CONTENT

CH 1 Safety Instruction .......................................................... A-1
  1-1 The basic condition of safety performance ...................... A-1
  1-2 The regulation of warning sign usage .............................. A-4
  1-3 Safety prevention .......................................................... A-5
  1-4 The hazard zone of the machine ...................................... A-10
  1-5 Position of warning plate ............................................... A-11

CH 2 Carry and Stock ............................................................. A-15
  2-1 Packing of the machine ................................................... A-15
  2-2 The carry of equipment .................................................. A-15
  2-3 Fork lift instruction ....................................................... A-16
  2-4 Cable lift instruction ..................................................... A-19
  2-5 The stock of machine ..................................................... A-20

CH 3 Dismantle and Installation instruction ......................... A-21
  3-1 Dismantle instruction ..................................................... A-21
  3-2 Before installing ........................................................... A-22
  3-3 Installation instruction .................................................. A-23
  3-4 Electricity requirement .................................................. A-24
  3-5 Remove the shipping bracket ......................................... A-24
  3-6 Cleaning and lubricating ............................................... A-26
  3-7 Machine’s grounding .................................................... A-26
  3-8 Balance of the machine ................................................. A-27

CH 4 Test Run instruction ...................................................... A-28
  4-1 The wiring inspection before test run ............................. A-28
  4-2 The precaution before warming up .................................. A-28
  4-3 Test run ........................................................................ A-29
  4-4 Cutting practice ............................................................. A-34
  4-5 End of test run .............................................................. A-34

CH 5 The maintenance Description ........................................ A-35
  5-1 Daily inspection and operating devices ............................ A-35
  5-2 Maintenance and inspection area ...................................... A-36
  5-3 Maintenance ................................................................. A-37
  5-4 The notice of the machine .............................................. A-38
  5-5 Air compressor system ................................................... A-40

CH 6 Failure and trouble shooting ...................................... A-41
  6-1 The failure of tool clamping .......................................... A-41
  6-2 The failure of ATC ......................................................... A-42
  6-3 The failure of the coolant system .................................... A-43
  6-4 The failure of the lubrication system ............................... A-44
【Chapter 1  safety instruction】

1-1 The basic condition of safety performance

Please obey exactly the five basic conditions below:

1. Only the person whose ability is confirmed or the qualified person can be equipped with the job of operation or maintenance:
   The qualified person must accept the suitable training in order to understand the safety precaution and maintenance of the machine, meanwhile, as to the safety control field, his (or her) capability must be qualified. Especially for the electro-maintenance, the charged person has to have the experiences and capable of this job. Meanwhile, he must be familiar with the safety standards and official regulations.

2. Before operating the machine, the person must pay highly attention on the safety instructions in every individual part; it 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.

※Before maintenance, or any emergency situations, please turn this knob to OFF position.
4. The safety key needs to be stored by pointed person. This machine is equipped with two safety keys in order to protect the memory in the controller, and prevent the cabinet’s door opened without permitting.

   (1). The memory protection key: This key protects the memory that could not be modified without authorizing.

   (2). Electric cabinet protection key: This key protects the electric cabinet that could not be opened without authorizing.

5. All of this machine’s operation manuals should be kept in a convenience place. If the operation manual’s contents or words are too muddy to read, please contact the agent and inform him (or her) the model of yours machine.
1- 2. The regulation of warning sign usage

1. **Forbidden sign**: Highly hazard, Once the accident happened, it will lead to severely person injured or died.

![Forbidden sign]

2. **Warning sign**: Hazard, once the accident happened, it will lead to severely person injured or machine damaged.

![Warning sign]

3. **Safety instruction sign**:

![Safety instruction sign]

4. **Situation instruction sign**:

![Situation instruction sign]
1-3. Safety prevention

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

1-3-1. The basic operation practice

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

1. **Warning**
   1. Please do not touch the control button with wet hand.
   2. The operator must be familiar with the position of Emergency Stop button in case of the emergent situation happens.
   3. When replacing the fuse, the main power must be turned off.
   4. Please preserve enough working space, and prevent the falling of tool and work-piece.
   5. Please keep the cleaning of the working field. The coolant, oil, chips must be cleaned any time in order to prevent the slip.
   6. When operating, please make sure the button is what you’re going to push.
   7. If there are two or more than two people operating the machine in the same time, these people have to be will-trained, and these people have to build good communication before operating the machine in case of the accident happened.

