-26	Sleeve	1
12	GB276/16007	Bearing	1
13	Z5035-03-28	Screw	1
14	GB308/8	Ball	3
15	GB893.1/62	Retainer Ring	1
16	GB276/16007	Bearing	1
17	GB893.1/62	Retainer Ring	1
18	Z5035-03-31	Handle	1
19	RUN6241-105016	Clamping screw	1
20	GB78/M8×12	Screw	1
21	Z5035-03-48	Handle Shaft	3
22	Z5035-03-50	Handle	3
23	Z5035-03-47	Fill Oil Plate	1
24	Z5035-03-02	Feed Box Cover	1
25	GB879/8×45	Pin	2
26	M27×1.5	Slight Glass	1
27	Z5035-03-27	Gasket	1
28	Z5035-03-51	Handle	1
29	Z5035-03-49	Handle Shaft	1
30	Z5035-03-29	Turn Style Hub	1
31	CL6132-04-06	Fill Oil Plug	1
32	GB70/M8×40	Screw	4
33	Z5035-03-36	Plate	1
34	GB823/M6×12	Screw	2

IV. Headstock(1/2)



IV. Headstock(2/2)



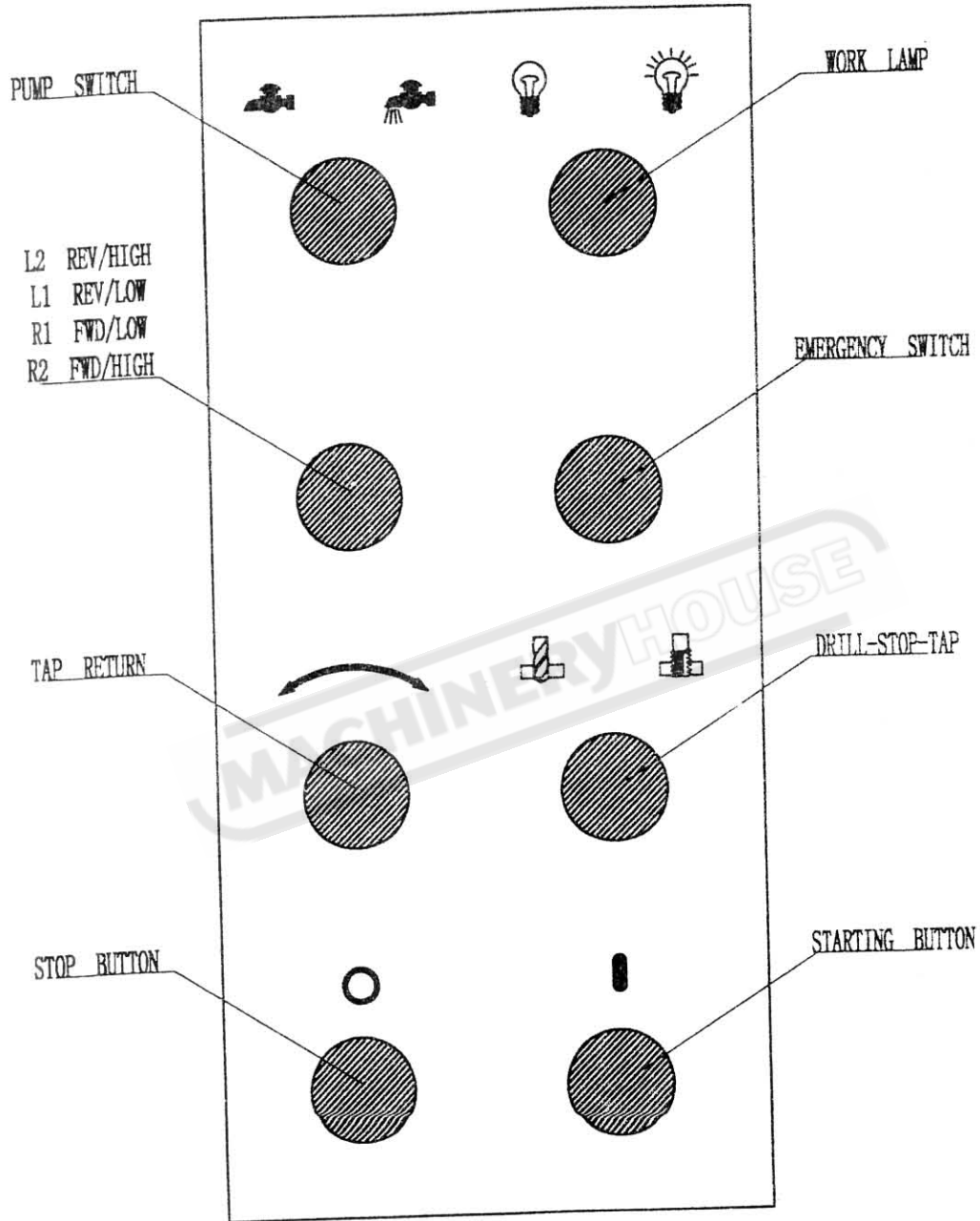
*Drilling Machine Instruction Book***IV. Headstock**

