UNIVERSAL MILLING MACHINE MANUAL

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A REQUEST

Before starting to operate the 'SI' Universal Milling Machine Model NO.-MODEL : SI-SA-2H operator should carefully read this working instruction and make himself acquainted with the design of the machine, method of operation and work safety rules.

The Content of the Operation Manual must also known to the foreman, the instructor, head of the Machine shop and the shop and the head of the repair and maintenance shop.

NOTE : *The design of our machine is subject to continuous development and, therefor, this Operation Manual is valid only for the machine with the corresponding serial number.*

ORDERING FOR SPARE PARTS

List of spare parts for Milling Machine Model NO.-MODEL : SI-SA-2H have been illustrated separately with reference to drawing of General view and sub assemblies for particular Model of each machine.

While ordering for spare parts please quote part No. And reference Drawing No. From the illustration with Serial No. Of corresponding model of machine supplied. This would help us to pay quick attention to your requirements.

GENERAL VIEWS OF THE MACHINE :

General view of the SI Universal Milling Machine Model No.-MODEL : SI-SA-2H for production milling with a light administrative grey color looks very nice and a selected one for Production shop and tool rooms of a reputed engineering company and plants. The construction of the machine has been designed for heavy duty job works of milling operations. Appearance and machine controls are kept centralised and symmnetrical for good out look with easy operation

DESIGN FEATURES :

1. MAIN MOTOR :

Main Drive Motor to be used 1.5 K.W. and 2 HP foot mounted. Main Drive Motor is kept in column housing on base plate mounted with column to provide belt tightening provision with a hinge. Motor and main pulley are of 2 Grooves V-belt section B-62 having sufficient arc of contact to achieve maximum out put efficiency and mechanical advantage.

2. THE COLUMN :

The column is box type rigid high grade casting with stiffening ribs at inside and frame moulding at all opening of the body. it has been provided with a Oil sump at top for lubrication of main drive gear box and spindle. Front of the column has a closed rigid knee vertical bearing surface and top with a horizontal dove tail bearing for over arm. The column base has a thick mounting frame in side at bottom for clamping with base casting. Bottom half of the column is kept hollow to accommodate main motor and electrical system with a opening at back to pass motor inside the column.

3. OVER ARM :

Over arm is a ram type hollow casting. it has a dove tail slide at bottom ends to mount an Arbour supports for spindle bearing.

4. MAIN SPINDLE :

The main spindle has been made from carbon steel having hardened and ground to resist wear and tear for long life. It has been provided with a standard ISO-40 taper nose at front and slots at taper neck to accommodate and lock of cutter adopters. It has been also kept hollow through hole to pass the draw bolt for clamping of cutter holders. A hexagonal nut & collar washer have been mounted at back to lock the draw bolt. Slight movement can be given to spindle easily from tail.

5. OVER ARM BRACE :

It is a solid casting with a bearing slot for side block fixed at front end of the arm. Base of the Arm Brace is having dove Tail Shape of slide to mount on knee Top bearing at front.

6. LUBRICATION :

Main Spindle : Main drive gear box and shaft bearing have been lubricated by an gear pump set on a shaft and supplying oil through copper pipe on the spindle gears forcibly from oil sump provided below main gear box in column housing. Bottom shaft/gears are running in oil and Lubricating Intermediate shaft and gears through self Lubrication.

7. HIGH GRADE CASTING :

Properties of casting for the whole machine are of high grade casting with a grade of Rockwell Hardness. Main parts specially the working table of milling machine machines contain a special property of alloys for long life & to with stand against Wear and tear.

8. BASE PLATE :

Base casting is a rigid hollow base plate having coolant reservoir in whole base. A coolant pump accomodation has been provided in casting at left side. Front face of the base is a square shape having cored hole at center to accommodate telescopic screw. Flange mount nut at top face at center will also serve the purpose of knee support. Foundation bolt holes & setting bolts provision have been made at left & right side.

9. KNEE CASTING :

Knee casting is a box shaped hollow casting. It has a dove tai bearing ways at top and back for vertical and cross traverse feed by hand. Telescopic screw is serving as knee support. Telescopic screw gives up & down motion of knee with help of four start worm & gear.

10. KNEE SUPPORT :

A support of screw & nut is provided in front of knee with hollow brush. Knee support prevents cross word down bearing support to knee back side for vertical traverse.

11. FEED BOX :

Feed Box is an Oil Contained Gear Box. It is opened at the right side to remove the cover for assembly and inspection. It is fixed at right side of the body with lever.

12. KNEE SADDLE :

Knee saddle is a solid casting dove tail bearing ways at bottom only. It has a table rotary bearing provision at top with help T slot.

13. TABLE SADDLE :

Table bearing saddle is also a solid casting having dove tail table bearing ways at top and table rotary bearing system at bottom. Which have provision to tilt 25º both side.

14. TABLE :

Table is a solid casting having dove tail bearing ways at bottom and plain surface at top with Three T-Slots & Two V at both end in longitudinal. Bottom bearing ways are having table screw accommodation at centre in whole length of table. Coolant is drained back to left end through slot and returned back to coolant reservoir through plastic flexible pipe joined at inner side end.

INSTALLATION :

1. INSPECTION :

Machine has been throughly inspected after completion and finishing at works. A test certificate from the inspection, department of works has been given after final checking as per prescribed Test Charts of Milling Machine. The machine bearing surfaces opened have been covered by antifriction greases to protect from rust. Whole machine is covered by the water proof plastics hood of machine size. Base of wooden packing case bolted on machine base to avoid vibration occurred in Transport. General handle and standard accessories are fastened at table by the bolts & nuts. Direction of machine top is kept clear on outside of wooden case by black pain to handle the machine case with care. Inspection is also necessary at the place of unloading at transport so that the damage report may be claimed in time in case of breakage in transport.

2. TRANSPORT (Loading and unloading) :

For transport on railcars the machined surfaces of the various assemblies of Milling Machine are protected with anti-corrosive coating, and the machine is secured on th platform by means of wooden beams. The equipment is packed separately in cases which are also fastened to the platform.

The method of suspending parts and assemblies or the whole machine by means of hook and ropes. To prevent possible accidents these methods of suspension should be adhered to strictly. The bridge crane capacity and the strength the employed lifting ropes must also be taken into account.

Both transportation and unloading must be effected carefully, without jobs. After arrivals of the machine at its destination, it should be inspected externally and than the contents of the shipment should be checked.

Any shortage or transport damages must be ascertained by a commission, taken down in form of a claim, and forwarded to the transporters of machine.

3. CLEANING AND LUBRICATION

Machine should be cleaned first before errection so that levelling may be checked prop erly on bearing surfaces,i.e. Vertical & Horizontal. Coat of antifriction grease should be removed from all finished surfaces before levelling.

4. ERECTION AND FOUNDATION :

Foundation should be made according to foundation plan sent with the machine. A plat form 25 mm above floor level should be laid in which half inch thick plate be grouted below levelling bolts of the machine to level afterward. Projection of the foundation Bolt should be kept according to the Base plate casting bolt holes and cavity provided for nut and leveling bolt. A slinging diagram is sent in the manual for erection of machine of plat-form. Machine base bolt holes should be kept straight to foundation bolt by hand while slinging the machine Rectangular solid washers should be kept below levelling bolt before errection to level the machine. Top of washers should be kept in level of platform by grouting in plastering. Spirit levels may be used to level the machine properly.

5. GROUTING AND LEVELLING:

Machine Foundation Bolt holes should be grouted in Cement Concrete 1: 2:4 ratio after keeping the machine in position of platform. Foundation Bolts can be retained in Cement Concrete by the hole size plate of rod to be attached at Bottom. After setting foundation machine should be levelled accurately by levelling screws provided beside Foundation Bolt holes in base. Foundation Bolt Nuts should be properly tightened after levelling the machine.

6. ELECTRIC SUPPLY CONNECTIONS :

Main supply will be given to left side switch control Box from back through the flexible pipe.

OPERATIONS :

1. MACHINE CONTROL POINTS: (Fig:3)

1. *Knee support lock nut.*
2. *Knee support Jack*
3. *Knee lock handle*
4. *Knee wedge setting bolts*
5. *Belt tighting rod & nuts (invisible)*
6. *Oil draw plug main gear box.*
7. *Sight glass main gear box oil level*
8. *Oil filler main gear box.*
9. *Table angular movement lock nuts.*
10. *Cross movement wedge setting bolts.*
11. *Cross movement lock handle.*
12. *Knee up-down movement handle.*
13. *Table lock handle*
14. *Table manual longitudinal travel hand wheel*
15. *Tables safety stop pins.*
16. Table limit stopper.
17. Table Wedge setting bolt.
18. Arbour Neck lock nut.
19. Arbour support lock handle.
20. Spindle lock & limit switch
21. Over arm lock handle
22. Fast & Slow spindle speed lever
23. Selected spindle speed lever.
24. Draw bolt lock nut. (Arbour back Side, Invisible)
25. Oil filler feed gear box
26. Sight glass main feed gear box oil level
27. Selected feed lever.
28. Oil draw plug feed gear box.
29. Universal joint set.
30. Telescopic screw boss.

2. TEST RUN :

On completion of supply circuits machine should be started first for test run and to circulate the oil supply of lubrication and coolant system. There should be no load on machine for Test run. All the lubricating parts as shown on Lubrication diagram which should be well lubricated daily before operation

3. STARTING THE MACHINE :

Before starting the machine an operator should follow all the working instructions sup plied with the machine as a manual, Cautions as given on each gear box should carefully kept in mind by the operator. Speed change lever and safety stop dog of slide should be fixed in position according to the job and interlock Buttons of feed levers be kept at lock position on operation of machine. Spindle arbour as supplied with the machine should be fitted first for mounting cutter on it. Arbour supports will be kept on suitable position to serve as bearing end. A draw bolt is supplied with the machine to hold the arbour and cutter position on operation.

4. HAND FEED :

Manual feed are derived from front control points locating at right and middle of knee face by general handle for vertical traverse of knee and cross traverse of table Table horizontal hand feed traverse is taken from Hand wheels at both ends of table. Arbour supports are positioned by hand sliding for spindle bearing lock pin Nut Arbour support are located at right to look on position.

5. GEAR SPECIFICATION :

Gear Specification is given for whole machine as per schematic diagram for main and feed drive. It will also help for replacement of any gear on requirement of easy location and surve the purpose of spare gear special parts illustration for kinetic system.

GEAR SPECIFICATION : S - 2H

MATERIAL :

All Gear made of carbon steel 20mn Cr5 or SAE 8620

Main Drive gear box spindle & shafts : (Fig : 5)

Gear No.	No. of Teeth	No. of Module	Qty.
1	80	2.5	1
2	42	2.5	1
3	26	2.5	1
4	64	2.5	1
5	51	2.5	1
6	67	2.5	1
7	59	2.5	1
8	42	2.5	1
9	42	2.5	1
10	26	2.5	1
11	34	2.5	1
12	51	2.5	1

Feed gear Box Shaft No. : (Fig : 07)

Gear No.	No. of Teeth	Gear No.	Qty.
1	36/26	2.5/2.5	1
2	20/31	2/2.5	1
3	16	2.5	1
4	45	2	1
5	26	2.5	1
6	21	2.5	1

Worm box & bevel shaft :

Gear No.	No. of Teeth	Gear No.	Qty.
1	16 Worm gear	2.5/2.5	1
2	Single start worm wheel	2/2.5	1
3	20 Bevel	2.5	1
4	29 Bevel	2	1
5	26 Bevel	2.5	1
6	18 Bevel	2.5	1

Vertical movement shaft.

Gear No.	No. of Teeth	Gear No.	Qty.
1	24 Worm gear (Pb2)	8 DP	1
2	Four start worm wheel	8 DP	1

STANDARD & SPECIAL EQUIPMENT

STANDARD EQUIPMENT

1. *Spindle Arbour*
2. *Instruction Manual*
3. *Draw Bolt*
4. *Handle*
5. *Tool Kit*
6. *Foundation Setting Bolt*

SPECIAL EQUIPMENT AT EXTRA COST

1. *Vertical & Angular Milling Attachment*
2. *Coolant Pump*
3. *Coolant Stand.*
4. *Machine Lamp.*
5. *V - Belt*
6. *Foundation Bolt.*
7. *Special Size Milling Arbour*
8. *Milling Swivel Base Vice*
9. *Universal Milling Vice*
10. *Universal Deviding Head.*
11. *Rotary Table*
12. *Rack Cutting Attachment*

CONTROLS :

1. SAFETY STOP FOR TABLE MOVEMENT

Safety press pins are set at centre of table saddle for tripping of power feed on either direction of Horizontal traverse of table

COOLANT AND LUBRICANT :

1. COOLANT SUPPLY

Supply is taken to coolant pump through a transparent Plastic tube to check the water flow at nozzle. Return supply is also through a plastic tube being a flexible for travers and swivelling of table

2. OIL AND GREESE SPECIFICATION

Oil and Greese should be used of a quality machine oil lubricant with a viscosity at 50" C. Antifriction bearing grease should have a dript point not below 140 C. Specification for quality is given separately for use at different purposes. Use SERVO-57.