2. **Attention**
   1. When the power of this machine is malfunction, please turn off the main power immediately.
   2. Please use the recommended lubricating oil.
   3. The fuse should be replaced with the general, and common fuse.
   4. Preventing the NC unit, control box, electro box … etc from leak of electricity in case of the malfunction.
   5. Do not modify the computer setting, and storage capacity arbitrarily. Please save the original data as a back up file before making a modification.
   6. The warning plate must be kept clean, when it is not clear enough, please replace the plate. Remember to make a mark below of the warning plate in order to avoid the wrong installation.
1-3-2. Before starting the machine

Before starting, make sure the power supply is grounded correctly and exactly.

Hazard objects:
Before operating, please inspect all the ropes, slings, and electric wires are in the correct position in order to prevent the pulling, pushing, or entanglement of wires and the electricity leakage, or any dangers of the machine.

1. 【Warning】
   1. Please make sure the operator understanding all the instructions, being familiar with every function and working procedure.
   2. Please wear the anti-slip boots, and the security clothing.
   3. Please make sure all the safety doors and guards that are protected the NC unit, controller, electric cabinet… etc. being closed.

2. 【Attention】
   1. The electric wires must be fixed on the floor and isolated by insulation sleeves in order to prevent the chips damage the wire's insulation and the shortcut.
   2. Before operating the machine that didn’t operate for a long time, or a new machine, please make sure the slide ways are well-lubricated.
   3. Please fill up all the oil containers in each part.
   4. Please lubricate each pointed 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 operating 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 main circuit switch are turned to “ON” position.

1-3-3. After the power switch is turned ON

1. 【Attention】

When the power switch is turned to ON position, the READY light will light up. If not, please inspect the malfunction’s position.

1-3-4. Routine inspection

1. 【Warning】

When inspecting the belt, please do not stretch your hands between belt and belt pulley.
2. **[Attention]**

1. Please inspect the pressure gauge; it must be set up correctly.
2. Please pay attention on the motor • gear box and other assembly parts to see if there are unusual noise.
3. Please inspect the lubrication unit and lubricating oil level.
4. Please inspect every security equipment, and guard.
5. Please inspect the belt's tightness. If it is necessary, please replace the belt with same tension.
6. Please inspect the oil pressure unit to see if there is oil.

**1-3-5. The warming-up before operation the machine**

1. **[Attention]**

   1. Using the automatic control to control the feeding of each axis and the rotation of main axis for 10 to 20 minutes, and setting the speed at the half or 1/3 speed of the highest speed.
   2. Meanwhile, please inspect the action of others assembly parts with automatic control program.
   3. Please pay special attention on the spindle's warming-up when rotation speed is up to 4000 RPM. If operating the machine after it is just started without sufficient lubrication, the machine will be damaged. Meanwhile, due to the thermal expansion of each part, the machine is unstable, and causes the defeat of accuracy.

**1-3-6. Preparation**

1. **[Warning]**

   1. The tools and cutters have to meet this machine's requested specification.
   2. The extreme worn tools will hurt the working piece or the people. Hence it must be replaced in advance.
   3. Surrounding the working field, it must have sufficient light for safety and convenience of doing some inspection.
   4. The cutters and other parts must be put on suitable and 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 of other tools.
   2. Please run the test drive after clamping the cutter.
1-3-7. When the machine is performing

1. 【 Warning 】

1. The long hair must be tied neat and put under the cap.
2. Please do not push any control button with glove in case of the malfunction.
3. When carrying huge work-piece, it should be more than 2 people to carry it in order to prevent the danger.
4. Only the experienced, and well-trained people could operate the lifter, crane, sling, and other lifting devices.
5. When operating the lifter above (lifter, crane), please do not collide with other devices.
6. When hanging the work piece, please confirm the strength of slings, belts and ropes.
7. Please make sure the work piece is fixed stably.
8. The coolant flux should be adjusted when the machine is stopped.
9. Please do not touch the functioning working piece or spindle.
10. The working piece and the cutter must keep a safety distance, and the working piece only can be carried 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 working piece be before installing the safety guards, and splashguards.
13. Please clean the cutter with brush. DO NOT use hands.
14. When machining the magnesium alloy, please wear the protection mask.

2. 【 Attention 】

1. Please do not open the door and window during running.
2. During heavy load machining, please pay highly attention on the jumped-out chips in order to avoid the burning of skin.

1-3-8. End of machining

1. 【 Warning 】

When end of the machining, please turn NFB switch to OFF position.

1-3-9. End of work

1. 【 Attention 】

1. When cleaning the chips on the machine, please wait for the stop of the machine.
2. All of the cutters, tools and parts must be return to its own position.
3. Please inspect the damaged felt wipers, and replace it when necessary.
4. Please inspect the polluted degree of the coolant, oil inside the oil cylinder, and lubrication oil. Please replace them 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 when stopping the machine for a long time.