Index No.	Parts No.	Description	Qty.
1	Z5035-03-01	Headstock	1
2	Z5035-03-38	Shift Fork	1
3	GB119/10×20	Pin	1
4	Z5035-03-44	Shift Lever	1
5	Z5035-03-39	Handle	1
6	GB79/M8×25	Screw	1
7	Z5035-03-45	Handle	1
8	GB308/6	Ball	1
9	GB2089/0.8×5×16	Spring	1
10	GB77/M8×16	Screw	1
11	GB308/6	Ball	1
12	GB2089/0.8×7×12	Spring	1
13	Z5035-03-41	Shaft	1
14	GB79/M8×25	Screw	1
15	GB6172/M8	Nut	1
16	GB823/M6×12	Screw	2
17	Z5035-03-43	Plate	1
18	GB70/M6×20	Pin	2
19	Z5035-03-46	Plate	1
20	GB827/2×4	Pin	4
21	C0632-08405b	Index Ring	1
22	GB823/M6×12	Screw	2
23	Z5035-03-18	Plate	1
24	GB70/M4×12	Screw	4
25	Z5035-03-34	Plate	1
26	Z5035-03-33	Slate Plate	1
27	Z5035-03-32	Pin	1
28	Z5035-03-11	Bracket	1
29	GB38-3A/ Z3/8"	Plug	1
30	GB823/M6×12	Screw	4
31	Z5035-04-01	Cover Plate	1
32	Z5035-03-10	Plate	1
33	JB3717.22/M10×40	Handle	1
34	GB70/M5×8	Screw	2
35	GB78/M6×16	Screw	1
36	Z5035-03-07	Collar	1
37	GB70/M8×40	Screw	2
38	GB879/3×25	Pin	1
39	Z5035-03-04	Holder	1
40	Z5035-03-08	Shaft	1
41	Z5035-04-05	Cover Plate	1
42	GB823/M6×12	Screw	4