ELECTRICAL EQUIPMENT :

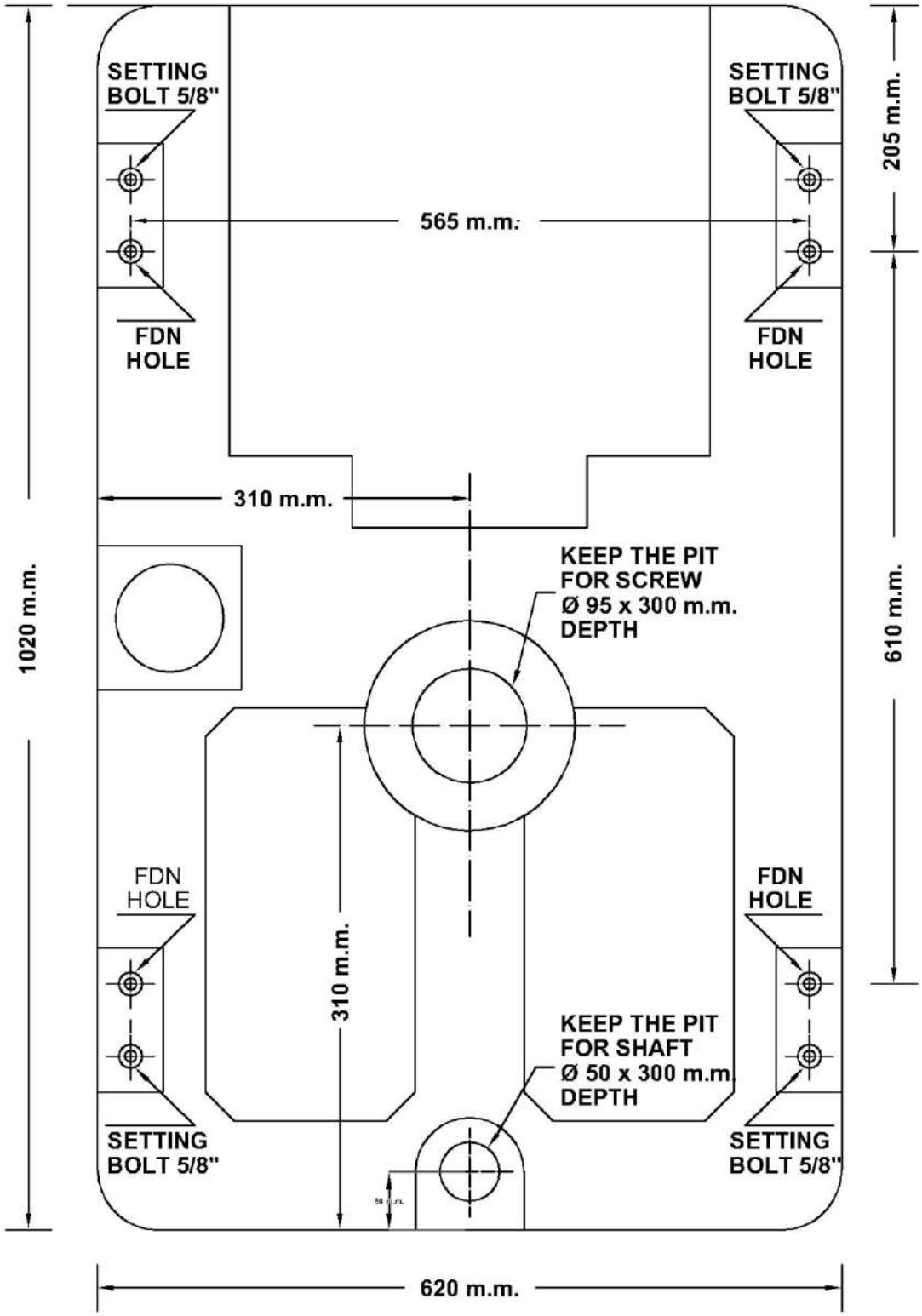
1. CARE AND MAINTENANCE OF MOTOR

An Electrical circuit diagram is supplied with the machine in addition to working Instruction Manual for fault checking in supply Supply line should be earthed properly upto junction box.

LIST OF DRAWING :

FIG : 1 GENERAL VIEW OF MACHINE (SI-SA-2H)

FIG : 2 ERRCTION & FOUNDATION PLANT (SI-SA-2H)



FOUNDATION BOLT TO BE USED M 16 (DRILL 21/32")

FIG : 3 GENERAL VIEW SHOWING MACHINE CONTROL POINTS (SI-SA-2H)

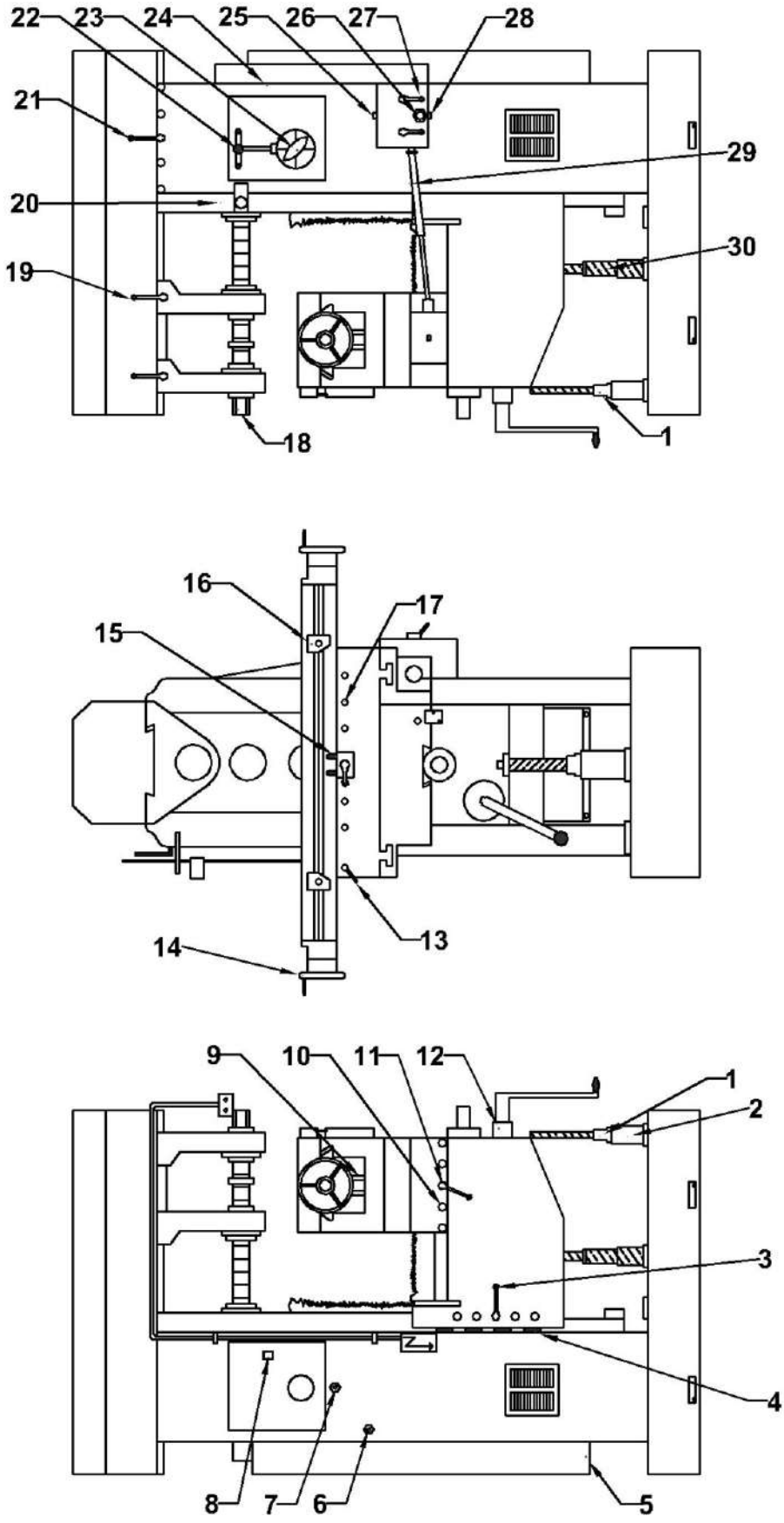


FIG : 4 GENERAL VIEW SHOEING LUBRICATION POINTS (SI-SA-2H)

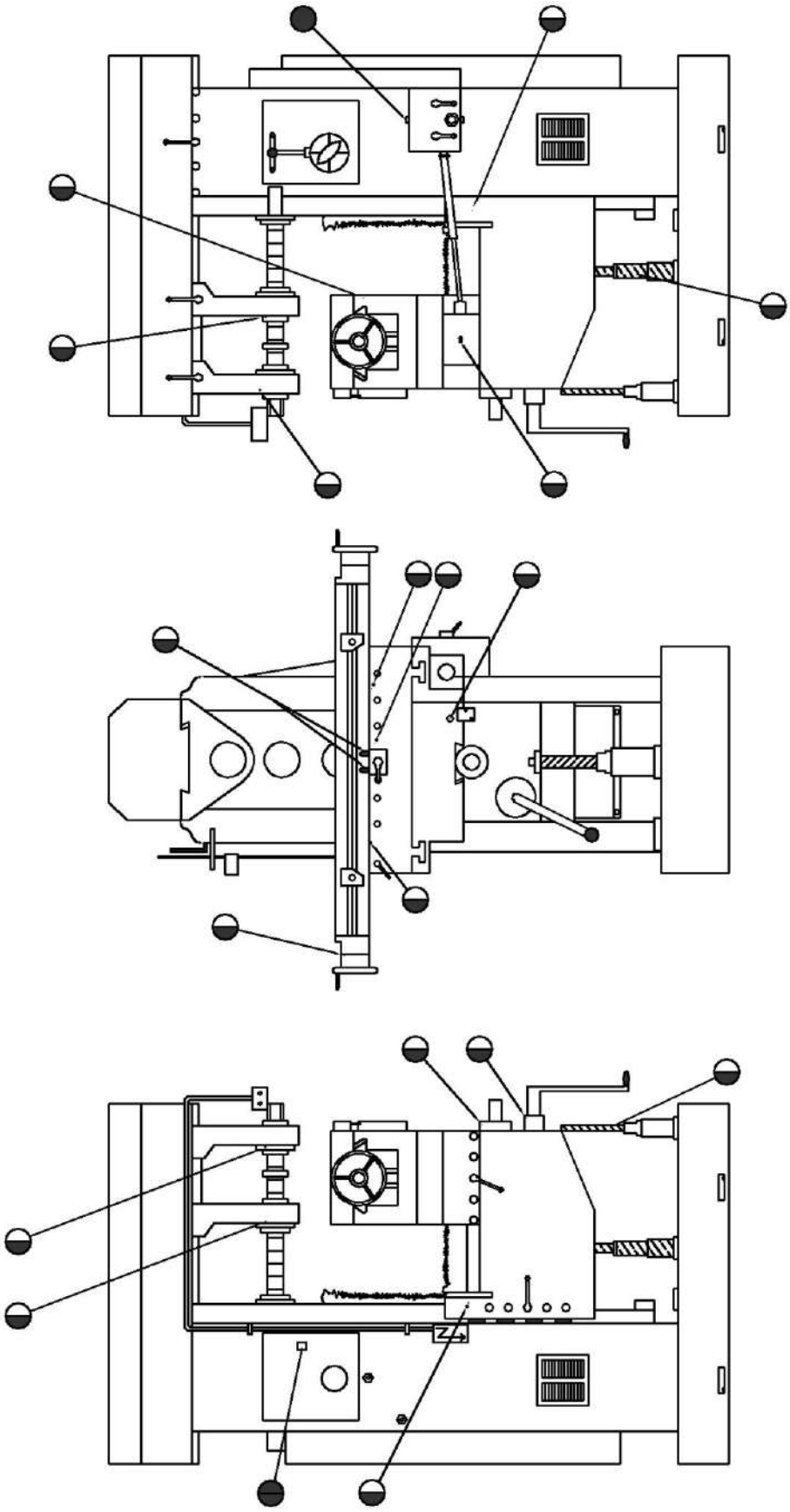


FIG : 5 SCHEMATIC DIAGRAM OF MAIN DRIVE (SI-SA-2H)

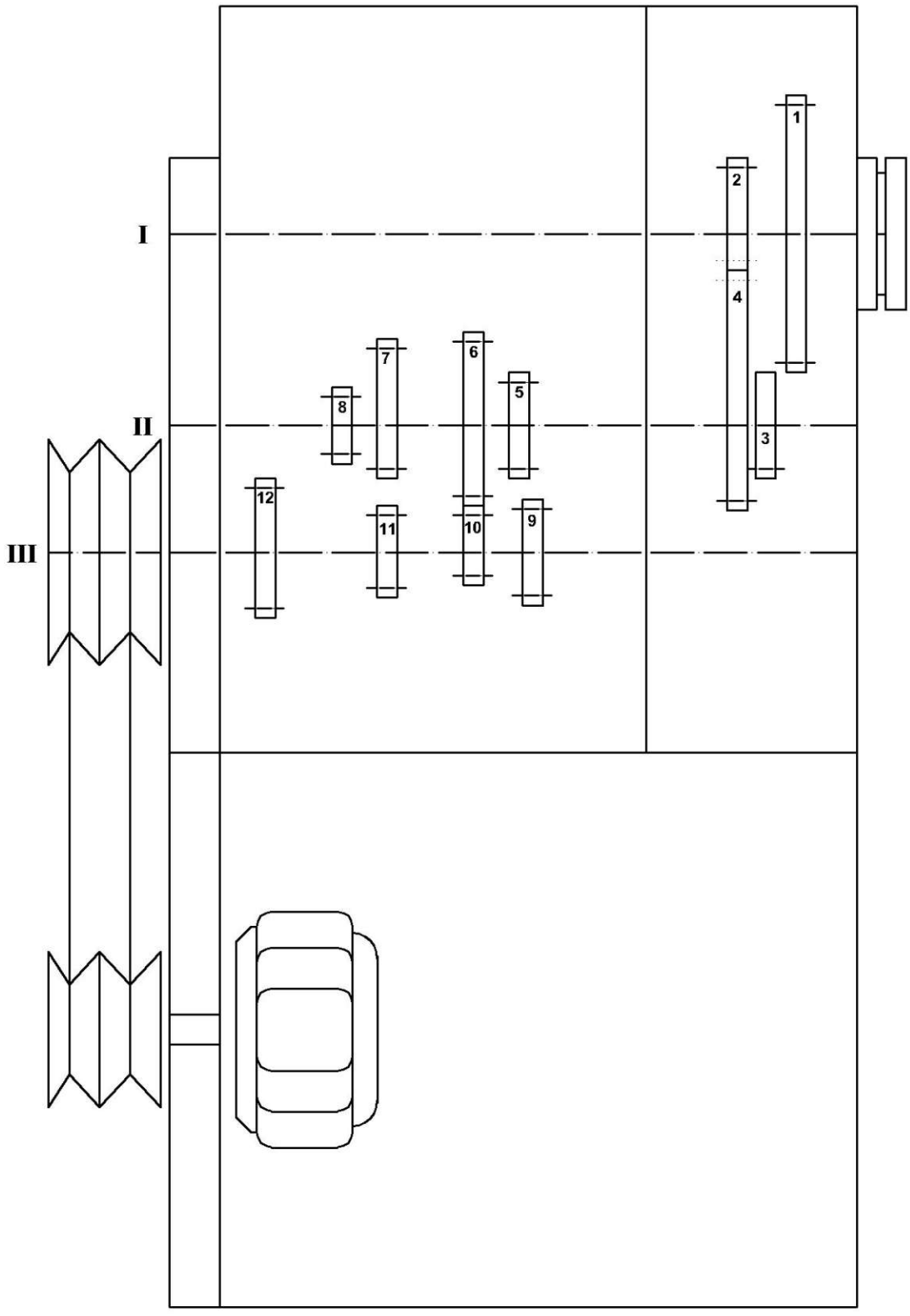


FIG : 6 SCHEMATIC DIAGRAM OF FEED BOX (SI-SA-2H)

