

TB-38

Operation Instruction



SOCO MACHINERY CO., LTD.

#7, 14TH RD. TAICHUNG INDUSTRIAL PARK. TAICHUNG TAIWAN

TEL: 886-4-23591888 FAX: 886-4-23592386

E-MAIL: sales@soco.com.tw

Website: <http://www.soco.com.tw>

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Chapter 0 Instruction

This operation manual gives handling information and precautions for using the tube bender with twin machine head. Incorrect handling may cause an unexpected fault. Before using the tube bender, please read this operation manual.

This machine is suitable for bending of metal tube or rod.

Chapter 1 Safety Precautions

Do not attempt to install, operate, maintain or inspect the tube bender until you have read through this operation manual and appended documents carefully and can use the machine correctly.

Caution : Before operating this machine, the installer must protect the operating range to avoid the operator entering the working zone with fence. The operator must ensure that others do not enter the operating range. If the length of the workpiece is so long that it exceeds the operating range, the operator must enlarge the extent of the fence for safety.

1. Machine operation is prohibited. If a fence is not properly installed and functioning.
2. The machine shouldn't be used in a potentially explosive environment.
3. The operator should be a trained and qualified technician.
4. Press the emergency button immediately and turn off the power switch when abnormal phenomenon or malfunction happens on the machine.
5. Operator shall stay within the area where he can easily touch the emergency button when the machine is on.
6. In order to avoid being injured, the operator should keep away from all moving parts (i.e., bending arm, clamping vise, etc.) when the machine is on.
7. Turn off power when adjust, replace, or repair any components of the machine.
8. Only one person is allowed to operate the machine at a time. Confirm no other people are staying in the area reached by the moving components.
9. Install a protective handrail or fence around the machine, to prevent other people going into the working area.
10. Do not touch the control and display screen with sharp or hard things to avoid damaging the screen and been injured by electricity shock.
11. Only the authorized responsible person is allowed to operate the machine. He shall thoroughly understand all the safety precaution items and other sections of this instruction.
12. Before opening the electrical boxes, it is necessary to turn the power switch to OFF position and open it with a key to prevent electrical accident.
13. Environment lighting shall be at least 250 lux.
14. The noise level of the machine is under 75dB.

Safety precautions are classified either as “**Danger**” or “**Caution**” which are defined as follows.

Danger: Mishandling may cause a dangerous situation which could result in a death or fatal injury.

Caution: Mishandling may cause a dangerous situation which could result in a medium scale physical or material damage or light injury.

It should be remembered that even if a situation is classified in the category of Caution, it could turn out to be a serious result depending on circumstances. Whichever classification it may belong to, these precautions describe important information and so they need to be observed.

General precautions

- Safety precautions quoted in this manual are subject to change for improvement of products, change in specification as well as for improvement of convenience of operation.
- Such changes will be enacted by revising the No. of safety precautions on the revised edition of the manual.
- The No. of safety precaution is indicated at the top right corner of the previous page.
- Warranty of the products does not cover any problems resulted from a modification made to the products by the customer.
- Printing of the safety precautions is available from the company whenever you might have lost or damaged it.
- Safety labels for Caution, Danger and Warning which are attached to the body of the products may become illegible by aging or working circumstance. When they are found unable to read clearly, you should report to us the No. of label and obtain the replacement immediately. (It is dangerous not to replace an illegible label.)

1 Precautions for use



Danger

- ◆ There is a risk of electrical shock or malfunction of equipment. Make sure to observe following points.

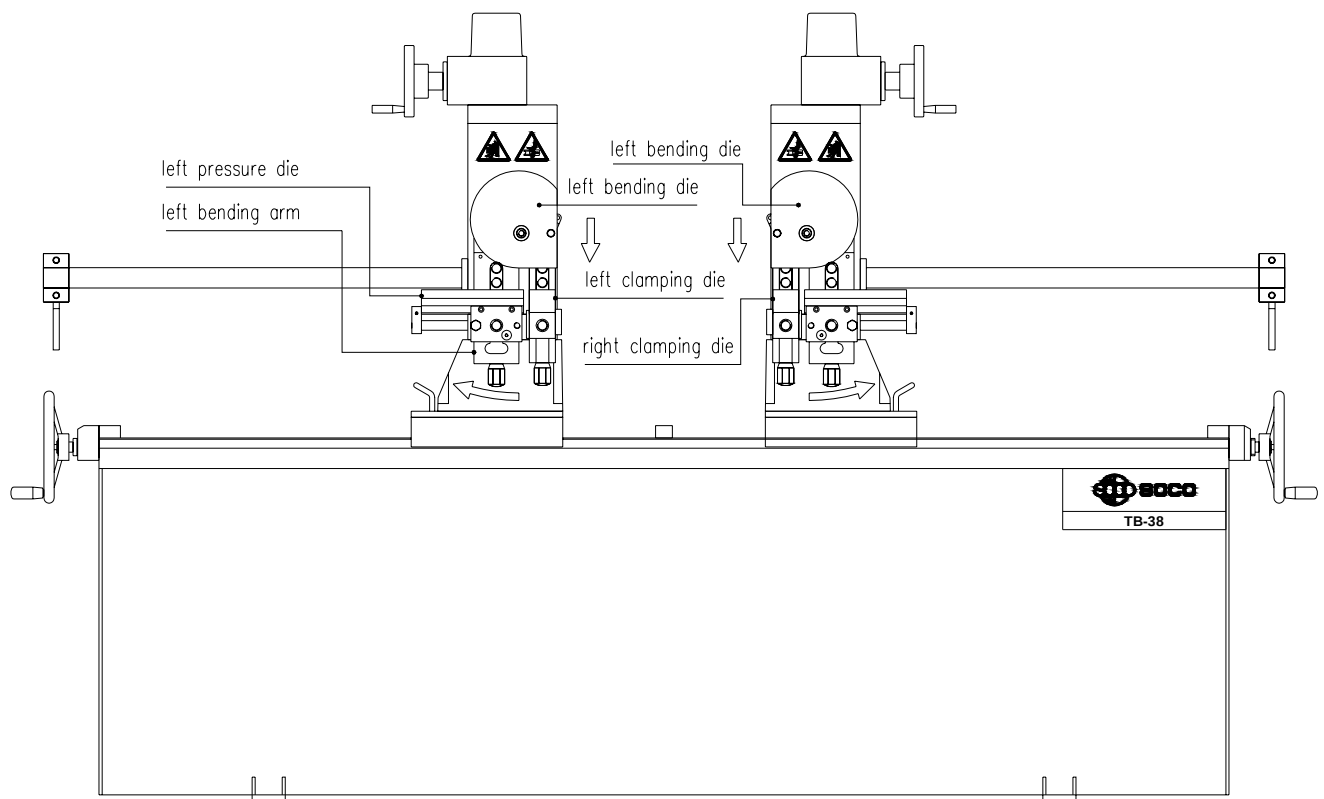
- Don't touch any live units, terminals, etc.

