

VERTICAL MACHINING CENTER

MODEL: TW-32-MCO

OPERATION MANUAL (1)



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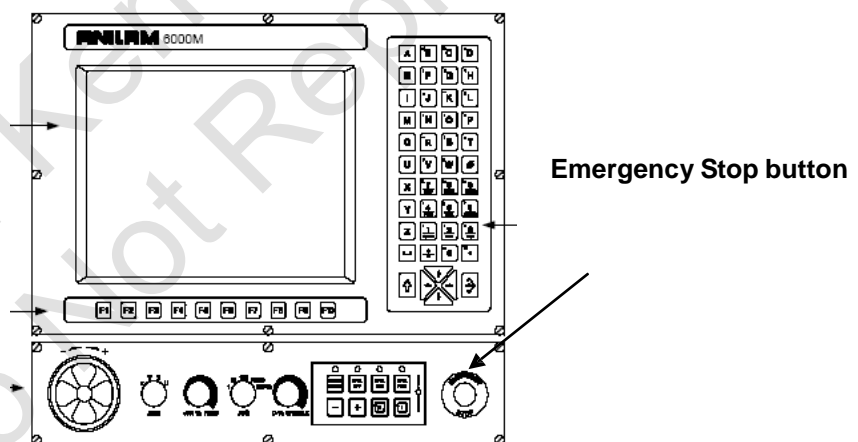
【Chapter 1 Safety Instruction】

1-1 The Basic Conditions for Safety Performance

Please comply with the three basic safety conditions below:

1. Only qualified personnel can operate or perform maintenance on the machine:
The qualified person must undergo proper training in order to understand the safety precautions and correct maintenance of the machine. Especially for the electrical maintenance, the qualified person has to have the experience and capability of performing this job. Meanwhile, he/she must be familiar with the safety standards and official safety regulations.
2. Before operating the machine, the person must pay close attention to the safety instructions on every individual part; this includes the detail procedure of operation, program, and maintenance.
3. The machine operator and maintenance person must be familiar with the position and function of the **“Emergency Stop”** button.

Operation Panel



Before maintenance, or in any emergency situation, please turn this knob to the **“OFF”** position.

Power Switch
(Electric Cabinet)

OFF ON

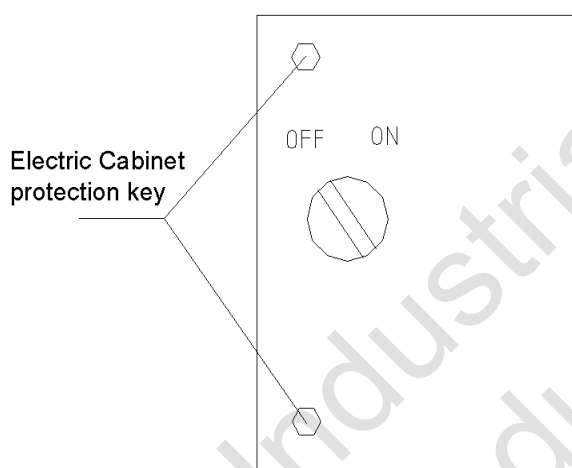


4. The safety key needs to be stored by appointed person.

This machine is equipped with two safety keys in order to protect the memory in the controller, and to prevent the cabinet's door from opening unintentionally.

- (1) Electric cabinet protection key:

This key protects the electric cabinet. The electric cabinet cannot be opened without authorization.



5. All of the operation manuals for this machine should be kept in a convenient place. If the operation manual's contents is too difficult to read, please contact the company and inform us of the make and model of your machine.

1-2. Safety & Prevention

Safety & Prevention Instructions:

This machine is equipped with many safety devices in order to prevent injury to the operator and damage to machine components. Therefore, the operator must completely understand the safety and prevention instructions below:

1-2-1. Basic Operation Practice

Our milling machine possesses the potential dangers as follows: specific control buttons, transformer, motor, circuit combination box, high-voltage connector, etc. Please do not touch these dangerous objects.

1. 【 Warning 】

1. Please do not touch the control button with wet hands.
2. The operator must be familiar with the location of the “Emergency Stop” button in case of an emergency.
3. When replacing a fuse, the main power must be turned off.
4. Please reserve enough working space and prevent tools and workpieces from falling.

5. Please keep the working area clean. The coolant, oil, and chips must be cleaned frequently in order to prevent slippage and injury.
6. When operating, please make sure to press the correct buttons for the exact function you wish to execute.
7. If there are two or more people operating the machine at the same time, ensure that these individuals are well trained, and can communicate well with one another before operating the machine to prevent accidents from occurring.

2. 【 Attention 】

1. When the power from this machine malfunctions, please turn off the main power immediately.
2. Please use the recommended lubricating oil.
3. The fuse should be replaced with the general, common fuse.
4. Prevent the control box, electrical box, and etc. from leaking electricity in the case of a malfunction.
5. Do not modify the computer setting and storage capacity without saving the original data. Please save the original data as a backup file before making a modification.
6. The warning plate must be kept clean. If it is not clear enough, please replace the plate. Remember to make a mark below the warning plate in order to avoid incorrect installation.

1-2-2. Before Starting the Machine

Before turning the machine on, make sure the power supply is grounded correctly.

Hazardous Objects:

Before operating, please ensure all the ropes, slings, and electrical wires are in the correct position in order to prevent the pulling, pushing, or entanglement of the wires. It is also to prevent electricity leakage, or any dangers to the machine.

1. 【 Warning 】

1. Please make sure the operator understands all the instructions and is familiar with every function and working procedure of the machine.
2. Please wear slip resistant boots and protective clothing.
3. Please make sure all the safety doors and guards that are protecting the NC unit, controller, electrical cabinet, and etc. are closed.

2. 【 Attention 】

1. The electric wires must be fixed to the floor and isolated by insulation sleeves in order to prevent damage to the wires and chip.

2. Before operating a machine that has not been used for a lengthy period of time, or a new machine, please make sure the slide ways are well lubricated.
3. Please fill up all the oil containers in the machine.
4. Please lubricate each required point, use the recommended lubricating oil and maintain the suitable oil volume in accordance with the instructions on the nameplate.
5. Please inspect each button and handle operation smoothly.
6. Please inspect the coolant volume.
7. Please make sure the power supply switch of the factory, the main power switch of the machine, and the main circuit switch are turned to the "ON" position.

1-2-3. After the Power Switch is turned ON

1. 【 Attention 】

When the power switch is turned to the “ON” position, the “READY” light will turn on. If it does not turn on, please inspect the problem area.

1-2-4. Routine Inspection

1. 【 Warning 】

When inspecting the belt, please do not place your hands between the belt and belt pulley.

2. 【 Attention 】

1. Please inspect the pressure gauge; it must be set up correctly.
2. Please pay attention to the motor, gear box, and other assembly parts to see if there are any unusual noise.
3. Please inspect the lubrication unit and lubricating oil level.
4. Please inspect every safety device and guard.
5. Please inspect the belt's tightness. If necessary, please re-tighten or replace the belt with the correct tension.
6. Please inspect the oil pressure unit to see if there is enough oil.

1-2-5. Warming-Up Before Operation of the Machine

1. 【 Attention 】

1. Use the automatic control to control the feeding of each axis and rotation of the main axis for 10 to 20 minutes, while setting the speed at half or a third of the highest speed.
2. Meanwhile, please inspect the action of other assembly parts with the automatic control program.
3. Please pay special attention while the spindle is warming-up when rotation speed is up to 4000 RPM. When operating the machine after it has started without sufficient lubrication, the machine will become damaged. Meanwhile, the thermal expansion of each part will cause the machine to become unstable and inaccurate.

1-2-6. Preparation

1. 【 Warning 】

1. The tools and cutters have to meet this machine's required specification.
2. Extremely worn out tools will damage the workpiece or inflict injury to people. Thus, these tools must be replaced in advance.
3. Surrounding the work environment, sufficient light must be used for safety and convenience when conducting inspections.
4. The cutters and other parts must be placed on a suitable clean box.
5. Do not clamp the cutter on the spindle, and put the cutter on the tool magazine, and the guards.

2. 【 Attention 】

1. Please check the length of the cutter in order to avoid the interference with other tools.
2. Please run the test run after clamping the cutter.

1-2-7. When the Machine is Running

1. 【 Warning 】

1. Long hair must be tied neatly and worn under a hat.
2. Please do not push any control button with a glove on in case of malfunction.
3. In order to prevent injury, two or more people should be lifting heavy workpieces.
4. Only experienced and well-trained individuals can operate the lifter, crane, sling, and other lifting devices.
5. When operating lifting devices, please do not collide with other devices.
6. When hanging the workpiece, please ensure the slings, belts, and ropes are strong enough to hold the weight of the workpiece.
7. Please make sure the work piece is fixed and stable.
8. The coolant flux should be adjusted when the machine is stopped.
9. Please do not touch the functioning workpiece or spindle.
10. The workpiece and the cutter must be kept at a safe distance, and the workpiece can only be moved when the spindle is stopped.
11. When the machine is running, please do not clean the chips with hands or rags.
12. Do not machine on the workpiece before installing the safety guards and splashguards.
13. Please clean the cutter with a brush. DO NOT use your hands.
14. When machining magnesium alloy, please wear a protection mask.

2. 【 Attention 】

1. Please do not open the door and window during operation.
2. During heavy load machining, please pay close attention to the jumped-out chips in order to avoid damage to the skin.

1-2-8. End of Machining

1. 【 Warning 】

When finished machining, please turn “NFB” switch to “OFF” position.