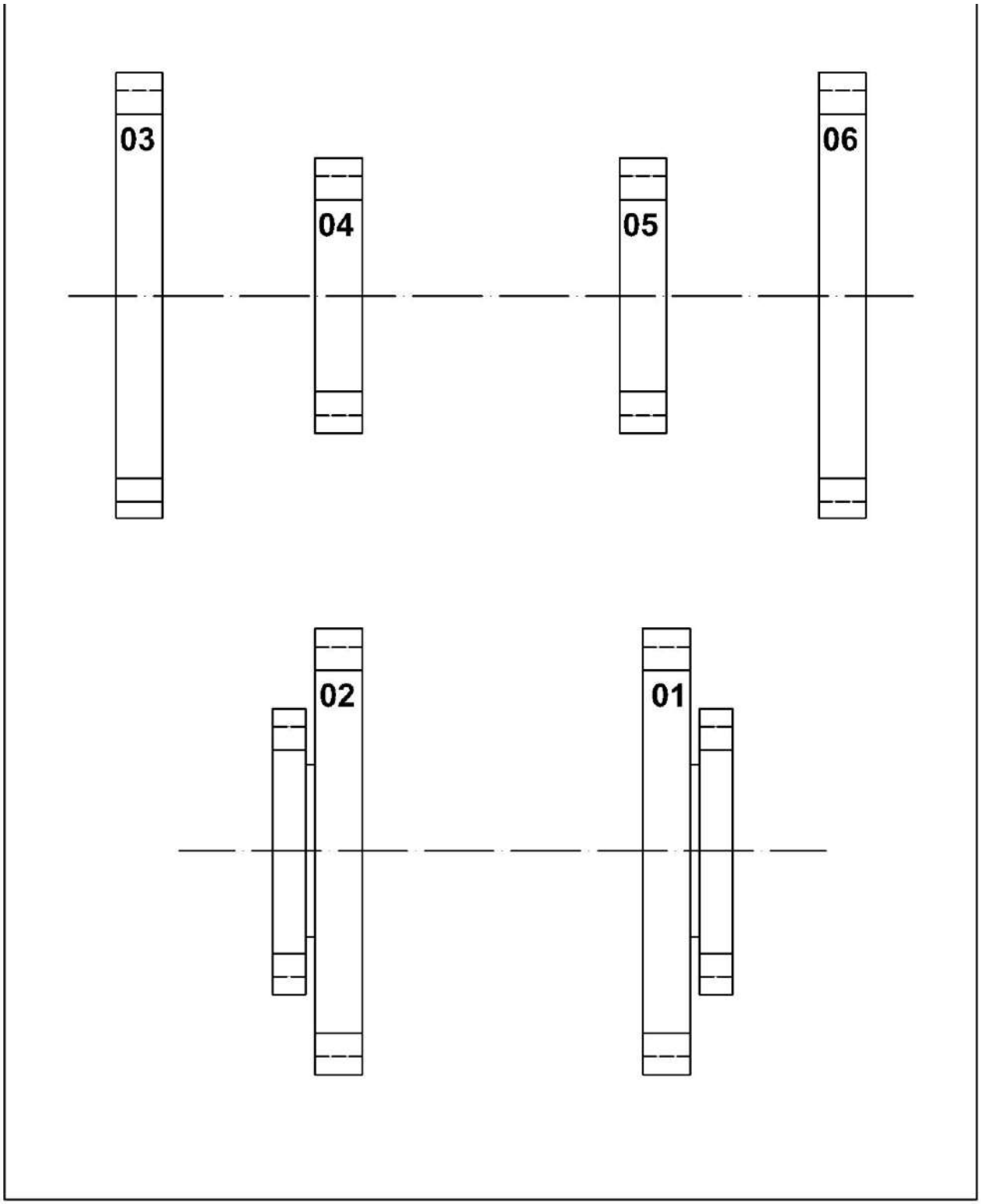


FIG : 7 SCHEMATIC DIAGRAM OF KNEE (SI-SA-2H)

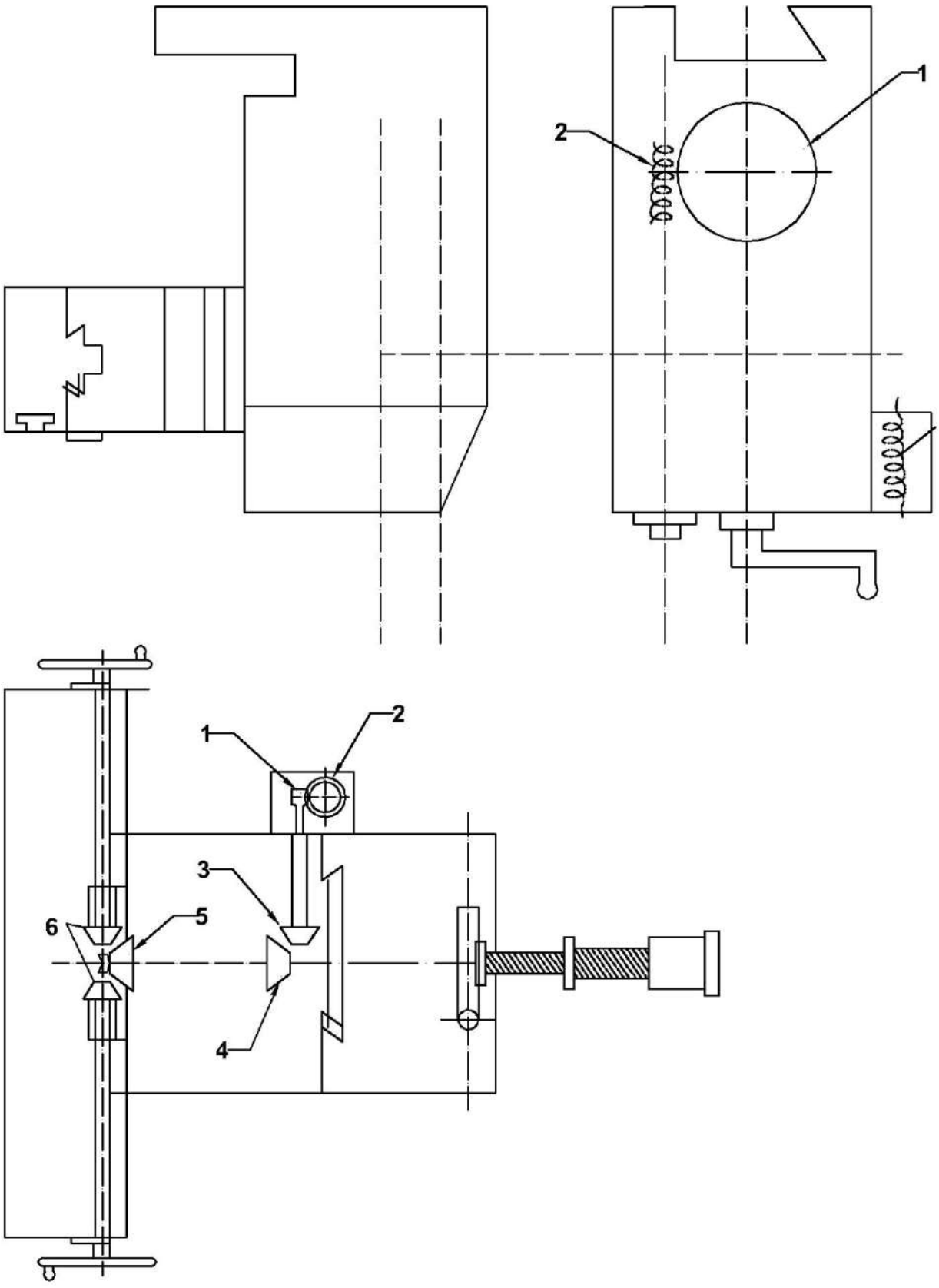


FIG : 8 WORKING TABLE (SI-SA-2H)

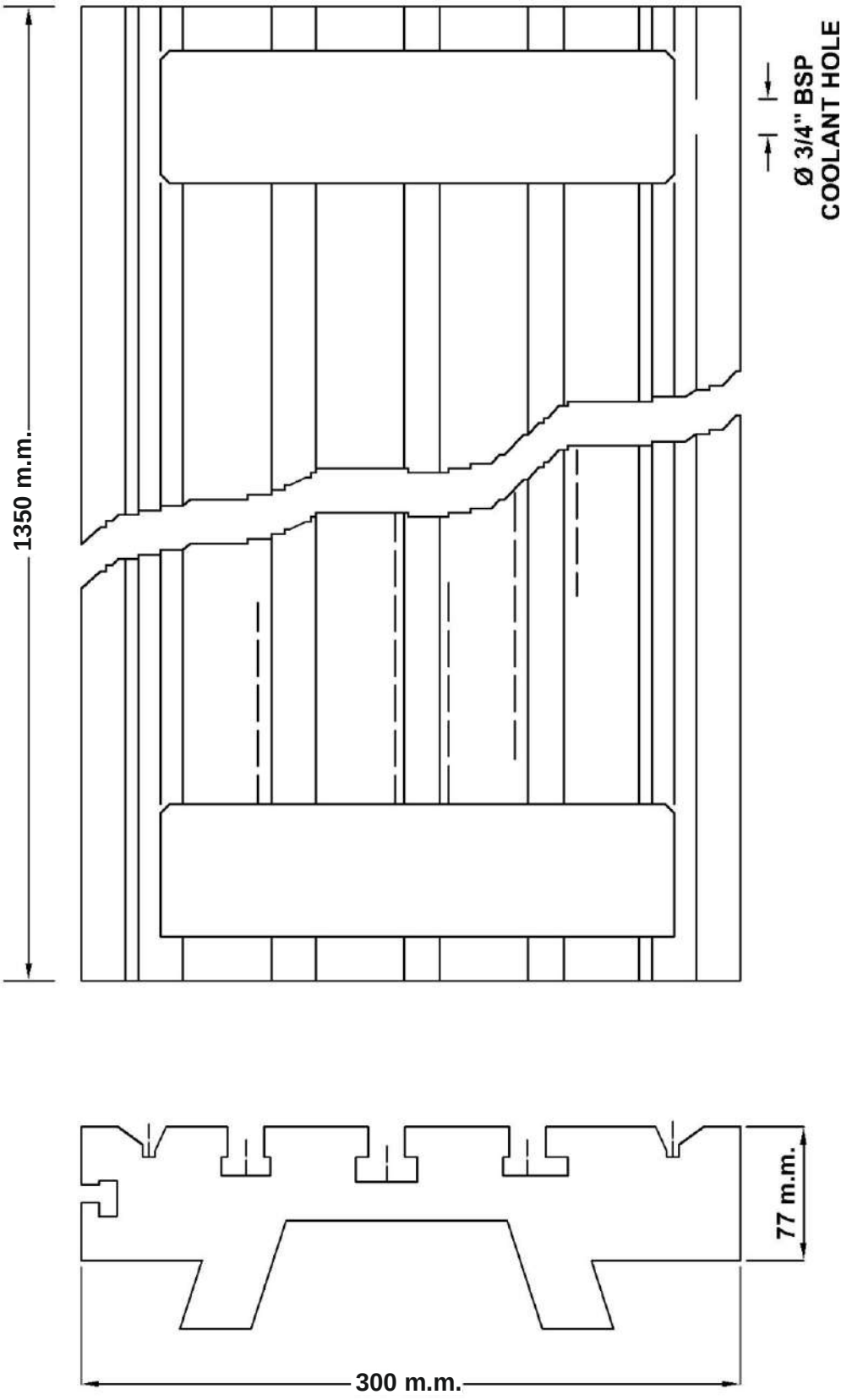
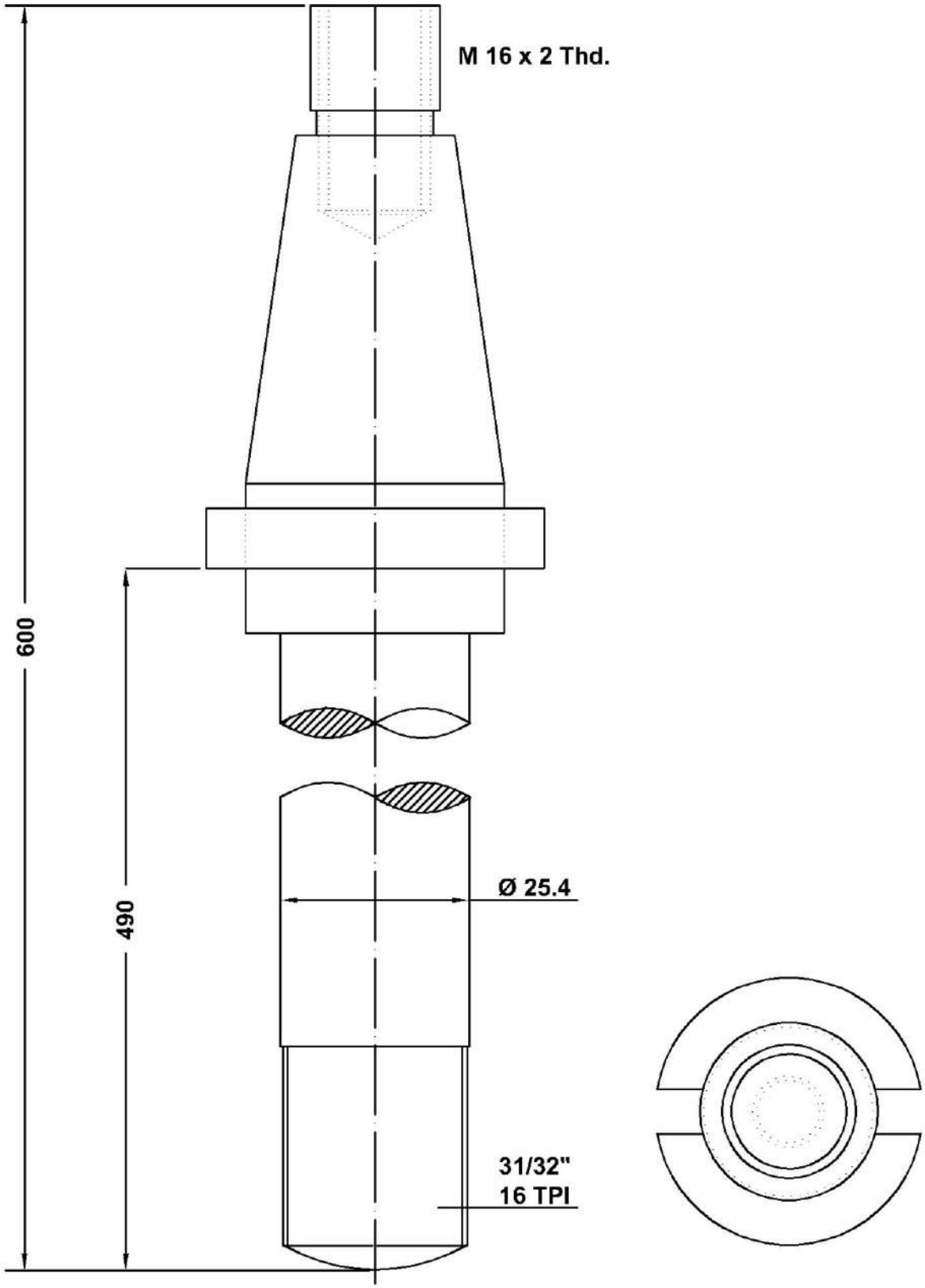