Please note that the electric charge is retained for some time even after power is turned

off.

Don't touch them minimum 5 minutes after the main power supply is shut down.

- Provide a power supply for the equipment in compliance with the electrical equipment engineering standard and the extension wiring regulations.
- Make sure to ground the equipment by means of the one-point grounding of Class 3 or higher grade.
- Don't place a device which may raise noises, around the equipment, It is very dangerous because noises may be picked up and cause a malfunction of the equipment.
- ◆ Be careful not to damage, apply undue stress to or nip the cables, There is a risk of malfunction or electrical shock.
- ◆ Utmost attention should be paid neither to touch any moving or revolving part of the equipment on which power is turned on, nor step in within the reach of moving part. There is risk of physical injury.
- ◆ Before starting the operation, make sure no tools, jigs, etc. are left over around the machine or nobody but the operator is present within the operating range.
- ◆ While the machine is operating, utmost attention is called for on the following moving devices:



It is strictly prohibited to bring hands or part of body within the reach of these moving sections. There is a risk of death or serious injuries such as a severing, broken bone, etc.



Danger

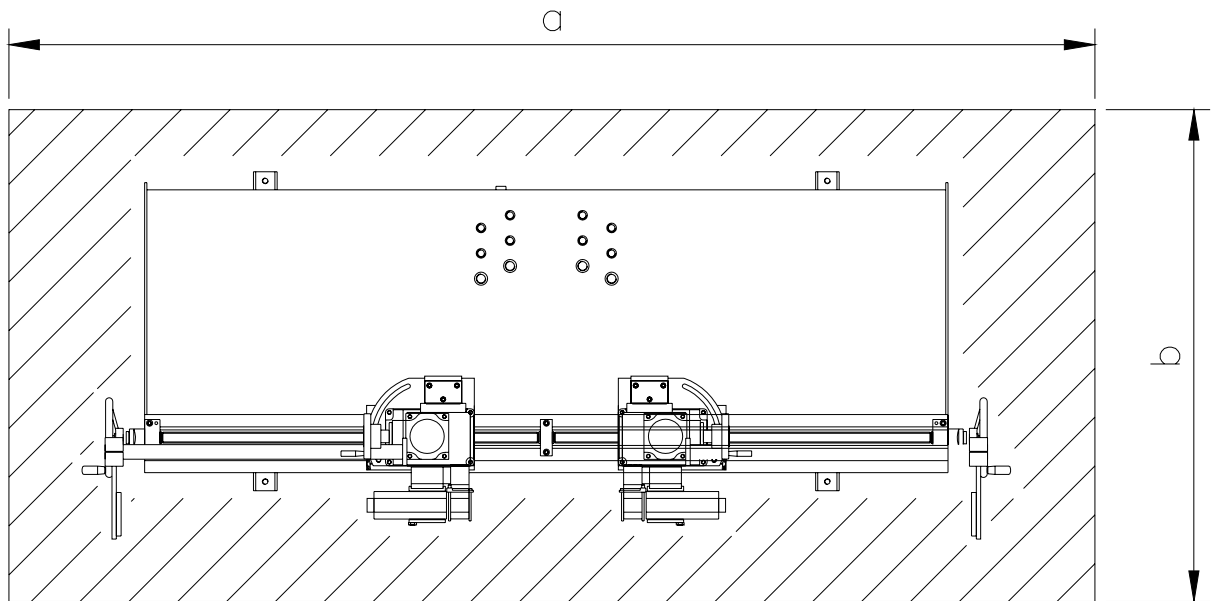
- ◆ Make sure to connect safety devices provided by the customer to the terminals for safety devices. Machine will not start unless they are connected properly.

(When the customer cannot provide, we can install them.)

Please note that, when the input of safety device is modified or disabled by the customer, we are not liable to the responsibility for an accident resulted from such modification or disobedience.

Installation standard of safety device

1. Don't step in the operating range of machine while the machine is operating (when the operating power is turned on).
 - Determine and fence the operating range before installing the machine.
 - Determination of the operating range is necessary to ensure the security of safety and for the maintenance.
 - The operating range should be given an abundant allowance considering the size of workpiece being handled by the customer in addition to the operating range inherent to the machine itself.