1-2-9. End of Work

1. 【 Attention 】

1. When cleaning the chips from the machine, please wait for the machine to stop.
2. All of the cutters, tools, and parts must be returned to where they belong.
3. Please inspect the felt wipers for damage and replace when necessary.
4. Please inspect the coolant for pollution, oil inside the oil cylinder, and lubrication oil. Please replace when necessary.
5. Please inspect the level of the coolant, and oil inside the oil cylinder, and refill them when necessary.
6. Please make sure all switches are turned off before leaving the machine.
7. Please turn off the main power to the machine when it is no longer being used.

1-2-10. Safety Equipment

1. Enclosure, splashguard, chip pan, and telescope of three axes.
2. Limit switch for program saving (NC software).
3. Emergency Stop button.

1-2-11. Preparation of Maintenance

1. Maintenance personnel must be authorized by their supervisor to maintain the machine.
2. Please prepare the accessories, parts and the following items below. (oil-sealing, O-ring, machine oil, grease)
3. Prepare to record every job, which is or isn't needed to maintain or adjust.

【 Attention 】

1. Please understand every safety precaution procedure first.
2. Please use the specified tools to process the maintenance job in order to prevent damage to the machine.

1-2-12. Maintenance

【 Attention 】

Perform the maintenance work only after the machine has stopped completely.

【 Hazard 】

1. Only experienced personnel or persons who are familiar with it are allowed to conduct electric cabinet maintenance work. Do not maintain the machine arbitrarily. There needs to be good communication between the maintenance personnel and the charged person.
2. Please do not move the dogs, limit switches, approaching switches, or other connecting mechanisms.
3. Please use a ladder to maintain devices that are too high to reach.
4. Please use high quality fuses and wires.
5. Please turn off the main power before performing any maintenance work.

1-2-13. Work before Starting the Machine after Maintenance

【 Warning 】

1. Please keep the oil-wipe rag, oil cleaner, and etc. for cleaning.
2. Please return the unnecessary tools, parts, and rest of oil to where they belong.

【 Attention 】

1. The maintenance person has to make sure the machine running safely.
2. Please keep the maintenance record and data for reference.

1- 3 The Hazard Zone of the Machine

1-3-1 Moving Parts

Because the spindle is running at high speeds, the actions of each axis, and the automatic tool changing, the area between the table, spindle, and tool magazine is very dangerous. Meanwhile, the inside of the machine will be wet and at a high temperature due to the splashing of chips and coolant during machining.

- ※ The full enclosure is an optional accessory; the table guard with Plexiglas is the standard specification.

【 Warning 】

1. Under Auto mode, do not open the working door, Plexiglas window, and other enclosures.
2. Please pay special attention to the operating condition and the power of the machine when “**ON**.” Ignoring the warning above can lead to death and extreme injury, or damage to the machine.

【Chapter 2 Carry and Stock】

2-1. Packing of the Machine:

Crate size (L × W × H) : 2185x2000x2350 mm

Net Weight : 2000kgs

Gross Weight: 2200kgs

※ The machine is packaged in a crate for transportation. This is the standard method unless the buyer requests for a different packaging method.

2-2. Lifting the Equipment:

2-2-1. Forklift Requirements:

Machine weight : 2,200kgs

Fork Length : 1,300mm

** The forklift must be capable of lifting at least this weight.
The sling must be capable of lifting at least this weight.
The trailer or the dray must be capable of transporting at least this weight and supporting this length.

2-2-2. Safety Requirements for Lifting

1. Crane:

- (1) During lifting and unloading, please avoid compression or collision because of the fact that this machine is a high precision machine. (The speed must be lower than 25m/min)
- (2) Jog the table to the machine's center, and the head to the bottom. Then fix the head with a stationary barrier.
- (3) The counterweight is locked by the stationary barrier.
- (4) Place a pad between the doors, pull them closed, and secure them with two wire ties through the handles.
- (5) The lube unit's exhausting holes must be locked.
- (6) The lift method and the lifter should be inspected.
- (7) The crane or forklift operator should be well trained and experienced.
- (8) All loose parts must be tightened before lifting. The contact surface of the machine should be protected with rags or wood to prevent scratching.
- (9) In order to prevent the swing from moving, please tighten a strong rope to a corner of the machine.

- (10) Please pay close attention to the air pressure pipes, wires, NC controller, and other devices when the slings are being pulled.
- (11) Please confirm that there are no people on top of the machine, on the side of the machine, and in the way of movement before moving the machine.
- (12) Please remove objects that are in the way of the machine, and pay close attention to the control buttons.
- (13) The length of the slings on the four corners should be equal, and the distance of the four corners between the machine and the ground should be kept leveled when lifting (50 cm suggested).
- (14) Please ensure that there are no wires, pipes, and etc. on the ground when putting down the machine.

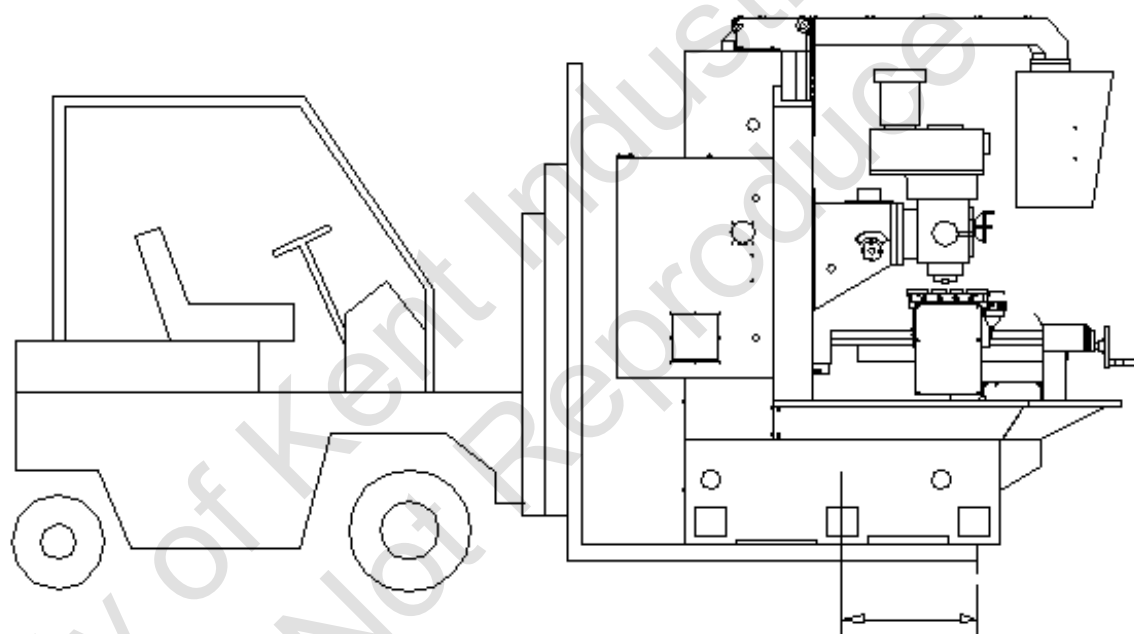
2. Forklift:

- (1) During lifting and unloading, please avoid compression and collision due to the fact that this machine is a high precision machine. (The speed must be lower than 25m/min)
- (2) Jog the table to the machine's center, and the head to the bottom. Then fix the head with a stationary barrier.
- (3) The counterweight is locked by the stationary barrier.
- (4) Place a pad between the doors, pull them closed, and secure them with two wire ties through the handles.
- (5) The lube unit's exhausting holes must be locked.
- (6) The lift method and the lifter must be completely inspected.
- (7) The crane or forklift operator must be well trained and experienced.
- (8) Please remove the objects that are in the way, and pay close attention to the control buttons.
- (9) Please confirm that there are no people on top of the machine, on the side of the machine, and in the way of movement before moving the machine.
- (10) Please ensure that there are no wires, pipes, and etc. on the ground when putting down the machine.

2-3. Fork Lift Instruction: (As the figure 2-3 shown)

Machine Weight : 2,200kgs

Fork Length : 1,300mm

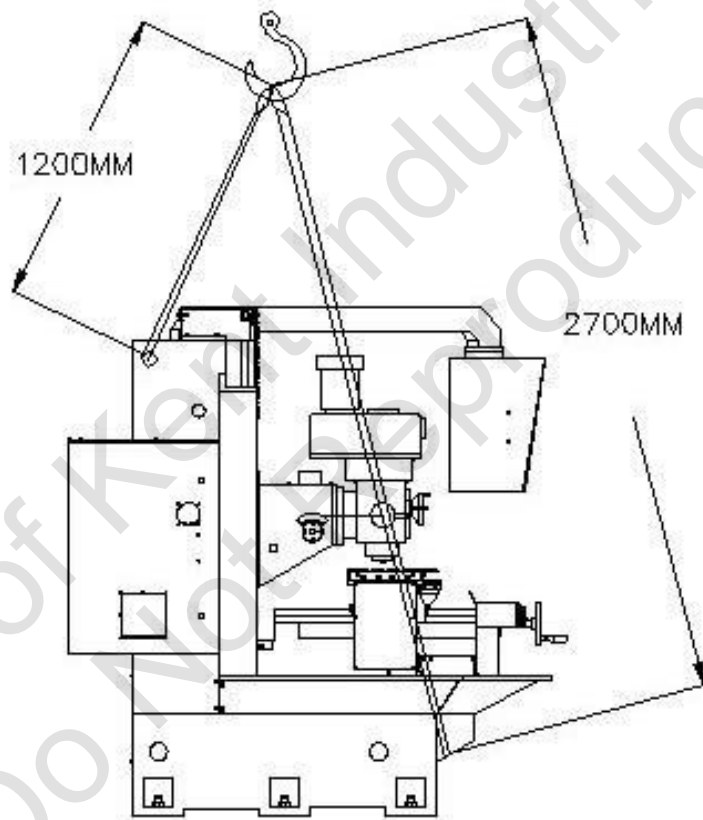


Over 100mm from the center

2-4. Cable Lift Instruction: (As the figure 2-3 shown)

Max. Load of Crane (kg) : 4,000 Kg

Sling Specification (D: mm) : 25mm



2-5. The Stock of the Machine :

1. If the machine is not installed immediately after arrival, please keep it in stock condition in order to prevent dust or damp buildup.
2. Storage Temperature Range: -5 °C to 45 °C
3. Ambient Humidity: less than 90 % relative humidity, non-condensing.
4. The machine must be placed on a flat surface in order to maintain the machine's accuracy.
5. The anti-rust oil should be reapplied when storing the machine because the oil gets removed during shipping.
6. Suggested anti-rust oil: (Please keep mind the valid day of storage)
 - (1) The transparent, and clear type: (Brand: COTEC Model :VCI-369G)
The anti-rust oil can prevent the machine from rusting for 6 months after the machine leaves our company.
 - (2) The brown & greasy type: (Brand: Model:)
The anti-rust oil can prevent the machine from rusting for 6 months after the machine leaves our company.