1-3-10. Safety equipment

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

1-3-11. Preparation of maintenance

1. The maintenance personnel have to be authorized by the superior to maintain the machine.
2. Please prepare the accessories, parts and the consuming items previously. (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 firstly.
2. Please use the specified tools to process the maintenance job in order to prevent the damage of the machine.

1-3-12. Maintenance

【 Attention 】

To process the maintenance job after the machine is stopped completely.

【 Hazard 】

1. Only the experienced person or the person who is familiar with it can do the electric cabinet maintenance job. Do not maintain the machine arbitrary. It has to have good communication between the maintenance personnel and the charged person.
2. Please do not move the dogs, limit switch, approaching switch, and other connecting mechanism.
3. Please use the ladder to maintain the devices that are on the high position.
4. Please use the high quality fuses, wires.
5. Please turn off the main power before doing any maintenance job.
1-3-13. The work before start the machine after the maintenance

【Warning】

1. Please keep well of the oil-wipe rag, oil cleaner.... etc for maintaining.
2. Please return the unnecessary tools, parts, and rest oil to its original place.

【Attention】

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

1-4 The hazard zone of the machine

1-4-1 Moving parts

Because the spindle is running at high speed, and the actions of each axis, and the automatically tool changing, the area between the table, spindle, and too magazine is very dangerous. Meanwhile, the inside of the machine will be wet and high temperature due to the splashing chips and coolant when it is machining.

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

【Warning】

1. Under Auto mode, do not open the working door, Plexiglass window, and other enclosure.
2. Please pay special attention on the condition of operating or the power of the machine is “ON”. In case ignoring the warning above, it may lead to the death and extremely injury of people, or machine’s damage.
1-5 POSITION OF WARNING PLATE

1-5-1. Danger warning plate

- **WARNING**: Unexpected objects may fly out, and cause injury.  
  1. Keep the doors closed during machining.  
  2. Keep interlocks and other safety devices in place and functioning.

- **WARNING**: Tools move when ATC operates. The moving parts in the magazine may cause injury.  
  1. Do not remove the protective cover arbitrarily.  
  2. Do not exchange or grab tools when the magazine rotates.

- **WARNING**: It can be executed under spindle orientation & auto tool change to have the same position during manual tool change.
Unexpected objects may fly out, and cause injury.
1. Keep the doors closed during machining.
2. Keep interlocks and other safety devices in place and functioning.
1-5-2. OPERATION MANUAL TABLE
【Chapter 2  Carry and Stock】

2-1. Packing of the machine:

<table>
<thead>
<tr>
<th>Model</th>
<th>Crate size(LxWxH)</th>
<th>Net weight</th>
<th>Gross weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>KVR-3620</td>
<td>2200×2400×2400 mm</td>
<td>3,880 kgs</td>
<td>4,250 kgs</td>
</tr>
<tr>
<td>KVR-4020</td>
<td>2200×2500×2400 mm</td>
<td>4,280 kgs</td>
<td>4,450 kgs</td>
</tr>
</tbody>
</table>

※ The machine packaged in a crate for transportation is a standard transportation method, unless the buyer asks for other method for package.

2-2. The carry of equipment:

2-2-1. The lifter’s requirement:

<table>
<thead>
<tr>
<th>Model</th>
<th>KVR-3620</th>
<th>KVR-4020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine weight (Kg)</td>
<td>3,880</td>
<td>4,280</td>
</tr>
<tr>
<td>Fork Length (mm)</td>
<td>1,800</td>
<td>1,800</td>
</tr>
</tbody>
</table>

** The forklifter 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 length
2-2-2. The safety requirement of carry

1. Crane:

   (1) During the carry and unloading, please avoid compression or collision because of the fact 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 by 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 carry method and the lifter should be totally inspected.
   (7) The crane or forklifter’s operator should be well trained or experienced.

   (8) The loose parts should be pulled tight when lifting. And the contact surface of machine should be protected by the rags or woods in case of the scratch.
   (9) In order to prevent the swing of the machine, please tight a strengthened rope on a corner of the machine. The hands are extremely forbidden.
   (10) Please notice on the air pressure pipes, wires, NC controller, and other devices, when the slings are pulled.
   (11) Please confirm that there are no people on the top of the machine, on the side of the machine, and on the way of move before moving the machine.
   (12) Please remove the objects occupied on the way, and pay highly attention on the control buttons.
   (13) The length of the slings on four corners should be same, and the distance of four corners between the machine and the ground should be kept the same when lifting (50 cm suggested).
   (14) Please notice on the ground when putting down the machine in order to confirm there are no wires, pipes under the machine.
2. Forklifter:

(1) During the carry and unloading, please avoid compression or collision because of the fact 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 by 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 carry method and the lifter should be totally inspected.

(7) The crane or forklifter’s operator should be well trained or experienced.