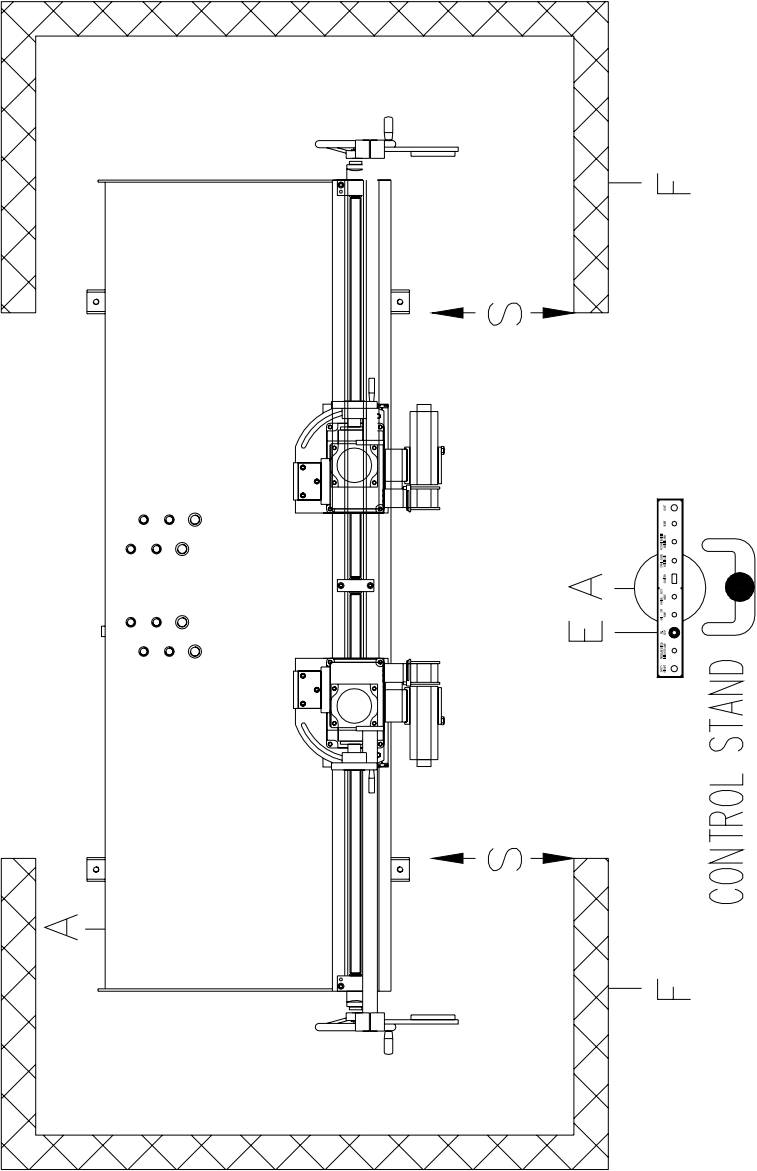


Note: a=4500mm, b=1500mm

2. Before operating the machine, it is necessary to install a safety device which is determined as described in 1. above.
3. If the length of the workpiece is so long that it exceeds the operating range, the operator must enlarge the fence for safety.

SAFETY DEVICE

- A: Operating box connector
- E: Emergency button
- F: Fence
- S: Notice that the height of the fence must exceed 1600mm.
- S: Distance to the hazardous area
- S: Notice that the value of S must exceed 1000mm.



This machine will not operate unless the safety device is connected properly.

Optimum safety device shall be selected depending on the operating circumstance where the machine is installed.

Kinds of safety device

- Safety fence: It is installed the operating range.



Caution

- ◆ Should the machine be operated in an atmosphere of high temperature, high humidity, presence of dust or corrosive gas, vibrations or impacts, there is a risk of electrical shock, fire or malfunction.

Recommended circumstances are:—

1. There is no risk of explosive atmosphere of gas or steam.
2. Where the machine is not exposed to corrosive gas or splashed with cutting oil or organic solvent.
3. Humidity shall be within the range of 20-80% RH and there shall be no dewing.
4. Ambient temperature shall be within the range of 0-40°C and there shall be no freezing.
5. Vibration shall be not higher than 0.2 g.

The install procedure of the safety devices is described below.

1. Move the operating box to the safe position . Then connect the connector A of the operating box with the connector A of the machine.
2. Put the fence on the ground (position F).

2 Storage



Prohibition

- ◆ Machine should not be stored where it is splashed with water, or in the presence of toxic gas or liquid.



Enforcement

- ◆ Ambient temperature for storage shall be “-20-60°C”.

Humidity shall be within the range of 10-90%. The machine should be stored at a clean place in a building.

3 Transport



Caution

- ◆ The machine shall be protected from any strong impacts during transit in order to prevent a cause of trouble.
- ◆ Since the machine is a precision equipment, it must be protected from any strong impacts during transit in order to prevent a cause of trouble.
- ◆ When lifting the machine, the operator must notice the descriptions as below.

SAFETY RULES FOR MACHINE LIFTING

1. Pay special attention to the balance of the machine while lifting.
2. Use a forklift with sufficient loading capacity to lift the machine.
3. Have another person help guide the way when lifting the machine.
4. The forks of forklift must protrude from under the machine underside.
5. The forklift must only be driven by an experienced forklift driver.

LIFTING THE MACHINE

1. The machine can be lifted by a forklift.
2. Their forks should insert through the machine bottom.
3. Attention should be paid to the balance of the machine while lifting.
4. The weight of the machine is listed below.

Model	Machine weight	Forklift capacity (Kgs)
TB_38	1500 Kgs	2500 kgs



Prohibition

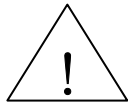
- ◆ The machine should not be carried where rain or water is splashed, or in the presence of toxic gas or liquid.



Prohibition

- ◆ Ambient temperature for operation shall be “-20-50°C”.
Humidity shall be within the range of “20-80%”.

4 Installation



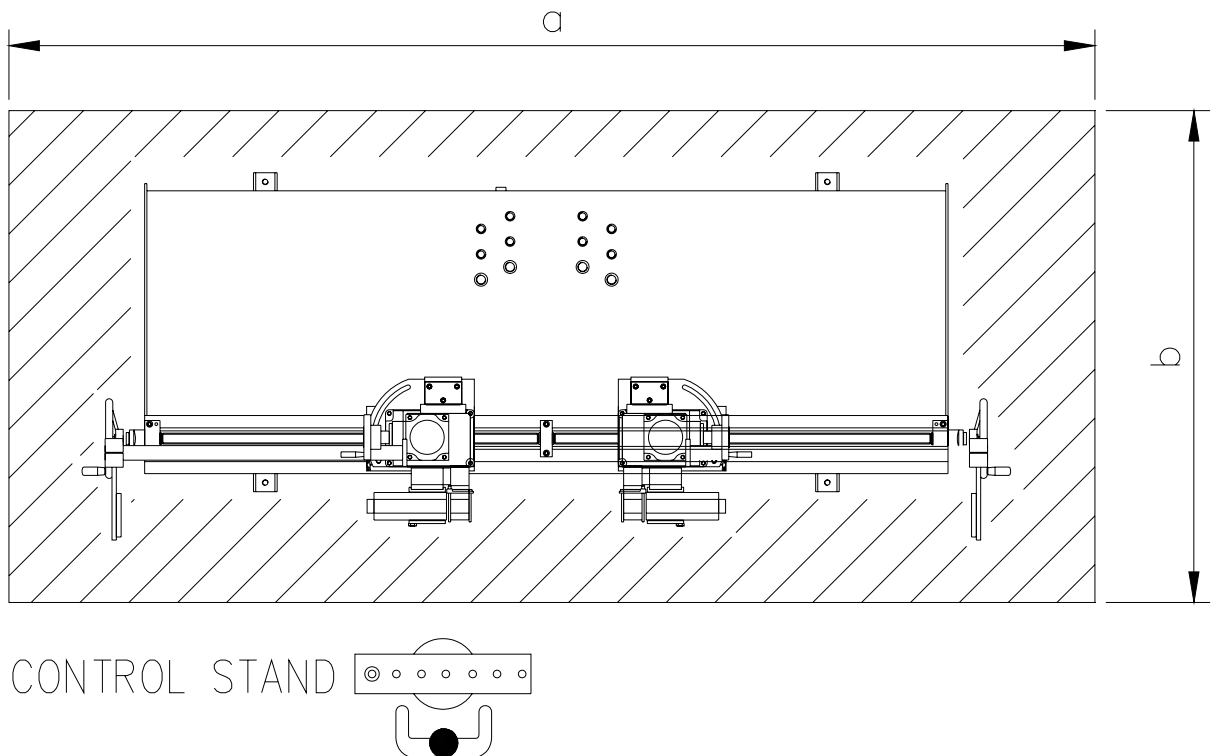
Caution

- ◆ Environment of installation place
 - Select a place where the machine and PC equipment will not be exposed to direct sunlight or spray of chips, water, oil, etc. from other machines.
Ambient temperature “0-40°C”
Humidity shall be “75% or less” without dewing.
 - Where protected from a transmission of big vibration.
 - Where the installation foundation is sufficiently rigid.
 - The machine shall be installed avoiding dust and mist as much as possible.