【Chapter 3 Dismantle and Installation Instruction】

3-1. Dismantle Instruction:

1. Installation Tools Required:

- (1) Crane
- (2) Scissors
- (3) Wrench (17/19mm)
- (4) Adjustable Wrench
- (5) Ladder
- (6) Claw Hammer
- (7) Air Wrench (21mm)
- (8) Hammer

2. Uncrating:

- (1) Pry off the clips around the top of the crate with a claw hammer and remove the top panel. Some crates have lag screws, which hold the crate walls and roof together. A wrench is necessary to remove these.
- (2) Pry off the enforcement beam inside the craft's top (It should be pried by two people).
- (3) Pry off all but one clip at each corner of the crate.
- (4) Remove plastic cover.

3. Uncrating the Pallet:

- (1) Unbolt the 6 fixed bolts and caps on the pallet with a wrench or adjustable wrench.
- (2) Cut off the iron plate that fixes the accessories onto the pallet, and remove the accessories by crane.

4. Move the machine without the crate: Move the machine by crane or forklift.

- (1) The required of forklift is stated in the previous chapter. The forks must be over 1800mm (at least over 100mm from machine's center).
- (2) When moving by forklift, make sure to move slowly and pay attention to its balance.
- (3) Please use suitable slings and steel frames to lift the machine.
- (4) Please remove the machine from the pallet by crane or forklift.
- (5) Refer to Section 2-2.

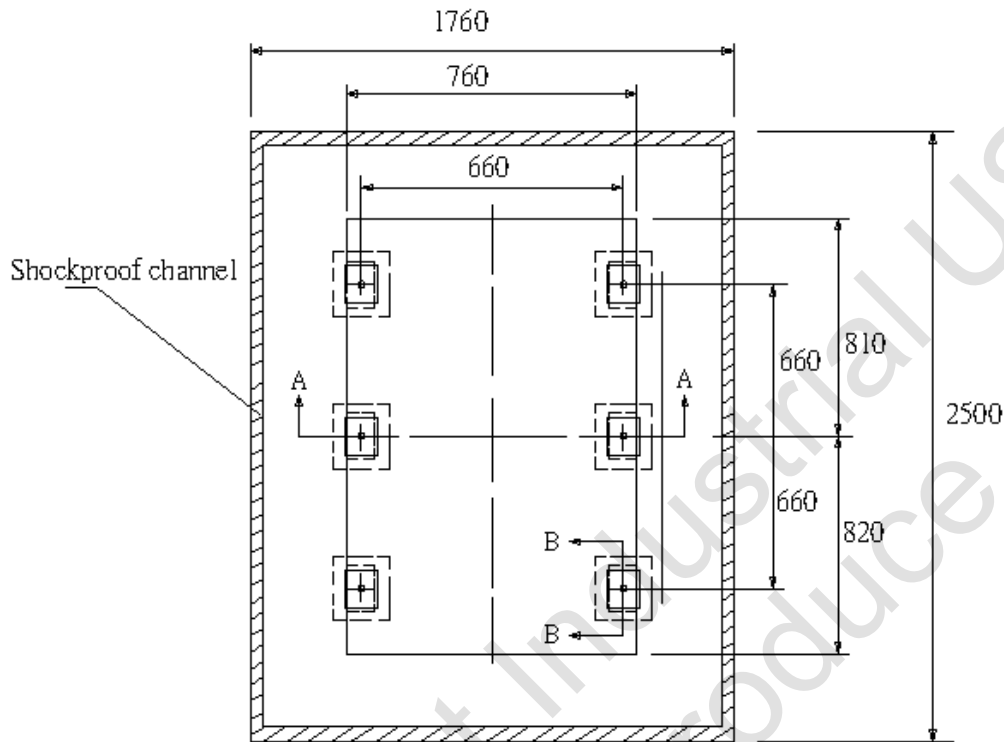
5. Inspection:

Our machine passes the strict function test and quality test before shipping. The customer shall check the follows items after uncrating:

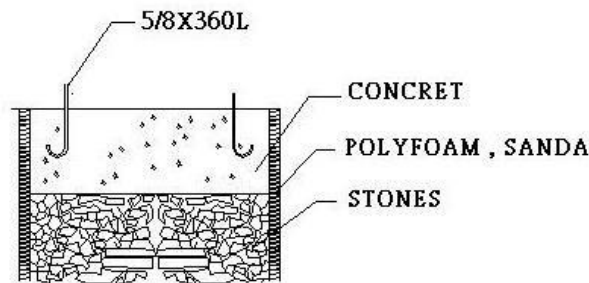
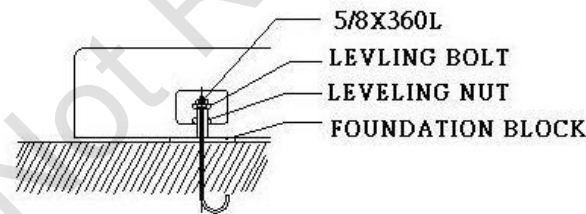
- (1) Whether or not the model is correct (matches with order).
- (2) Whether or not the accessories or parts are complete.
- (3) Whether or not the machine was damaged during transportation.
- (4) Whether or not the machine includes the inspection record.

3-2. Before Installing:

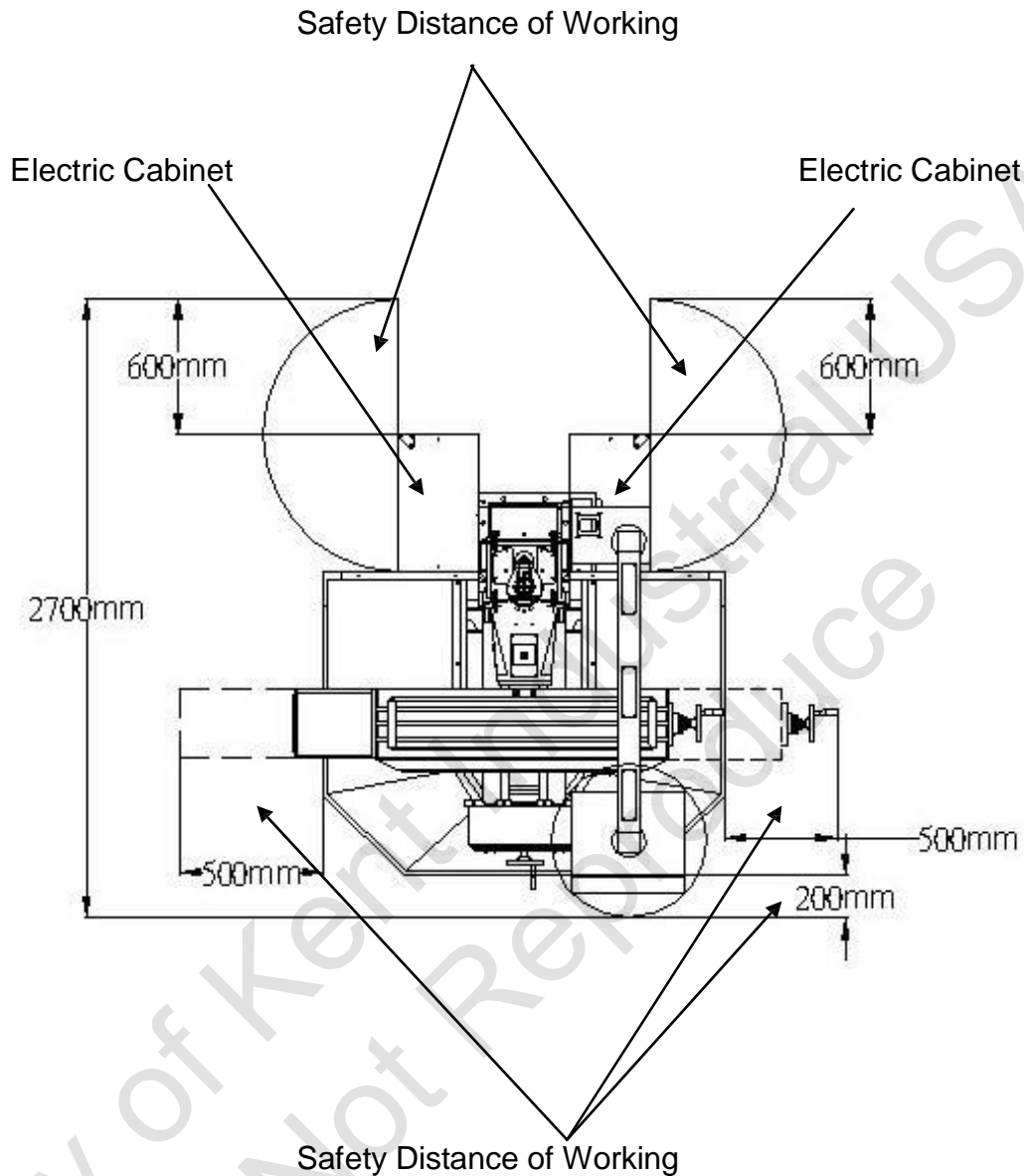
1. The machine's foundation work is shown in the drawing below:



The foundation's drawing of machine



2. Before the machine arrives at the buyer's factory, the customer should contact a forklift operator to lift and move the machine in accordance with Chapter 2.
3. Please move the machine in accordance with sections 2-2, 2-3.
4. Please uncrate the machine in terms of Section 3-1.
5. In order to make repair convenient, the machine's location must reserve sufficient space to fully open the electric-cabinet and enough space for the worker to move around (shown in the drawing).