Drilling Machine Instruction Book

43	Z5035-03-06	Spindle	1
44	Z5035-03-09	Quill	1
45	GB894.1/75	Retainer Ring	1
46	GB1235/85×5.7	O-Ring	1
47	Z5035-03-05	Washer	1
48	GB301/D8108	Bearing	1
49	GB/T5801/RUA49/32	Bearing	1
50	Z5035-03-13	Small Quill	1
51	GB279/180106G	Bearing	1
52	Z5035-03-17	Clamp Nut	1
53	GB70/M4×14	Screw	4
54	GB119/12×46	Pin	2
55	Z5035-03-12	Spring	1
56	Z5035-03-14	Gear	1
57	GB894.1/25	Retainer Ring	1
58	Z5035-03-16	Washer	1
59	GB279/180205	Bearing	1
60	GB893.1/52	Retainer Ring	1
61	GB893.1/52	Retainer Ring	1
62	GB279/180205	Bearing	1
63	GB1096/A6×18	Key	1
64	Z5035-03-15	Shaft	1
65	GB1096/A6×12	Key	1
66	Z5035-03-19	Gear	1
67	GB894.1/25	Retainer Ring	1
68	GB894.1/35	Retainer Ring	1
69	GB893.1/32	Retainer Ring	1
70	GB279/180102	Bearing	1
71	GB893.1/32	Retainer Ring	1
72	Z5035-03-03	worm	1
73	GB290/46941/25	Bearing	1
74	Z5035-03-23	Collar	1
75	Z5035-03-22	Gear	1
76	Z5035-03-23	Collar	1
77	GB119/6×8	Pin	2
78	GB1972/45×24×1.75	Spring	6
79	Z5035-03-21	Clamp Nut	1
80	Z5035-03-20	Shaft	1
81	GB77/M8×8	Screw	1
82	Z5035-03-57	Plate	1
83	Z5035-03-56	Plate	1
84	Z5035-03-58	Washer	1