Caution

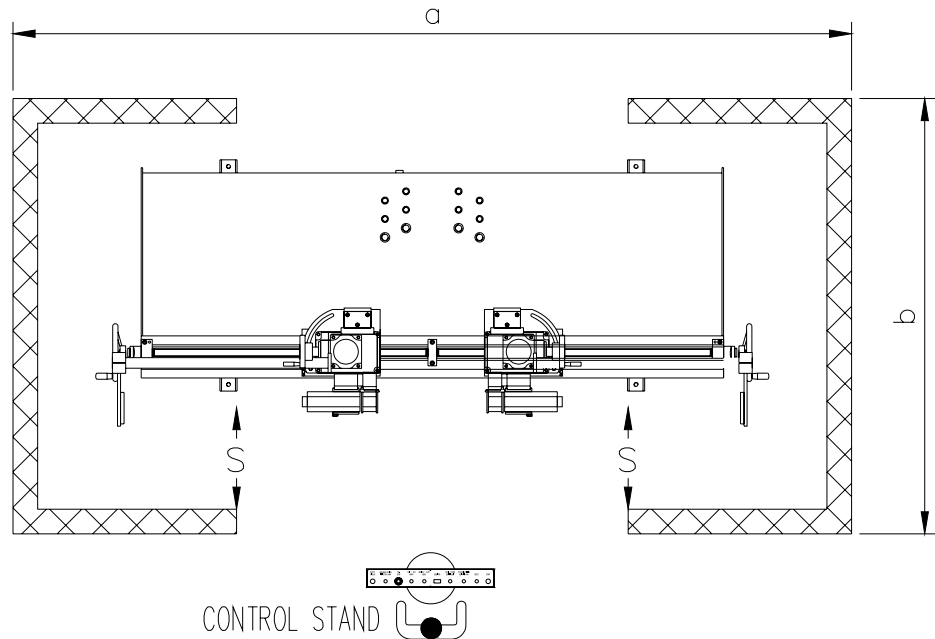
- ◆ Installation of the safety device
 - Before operating the machine, the setter must fence the operating range.



a=4500mm, b=1500mm

■ For fence :

The height of the fence must be greater than 1600mm. So the distance S to hazardous area by EN 294 is 600mm.



a=5000mm, b=3000mm, s=1000mm



Caution

◆ Precautions for installation

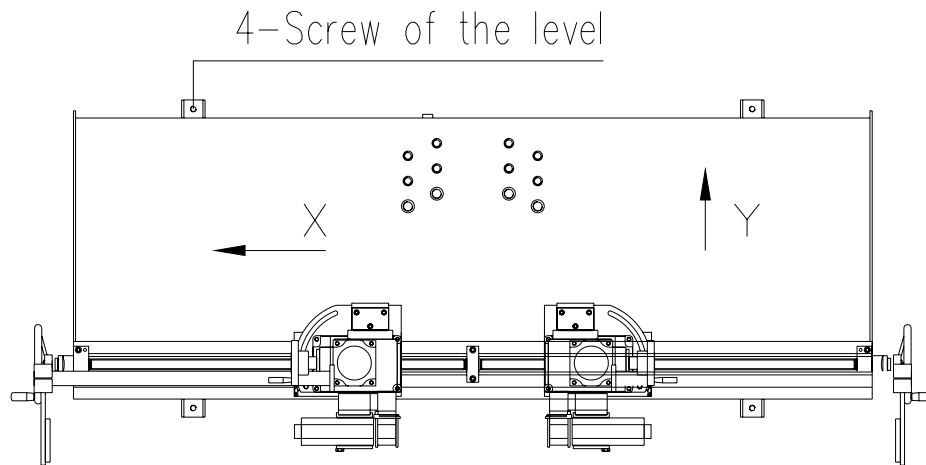
- Provide strong wires and shackles which can support the machine sufficiently to hoist it (Operation shall be carried out by professional operators.)
Gross weight of the machine is approx. 2800Kg.(SB-38X4A-3SV)
Gross weight of the machine is approx. 3500Kg.(SB-51X4A-3SV)
Gross weight of the machine is approx. 4000Kg.(SB-63X4A-3SV)
- Machine is secured at various points for transportation. It is necessary to remove securing hardware after completing the installation.

◆ Level adjustment

- Machine shall be installed precisely at level. Otherwise, the machining accuracy could be affected by an inclination, twist or vibration on the machine after the installation so that undesirable effect will be imposed on the entire aspect of machine accuracy.

Use the level pads or anchor bolts and shims to adjust the level.

- Place a level gauge on the top surface of the machine and adjust the screw of the level from X direction to Y direction as illustrated below.



Danger

◆ Input power supply

- Input power supply shall not be connected to any source of large noise such as an electric welding machine, discharge processing machine, etc.
- Excessive voltage drop or noise due to insufficient capacity on the power supply from the factory could cause a malfunction of PC equipment.
- Make sure to obtain the power supply independently and directly from the power outlet of the factory.
- Sufficient capacity of input power supply shall be secured.

Gross electric capacity of the machine is 7.5 KVA.

Tolerable fluctuation range of input power supply:

AC 220/220 V $\pm$ 10%, 50/60 Hz



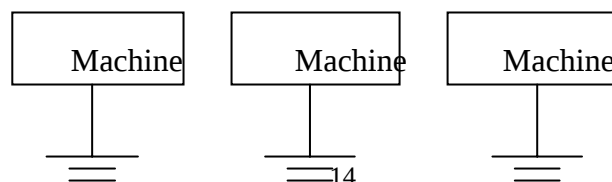
Enforcement

◆ Grounding

Have the machine grounded properly in order to prevent a fault current or electric noise.

Class 3 grounding Grounding Resistance 10 Ω or under

- Make sure to provide a dedicated and secure grounding.



Respective grounding resistances 100Ω or under

- When the grounding cable of electric welding machine, discharge processing machine, etc. is connected to the structural steel of building, it is strictly prohibited to connect the machine's grounding cable to the structural steel.