6. Working Environment Requirement:

- (1) Temperature: $0^{\circ}\text{C} \sim 45^{\circ}\text{C}$.
- (2) Humidity : 40% ~ 75%.

7. When positioning the machine, do not operate the machine in these types of environments:

- (1) A location where oil, water, and chips might splash.
- (2) A location where there are strong electromagnetic devices or electro welding machines nearby.
- (3) A location where there are vibrational sources, such as a punching machine, press machine, or shearing machine nearby.
- (4) A location where exposed under direct sunlight.
- (5) A location where the ground is inclined or slippery.

3-3. Installation Instruction:

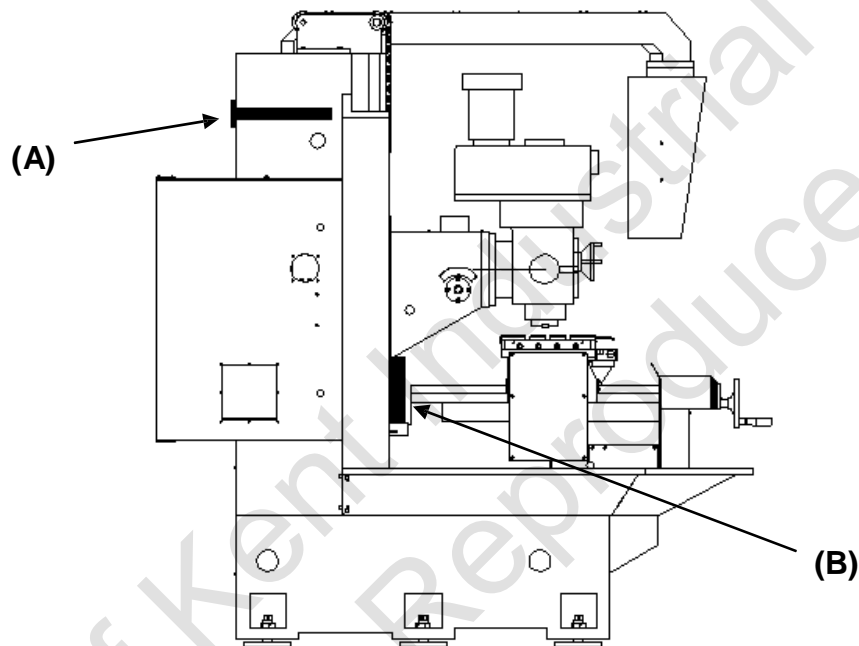
1. Put the machine on the planned foundation first.
2. Put the foundation bolts and foundation brackets beside the foundation holes temporarily.
3. Lift up the machine, and then put in the foundation bolts, and brackets to the holes of the leveling screws, then tighten up the nuts to prevent from falling.
4. Lower the machine onto the ground, and then insert the foundation bolts into the foundation holes.
5. Pour a small amount of concrete into the foundation hole first. Take note that the concrete should use the suitable proportion, and expanding coefficient in order to prevent a shrinking effect after adjusting.
6. After the foundation bolts are in the leveling screws, please pour the concrete into the foundation holes and fill it. After that, level the machine.
7. After leveling, please screw up the leveling nuts of the leveling screws, foundation bolts, and hexagon nut.

3-4. Electricity Requirement:

1. Power Supply System:
 - (1) Voltage: 220V
 - (2) 3 Phase Power Supply: 60Hz
 - (3) Electricity Currency: over 50A
2. The diameter of the power supply's wire should be 16 to 25mm, and should be mounted with a 30A's breaker (NFB breaker).
3. After inspecting the wiring and connection, please check the voltage, which needs to be 220V $\pm 10\%$.
4. Confirm the orientation of the motor's phase when running.
5. Compressor's Specification:
 - Pressure: 6 to 8 KgF/cm
 - Supply Capacity: 200 L/min

3-5. Remove the Shipping Bracket:

1. Jog the Z-axis 3 mm toward the +Z direction, and remove the wood block (A) between the spindle and column.
2. Jog the Z-axis toward the -Z direction in order to pull tight the chains where upon the counterweight (B), and take out the fixed rod of the counterweight.
3. When the machine is fixed on the ground, please store the shipping bracket well.
4. Remove all the driers hanging in the machine including the electric cabinet.
5. Please DO NOT power on the machine before the shipping bracket is removed correctly.

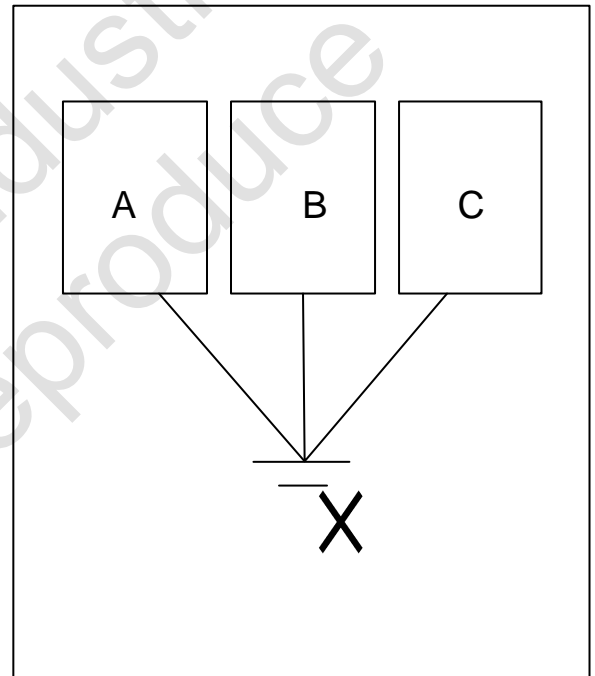
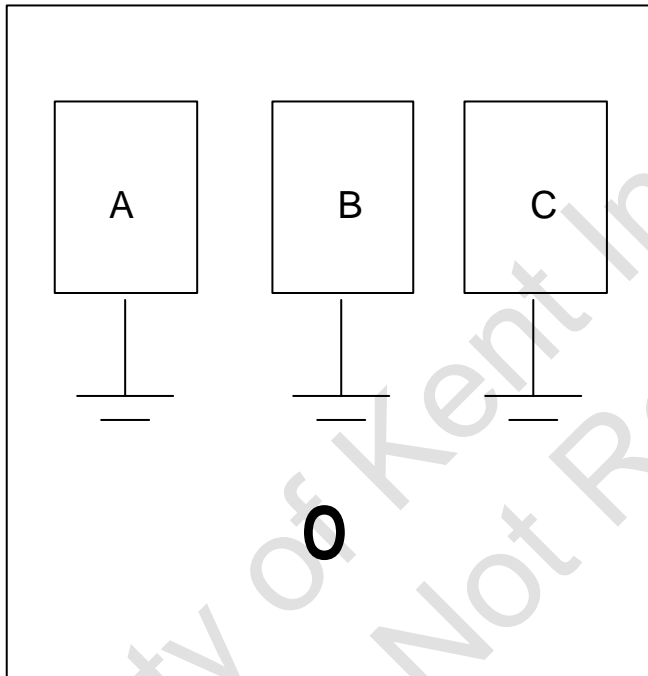


3-6. Cleaning and Lubricating:

1. In order to prevent rust and corrosion, we spray anti-rust oil on the parts not painted. Therefore, after installing, please wipe off the anti-rust oil with soft rags and kerosene.
2. DO NOT pour kerosene or other cleaning agents into the spindle and the three axes. It may void the warranty.
3. After cleaning, the unpainted parts should be sprayed with lube oil.

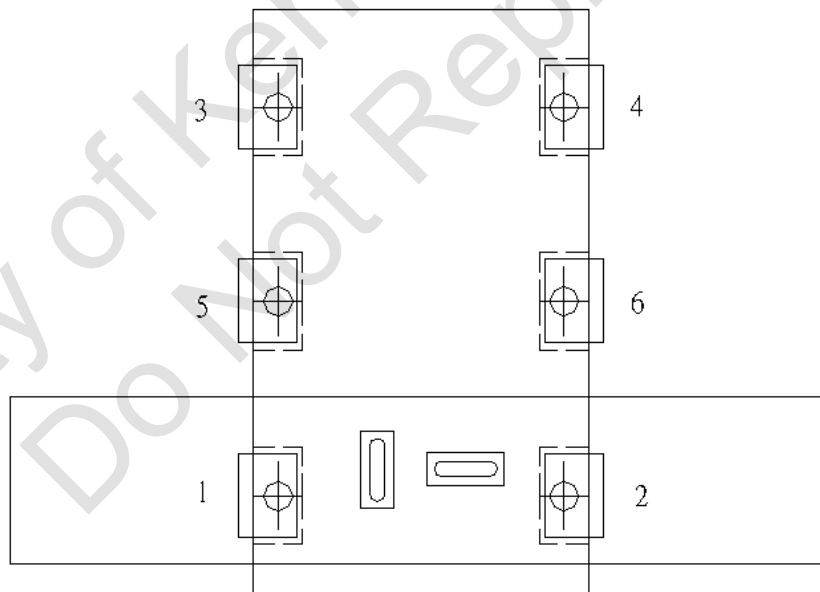
3-7. Machine's Grounding:

1. It is best to ground the machine's electric elements and factory's power system together. In general, it is connected in series. Please notice that it is NOT connected in parallel method.
2. The grounding wire should be selected with a diameter over 19mm's insulation wire.
3. The Grounding resistance must be below 100Ω .
4. Use steel rods as a grounding pole; the inner diameter should be over 19mm. Copper rods are a better choice and its length should be over 1 meter.
5. The grounding pole should be buried in the ground over 1m. If the rod is obstructed by a rock, it can be buried transversely in the ground over 1.5m depth.