(8) Please remove the objects occupied on the way, and pay highly attention on the control buttons.

(9) Please confirm that there are no people on the top of the machine, on the side of the machine, and on the way of move before moving the machine.

(10) Please notice on the ground when putting down the machine in order to confirm there are no wires, pipes under the machine.
2-3. fork lift instruction: (As the figure 2-3 shown)

<table>
<thead>
<tr>
<th>Model</th>
<th>KVR-3620</th>
<th>KVR-4020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine weight (Kg)</td>
<td>3,880</td>
<td>4,280</td>
</tr>
<tr>
<td>Fork Length (mm)</td>
<td>1,800</td>
<td>1,800</td>
</tr>
</tbody>
</table>

Over 100 mm from the center
2-4. Cable lift instruction: (As the figure 2-3 shown)

<table>
<thead>
<tr>
<th>Model</th>
<th>KVR-3680</th>
<th>KVR-4020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Load of crane (Kg)</td>
<td>5,000</td>
<td>8,000</td>
</tr>
<tr>
<td>Sling specification (D: mm)</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>
2-5. The stock of machine:

1. After the arrival of machine, if it is not installed immediately, please store in the stock in order to prevent the dust and the damp.

2. Storage Temperature Range: -5 °C to 45 °C

3. Ambient Humidity: less than 90 % relative humidity, non-condensing.

4. The machine must be put on the flat place in order to maintain the machine’s accuracy

5. The anti-rust oil should be respray when storing the machine because the oil would be wiped off 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 could prevent the machine from rust for 6 months since the machine leave our company.

   (2) The brown & grease type: ( Brand: model: )

   The anti-rust oil could prevent the machine from rust for 6 months since the machine leave our company.
3-1. Dismantle instruction:

1. Installation tools required:
   (1) Crane.
   (2) Scissors
   (3) Wrench (17 / 19 mm)
   (4) Adjustable wrench.
   (5) Ladder.
   (6) Claw hammer.
   (7) Air wrench. (21 mm)
   (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 where 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 where on the pallet by wrench or adjustable wrench.
   (2) Cut off the iron plate, which fixed the accessories on the pallet, and remove the accessories by crane.

4. Move the machine without the crate: Move the machine by crane or forklifter.
   (1) The capability of forklifter is stated as previous chapter, The forks must be over 1800 mm (at least over 100mm from machine’s center)
   (2) When moving by forklifter, it has to move slowly and pay attention on balance.
   (3) Please use suitable slings and steel frames to lift the machine.
   (4) Please remove the machine from the pallet by crane or forklifter.
   (5) The notices are same as 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 (coincidence with order)?
   (2) Whether or not the accessories or parts are complete?
   (3) Whether or not the machine was damaged due to transportation?
   (4) Whether or not the machine includes the inspection record?

3-2. Before installing:
1. The machine’s foundation’s work shown on the drawing below:

   A. KVR-3620 / KVR-4020

   The foundations drawing of machine
2. Before the machine is arrived at the buyer’s factory, the customer should contact with the riggers or the forklifters for moving the machine in accordance with Chapter 2.
3. Please move the machine in accordance with sections 2-2, 2-3.
4. Please uncrate the crate in terms of section 3-1.
5. In order to make convenience of repair, the machine’s location must preserve sufficient space for opening fully of the electric-cabinet and the worker. (Shown on the drawing)
6. Working environment requirement:
   (1) Temperature : 0℃ ~ 45℃.
   (2) Humidity : 40% ~ 75%.

7. When positioning the machine, do not operate the machine under these environments:
   (1) The location where oil · water · chip might splash.
   (2) The location where there are strong electromagnetic devices or electro welding machines nearby.
   (3) The location where there are vibrational sources, such as punching machine, press machine, shearing machine surrounded.
   (4) The location where exposed under the sunlight.
   (5) The location where the ground is inclining or slide.

3-3. Installation instruction:

1. Put the machine on the planned foundation firstly.

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 leveling screws, then tight up the nuts to prevent the falling.

4. Lift down the machine on the ground, and then insert the foundation bolts into the foundation holes.

5. Pour a little of the concrete into the foundation hole firstly, please notice that the concrete should use the suitable proportion, and expanding coefficient in order to prevent the shrink effect after adjusting.

6. After the foundation bolts are in the leveling screws, and then please pour the concrete into the foundation holes and fill it. After that please level the machine.

7. After leveling, please screw up the leveling nuts of the leveling screws, foundation bolts and hexogen nut.
3-4. Electricity Requirement:

1. Power supply system:
   
   (1) Voltage: 220V.
   (2) 3 phase power supply: 60 Hz
   (3) Electricity currency: over 50 Amp.