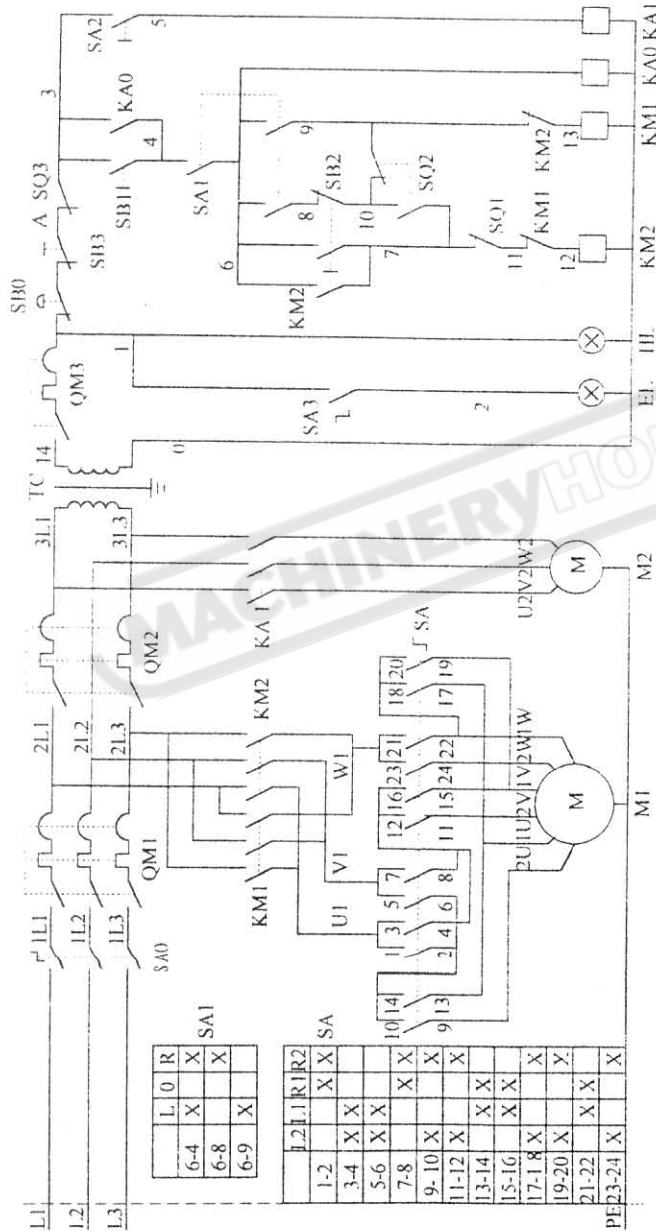
Operation Panel



50~1450 rpm

Wiring Diagram

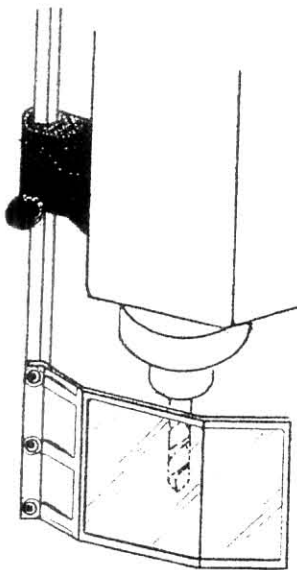
50~1450 rpm



Electrical Schematic Symbol Glossary

CODE	NAME	FUNCTION	SPECIFICATION
M1	MAIN MOTOR	SPINDLE	Y90L-4 (YD100L-4/8)
M2	PUMP	COOLANT	AB12
QM1	CIRCUIT BREAKERS	M1 PROTECTION	DZ160N
QM2	CIRCUIT BREAKERS	M2 PROTECTION	DZ160N
QM3	CIRCUIT BREAKERS	CONTROL CIRCUIT PROTECTION	DZ160N
SA	SWITCH	FWD-REV/HIGH-LOW SELECTION	LW8-20
SA0	MAIN SWITCH	POWER ON/OFF	LW8C S-20
SA1	SWITCH	DRILL-STOP-TAP	K3S51-10B-KCBH-30
SA2	SWITCH	PUMP SWITCH	C2SS1-10B-10
SA3	SWITCH	LAMP SWITCH	C2SS1-10B-10
KM1	AC CONTACTOR	FORWARD CONTROL	3TB4122 24V
KM2	AC CONTACTOR	REVERSE CONTROL	3TB4122 24V
KA0	RELAY	AUTO RESTART PROTECTION	TH8040 24V
KA1	RELAY	PUMP CONTROL	3TH8040 24V
TC	TRANSFORMER	CONTROL VOLTAGE	JBK5-100 24V
EL	WORKING LAMP	WORKING LAMP	JC34A 24V50W
SB0	BUTTON	EMERGENCY STOP	KPMT3-10R
SB1 HL1	BUTTON+PILOT LAMP	START BUTTON+PILOT LAMP	KP1-11G+KCBH-101
SB2	BUTTON	RETURN BUTTON	CP1-10Y-11
SB3	BUTTON	STOP BUTTON	CP1-10R-01
SQ1	LIMIT SWITCH	TOP LIMIT SWITCH	LW5-11N1
SQ2	LIMIT SWITCH	BOTTOM LIMIT SWITCH	LX5-11N1
SQ3	LIMIT SWITCH	SAFE LIMIT SWITCH	JW2-11

DRILL PROTECTION GUARD



The machine is provided with a security micro drill guard.

Before pressing the starting pushbutton, set the drill guard in the working position, otherwise the machine controls will not start.

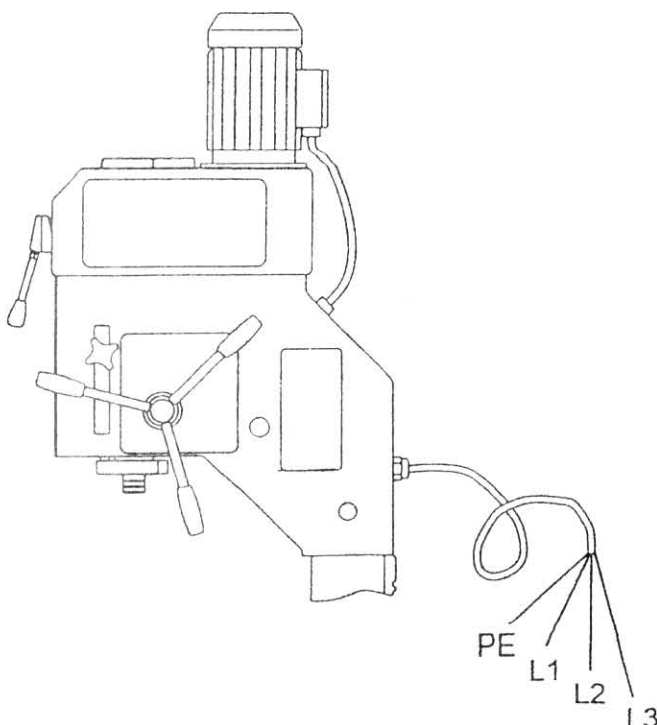
Note If the guard is opened when operating the machine, the machine will stop.