3-8. Balance of the Machine:

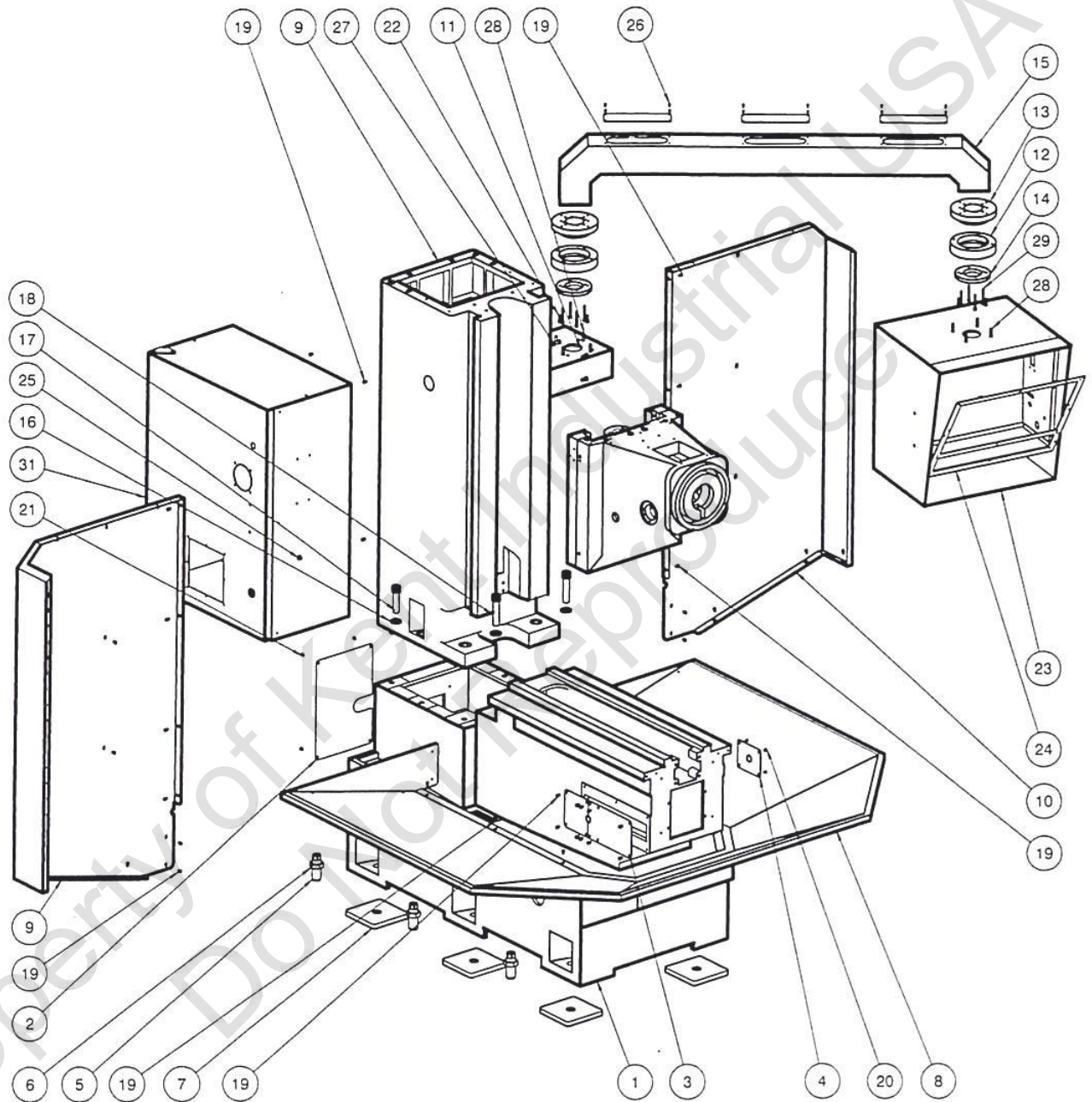
1. Prepare two of precision bubble levels (0.02mm per scale).
2. Before adjustment, please check first the accuracy of the precision bubble level by following the method below:
 - (1) Put the level on a fixed position on the table.
 - (2) After the bubble is stable, please record the bubble position, and then rotate it to 180° . When the bubble is stable, please compare with 0° 's bubble position, the tolerance is allowed within 1/3 scale.
3. Jog the table and saddle to the center.
4. Put the precision bubble level on the center of the table; please adjust the machine's level in accordance with the position of the bubble by adjusting the foundation bolts as shown.
5. Please adjust bolts 1 - 4 first and then adjust 5 - 6 in sequence.
6. The leveling accuracy should be within 0.04 mm (about 2 scales). After leveling, please tighten the foundation bolts.
7. Please notice that the foundation bolts should be inserted into the slots of the foundation brackets.
8. Calibrate and adjust the perpendicular degree between the table and the spindle center.
9. After 6 months of installation, please adjust again to make sure the foundation is stable.



CH 4 Parts List

COLUMN & BASE	23
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Z-AXIS ASSEMBLY	29
RIGID HEAD & SPINDLE.....	
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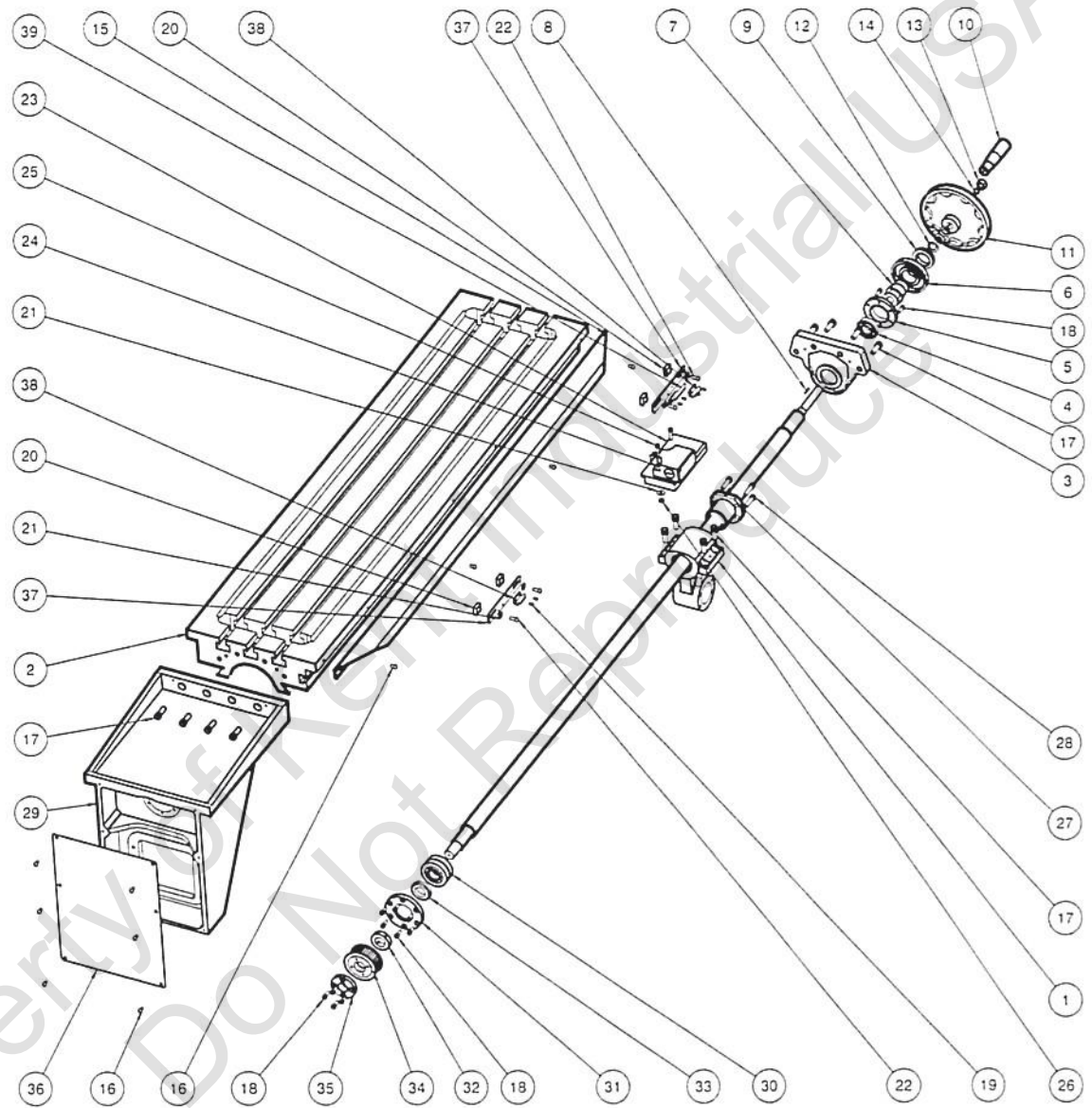
TW-32 COLUMN & BASE