2. The diameter of power supply's wire should be 16 to 25 mm, and mount with a 75 A's breaker (NFB breaker).

3. After inspecting the wiring and connection, please check the voltage that is 220 V±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 to the +Z direction, and remove the wood block (A) between spindle and column.

2. Jog the Z-axis toward to 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 electric cabinet.

5. Please DO NOT power on the machine before the shipping bracket is removed exactly.
3-6. Cleaning and lubricating:

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

3-7. Machine’s grounding:

1. It is better to ground the machine’s electric elements and factory’s power system together. In general, it is connected in series connection, but please notice that DOES NOT connect in parallel method.
2. The grounding wire should be selected with the diameter over 19 mm’s insulation wire.
3. The Grounding resistant must be below $100 \, \Omega$.
4. Use steel rods as grounding pole; the inner diameter should be over 19 mm, The copper rods is a better choice, and its length should over 1 meter.
5. The grounding pole should be buried in the ground over 1 M, if the rod is obstruct by the rock, it can be buried transversely in the ground over 1.5 M depth.
3-8. Balance of the machine:

1. Prepare two of precision bubble levels (0.02mm per scale)
2. Before adjustment, please check firstly the accuracy of the precision bubble level, the method is as below:
   (1) Put the level on a fixed position of 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 central.
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.

![Diagram]

5. Please adjust bolts 1 to 4 firstly, and then adjust 5~6 in sequence.
6. The leveling accuracy is within 0.04 mm (about 2 scales). After leveling please tighten up the foundation bolts.
7. Please notice that the foundation bolts should be put into the slots of the foundation brackets.
8. Calibrating and adjusting the perpendicular degree between the table and spindle center.
9. After 6 months of installation, please adjust again to make sure the foundation is stable.
【 Chapter 4 Test Run Instruction 】

4-1. The Wiring inspection before test run

1. Set the entire power switch on the “OFF” position.

2. Inspect the loading power system in order to match the standard below:
   (1) Voltage: 220V. (380V / 400V / 415V / 440V)
   (2) 3 phase: 50 / 60Hz
   (3) Electric current: Above75Amp
3. Make sure the machine is grounded exactly in terms of the regulation.

4. Check all wirings in order to prevent any loosing or falling, and tight it up.

5. It is restricted to connect any equipment’s power to the interfering distributor.

4-2. The Precaution Before Warming up

1. The electric box, and operating box has to be closed exactly in order to prevent any coolant and dust entering.
2. Check the enclosure’s sheet metals and accessories installed correctly or not, or short of the parts of sheet metal.
3. Check the coolant level, whether the level is on the max. position of the coolant tank or not.
4. The compressed air pressure has to within standard request:
   Pressure: 6 ~ 8 KgF / cm, Supply volume: above 200L/ min
5. Before the machine is started, make sure there are no people or objects remaining inside the enclosure or dangerous zone.
6. The operator has to familiar with the power switch, especially the emergency button.
7. Turn on the factory’s main power, machine’s power and the power switch on the operating box in sequence.
4-3. Test Run : (Please refer to Operational manual (II) before operating)

1. Turn on the power supply and the power switch on the machine in sequence.

2. Press the POWER ON button on the control panel.

3. The monitor will display the ALARM sign.

4. To clear the ALARM signal, please turn the emergency button clockwise.

5. Check the lubrication oil device:

   The slide way, lead screws and every lubricated point need to be well-lubricated by grease in order to keep the accuracy, reduce the fault of the machine, and extend the life of the machine, therefore, those place have to be lubricated all the time in the normal time. Hence, when the first time of test run or restarted after stop the machine for a long time, it has to follow the instructions below to restart or test the machine.

   (1) After turning on the power, please check the lubrication device’s action is normal or not.

   (2) Because the slide way, and each lubricated point may not posses lubricating oil for the first time of test run, the lubricating time has to be set over 60 seconds until the lubricating oil is enough.

   (3) Reset the lubricating time to the factory setting (Cycle time: 30 min, each lubricating time: 20 sec.)

6. Test the coolant system device :

   (1) Turn off the coolant adjustment valve switch.

   (2) Turn the coolant switch on the panel to the ON position.

   (3) Check the coolant pump’s rotating direction; if it rotates in the wrong direction, please exchange pair of power wires of the coolant pump
arbitrarily until the direction is correct.

(4) Turn on the coolant adjustment valve, and make sure the coolant is flowing out, then try to adjust the flow current of the coolant.

7. ZRN for 3 axes:

(1) Mode select: M.P.G mode.

(2) Use the M.P.G to move the three axes from zero to the center above 10 mm.

(3) Mode select: ZRN mode.

(4) Please return the Z-axis to home firstly (to avoid the machine crashing). The Z-axis Home Return indicator will light up when the ZRN of Z-axis is completed.