Caution

◆ Confirmation of working oil

- Supply the working oil up to the adequate level in the hydraulic oil tank (center of oil gauge).

Working oil quantity of the machine is 160 L.

- Working oil shall be of the following brand or equivalents.

Brand name AW46

5 Control, operation

The machine shall be controlled and operated in compliance with the instructions described in the instruction manual which should be read through carefully before starting operation.

- Please note that we are not liable to responsibility concerning any accident resulted from handling which is not instructed in the manual, or a modification made to the machine by the customer.



Enforcement

◆ Machine shall be controlled and operated by single operator only.

It is very dangerous and strictly prohibited to control and operate the machine by more than one operators.

◆ Never insert hands or part of body in the machine while it is operating. It is very dangerous and strictly prohibited.

◆ When dies are replaced or the setup is changed, make sure to turn off the hydraulic and other motors and start the service only after confirming these motors are stopped completely. It is very dangerous to neglect the confirmation.

◆ Be careful not to step in the operation range of the machine while it is operation. It is very dangerous and strictly prohibited.



Caution

- ◆ Please note that the dangerous operating range of the machine may extend depending on the size of workpiece (because the workpiece may be swung around). Never step in such extended operating range during operation.
It is very dangerous and strictly prohibited.
- ◆ Before entering in the operation, confirm no tools, jigs or other unnecessary objects being left over in the operating range.
It could break down the machine or cause a physical injury.

6 Maintenance, inspection

Prohibition

- ◆ Partial modification on the units, etc. are strictly prohibited.
It could cause a fire, trouble or malfunction.
- ◆ Never weld something directly to the machine.
It could cause a trouble or malfunction.
- ◆ It is prohibited to change the internal setting of printed circuit boards or internal setting of parameters.
It could cause a malfunction.

Danger

- ◆ Before installing or removing units, parts, etc., turn off the power supply (including the primary power supply) and wait for 5 minutes.
Negligence of this precaution could cause an electrical shock or trouble.
- ◆ Make sure to turn off the power supply before replacing batteries.
Negligence could cause an electrical shock or trouble.
- ◆ Shut down the power supply (including the primary power supply) before starting the daily inspection.
There is a risk of electrical shock if the machine is inspected while it is live.

Caution

- ◆ It is necessary to display sign boards warning “Don’t turn on the power” or “Don’t turn on

the power switch” at the primary power supply, etc. on the control boards of related equipment in order to prevent power being turned on inadvertently by a third person during maintenance or inspection.

Unexpected electrical shock or injury could result.

- ◆ Don't connect or disconnect wires, printed circuit board, connectors, etc. While they are live.

There is a risk of electrical shock, breakage or malfunction.

- ◆ When an alarm has occurred, check and remove the cause of trouble and confirm the safety before resetting the alarm.

There is a risk of malfunction.

- ◆ When a maintenance or inspection has been completed, confirm that all lock bolts are tightened securely, no tools, etc. are left over and doors and covers of control board and machine are closed properly.

Negligence of the precaution could result in an electrical shock, fire, injury or malfunction.

- ◆ Regarding the machine sequence, when the sequence is installed by the customer, we are not liable for responsibility to any breakage, trouble or damage caused by the sequence.

Chapter 2 Machine Specifications

Item / Model	TB-38
Max. Steel Tube O.D. (*)	$\varnothing 38.1 \times 2.0t \times \text{CLR } 2.5D$
Max. Stainless Steel Tube O.D.	$\varnothing 31.75 \times 2.0t \times \text{CLR } 2.5D$
Max. Bending Radius (*)	180 mm
Min. Bending Radius	$2.5 \times \text{Tube Diameter}$
Max. Bend Angle	185°
Center Distance Between Two Shafts (*)	196-1700 mm
Number Of Multiple Tube Bending	$\varnothing 25.4 \times 2$
Head Rotation Angle In Two Dimensions	$0-90^\circ$
Max. Hydraulic Pressure	150 kg/cm^2
Motor Power For Hydraulic	10 HP
Gross Weight	1360 <i>kgs</i>
Machine Dimension	$257\text{cm} \times 102\text{cm} \times 156\text{cm}$

Note : 1. The ultimate strength of the tube material is based on 40 kg/mm^2 .

2. (*) can be extended by special order.

3. To be suitable for use :

The tube diameter is less than $\varnothing 38.1$ and the conditions as below must be satisfied.

- $2.5D \quad \text{CLR} < 3.0, D/t \quad 20$
- $3.0D \quad \text{CLR} < 4.0, D/t \quad 25$
- $4.0D \quad \text{CLR} < 5.0, D/t \quad 30$
- $5.0D \quad \text{CLR} \quad , D/t \quad 35$

D : tube diameter , t : wall thickness , CLR : center line radius

Chapter 3 Installation Instructions

1. The machine should be installed on a hard, level concrete surface and its 4 legs should be mounted over the level pads.
2. Place a level gauge on the top surface of the machine and adjust the screw of the level pads to let the machine bed be level.
3. Check the hydraulic oil tank to make sure that the level is at 2/3 full. The oil tank capacity is 200 liters. One of the following brand name hydraulic oils or an equivalent class hydraulic oil should be used.

VISCOUTY	MITSUBISHI	SHOWA	MOBIL	SHEEL
1 SO, VG46	DIAMOND HYD.F10001 46	SHOSEKI JH46	MOBIL DTE OIL LIGHT	SHELL TERAS OIL C46

4. First, check and make sure the electrical power supply source follows machine's requirements. Use an electric voltage meter to ensure the power source is a stable 3 phase current that does not vary in voltage by more than 10% (+ or -). We suggest the usage of an electrical power stabilizer to protect the machine control unit. Make sure to provide a dedicated and secure grounding and the grounding resistance must be under 50Ω .