TW-32-COLUMN & BASE

ITEM NO	PARTS NO.	DESCRIPTION
1	TF1001	BASE
2	TB-1005	COVER
3	TF-4044A-KENT	COVER
4	5A-4001-1-23	COVER
5	TB-1001-1	ADJ. BALANCE BOLT (6Req)
6	009-M0000030	JAM NUT (6Req)
7	TB-1001-3	ADJ. BALANCE BOLT (6Req)
8	TF-1204	COOLANT TRAY
9	TF-1008	LEFT SPLASH GUARD
10	TF-1009	RIGHT SPLASH GUARD
11	TB-1108-1	HANG ARM
12	TA-1022A	ARM ADAPTER (2Req)
13	TA-1022B	ROTARY DISC (2Req)
14	TA-1022C	RETAINER RING (2 Rep)
15	TA-1020	ARM
16	TB-1012	WASHER (6 Rep)
17	001-M2000090	SOCKET HEAD CAP SCREW (4 Rep)
18	001-M2000120	SOCKET HEAD CAP SCREW (2 Rep)
19	002-M0600016	HEMISPHERE HEAD CAP SCREW (45 Rep)
20	002-M0500008	HEMISPHERE HEAD CAP SCREW (6 Rep)
21	002-M0600008	HEMISPHERE HEAD CAP SCREW (4 Rep)
22	001-M0600060	SOCKET HEAD CAP SCREW (4 Rep)
23	4G-1021	PENDANT BOX
24	4G-1021-1	PENDANT PLATE
25	002-M0400006	HEMISPHERE HEAD CAP SCREW
26	002-M0400008	HEMISPHERE HEAD CAP SCREW (18 Rep)
27	001-M0800025	SOCKET HEAD CAP SCREW (5 Rep)
28	001-M0800025	SOCKET HEAD CAP SCREW (8 Rep)
29	001-M0600035	SOCKET HEAD CAP SCREW (8 Rep)
30	TMV-1108-1	TOOL BOX

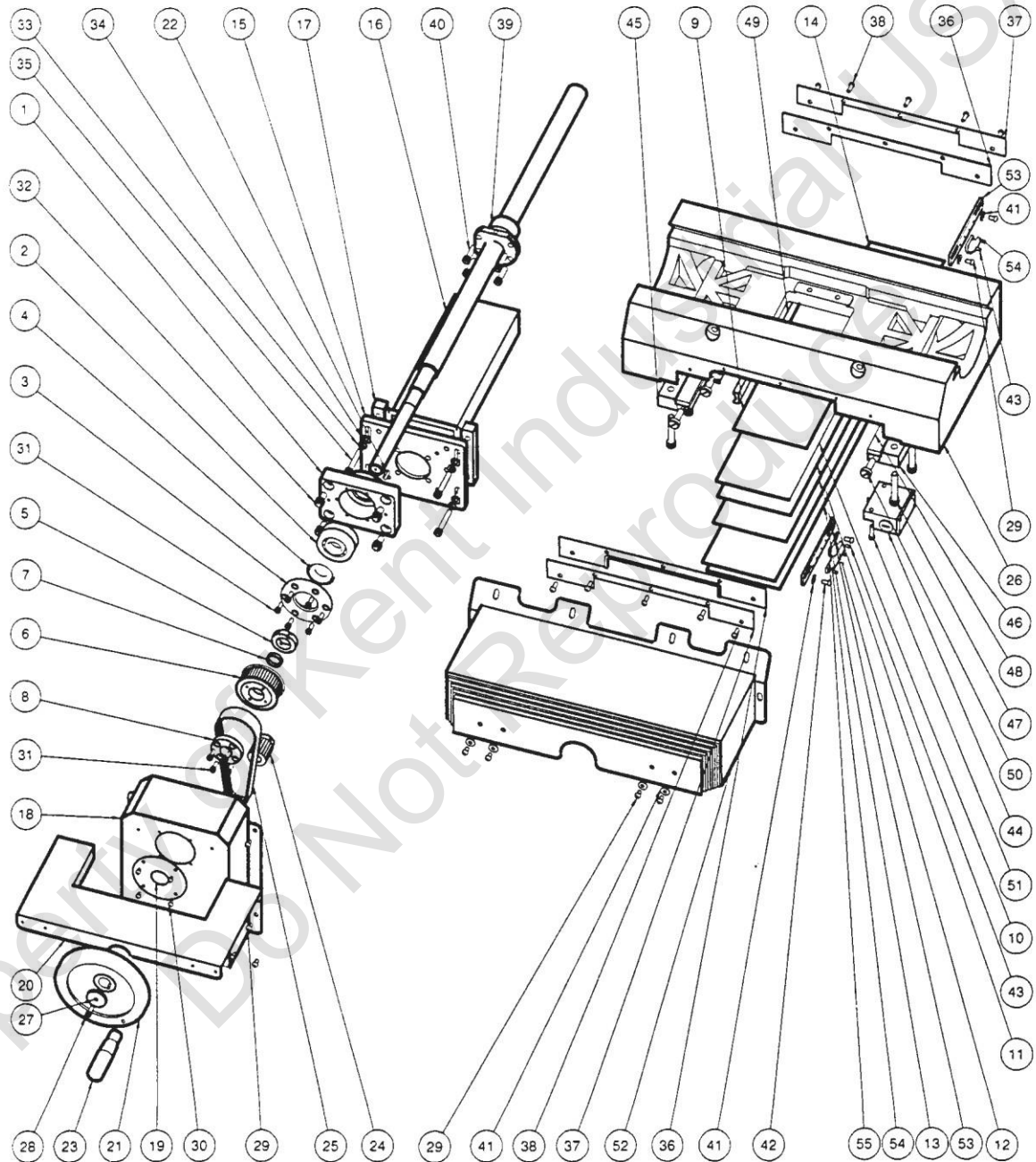
TW-32 X-AXIS ASSEMBLY



TW-32 X-AXIS ASSEMBLY

ITEM NO.	PARTS NO.	DESCRIPTION
1	TF-3025	LONGITUDINAL FEED BRACKET
2	5G-2001	TABLE (12"×50")
3	2006	BEARING BRACKET
4	020-006204ZZ	PRECISION BALL SCREW BEARING
5	3A-2011	BEARING RETAINER RING
6	2012	DIAL WITH 200 GRADUATIONS
7	2014	DIAL HOLDER
8	013-03030020	KEY
9	2016	DIAL LOCK NUT
10	4G-2018-1	HANDLE
11	4G-2018A	HAND WHEEL
12	034-AL500-011	WASHER (3 Req.)
13	009-10000006	JAM NUT
14	012-M0000008	SPRING WASHER
15	5A-2021-800	TABLE FRONT COVER
16	002-M0600010	HEMISPHERE HEAD CAP SCREW (10 Rep)
17	001-M1000025	SOCKET HEAD CAP SCREW (12 Rep)
18	001-M0600010	SOCKET HEAD CAP SCREW (16 Rep)
19	002-M0400008	HEMISPHERE HEAD CAP SCREW (6 Rep)
20	5A-2043	BLOCKING (4 Rep)
21	011-M0000006	WASHER (8 Rep)
22	002-M0600016	HEMISPHERE HEAD CAP SCREW (4 Rep)
23	4G-2036	LIMIT SWITCH BRACKET
24	3A-2034	LIMIT SWITCH
25	001-M0600025	SOCKET HEAD CAP SCREW (2 Rep)
26	009-M0000006	JAM NUT (2 Rep)
27	TF-2002A	X-AXIS BALL SCREW
28	001-M0800030	SOCKET HEAD CAP SCREW (4 Rep)
29	TF-2006A	X-AXIS MOTOR BRACKET
30	020-0BST2562	PRECISION BALL SCREW BEARING (2 Rep)
31	TA-2011	BEARING RETAINER RING
32	021-0000MR25	LOCK NUT
33	TA-2013	DUST PROOF WASHER
34	5B-2013A	TIMING BELT PULLEY
35	TA-2014A	FIXED BLOCK FOR COME RING KEY
36	TF-2007A	COVER
37	4B-2031	LIMIT SWITCH BRACKET (2 Rep)
38	4B-2029	LIMIT DOG (2 Rep)
39	4B2029H	LIMIT DOG