(5) Then change to the X-axis or Y-axis, the sequence is not restricted. The indicator will light up when the axis is in the position.

(6) It means the axis doesn’t return to home when the indicator doesn’t light up.

8. Spindle rotating:

a. Manual mode:

(1) Mode select: MPG, JOG, ZRN or any kind of modes except the AUTO mode.

(2) Press the SPINDLE FORWARD button: The spindle will rotate clockwise.

(3) Press the SPINDLE STOP button: The spindle will stop.

(4) Turn the SPINDLE % knob: It can adjust the spindle rotation rate when the spindle is running.

b. Program input:

(1) Mode select: MDI mode.
(2) Entry M code, S code (e.g. M03, S1000; spindle speed 1000 RPM)

(3) Press the CYCLE START button: the spindle is rotating.

(4) Press the SPINDLE STOP: the spindle stops.

(5) Rotating rate adjustment: Use the SPINDLE % knob to adjust the spindle’s rotating speed in order to match the value of S code shown on the screen.

9. Manual tool changing:

   a. Tool holding:
      (1) Mode select: Any modes, except the AUTO mode.

      (2) The operator holds the tool on the left hand, and insert to the spindle.

      (3) The key slot of the tool has to be matched the spindle’s key.

      (4) Press the Clamp / Unclamp button that on the right side of the spindle by operator’s right hand until the tool is inserted into the spindle.

      (5) After the tool put into the correct position, the operator can release the Clamp / Unclamp button.

      (6) After releasing the button, the operator should try to swing the tool in order to make sure the tool is held tightly.

      (7) If the tool is not held tightly, please redo the item 4, and insert the tool exactly.

      (8) After the confirmation, the right hand can leave the tool.
10. Auto tool change:

(1) Mode select: Manual mode.

(2) Press the TOOLS INDEX button: It turns the tool magazine pots to the holder which is going to put on a tool, and turns to the preparing position.

(3) Press the Clamp / Unclamp button in front the spindle.

(4) Install the tool. (Please refer to Chapter 7)

(5) Mode select: MDI mode (Turn the program protection key to ON position).

(6) Entry

O1000;
N1  G91  G30  X0  Y0  Z0 ;
N2  M6  TXX ;

(7) Mode select: Auto Mode

(8) Press the CYCLE START button.

(9) Then, the machine will execute the ATC Marco program, and the tool will be put into the holder in the tool magazine pot.

11. M.P.G Mode:

Make X, Y, and Z-axis moving and change the feed rate; H x 1, x10, x100, and make sure the displacement is matched up with the coordinate displacement. (By inspection device)

12. JOG mode:

a. Try to move three axes, and turn the RAPID % knob to adjust the feed speed.
b. Press the JOG button and RAPID button at the same time to move rapidly.

c. At the lower feed speed, move three axes to the positive or negative limit for checking the limit switch is normal or not.

13. MDI Mode (Manual Data Input):
   a. This is a simply method to edit the program.
   b. Press the CYCLE START button to execute program.

14. EDIT Mode (Program edition):
   a. Turn the program protection key to ON position.
   b. Please edit the program in accordance with the operating manual.

15. AUTO Mode :
   a. Please use the DRY RUN key to check the program is correct or not previously.

   b. Use the SINGLE BLOCK mode to check every block is correct or not.

   c. Release the SINGLE BLOCK mode, and move three axes on low feed rate, then execute the whole program under AUTO mode.

16. Please check every button on the control panel in sequence.
4-4. Cutting Practice

1. Please clamp the working piece at an appropriate position on the table.

2. Execute ZRN program for three axes.

3. Edit program.

4. Put tools on the tool magazine pot’s holder.

5. Find out the Zero position of working coordinate.

6. Enable the AUTO mode.

7. End of the program.

8. Open the safety guard door.

9. Check the working piece is machined in accordance with the standard cutting regulation or not.

4-5. End Of The Test Run

1. After the end of the test run, please turn the power switch to OFF position.

2. Wipe off the cut chips on the machine.

3. Check the leaking of the enclosures. If it leaks coolant, please use Silicon glue to patch the cleavage.

4. Please spray a thin machine oil on the table in order to prevent the rust

5. Please check again all powers switches are turned to the OFF position exactly.
5-1. Daily Inspection and Operating Devices:

This machine has many kinds of switches and buttons, and a daily inspection charter. Please read the operating manual carefully, and understand every switches and button's positions and functions. (Shown in the picture below)
Air pressure garage

Lubrication Indicator

ON /OFF Power switch (Electric cabinet)
5-2 Maintenance and Inspection Area:

The maintenance area that described below has to have sufficient working space.