Do not remove the guard under any circumstances.

● ELECTRIC CONNECTION

The electric connection is a dangerous operation. This task must be carried out by trained or authorized staff for such purpose.

WARNING: The electric cabinet of the machine does not include the protection differential switch. The user must install an individual power supply for the machine, including a protection differential switch of 0,300 amps sensibility and the earth connection.



The present machine has a 4 wire electric hose to connect it to the electric power supply through a protection differential switch. Do always connect the PE protection wire first and after that all the others. Connection voltage: the features sheet shows the voltage the machine must be connected to.

Total power installed: 1Kw.

WARNING : Once the electric connection has been made, make sure that the main screw turns clockwise and that the motor pump (if required on machine model) pumps the coolant liquid. Should not this happen so, invert the current inlet phases.

ATTENTION: Auxiliary circuit under tension once the main power switch of machine has been deactivated

Attention: In this machine, when the main power switch is placed at "0" position, the minimum tension auxiliary circuit remains under tension.

For minimum tension auxiliary circuit maintenance or reparation jobs, put first at "0" position the protection differential switch to which the machine has been connected. In this way, the whole machine electric circuits will remain without electric tension.

In some machine models, the operator must open the machine head cover for changing spindle speeds. In that case, press the emergency pushbutton first and then, only the minimum tension auxiliary circuit will remain under tension. The circuit under tension is identified by the orange colour wiring or otherwise, corresponding warning tables will be stuck to the associated wiring. The rest of the electric circuit will remain without electric tension.

Please, check thoroughly the electric drawing of the supplied machine in the instruction book for any maintenance or reparation job.

Note: The machine must be connected to the electric power through a protection differential switch. Any electrical maintenance or reparation job must be made for qualified and trained technician.

SECURITY AND GENERAL INFORMATION.**1. SECURITY.**

A drilling machine, due to its purpose, is considered an "open machine". Therefore, some safety measures have to be taken to avoid accidents.

Bear in mind the following safety instructions:

- The machine must always be operated for the purpose for which was designed.
- Do not ever stand under a hanging machine or nearby, when it is been loaded for transportation.
- Connect the machine to an exclusive electric connection, which includes a differential switch of protection. Plug in first the green—yellow protection wire and then the others.
- The piece must always be fastened with suitable devices. Do not ever handhold the pieces.
- Sharpened tools in good condition must always be used.
- Appropriate tools must always be used, Do not ever adapt a tool for a use for which it was not designed.
- Use the correct speeds and feeds for the material being machined as well as for the tool being used.
- Use glasses to prevent small chips from getting in the eyes.
- Insert the tools correctly in the tool holder cone.
- Fix the piece fastening devices to the machine table.
- Do not wear baggy clothes, loose gloves, etc, which can be caught by the tool while drilling.
- Keep the working place clean.

Drilling Machine Instruction Book

- Gather the chips with suitable instruments (brush , gloves, etc.).
- Before carrying out any operation which is not strictly drilling , tapping etc. (like lubricating, changing of tools, etc.) turn the main switch to the “0” position.
- Before changing speeds, stop the machine and wait until all moving elements are completely brought to a halt.
- Do not ever leave the machine on without supervision. When leaving the machine, check that the general switch is in the “0” position and that all moving elements are stopped.
- Check periodically the correct operating of all security controls and elements of the machine.
- Before pressing the starting pushbutton, set the drill protector guard in the working position.
- Consider work area environment. Don’ t use electric power driven tools in damp or wet locations. Keep work area well lit. Don’ t use electric power tools in presence of flammable liquids or gases.
- Keep children away.
- Use only such accessories and attachments as are recommended in the operating instructions or the catalogue for the power tool concerned.