TW-32 Y-AXIS ASSEMBLY

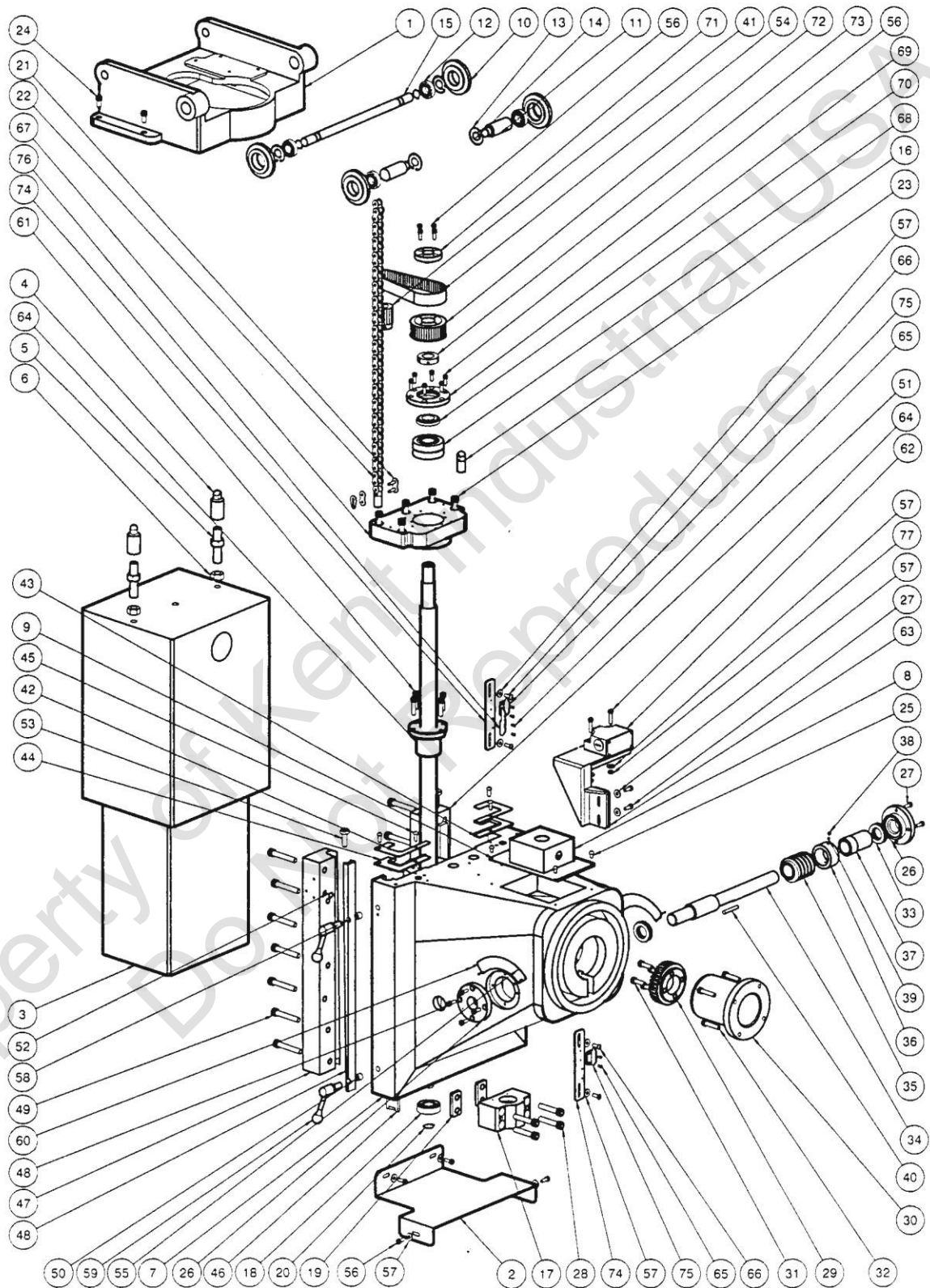


TW-32 Y-AXIS ASSEMBLY

ITEM NO	PARTS NO.	DESCRIPTION
1	3B-3005	CROSS FEED BEARING BRACKET
2	020-0BST2562	PRECISION BALL SCREW BEARING (2Req)
3	TA-2011	BEARING RETAINER RING
4	TA-2013	DUST PROOF WASHER
5	021-0000MR25	LOCK NUT
6	5B-2013A	TIMING BELT PULLEY
7	032-00022X26	CONE RING KEY
8	TA-2014A	FLED BLOCK FOR CONE RING KEY
9	TF-3011	CHIP GUARDS
10	TF-3012	CHIP GUARDS
11	TF-3013	CHIP GUARDS
12	TF-3014	CHIP GUARDS
13	TF-3015	CHIP GUARDS
14	TF-3016	CHIP GUARDS
15	5B-3006E	MOTOR BRACKET
16	5B-3006E-1	MOTOR SHAFT
17	TB-3020-1	BLOCK (2Req)
18	3B-3004	CROSS FEED PULLEY COVER
19	3B-3004-1	Y-AXIS COVER
20	TF-3037A-1	TELESCOPIC GUARD SUPPORT
21	4G-2018	HAND WHEEL
22	013-05050020	KEY
23	4G-2018-1	HANDLE
24	5B-2018Z	TIMING BELT PULLEY
25	023-05M47525	TIMING BELT
26	5K-3001	SADDLE
27	011-M0000006	WASHER
28	002-M0600016	HEMISPHERE HEAD CAP SCREW
29	002-M0600010	HEMISPHERE HEAD CAP SCREW (14Req)
30	002-M0500008	HEMISPHERE HEAD CAP SCREW (4Req)
31	001-M0600010	SOCKET HEAD CAP SCREW (10Req)
32	001-M1000016	SOCKET HEAD CAP SCREW (4Req)
33	012-M0000008	SPRING WASHER (Req.)
34	011-M0000008	WASHER (4Req)
35	001-M0800050	SOCKET HEAD CAP SCREW (4Req)
36	4H-3037	FELT WIPERS (2Req)
37	4H-3037-1	WIPER HOLDER (2Req)
38	002-M0600016	HEMISPHERE HEAD CAP SCREW (10Req)
39	TF-3002A	Y-AXIS BALL SCREW
40	001-M0800030	SOCKET HEAD CAP SCREW (4Req)
41	011-M0000006	WASHER (8Req)
42	002-M0600012	HEMISPHERE HEAD CAP SCREW (2Req)
43	002-M0400008	HEMISPHERE HEAD CAP SCREW (6Req)
44	3A-2034	LIMIT SWITCH
45	5K-3050	SADDLE/BASE GIB SUPPORT
46	5K-3051	SADDLE/BASE GIB SUPPORT
47	001-M1000060	SOCKET HEAD CAP SCREW (4Req)
48	4H-3027-1	SADDLE/BASE GIB (2Req)
49	4H-3027	SADDLE/BASE GIB
50	3028	GIB ADJ. SCREW (6Req)
51	001-M0600025	SOCKET HEAD CAP SCREW (2Req)
52	TF-3037	TELESCOPIC COVER
53	4B-2031	LIMIT SWITCH BRACKET (2Req)
54	4B-2029	LIMIT DOG (2Req)
55	4B-2029H	LIMIT DOG

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TW-32QI Z-AXIS ASSEMBLY



TW-32QI Z-AXIS ASSEMBLY

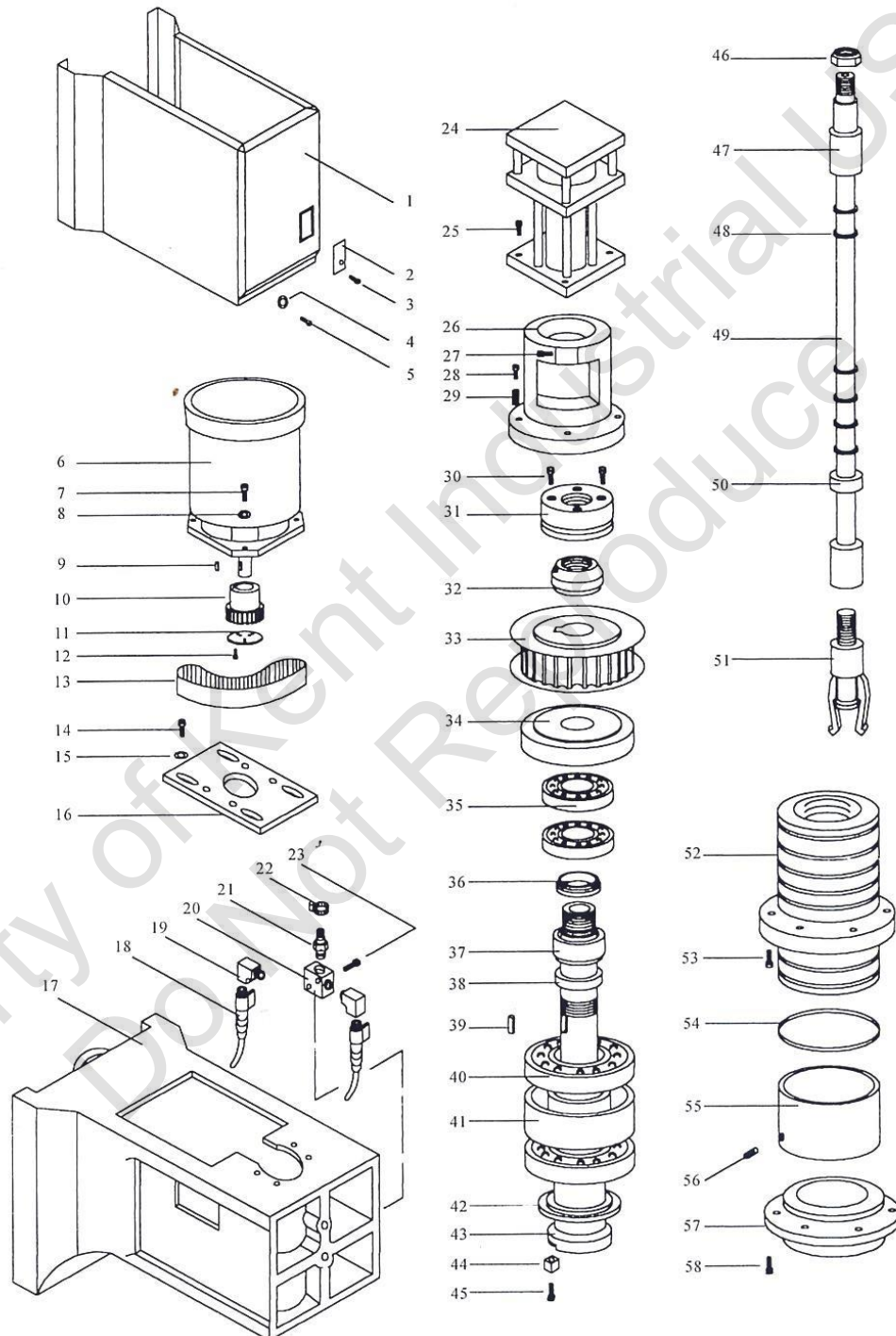
ITEM			ITEM		
NO.	PARTS NO.	DESCRIPTION	NO.	PARTS NO.	DESCRIPTION
1	TF-5002	CHAIN BRACKET	40	013-060600454	KEY
2	TF-4003	COVER	41	5B-2018Z	MOTOR TIMING BELT PULLEY
3	TF-5026	COUNTER-WEIGHT	42	TB-4011-2	WIPER HOLDER (2 Req.)
4	TP-5010	COUNTERWEIGHT CHAIN JOINT (2 Req.)	43	TB-4011	FELT WIPERS