【NOTICE】

1. The space between the electric cabinet and the other object has to be large enough in order to open the cabinet door.
2. It has to be convenience to wipe out the cutting chip, pipe out the lubrication oil, and operate the chip conveyer.
3. It has to be convenience to load and discharge the working pieces. It may injure the operator or damage the machine if the notice does not be executed exactly.

5-2-1 Maintenance and Inspection Area
5-3. Maintenance:

In order to extending the life of the machine, the items listed below have to be executed exactly. Please start the machine after the inspection of these items.

<table>
<thead>
<tr>
<th>Inspection Item</th>
<th>Inspection Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Please warm up the machine after the slideway is well lubricated, and check the lubrication oil all the time. Please pay highly attention when the machine is idled for a long time on the slide way.</td>
<td>Daily</td>
</tr>
<tr>
<td>2. The air pressure has to be maintained on 5.5 Kg/cm(^2) (78 PSI). The gauge could check the air pressure. This item should be executed extremely.</td>
<td>Daily</td>
</tr>
<tr>
<td>3. If the operator or inspector hears the leaking sound of the Air hoses, please fix it immediately in order to stop the compressed air leaking out</td>
<td>Daily, All the time</td>
</tr>
<tr>
<td>4. The air cylinder in the ATC device has to be lubricated all the time. Hence, the lubrication oil in the air filter / Lubricator has to maintain standard level in order to keep the system with foggy.</td>
<td>A period day (2 to 3 days)</td>
</tr>
<tr>
<td>5. The coolant tank of enclosure and semi-enclosure is installed on the front and left side of base. The coolant should be refilled if the coolant level is too low. The coolant level could be observed by coolant level indicator.</td>
<td>A period of time (Fuel tank: 240 L)</td>
</tr>
<tr>
<td>6. The contact surface between the spindle and tool has to be kept absolutely clean. If there are some dust or cutting chips, it should be wiped away by soft fabric.</td>
<td>Daily</td>
</tr>
<tr>
<td>7. Please check the slide way of X, Y, Z-axis all the time. If there are some particle or cutting chips, please wipe out immediately in order to protect the slideway</td>
<td>Half a year</td>
</tr>
<tr>
<td>8. It has to be no any objects remaining in the operating area.</td>
<td>Any time</td>
</tr>
<tr>
<td>9. Please check the felt wiper of three axes. If it is broken, please change a new one in order to protect the slide way.</td>
<td>Half a year</td>
</tr>
<tr>
<td>10. Please inspect the head’s gibbs. Please adjust the gib if it needs to be adjusted.</td>
<td>Half a year</td>
</tr>
<tr>
<td>11. Before operating the machine, please run the three axes on low speed and reach to the limit. Please run the three axes for 10 to 20 minutes daily.</td>
<td>Daily</td>
</tr>
</tbody>
</table>
5-4. The notice of the machine.

It is very important to maintain and extend the life and the accuracy of the machine. Therefore, the wrong operating method will damage the machine.

The Notice of Operation:

5-4-1. Preparing Work

1. Fill and Re-fill the coolant
   a. The coolant tanks are composed by two sheet metal tanks where under the machine. The operator could dump the coolant to the tank directly via the reticulate hole.
   b. Please fill the coolant between the H and L on the coolant level indicator. The capacity of a coolant tank is 80 liters.

2. The cleaning of the coolant tank
   a. The cutting chips accumulate on the bottom of the tank, sometimes through the reticulate hole. Please vent the coolant from the vent hole and clean the inside of the tank after a period of time.
   b. The coolant tank could be pulled out easily due to the wheels mounted on the bottom of the tank.
   c. Please vent the coolant from the vent hole

5-4-2. Precaution of the safety

The precaution of the coolant
1. Please clean the hole of filter mesh weakly.
2. Please replace the coolant after a period of time.
3. Please check the level of the coolant before operating the machine.
5-5 Air Compressor System:

5-5-1. The air compressor unit
   1. Specification: AC3010-3D (SMC)
   2. Max. Working pressure: 9.9 Kg / cm
   3. Adjusting range: 0.5 ~ 8.5 Kg /cm
   4. Filter Mesh: Specification 111511-5B, 5 μ tr
      Lubrication oil suggestion: ISO VG32
   5. The actions listed below are controlled by the air compressor:
      (a) Tool claming and unclamping.
      (b) ATC action
      (c) Blowing out the air from the nose of the spindle.
   6. The working pressure of this machine is 5 Kg / cm (71 PSI). The source of the air
      pressure has above 5 ~ 7 Kg /cm (78 PSI)

   7. The air filter could maintain the air quality; The dust and water could not remain
      In the air, please use the filter which accuracy is 5 μ .
   8. The Air filter / Lubricator (including air filer, pressure adjuster, and lubricator) is
      mounted on the back of the machine.