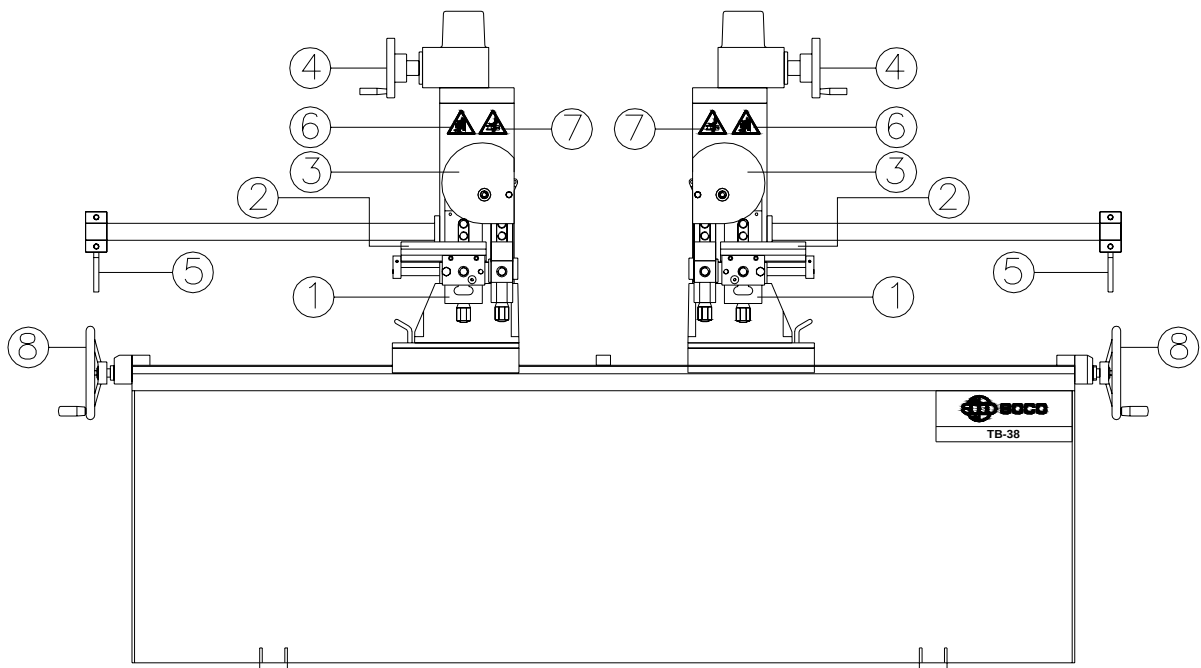
Notice: Only qualified electricians should be allowed to connect the electrical power to the machine.

5. After the power is connected to the machine, turn on the main power switch which is located on the door of the right electrical box. Then turn the switch of the manual/auto mode selection to manual mode. Push the button of the pump start/stop to run the pump. (Notice: If push the button one again, the pump stop.) Then turn the switch of the bending die open/close to open position and push the safety ensure button simultaneously. So the hydraulic pump will be engaged. Check if the main hydraulic system pressure gauge has 150 kg/cm^2 pressure. If not, please stop the pump, turn off the power and switch any two of the power line connections until the system pressure is engaged. Notice that the main hydraulic system pressure gauge must be 150 kg/cm^2 pressure.

Chapter 4 Machine Outline Description

4-1 The Whole Outline

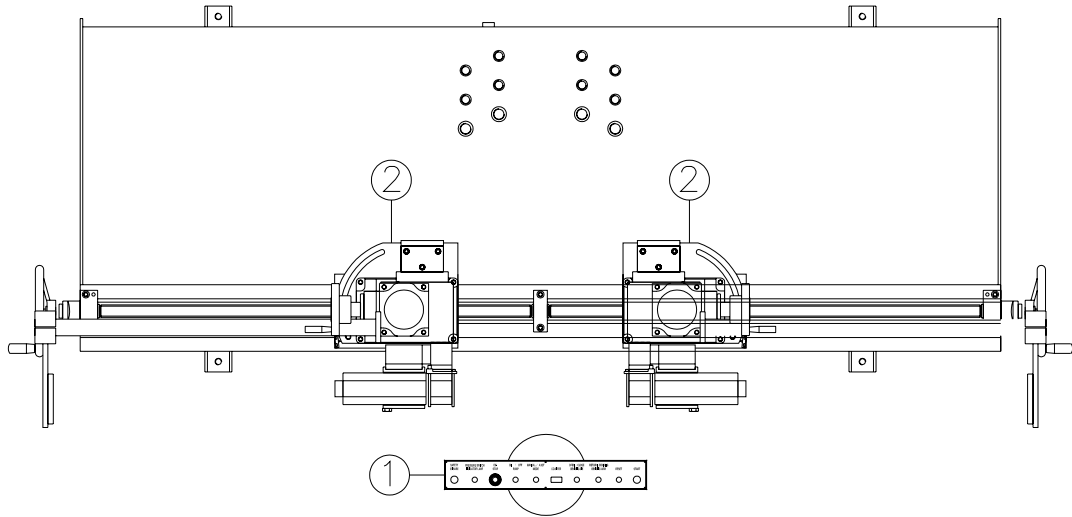
- ① Bending arm
- ② Pressure die
- ③ Bending die
- ④ Handwheel of the bending angle adjustment
- ⑤ Stopper
- ⑥  : Be care not to be touched by bending arm
- ⑦  : Be care not to be clamped
- ⑧ Handwheel of the center distance adjustment between two head



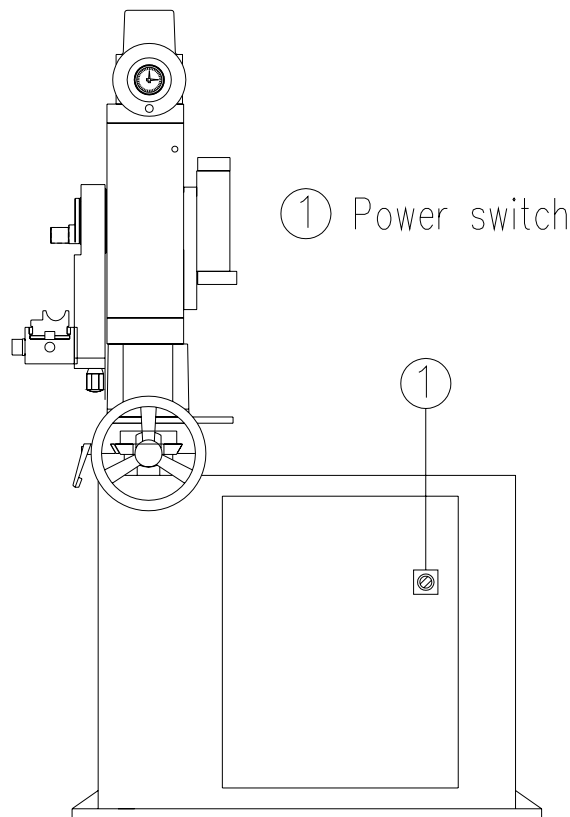
Front View

① Operating box

② Turning plate of the machinehead angle



Top View



Side View



MACHINE MODEL	
SERIAL NUMBER	
YEARS OF MANUFAC	
INSTALL POWER	KVA
FREQUENCY	Hz
CONTROL VOLTAGE	V
NOMINAL CURRENT	KA
NUMBER OF PHASES	
AIR PRESSURE	Bar
HYDRAULIC PRESSURE	Bar
BENDING CAPACITY	
MACHINE WEIGHT	Kg
MACHINE DIMENSIONS	mm