5	TP-5011	COUNTER-WEIGHT ADJ. SCREW (2 Req.)
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44	TB-4011-1	FIGHT WIPERS
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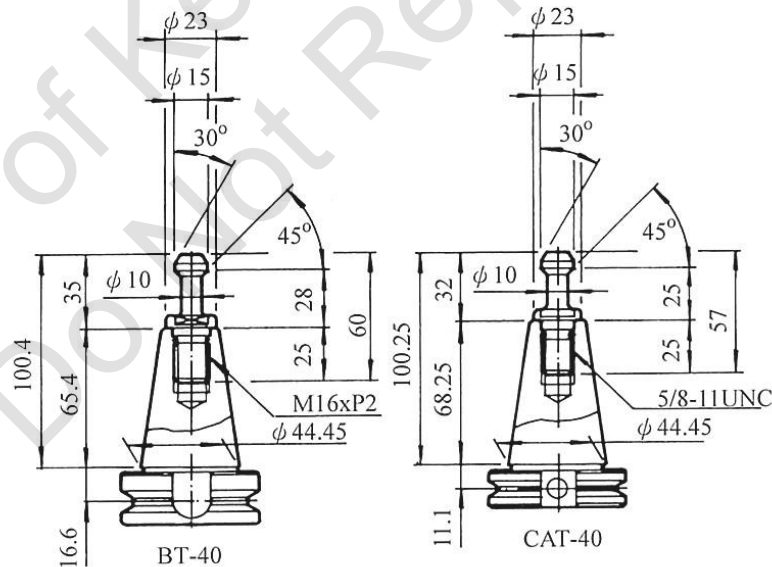
6	009-10000009	JAM NUT (2 Req.)	45	002-M0600016	HEMISPHERE HEAD CAP SCREW (4 Req.)
7	TB-4001	HEAD SLED-BLOCK	46	4H-4038	COLUMN/HEAD SLIDE BLOCK GIB
8	TF-4001-1	WIRING BOX	47	TB-4005	GIB SUPPORT
9	TF-4001-2	COVER	48	4H-4053	COLUMN/HEAD SLIDE BLOCK GIB (2 Req.)
10	TP-5018	CHAIN WHEEL (4 Req.)	49	001-M1000060	SOCKET HEAD CAP SCREW (14 Req.)
11	TB-5007	CHAIN WHEEL SHAFT (2 Req.)	50	008-10000004	SET SCREW (2 Req.)
12	020-006003ZZ	PRECISION BALL SCREW BEARING (4 Req.)	51	TB-4006	GIB SUPPORT
13	015-R0000035	SNAP RING (4 Req.)	52	024-0000P009	O RING (2 Req.)
14	015-S0000017	SNAP RING (6 Req.)	53	3028	GIB ADJ. SCREW (2 Req.)
15	TF-5007	CHAIN WHEEL SHAFT	54	023-5M040025	TIMING BELT
16	TP-5016	CHAIN JOINT (2 Rep)	55	5A-5043-1	HEAD SWIVEL PLATE (2 Req.)
17	TP-3035	BALL BEARING HOUSING	56	001-M0600010	SOCKET HEAD CAP SCREW (14 Req.)
18	020-006204ZZ	PRECISION BALL SCREW BEARING	57	011-M0000006	WASHER (12 Req.)
19	TP-3035-1	SPACER (2 Req.)	58	TB-4010	BRASS PLUG (2 Req.)
20	015-S00000020	SNAP RING	59	3030.31	LOCK BOLT HANDLE (2 Req.)
21	018-000000050	CHAIN JOINT	60	033-00000001	DRIVE SCREW (8 Req.)
22	018-0500P0069	CHAIN	61	001-M0800030	SOCKET HEAD CAP SCREW (4 Req.)
23	001-M1000035	SOCKET HEAD CAP SCREW (5 Req.)	62	3A-2034	LIMIT SWITCH
24	001-M0800016	SOCKET HEAD CAP SCREW(4 Req.)	63	4G-2036	LIMIT SWITCH BRACKET
25	002-M0600010	HEMISPHERE HEAD CAP SCREW (4 Req.)	64	001-M0600025	SOCKET HEAD CAP SCREW (6 Req.)
26	5K-5040-2	WORM FIXED COVER (2 Req.)	65	002M-0400008	HEMISPHERE HEAD CAP SCREW (6 Req.)
27	001-M0600016	SOCKET HEAD CAP SCREW (10 Req.)	66	002-M0600016	HEMISPHERE HEAD CAP SCREW (4 Req.)
28	001-M1000050	SOCKET HEAD CAP SCREW (4 Req.)	67	5A-3005A	BEARING BRACKET
29	5K-5033	WORM GEAR	68	020-0BST2562	PRECISION BALL SCREW BEARING (2 Req.)
30	5K-5033-1	WORM SHAFT	69	TA-2011	BEARING RETAINER RING
31	001-M0800025	SOCKET HEAD CAP SCREW (4 Req.)	70	TA-2013	DUST PROOF WASHER
32	001-M0800035	SOCKET HEAD CAP SCREW (4 Req.)	71	TA-2014A	FIXED BLOCK FOR COME RING
33	020-00051105	SINGLE DIRECTION THRUST BALL BEARING (2 Req.)	72	5B-2013A	TIMING BELT PULLEY FLANGE
34	5K-5040	WORM SHAFT	73	021-0000MR25	LOCK NUT
35	5K-5039	WORM	74	4B-2031	LIMIT SWITCH BRACKET (2 Req.)
36	5K-5040-1	ADJ. BUSHING	75	4B-2029	LIMIT DOG (2 Req.)
37	5A-5040-1-1	ADJ. BUSHING	76	4B-2029H	LIMIT DOG
38	008-M0600006	SET SCREW	77	009-M0000006	JAM NUT (2 Req.)
39	TW-6199-1	BRASS PLUG			

TW-31 MV / TW-40 MV RIGID HEAD & SPINDLE



TW-31 MV / TW-40 MV RIGID HEAD & SPINDLE

ITEM NO.	PARTS NO.	DESCRIPTION	ITEM NO.	PARTS NO.	DESCRIPTION
1	TRM4002N	Cover For Head	31	TM4026	Adj. Lock Nut
2	TM4052	Push Button Switch Plate	32	TM4018	Lock Nut
3	Tm4053	Cap Screw (M4 X 8)(4 Req)	33	TRM4617	Spindle Timing Belt Pulley
4	TM4002N-2	Washer (M6) (20 Req)	34	TRM4016	Cover
5	TM4002N-1	Cap Screw (M6 X 10)(20 Req)	35	Tm4014	Precision Bearing (#7012-P4)(2 Req)
6	TM-4050	Inverter Motor	36	TM4015	Bearing Spacer
7	TM4044	Cap Screw (M12 X 30)(4 Req)	37	TM4013	Lock Nut
8	TM4044-1	Washer (M12)	38	TM4012	Spacer
9	TM4056	Key (10x 8x60)	39	TM4019	Key (16x 10x30)
10	5B6009	Motor Timing Pulley	40	TM4010	Precision Bearing (#7014-P4)(2 Req)
11	TA4044	Pulley Washer	41	TM4011	Bearing Spacer
12	5B6009-1	Cap Screw (M4 x 20)(6 Req)	42	TM4009	Spindle Dirt Shied
13	TM4038	Timing Belt (740-5GT-30)	43	Tm4002	Spindle
14	TM4043-1	Cap Screw (M12 x 30)(4 Req)	44	TM4031	Keeper Key (2 Req)
15	TM4043-2	Washer (M12) (4 Req)	45	TM4030	Cap Screw (M8 x 20)(2 Req)
16	TM4043	Motor Bracket	46	TM4029	Lock Nut (M16 x P1.5)
17	TRM4001	Milling Head	47	Tm4028	Bushing
18	TM4048	Switch / Praying Pipe (Pt3/8" 1 x 4")	48	TM4024	Spring (31.5 x 16.3 x 2) (132 Req)
19	TM4047	L Type Pipe Joint (PT3/4) (2 Req)	49	TM4025	Draw Bar
20	TM4045	Tap Bracket	50	TM4023	Bushing
21	TM4045-1	Gas Adapter (PT 1/4 X PE1/2)	51	TM4022	4. Jews Collet
22	TM4045-2	Hose Clip (3/4")	52	TM4003	Quill
23	TM4046	Cap Screw (M6 X 35)(2 Req)	53	TM4035	Cap Screw (M8x 25)(6Req)
24	TM4033	Oil Cylinder	54	TM4007	O- Ring (G135)
25	TM4034	Cap Screw (M10 X 40)(4 Req)	55	TM4006	O-Ring Cover
26	TM4032	Oil Cylinder Seating	56	TM4005	Set Screw (M5 x 5)(2req)
27	TM4036	Cap Screw (M8 X 30)(4 Req)	57	TM4004	Nose -Piece
28	5K8036	Lock Spring Screw(4 Req)	58	TM4008	Cap Screw (M6 x16)(8req)
29	5K6242	Spring(4 Req)			
30	TM4027	Cap Screw (M8 X 30)(4 Req)			



Pull Stud & Tool Shank