2. FORESEEN USE OF THE MACHINE .

The drilling machine was designed to be used with specific tools and for certain machining operations.

The most common machining operation is the drilling of holes with helicoidal drills. The drilling of holes is carried out by the combination of a drill turning movement and a feed movement in the turning spindle direction.

Besides the helicoidal drill, other tools can be used to drill holes There is a great variety of drill types and shapes in the market which can be used on this machine, provided that they are designed for such a purpose and that can be fixed in the spindle taper. They will usually be the Morse taper or ISO type. The drill shanks should have the corresponding taper to the spindle in which they are to be fitted , or parallel shank if they are going to be fitted by means of a toolholder . Contact the tool manufacturer for any further information, Do not ever use tools which were not designed to be used in a drilling machine and that have been adapted.

A drilling machine can also perform other machining operations a part from the drilling , such as tapping , reaming ,chamfering, puch marking ,countersinking, spottfacing, to perform such operations, it is necessary to have appropriate tools, specially designed for this sort of jobs. In the tapping case, besides using the correct tool, the machine has to be provided with such a device that verses the turning direction of the tool when it reaches the tapping depth previously fixed.

3. CORRECT USE OF THE MACHINE.

The correct use of the machine involves:

Drilling Machine Instruction Book

- Not exceeding its working capacity.
- Operating the machine by qualified and trained staff and according to the points mentioned in the instruction book.
- Working under the safety systems provided with the machine, checking them and keeping them.
- Watching the safety measures mentioned in the instruction book and notices on the machine.
- Wearing clothes which provide personal protection as mentioned in the instruction book.
- Watching the safety measures which may affect work in the machine and that can be lawfully expected, as well as those demanded in the workshops.

4. PIECE CLAMPING.

Tangential cutting forces and axial forces in the feed direction of the tool are mainly produced during the drilling process. The tangential forces produce a moment of forces which make the piece being drilled turn. Therefore, the pieces to be drilled (or to be machined by one of the operations mentioned above) must be clamped in an appropriate device such as a drillchuck and the drillchuck must be correctly clamped to the machine table. For this reason the machine tables are provided with "T" slots.

The pieces must be clamped conveniently by some clamping device. The clamping devices in turn must be clamped to the machine table. The machine table is provided with "T" slots for such purpose.

5. TOOL FIXING.

The tools generally used in this machine will have parallel or tapershanks. Drillholders are normally used to fix to the main spindle of the machine the parallel shank tools. This fixing device has usually got three jaws, which hold the tool by the parallel part of the shank. These are used for small drill diameters (max. up to dia. 16mm). Bigger diameter drills, usually have taper shank of morse taper type (the ones of smaller diameters to 16mm can also have taper shanks).

The housing in the main spindle to insert the tool is of morse taper type. It is very important to insert the tool taper correctly in the main spindle taper to avoid the tool falling from its housing when turning and provoke an accident.

The coupling system itself of the tool male taper in the female taper of the main spindle is auto-locking, but for it the surfaces of the tool taper and spindle taper must be in contact. To get the best possible contact, the surfaces of the tool taper as well as the spindle taper should be in good conditions. Therefore, it is advisable to handle the tool as well as the main spindle of the machine carefully.

6. CHIPS DURING MACHINING.

The machining process removes material from the piece. This material is released in chips, which can be of different shapes depending on the material itself. The most common ones are of three types: fragmented chips in small bits, short helicoidal chips and long helicoidal chips.

The chips fragmented in small bits can be rejected from the machining area and can be dangerous if they reach the eyes of the operator. To avoid this, it is advisable to wear safety glasses.

The long helicoidal chips tend to roll up the tool and gain considerable volume before breaking, which is dangerous if they reach the operator as they may produce injuries. The reached volume may also displace the drill protector from its security position, increasing the risk of an accident. It is advisable to use chip breaking tools to machine materials which produce such chips. For further information contact the tool manufacturer.

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