   The electromagnetic valve, pressure valve, speed controller,
   And noise eliminator is installed on the back of the machine.
### Chapter 6  Failure and Trouble Shooting

#### 6-1. The failure of tool clamping

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The source of air pressure is lower than 6 Kg / cm.</td>
<td>Please adjust to 6 ~ 8 kg / cm</td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>(1) The air pressure switch is fault.</td>
<td>Please replace the switch</td>
</tr>
<tr>
<td>(2). The upper pressure limit value and the lower pressure limit value</td>
<td>Please re-adjust the value of upper pressure limit and the value of lower</td>
</tr>
<tr>
<td>of the air pressure switch are not correct.</td>
<td>pressure limit.</td>
</tr>
<tr>
<td>(If the air pressure lower than 3 kg / cm, the CNC will alarm.)</td>
<td></td>
</tr>
<tr>
<td>3. The clearance between the upper end of the spindle and the adjusting</td>
<td>Please adjust the clearance from 1.0 to 1.5 mm.</td>
</tr>
<tr>
<td>bolt of the air / oil cylinder of the tool clamping device is smaller</td>
<td></td>
</tr>
<tr>
<td>than 1.0 mm</td>
<td></td>
</tr>
<tr>
<td>4. The clearance between the draw bolt and the pull stud is not in the</td>
<td>Please adjust the clearance to the range; from 0.4 to 0.6 mm.</td>
</tr>
<tr>
<td>range; 0.4 ~ 0.6 mm</td>
<td></td>
</tr>
</tbody>
</table>
# 6-2 The failure of ATC

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The tool’s No. on the spindle is not the same No. of the tool's holder in the tool magazine. (Disorder of the tool’s No.)</td>
<td>(1) If it is loose, please tight up. Or if it is failure, please replace it. (2) Modify the value of the controller.</td>
</tr>
<tr>
<td>(1) The rotating position approach switch of (2) the tool magazine is loose or failure.</td>
<td></td>
</tr>
<tr>
<td>(3) The tool No. in the tool magazine is not the (4) same No. of the parameter setting in the NC controller.</td>
<td></td>
</tr>
<tr>
<td>2. The tool could not reach the exchange position when changing the tool.</td>
<td></td>
</tr>
<tr>
<td>(1) The air pressure’s source is lower than 6kg / cm.</td>
<td>(1) Please adjust the pressure to 6 kg / cm above.</td>
</tr>
<tr>
<td>(2) a. The air pressure switch is failure</td>
<td>(2) a. Please replace the switch.</td>
</tr>
<tr>
<td>b. The setting of the air pressure switch is not correct. (Max. limit: 4 Kg / cm Min. limit: 3 Kg / cm)</td>
<td>b. Please reset the correct air pressure.</td>
</tr>
<tr>
<td>(3) The adjusting bolt of the air cylinder (in front) is loose.</td>
<td>(3) Please tight it up.</td>
</tr>
<tr>
<td>(4) a. The clamping / unclamping tool’s limit switch of the air cylinder is failure.</td>
<td>(4) a. Please replace the switch.</td>
</tr>
<tr>
<td>b. The clamping / unclamping tool’s limit switch of the air cylinder is loose or installing on the wrong position</td>
<td>b. Please move to the correct position and tight it up.</td>
</tr>
</tbody>
</table>
## 6-3 The failure of the coolant system

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The coolant’s level is lower than the Low level.</td>
<td>Refill the coolant</td>
</tr>
<tr>
<td>2. The coolant pump is failure.</td>
<td>a. Please ask the dealer or our company to change the relay</td>
</tr>
<tr>
<td>b. The relay of the coolant motor in the electric cabinet is failure.</td>
<td>b. Please ask the dealer or our company to change the motor</td>
</tr>
<tr>
<td>b. The coolant motor is failure.</td>
<td></td>
</tr>
</tbody>
</table>

A - 43
## 6-4 The failure of the lubrication system

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| 1. The lubrication oil's level is lower than the Low Level.  
   a. The buzzer is failure. The buzzer could not alarm when the oil's level lower than the Low Level.  
   b. The low lubrication oil’s signal could not transmit to the NC.  
   c. The oil is lower than the Low Level. | a. Please ask our company or the dealer to change the buzzer.  
   b. Please ask our company or the dealer to fix it.  
   c. Refill the lubrication oil. |
| 2. Insufficiency of the lubricating oil  
   a. The lubrication time is too short.  
   b. The lubrication hoses are broken or bent  
   c. The connector is leaking or damage. | a. Please reset the time to 15 seconds at least.  
   b. Please replace the hose.  
   c. Please tight up or replace it. |