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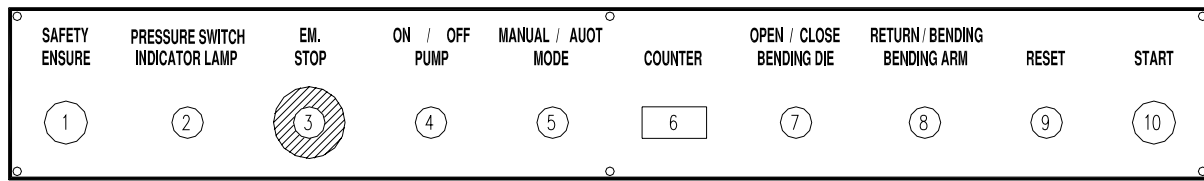
#7, 14TH RD. TAICHUNG INDUSTRIAL PARK, TAICHUNG TAIWAN

TEL: 886-4-23561888 FAX: 886-4-2356206

E-MAIL: soco@speed.net.tw

Website: <http://www.socomachinery.com>

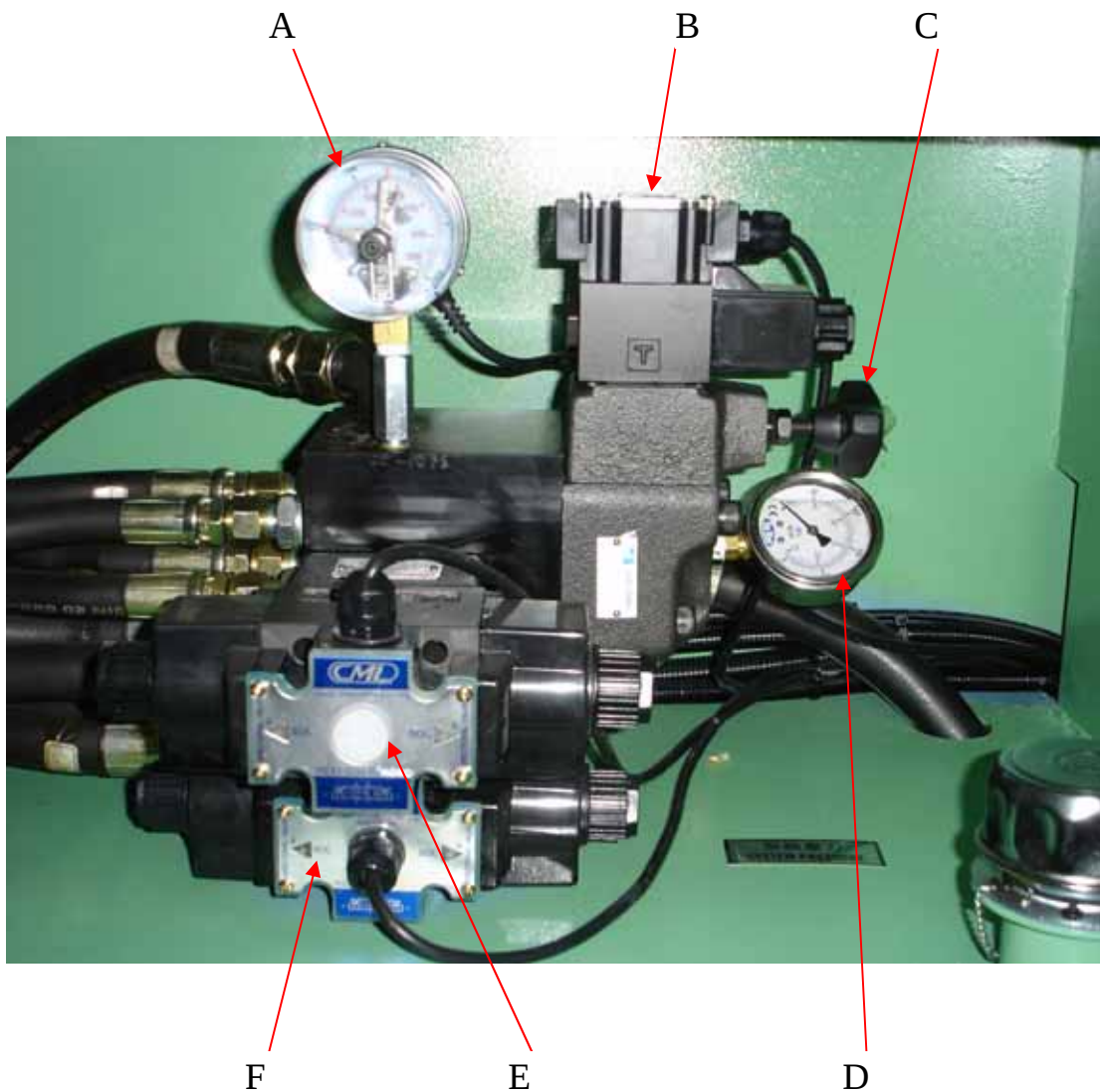
4-2 The Operation Panel



Each button's functionality is as follow:

1. **SAFETY ENSURE :**
For safety, the operator must press the safety ensure button and one of these function buttons at the same time to drive the function.
2. **PRESSUR SWITCH INDICATOR LAMP:**
When the pressure reaches the setting value, the lamp is on.
3. **EMERGENCY STOP:**
Press the emergency button immediately when abnormal behavior or malfunction occur during operation. So the machine motion stops and motor is off.
4. **ON / OFF PUMP:**
After press the button, the pump is on. And then press one again, the pump is off.
5. **MANUAL / AUTO MODE:**
The selection button of the manual and auto mode.
6. **COUNTER:**
When the cycle of a job is finished, the number of the counter is plus one.
7. **OPNE / CLOSE BENDING DIE:**
When the switch is turned to the OPEN position, the bending die moves upward. If the switch is turned to CLOSE position, the bending die moves downward and clamps the workpiece.
8. **RETURN BENDING / BENDING ARM:**
When the switch is turned to RETURN BENDING position, the bending arm moves toward zero position. If the switch is turned to BENDING ARM position, the bending arm bends outward.
9. **RESET:**
Press this button, it can unlock the protection of the safety device and let the machine run.
10. **START:**
Under the auto mode, press the START and SAFETY ENSURE buttons, the full cycle is executed.