FIG : 9 ISO-40 SPINDLE ARBOUR (SI-SA-2H)



X- LIST OF PARTS

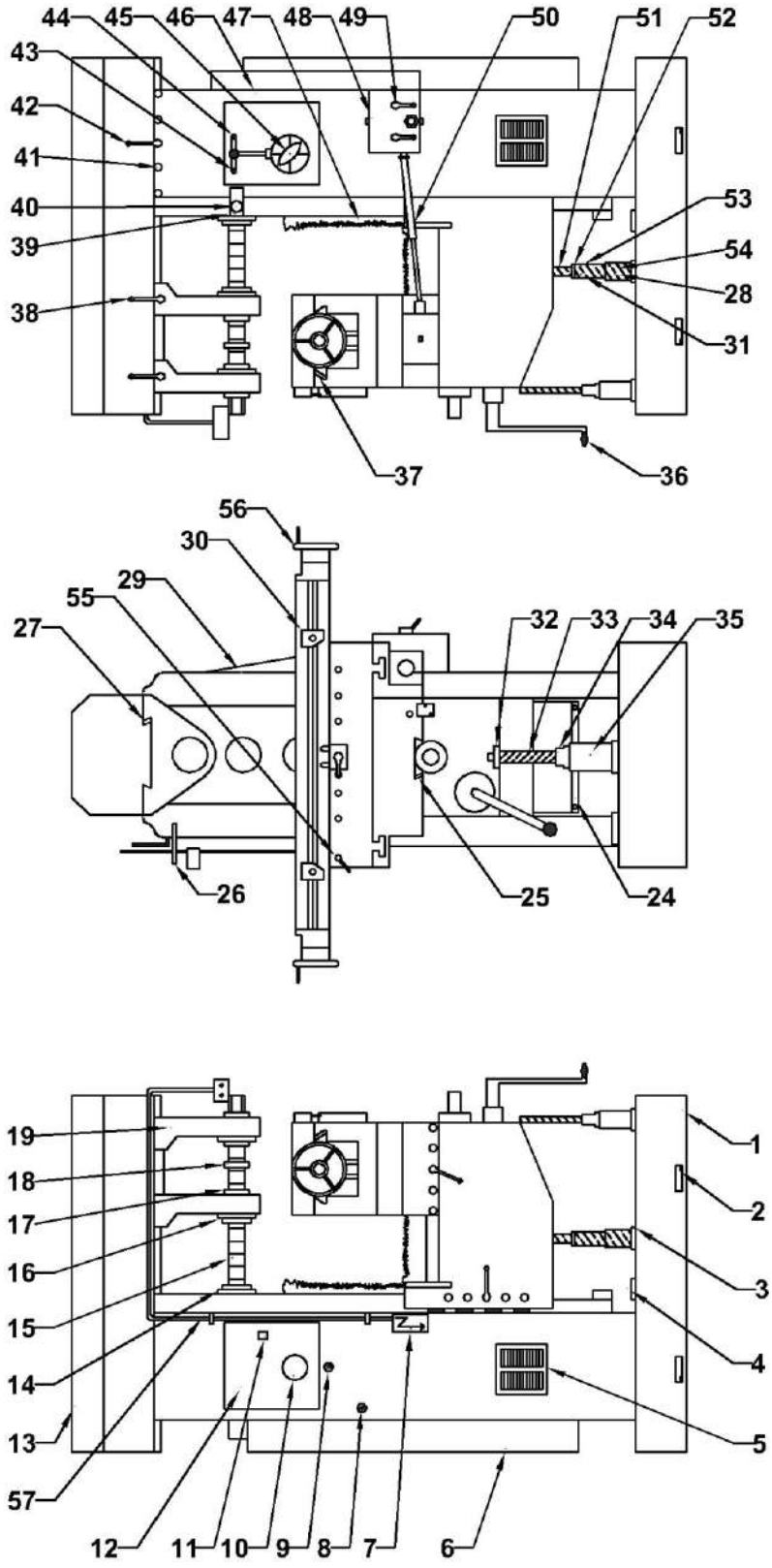
GENERAL VIEWS OF THE M/C (SI-SA-2H)

01.	Base casting	C.I.	G - 01
02.	Machine levelling bolts	M.S.	G - 02
03.	Coolant tank cover (invisible)	M.S. Sheet	G - 03
04.	Coolant pump Flange	C.I.	G - 04
05.	Bottom side cover	C.I.	G - 05
06.	Belt guard	M.S. Sheet	G - 06
07.	Electrical panel board	M.S. Sheet	G - 07
08.	Oil draw plug	M.S.	G - 08
09.	Sight glass	Alluminium	G - 09
10.	Acrylic glass	Acrylic	G - 10
11.	Oil filler cup	M.S.	G - 11
12.	singer name plate window	C.I.	G - 12
13.	Over arm	C.I.	G - 13
14.	Spindle arbour	EN-24	G - 14
15.	Spindle arbour bush	EN-8	G - 15
16.	Supporter bush	M.S.	G - 16
17.	Supporter bush check nut	EN-8	G - 17
18.	Cutter Support bush	EN-8	G - 18
19.	Over arm support	C.I.	G - 19
20.	Electric pipe	M.S. Pipe	G - 20
21.	Supporter bearing cover	C.I.	G - 21
22.	Arbour nut	M.S.	G - 22
23.	Table angular movement lock nut	M.S.	G - 23
24.	Knee vertical travel lock bracket M.S.	G - 24	G - 24
25.	Cross slide wedge	M.S.	G - 25
26.	Electric pipe clamp	C.I.	G - 26
27.	Over arm wedge	M.S.	G - 27
28.	Outer screw check nut	M.S.	G - 28
29.	Chain cover	M.S. Sheet	G - 29
30.	Table limit stopper	C.I.	G - 30

31.	Inner screw check nut	C.I.	G - 31
32.	Jack support (T)	C.I.	G - 32
33.	Jack support screw	M.S.	G - 33
34.	Jack support nut	C.I.	G - 34
35.	Jack support support	C.I.	G - 35
36.	General handle	M.S.	G - 36
37.	Long slide wedge	M.S.	G - 37
38.	Supporter lock media	M.S.	G - 38
39.	Spindle lock bracket	M.S.	G - 39
40.	Spindle lock bracket pin	M.S.	G - 40
41.	Over arm wedge setting bolt	M.S.	G - 41
42.	Over arm lock handle	M.S.	G - 42
43.	Gear change cover plate	C.I.	G - 43
44.	Gear change lever arrow	M.S.	G - 44
45.	Gear change lever handle	M.S.	G - 45
46.	Tie rod washer & nut	M.S.	G - 46
47.	Safety guard	Heat resi. reck	G - 47
48.	Feed box cover	C.I.	G - 48
49.	Feed lever	M.S.	G - 49
50.	Universal joint set	M.S.	G - 50
51.	Telescopic inner screw	M.S.	G - 51
52.	Telescopic inner screw nut	P.B.	G - 52
53.	Telescopic outer screw	M.S.	G - 53
54.	Telescopic outer screw nut	C.I.	G - 54
55.	Table lock handle	M.S.	G - 55

GENERAL VIEW OF MILLING MACHINE (SI-SA-2H)

G-1 to G-57



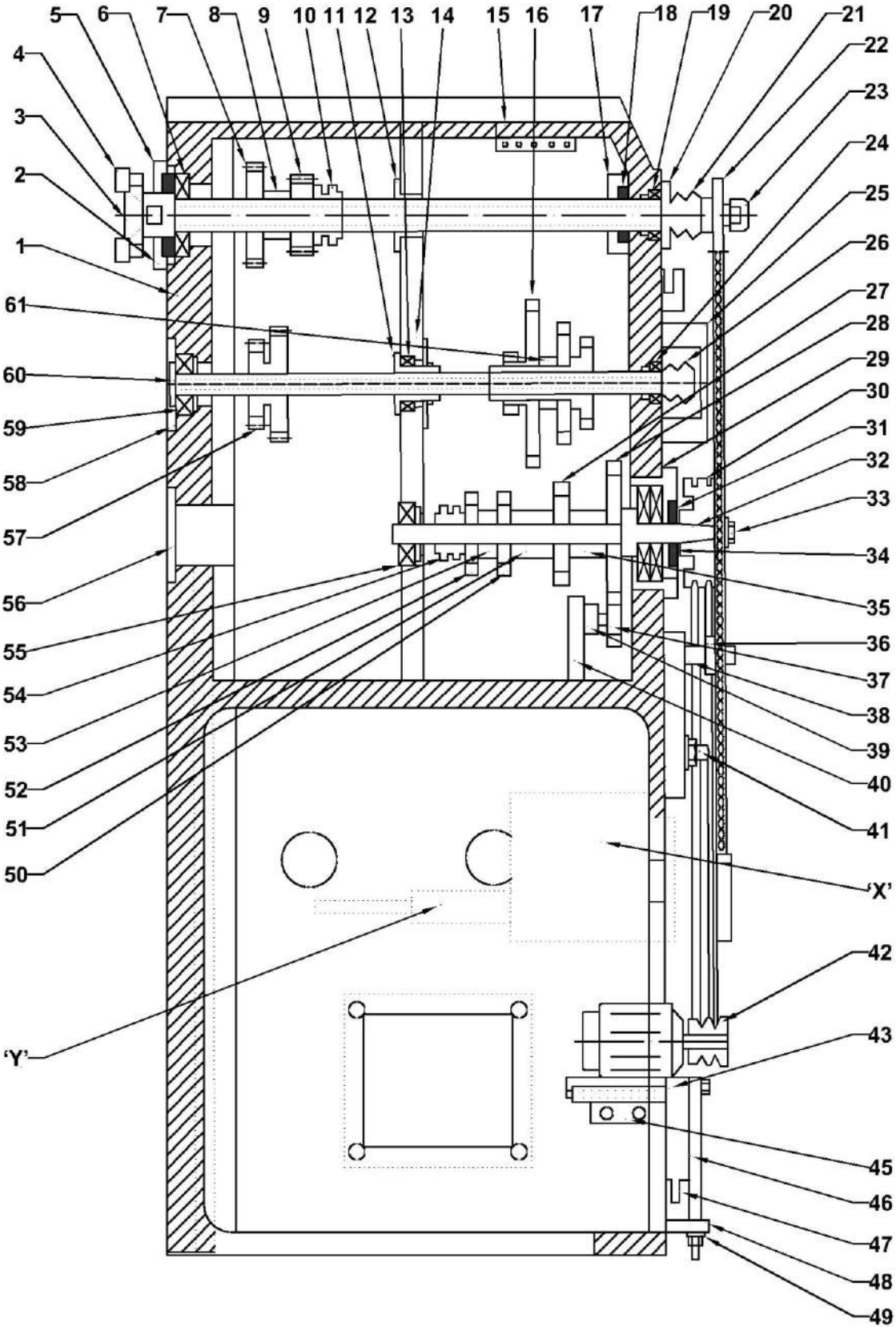
*MAIN DRIVE GEAR BOX **(SI-SA-2H)***

01.	*Main body*	*C.I.*	*M - 01*
02.	*Main spindle front oil seal*	*Rubber*	*M - 02*
03.	*Main spindle*	*EN - 8*	*M - 03*
04.	*Main spindle nose dog*	M.S.	*M - 04*
05.	*Main spindle front oil seal cover*	*C.I.*	*M - 05*
06.	*Main spindle front bearing (32214)*	*Brg. steel*	*M - 06*
07.	*Main spindle gear A-80T*	*20MnCr5*	*M - 07*
08.	*Main spindle gear distance piece*	*C.I.*	*M - 08*
09.	*Main spindle gear B-42T*	*20MnCr5*	*M - 09*
10.	*Main spindle gear check nut/lock*	M.S.	*M - 10*
11.	*Intermediate shaft spline bush*	M.S.	*M - 11*
12.	*Main spindle intermediate bush*	G.M.	*M - 12*
13.	*Intermediate bearing (6209)*	*Brg. steel*	*M - 13*
14.	*Spindle bush cover & circlip*	*M.S. & A-45*	*M - 14*
15.	*Oil distribution bracket*	*M.S.*	*M - 15*
16.	*Sliding gear (OMNP) 51T/67T/59T/42T*	*20MnCr5*	*M - 16*
17.	*Main spindle rear oil seal cover*	*C.I.*	*M - 17*
18.	*Main spindle rear oil seal*	*Rubber*	*M - 18*
19.	*Main spindle rear brg. (32211)*	*Brg. steel*	*M - 19*
20.	*Main spindle rear cover*	*C.I.*	*M - 20*
21.	*Main spindle rear brg. check nut*	*M.S.*	*M - 21*
22.	*Main spindle chain gear 20T*	*M.S.*	*M - 22*
23.	*Arbour tie rod, washer & nut*	*M.S.*	*M - 23*
24.	*Intermediate shaft rear brg. (30306)*	*Brg. steel*	*M - 24*
25.	*Intermediate shaft rear brg. cover*	*C.I.*	*M - 25*
26.	*Intermediate shaft rear brg. check nut*	*M.S.*	*M - 26*
27.	*Driving shaft gear N-34T*	*20MnCr5*	*M - 27*
28.	*Driving shaft gear P-51T*	*20MnCr5*	*M - 28*
29.	*Driving shaft gear rear brg. cup*	*C.I.*	*M - 29*
30.	*Driving pulley*	*C.I.*	*M - 30*
31	*Driving shaft rear brg. (6206)*	*Brg. steel*	*M - 31*

32.	*Driving shaft*	*EN-8*	*M - 32*
33.	*Pulley clamping washer & nut*	*M.S.*	*M - 33*
34.	*Driving shaft rear oil seal*	*Rubber*	*M - 34*
35.	*Driving shaft distance piece - c*	*M.S.*	*M - 35*
36.	*Chain tighner pin, washer & nut*	*M.S.*	*M - 36*
37.	*Oil pump gear - 33T*	*M.S.*	*M - 37*
38.	*Chain tightner pin, washer & nut*	*M.S.*	*M - 38*
39.	*Oil pump*	*M.S.*	*M - 39*
40.	*Chain cover*	*M.S. Sheet*	*M - 40*
41.	*chain tightner bkt, stud & nut*	*M.S.*	*M - 41*
42.	*Motor pulley*	*C.I.*	*M - 42*
43.	*Motor plate*	*C.I.*	*M - 43*
44.	*Motor plate rod*	*M.S.*	*M - 44*
45.	*Motor plate hinges*	*C.I.*	*M - 45*
46.	*Belt tightner rod*	*M.S.*	*M - 46*
47.	*Belt guard hinges*	*M.S.*	*M - 47*
48.	*Belt tightner bkt.*	*C.I.*	*M - 48*
49.	*Belt tightner washer & nut*	*M.S.*	*M - 49*
50.	*Driving shaft gear O - 26T*	*20MnCr5*	*M - 50*
51.	*Driving shaft distance piece - B*	*M.S.*	*M - 51*
52.	*Driving shaft gear M - 42T*	*20MnCr5*	*M - 52*
53.	*Driving shaft distance piece - A*	*M.S.*	*M - 53*
54.	*Driving shaft gear check nut*	*M.S.*	*M - 54*
55.	*Driving shaft front brg. 6206*	*Brg. Steel*	*M - 55*
56.	*Driving shaft front cover*	*M.S.*	*M - 56*
57.	*Sliding gear A / B - 26T/64T*	*20MnCr5*	*M - 57*
58.	*Intermediate shaft front brg. cover*	*M.S.*	*M - 58*
59.	*Intermediate shaft front brg. 30209*	*Brg. Steel*	*M - 59*
60.	*Intermediate shaft*	*EN-8*	*M - 60*
61.	*Intermediate shaft distance piece*	*M.S.*	*M - 61*
62.	*Spindle lock*	*M.S.*	*M - 62*

MAIN DRIVE GEAR BOX (SI-SA-2H)

M-1 to M-61



FEED BOX ASSEMBLY (SI-SA-2H)

VIEW - 'X'

01.	*Feed gear box*	*C.I.*	*F - 01*
02.	*Spur gear C-16T*	*20MnCr5*	*F - 02*
03.	*Distance piece*	M.S.	*F - 03*
04.	*Spur gear D-26T*	*20MnCr5*	*F - 04*
05.	*Distance Piece - 2*	M.S.	*F - 05*
06.	*Bearing - 30204*	Brg.Steel	*F - 06*
07.	*Chain gear shaft oil seal cover (Rear)*	C.I.	*F - 07*
08.	*Chain gear 30T*	M.S.	*F - 08*
09.	*Chain gear oil seal*	35x47x7	*F - 09*
10.	*Chain gear shaft (upper)*	En-8	*F - 10*
11.	*Joint end shaft check nut*	M.S.	*F - 11*
12.	*Joint end shaft cover (rear)*	*C.I.*	*F - 12*
13.	*Bearing - 30204*	Brg.Steel	*F - 13*
14.	*Joint gear N - 36T/26T*	M.S.	*F - 14*
15.	*Distance piece*	M.S.	*F - 15*
16.	*Tapper pin*	M.S.	*F - 16*
17.	*Feed box mounting allen bolt*	En-8	*F - 17*
18.	*Feed gear M - 20T/31T*	*20MnCr5*	*F - 18*
19.	*Joint end shaft*	En-8	*F - 19*
20.	*Joint end shaft oil seal cover (front)*	*C.I.*	*F - 20*
21.	*Universal joint end*	En-8	*F - 21*
22.	*Joint end oil seal*	35x47x7	*F - 22*
23.	*Bearing 30204*	Brg.Steel	*F - 23*
24.	*Chain gear shaft check nut*	M.S.	*F - 24*
25.	*Chain gear shaft front cover*	*C.I.*	*F - 25*
26.	*Bearing 30204*	Brg.Steel	*F - 26*
27.	*Spur gear check nut*	M.S.	*F - 27*
28.	*Spur gear A - 45T*	*20MnCr5*	*F - 28*
29.	*Distance piece - W*	M.S..	*F - 29*

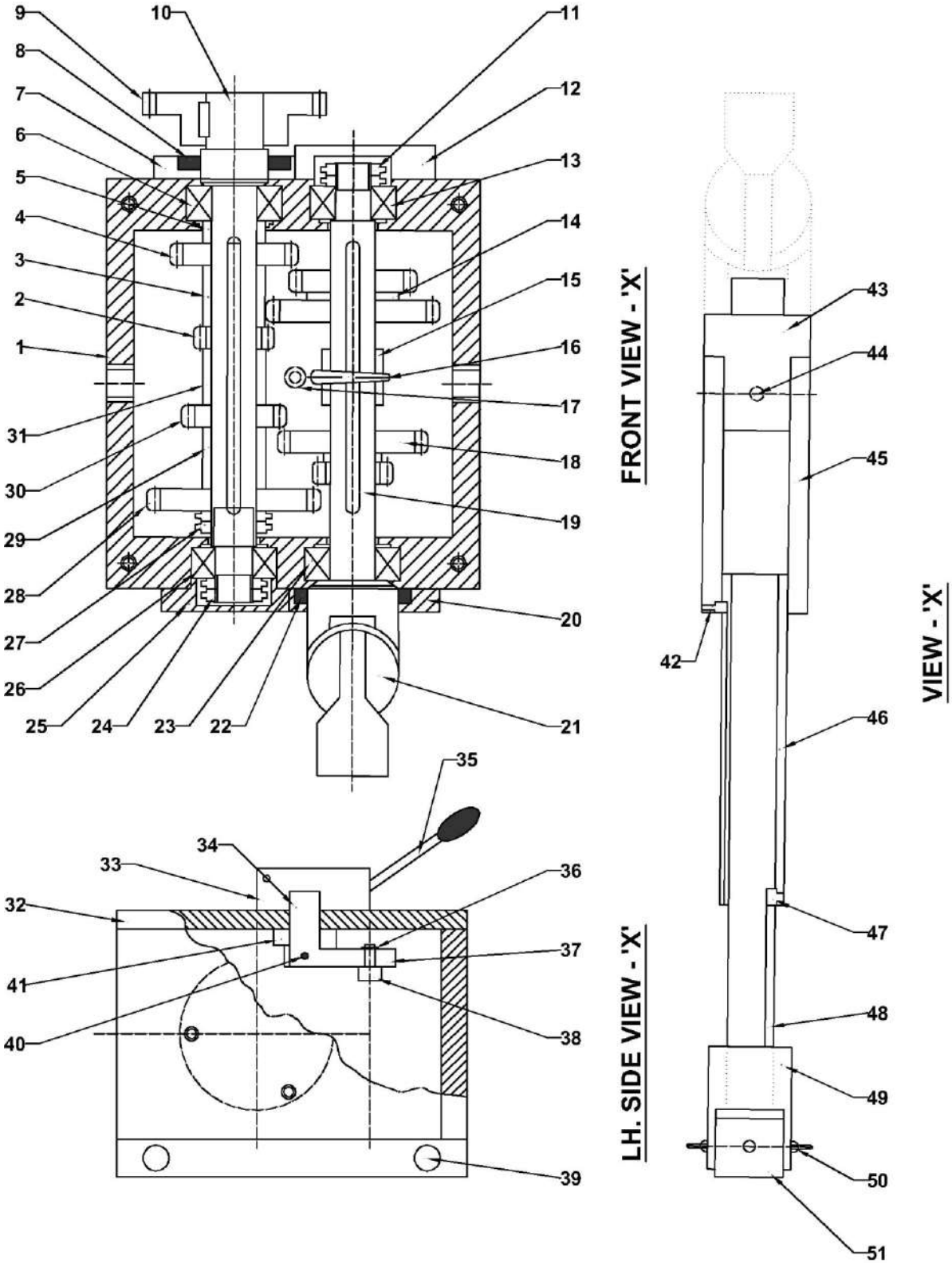
30.	*Spur gear B - 21T*	*20MnCr5*	*F - 30*
31.	*Distance piece - X*	*M.S.*	*F - 31*
32.	*Feed gear box cover*	*C.I.*	*F - 32*
33.	*Feed change lever boss*	*C.I.*	*F - 33*
34.	*Feed change lever pin*	*C.I.*	*F - 34*
35.	*Feed change lever handle*	*M.S.*	*F - 35*
36.	*Circlip*	*A - 16*	*F - 36*
37.	*Feed lever patti*	*M.S.*	*F - 37*
38.	*'C' Bracket*	*M.S.*	*F - 38*
39.	*Feed box Mounting bolts (holes)*	*M.S.*	*F - 39*
40.	*Taper pin*	*M.S.*	*F - 40*
41.	*Support boss*	*C.I.*	*F - 41*

VIEW - 'Y'

42.	*Stepped key*	*M.S.*	*F - 42*
43.	*Joint end boss*	*M.S.*	*F - 43*
44.	*Taper pin*	*M.S.*	*F - 44*
45.	*Main body*	*M.S.*	*F - 45*
46.	*Intermediate body*	*M.S.*	*F - 46*
47.	*Stepped key*	*M.S.*	*F - 47*
48.	*Internal body (Rod)*	*M.S.*	*F - 48*
49.	*Worm end kan*	*M.S.*	*F - 49*
50.	*Allen bolts / Hex nut*	*En-8/M.S.*	*F - 50*
51.	*square key*	*M.S.*	*F - 51*

FEED BOX ASSEMBLY (SI-SA-2H)

F-1 to F-51



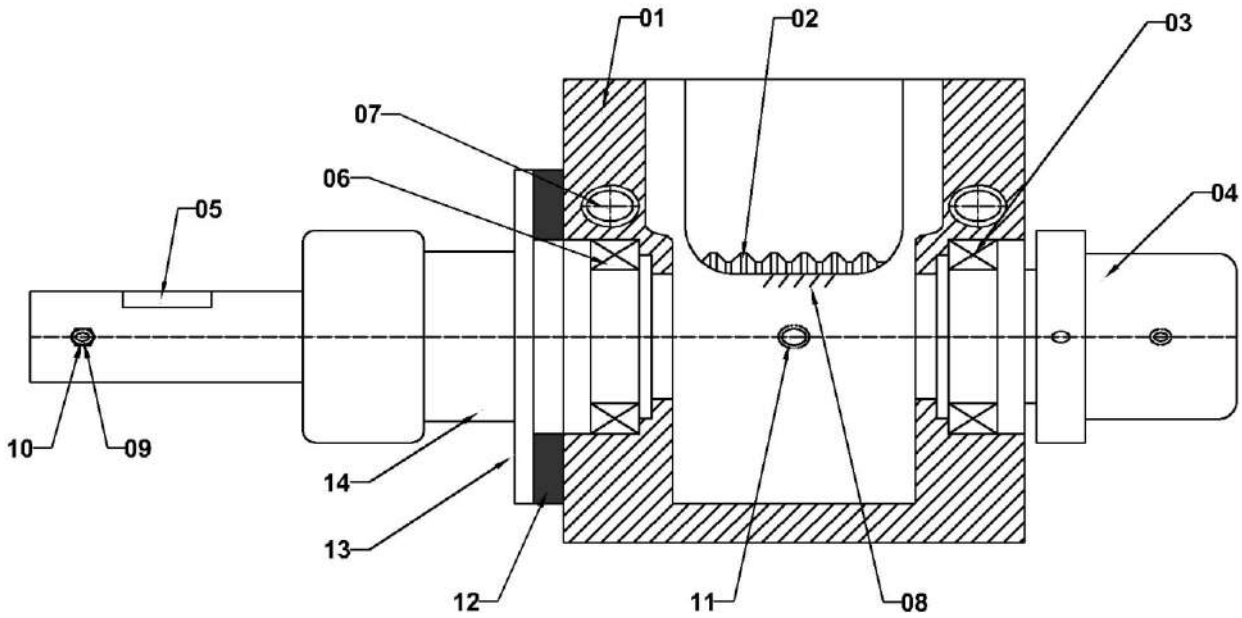
WORM BOX ASSEMBLY ***(SI-SA-2H)***

WBA - 01 TO WBA - 14

01.	*Worm box*	*C.I.*	*HBA - 01*
02.	*Single start worm*	En-8	*HBA - 02*
03.	*Brg. 30204*	Brg.Steel	*HBA - 03*
04.	*Shaft nut*	C.I.	*HBA - 04*
05.	*Key*	M.S.	*HBA - 05*
06.	*Brg. 30205*	Brg.Steel	*HBA - 06*
07.	*Allen bolts*	En-31	*HBA - 07*
08.	*Key*	M.S.	*HBA - 08*
09.	*Allen grub & Hex nut*	En-31 & M.S.	*HBA - 09*
10.	*Joint pin*	M.S.	*HBA - 10*
11.	*OIL CUP*	M.S.	*HBA - 11*
12.	*Oil seal*	Rubber	*HBA - 12*
13.	*Oil seal cove*	C.I.	*HBA - 13*
14.	*Worm shaft*	En-8	*HBA - 14*

WORM BOX ASSEMBLY (SI-SA-2H)

WBA-1 to WBA-14



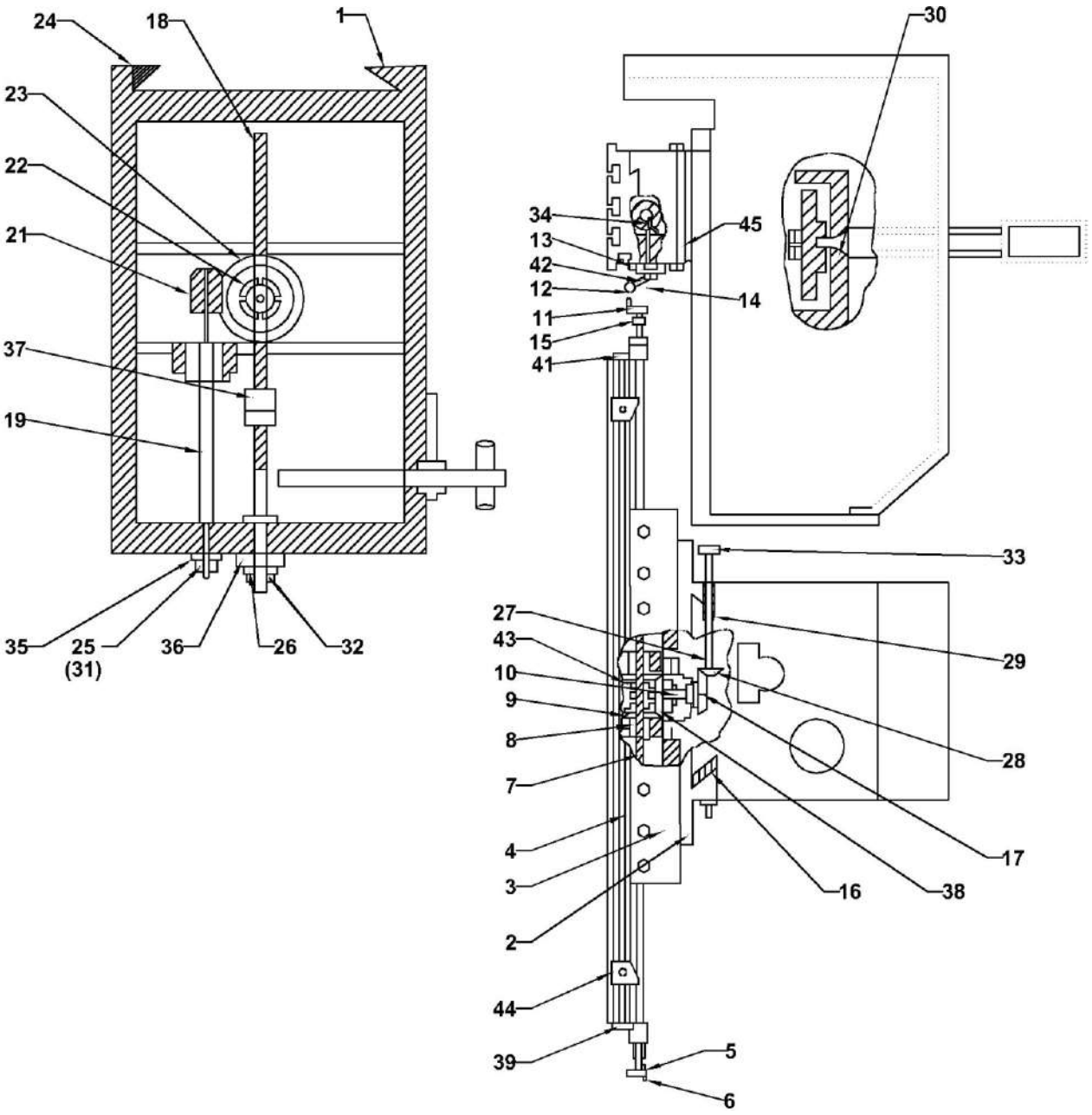
KNEE ASSEMBLY (SI-SA-2H)

K - 01 TO K - 45

01.	*Knee casting*	*C.I.*	*K - 01*
02.	*Knee saddle*	*C.I.*	*K - 02*
03.	*Table saddle*	*C.I.*	*K - 03*
04.	*Table*	*C.I.*	*K - 04*
05.	*Table handle wheel big*	*C.I.*	*K - 05*
06.	*Wheel handle*	*M.S.*	*K - 06*
07.	*Table screw*	*M.S.*	*K - 07*
08.	*Reversing bevel block*	*C.I.*	*K - 08*
09.	*Bevel 18T*	*20MnCr5*	*K - 09*
10.	*Bevel gear shaft*	*En-8*	*K - 10*
11.	*Lever handle*	*M.S.*	*K - 11*
12.	*Limit box*	*M.S.*	*K - 12*
13.	*Lever pin*	*M.S.*	*K - 13*
14.	*Safety press pins*	*M.S.*	*K - 14*
15.	*Knob*	*Bakalite*	*K - 15*
16.	*Upper bevel 26T*	*20MnCr5*	*K - 16*
17.	*Lower bevel 29T*	*20MnCr5*	*K - 17*
18.	*Cross slide screw*	*En-8*	*K - 18*
19.	*Vertical movement screw*	*En-8*	*K - 19*
20.	*Dial ring*	*PB - 2*	*K - 20*
21.	*Worm wheel 4 start*	*En-8*	*K - 21*
22.	*Worm check nut*	*M.S.*	*K - 22*
23.	*Worm gear 24 Teeth*	*PB - 2*	*K - 23*
24.	*Knee vertical bearing piece*	*C.I.*	*K - 24*
25.	*Cross slide boss*	*En-8*	*K - 25*
26.	*Vertical slide boss*	*En-8*	*K - 26*
27.	*Worm gear shaft no.3*	*En-8*	*K - 27*
28.	*Bevel gear 20T*	*20MnCr5*	*K - 28*
29.	*Bush (Worm shaft bush)*	*C.I.*	*K - 29*
30.	*Eccentric boss*	*M.S.*	*K - 30*
31.	*Dial ring boss*	*C.I.*	*K - 31*
32.	*Handle bush*	*M.S.*	*K - 32*
33.	*16 T Worm gear*	*PB*	*K - 33*
34.	*Lead screw nut*	*PB*	*K - 34*
35.	*Vertical move shaft boss*	*C.I.*	*K - 35*
36.	*Cross slide shaft boss*	*C.I.*	*K - 36*
37.	*Cross slide nut*	*PB-2*	*K - 37*
38.	*Bevel gear flange*	*C.I.*	*K - 38*
39.	*Lead screw bracket (Small)*	*C.I.*	*K - 39*
40.	*Lead screw bracket (Big)*	*C.I.*	*K - 40*
41.	*Wheel small*	*C.I.*	*K - 41*
42.	*Limit box star*	*M.S.*	*K - 42*
43.	*Cluster garedi*	*M.S.*	*K - 43*
44.	*Limit stopper*	*C.I.*	*K - 44*
45.	*Dhingali*	*C.I.*	*K - 45*

KNEE ASSEMBLY (SI-SA-2H)

K-1 to K-41



GEAR CHANGE ASSEMBLY (SI-SA-2H)

GCA - 01 TO GCA - 25

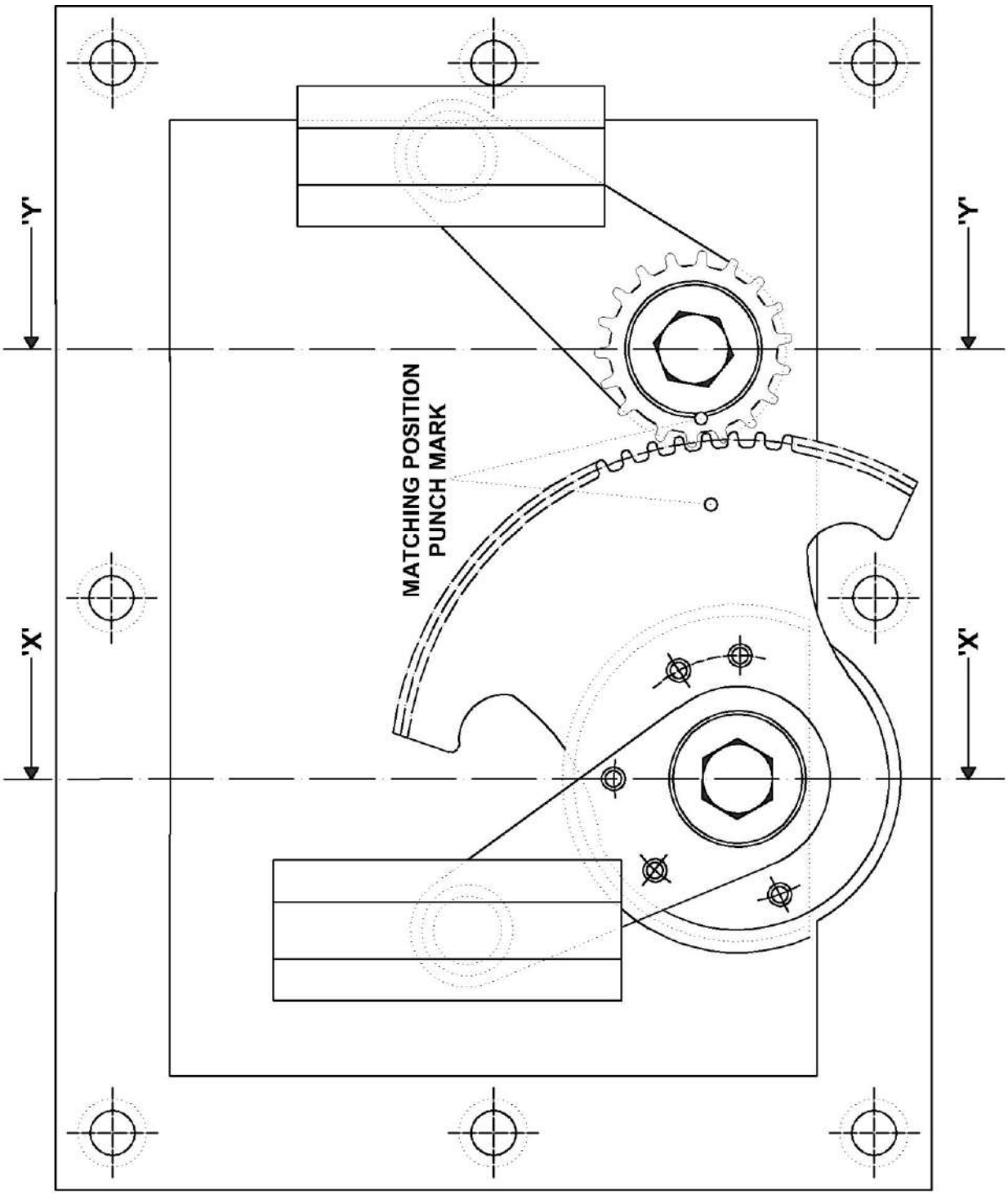
SECTION - "X-X"

01.	*Gear change cover plate*	*C.I.*	*GCA - 01*
02.	*'C' Bracket 'A'*	*M.S.*	*GCA - 02*
03.	*'C' Bracket mounting pin*	*M.S.*	*GCA - 03*
04.	*Pin - M*	*M.S.*	*GCA - 04*
05.	*Boss - X*	*C.I.*	*GCA - 05*
06.	*Allen bolts*	*En-31*	*GCA - 06*
07.	*Patti - O*	*M.S.*	*GCA - 07*
08.	*Washer & bolt*	*M.S.*	*GCA - 08*
09.	*Key*	*M.S.*	*GCA - 09*
10.	*Gear 22T*	*M.S.*	*GCA - 10*
11.	*Lever arrow pin*	*M.S.*	*GCA - 11*
12.	*Shaft - E*	*M.S.*	*GCA - 12*
13.	*Lever arrow*	*M.S.*	*GCA - 13*
14.	*Lever dial*	*Aluminium*	*GCA - 14*
15.	*Boss - Y*	*M.S.*	*GCA - 15*
16.	*Setting ball spring & bolt*	*Spring steel*	*GCA - 16*
17.	*Square handle*	*M.S.*	*GCA - 17*
18.	*Knob*	*Bakalite*	*GCA - 18*

SECTION - "Y-Y"

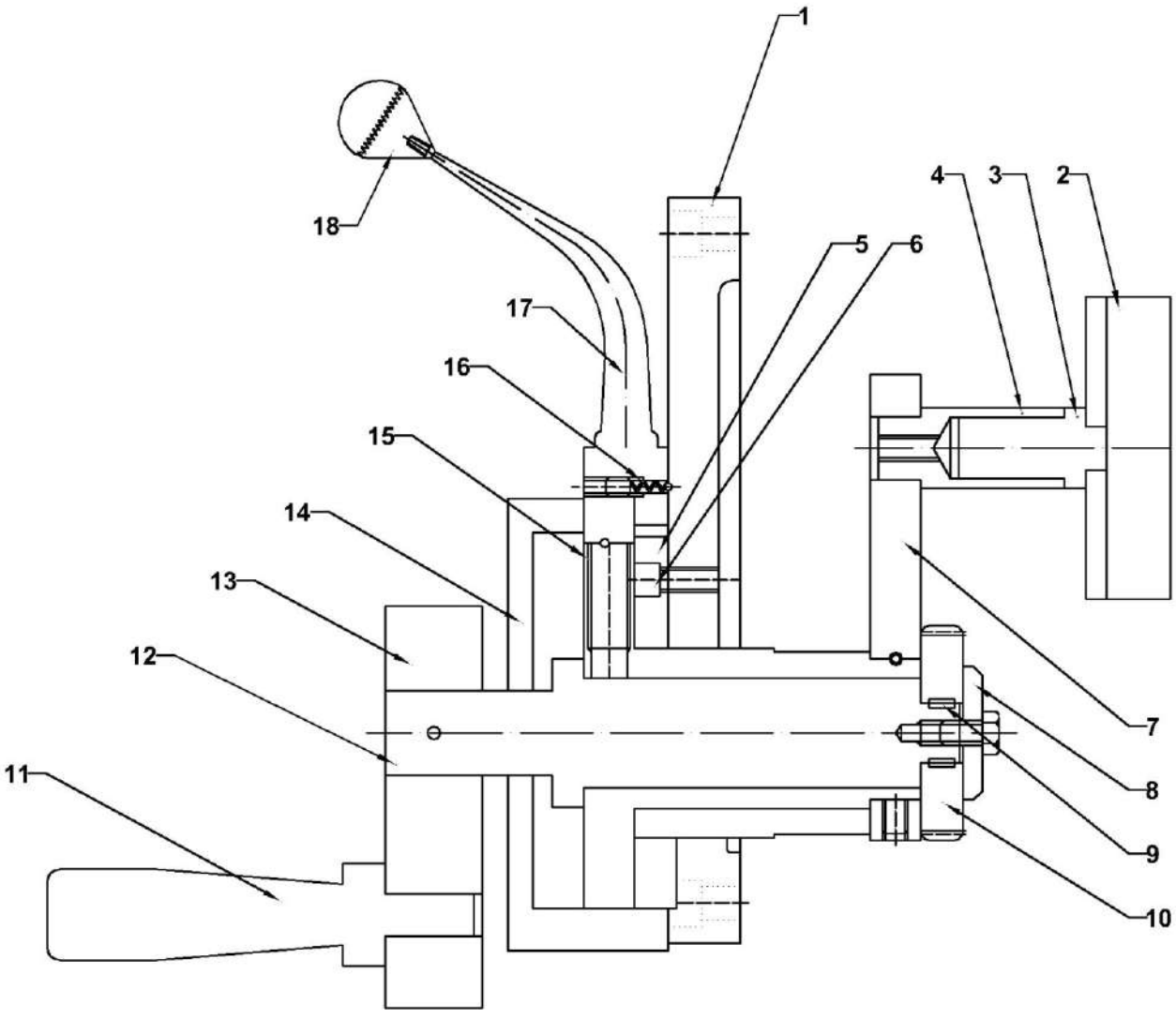
19.	*Boss - Z*	*C.I.*	*GCA - 42*
20.	*Panji gear 37T*	*C.I.*	*GCA - 43*
21.	*Pin - N*	*M.S.*	*GCA - 44*
22.	*'C' Bracket - B*	*M.S.*	*GCA - 45*
23.	*Patti - P*	*M.S.*	*GCA - 46*
24.	*Washer & Bolt*	*M.S.*	*GCA - 47*
25.	*Small shaft - F*	*M.S.*	*GCA - 48*

GEAR CHANGE ASSEMBLY (SI-SA-2H)



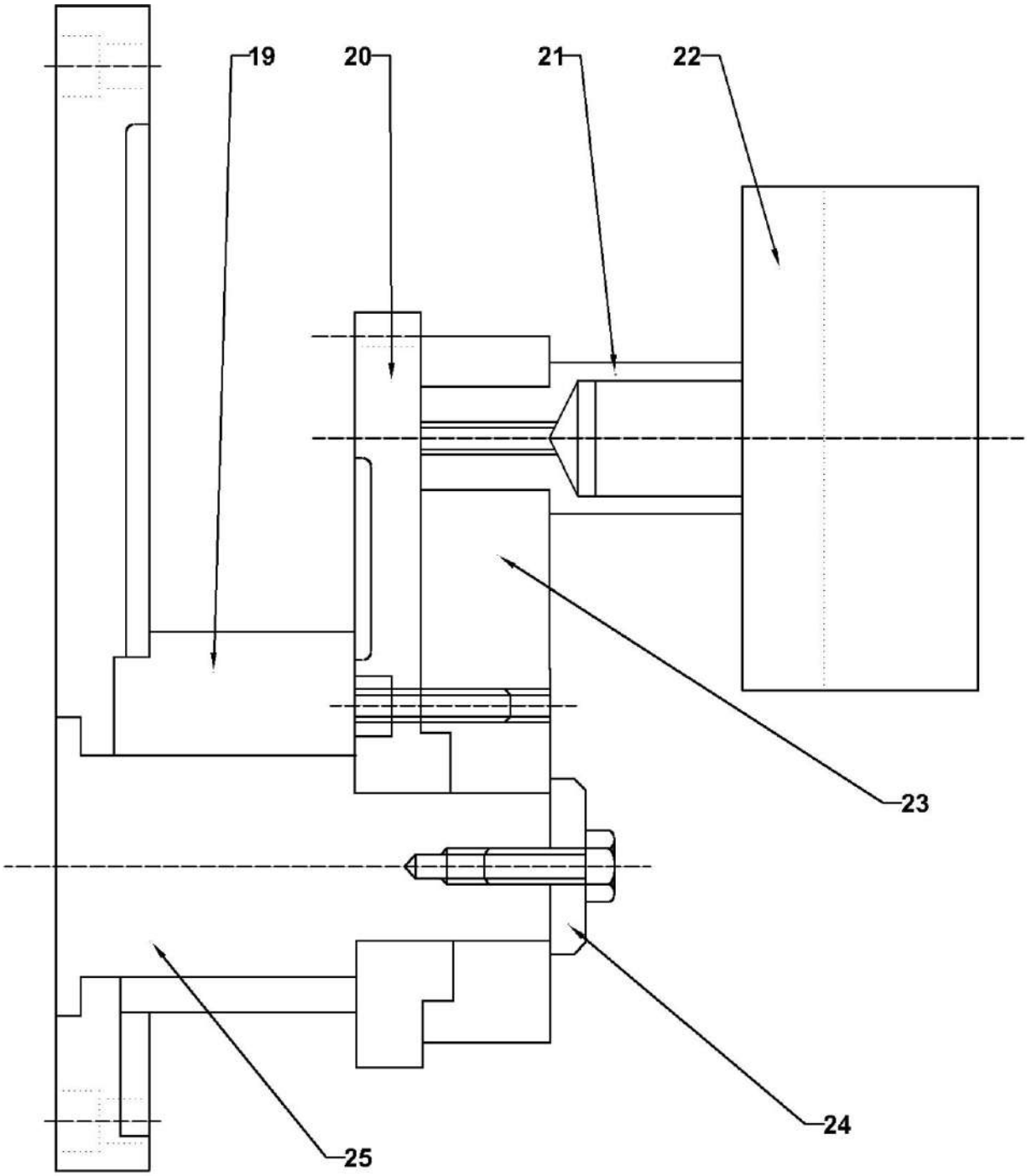
GEAR CHANGE ASSEMBLY (SI-SA-2H)

GCA-1 to GCA-18



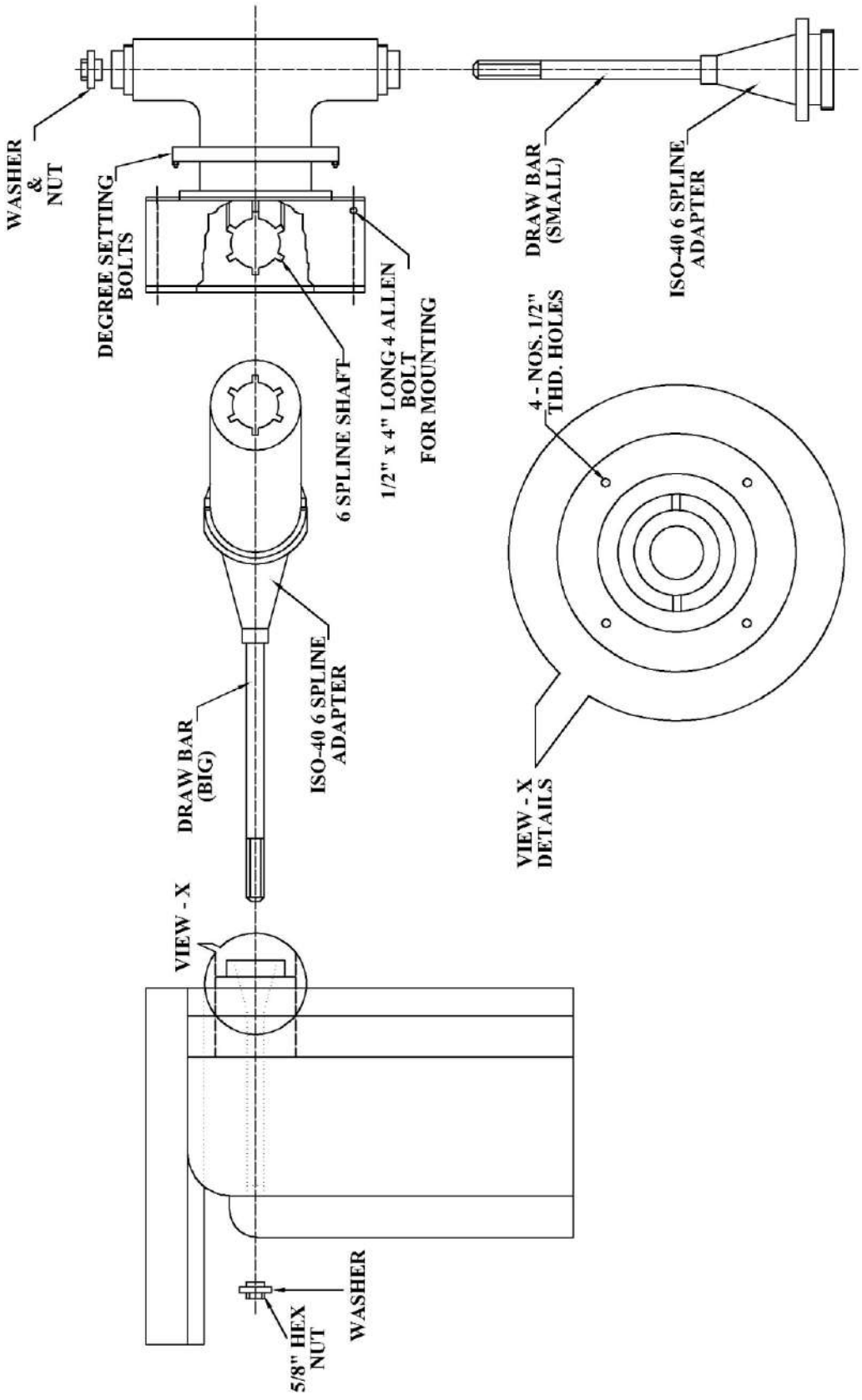
GEAR CHANGE ASSEMBLY (SI-S-2H)

GCA-19 to GCA-25



SECTION - 'Y-Y'

FIG : 9 VIEW OF VERTICAL HEAD MOUNTING (SI-SA-2H)



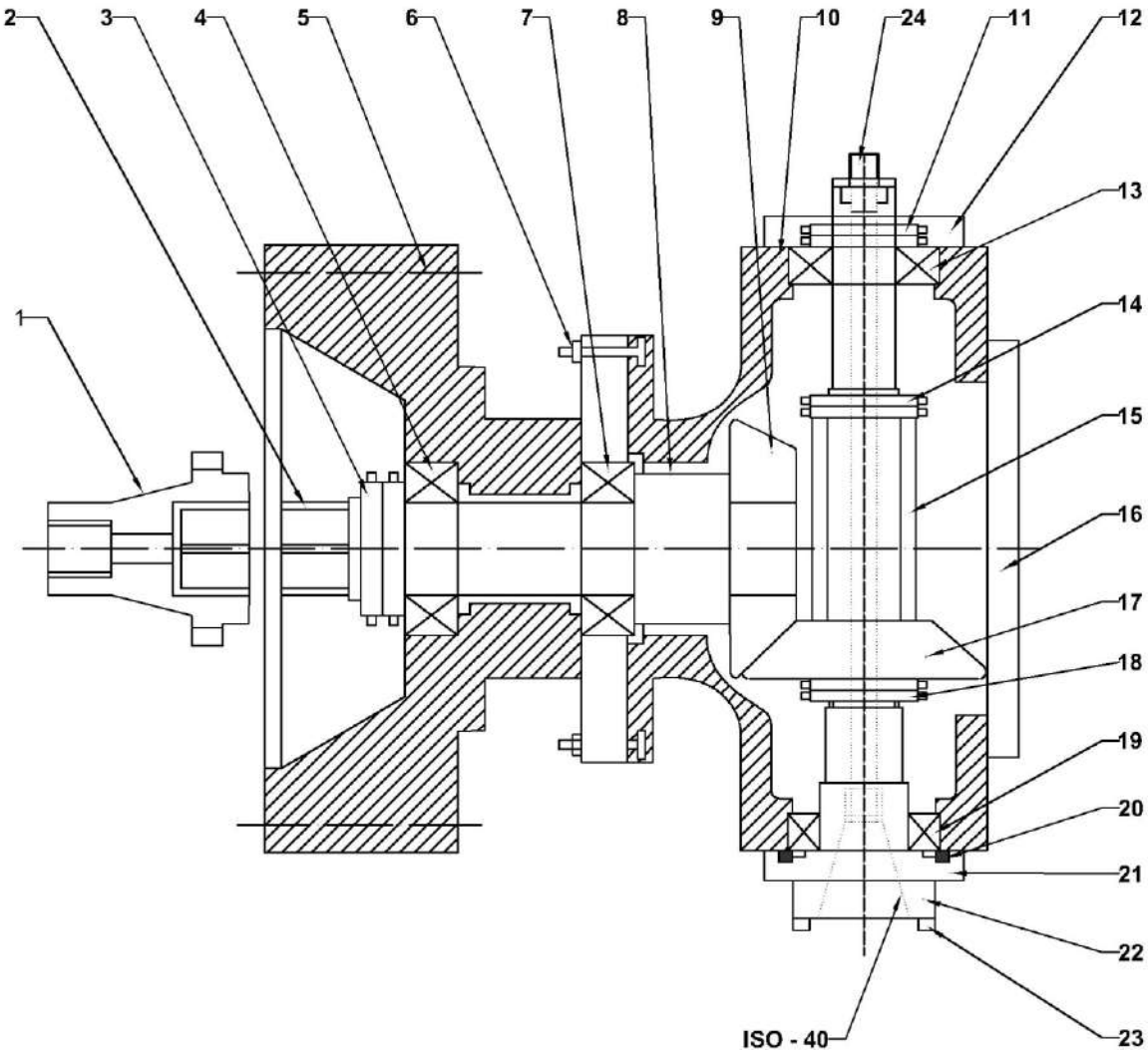
VERTICAL ATTACHMENT HEAD ASSEMBLY*(SI-SA-2H)*

VAH - 1 to VAH - 25

01.	*ISO-40 6 Spline socket*	*En-8*	*VAH - 01*
02.	*6 Spline shaft*	*En-8*	*VAH - 02*
03.	*Spline shaft check nut*	*M.S.*	*VAH - 03*
04.	*Bearing - 30206*	*Brg. Steel*	*VAH - 04*
05.	*Head mounting base*	*C.I.*	*VAH - 05*
06.	*T bolt & nut*	*M.S.*	*VAH - 06*
07.	*Bearing - 30206*	*Brg. Steel*	*VAH - 07*
08.	*Taper pin*	*M.S.*	*VAH - 08*
09.	*Spiral Bevel pinion gear - 24 T*	*SAE-8620*	*VAH - 09*
10.	*Vertical head body*	*C.I.*	*VAH - 10*
11.	*Spindle rear brg. check nut*	*M.S.*	*VAH - 11*
12.	*Spindle rear cover*	*C.I.*	*VAH - 12*
13.	*Bearing - 30207*	*Brg. Steel*	*VAH - 13*
14.	*Spiral bevel upper setting check nuts*	*M.S.*	*VAH - 14*
15.	*Distance piece*	*M.S.*	*VAH - 15*
16.	*Grease cover*	*Al.*	*VAH - 16*
17.	*Spiral bevel gear - 24T*	*SAE - 8620*	*VAH - 17*
18.	*Spiral bevel lower setting check nuts*	*M.S.*	*VAH - 18*
19.	*Bearing - 30210*	*Brg. Steel*	*VAH - 19*
20.	*Spindle lower oil seal*	*75 x 90 x 10*	*VAH - 20*
21.	*Spindle lower brg. cover*	*C.I.*	*VAH - 21*
22.	*Spindle*	*En-8*	*VAH - 22*
23.	*Spindle nose dog*	*M.S.*	*VAH - 23*
24.	*Tie rod*	*M.S.*	*VAH - 24*
25.	*Tie rod waher*	*M.S.*	*VAH - 25*

VERTICAL ATTACHMENT HEAD ASSEMBLY (SI-SA-2H)

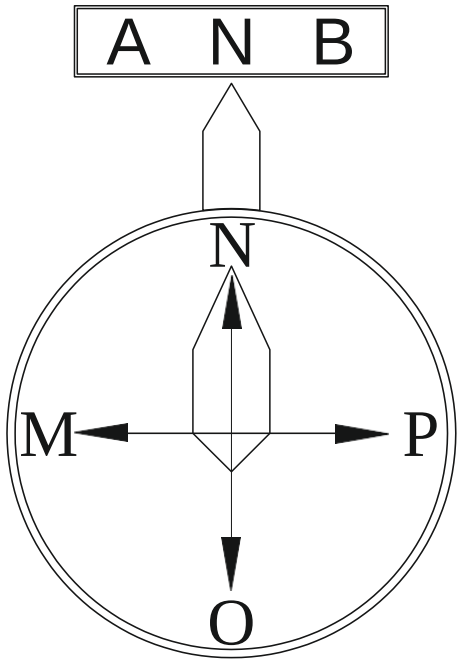
VAH-19 to VAH-25



*MODEL : **(SI-SA-2H)** FEED - TRAVERSE CHART*

SPINDLE R.P.M.	***LONG FEED***		
	Feed Lever Position	***mm/Rev.***	***mm/min.***
50	*A*	*0.45*	*22.50*
	B	*0.14*	*7.00*
	C	*0.09*	*4.50*
	D	*0.20*	*10.00*
80	*A*	*0.45*	*36.00*
	B	*0.14*	*11.20*
	C	*0.09*	*7.20*
	D	*0.20*	*16.00*
115	*A*	*0.45*	*51.75*
	B	*0.14*	*16.10*
	C	*0.09*	*10.35*
	D	*0.20*	*23.00*
170	*A*	*0.45*	*76.50*
	B	*0.14*	*23.80*
	C	*0.09*	*15.30*
	D	*0.20*	*34.00*
250	*A*	*0.45*	*112.50*
	B	*0.14*	*35.00*
	C	*0.09*	*22.50*
	D	*0.20*	*50.00*
380	*A*	*0.45*	*171.00*
	B	*0.14*	*53.20*
	C	*0.09*	*34.20*
	D	*0.20*	*76.00*
540	*A*	*0.45*	*243.00*
	B	*0.14*	*75.60*
	C	*0.09*	*48.60*
	D	*0.20*	*108.00*
800	*A*	*0.45*	*360.00*
	B	*0.14*	*112.00*
	C	*0.09*	*72.00*
	D	*0.20*	*160.00*

MODEL : SI-SA-2H - SPEED CHART



	A	B
M	**35**	**520**
N	**165**	**770**
O	**235**	**1100**
P	**350**	**1800**

BEARING LIST *(SI-SA-2H)*

(1) Bearing :

(a) Spindle bearing - 32214 , 32211, (SKF) One No. each.
(b) Intermediate shaft bearing - 30209, 6209, 30306 (SKF) One No. each.
(c) Drive shaft bearing - 6206, 6206, 6206 (SKF)
(d) Screw jack - 30206 & Thrust brg. 08 One No. each
(e) Idler chain gear : 6203 (1 no.)
(f) Feed drive gear box :

(1) Shaft no. 1 - 30204, 30205 (SKF)
(2) Shaft no. 1 - 30204, 30205 (SKF)

(g) Table Reversing :

(1) Bevel gear 2 pcs - 51108 (4 nos.)
(2) Table screw Thrust brg. 07 (2 nos.)

(h) Worm Box :

(1) 30204, 30205 (SKF) One No. each

(I) Bevel gear flange : 30205, 30205 (SKF)

Bevel gear shaft : 30205, 30205 (SKF)

(j) Supporter bearing : 30208 (2 nos.), 51108 (2 nos.)

(k) Cross slide screw bearing : Thrust brg. 08 (1 nos.)

(l) Vertical Attachment : 30206 (2 nos.), 30207 (SKF), 30210.

(2) Standard and Special equipments :

(a) Standard : Spindle arbour, Instruction manual, Draw bolt, Handle

(b) Special : Vertical milling attachment , Machine swivel base vice, Universal diving head, Special size milling arbour, foundation bolt, Rack cutting attachment

© V - belt : B - 60 (2 nos.)

Test Chart For Milling Machine with Table of Vertical height with Vertical Spindle

Sr No.	***Description***	***Measuring instument***	***Permissible***	***Actual***
(1)	*Sqaurness & Straightness of the knee of the table surface.*	*Dial guage & Square*	*0.02 mm Length of 300 mm*	*0.02*
(2)	*Flatness of the table Surface.*	Precision level or Straight edge and slip Guage	*0.04 mm upto 1000 mm Length*	*0.03*
(3)	*Parallism of the table Surface of its movements.*	(i) Longitudinally (ii) Transversly (both-dial guage)	*0.02 mm upto 300 mm Length*	*0.02*
(4)	*Runout of the spindle bore.*	*Dial guage*	*0.015 mm*	*0.014*
(5)	*True Runnig of the taper bore of the spindle.*	*Dial guage*	*0.02 mm*	*0.02*
(6)	*Arbour Runout with support.*	*Dial guage*	*0.015 mm*	*0.013*
(7)	*Arbour Runout without Support.*	*Dial guage*	*0.05 mm*	*0.04*
(8)	*Sqaurness of the spindle axis to the table surface.*	*Dial guage* *(1) For Horizontal* *(2) For Vertical*	*0.015 mm* *0.015 mm*	*0.011* *0.013*
(9)	*Vertical Spindle bore Runout.*	*Dial guage*	*0.05 mm*	*0.04*
(10)	*Sqaurness & Straightness of the cross movement of the knee to Arbour.*	*Dial guage 200 mm Length*	*0.040 mm Max.*	*0.032*

Inspected by.

Model : SI-SA-2H

M/C No. :

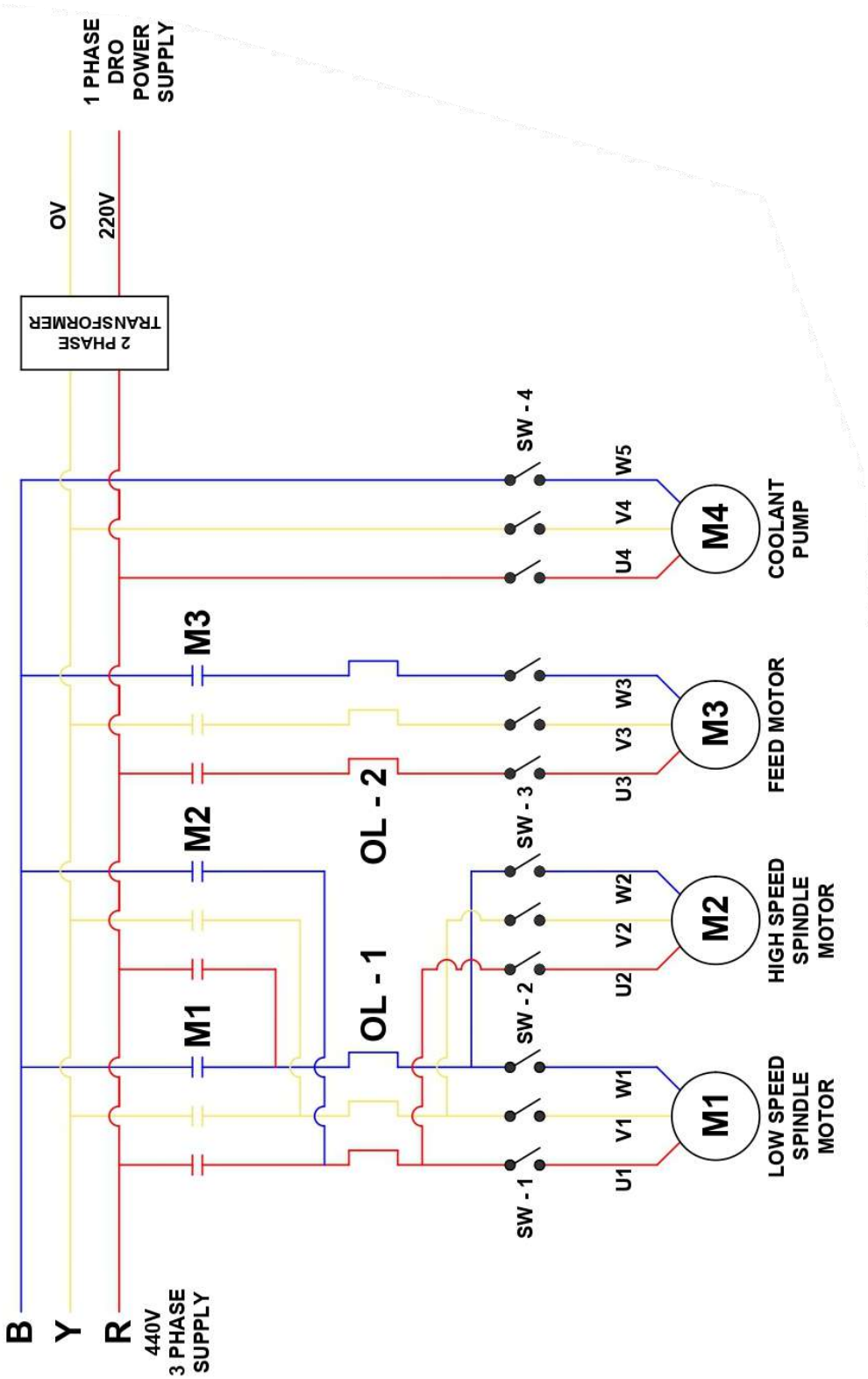
(Works Engineer)

Year :

Soham Impex,

Date :

Main Wiring Diagram (SI-SA-2H)



Control Wiring Diagram (SI-SA-2H)