4-3 The Adjusting Instruction of The Hydraulic element



- A. Pressure switch (pressure setting 135 km/cm^2) ★Don't adjust it.★
- B. Solenoid Valve for relief valve
- C. Relief valve for system pressure (pressure setting 150 km/cm^2) ★Don't adjust it.★
- D. System pressure gauge
- E. Solenoid valve for bending die
- F. Solenoid valve for bending arm

Chapter 5 Dies Installation and Adjustment

Tooling Description :

The tooling comprises one bending former, one slipper and one vice jaw for each bending module. For some applications a roller carrying box can be fitted to carry two rollers instead of the normal slipper carrying box (optional accessories). The height of the slipper can be adjusted by a jacking screw incorporated into the bending arm.

The bending former is attached to the inner shaft eccentric via a crank pin passing through the former. In order to maintain parallelism between the slipper, vice jaw and gripping surface of the bending former, a control link and connecting rod is incorporated into the assembly.

The vice jaw is fitted on to a bracket screwed to the module body and is adjustable for height by means of a jacking screw. Horizontal adjustment is also possible to allow the tools to be correctly aligned.

IMPORTANT - Before removing any part of the tooling, operate the machine in Manual mode until the bending arm has rotated through approximately 45 degrees. (see OPERATING THE MACHINE further on in this manual) This ensures that the bending former is in the correct position, and gives easier access to the slipper box jacking screws. Then Switch off the motor & isolator.

Never operate the machine without a Bending Former in position.

5-1 Bending Former Installation

Description :

This is normally mounted direct on to the eccentric pin, and also to the lower end of the link, and is fixed by a washer and bolt. When narrow single groove tooling is used a spacing collar is provided and should be fitted after the bending former and link has been assembled.

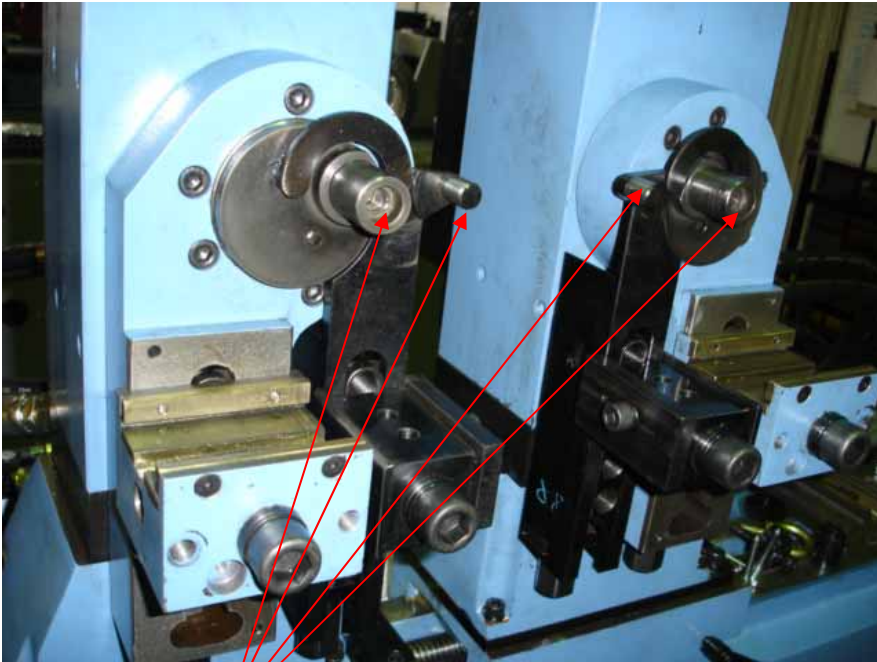
On M38 modules 44.0mm is the smallest inside radius. All crush bending tools utilise small radius adaptor blocks.

The Small Radius Adaptor is fitted on M38 modules after the stud and shaft extension is removed. The small radius adaptor may now be located on the lower end of the link and the shortened eccentric pin, and fixed by a special washer and screw. On no account attempt to remove the eccentric pin on M38 modules.

To Fit A Bending Former :

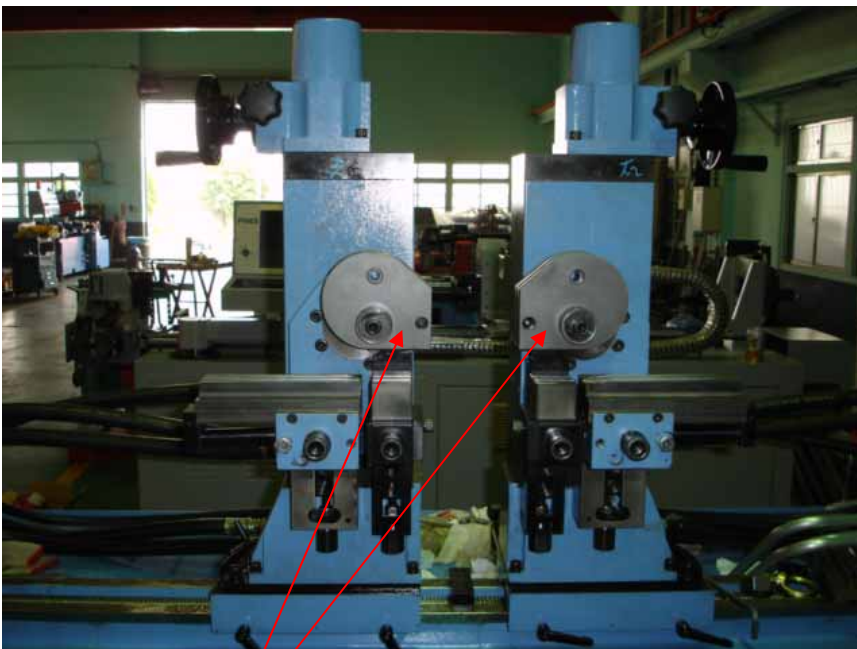
1. Apply grease to the eccentric and pivots of the control link and connecting rod.
2. Locate the control link into carrying bracket, and locate connecting rod in appropriate bush in drive shaft and into control link.
3. The bending former may now be located onto the eccentric pin and onto the control link. Secure by M12 bolt and special washer. Approximately 0.1mm end float should be present.

On small radius tools which are attached to a small radius bending adaptor, locate the former on to the dowels and secure by two bolts.



(1)

Put the bending formers on the position 1, shown as below:



bending formers

5-2 Vice Jaw Installation and Adjustment

Description :

The Vice Jaw is supported on an assembly attached to the body by a slide and a M20 cap headed screw. The Vice Jaw is clamped by a countersunk screw and clamping plate onto the assembly; this system allows horizontal adjustments. Vertical adjustment is made by moving the assembly to the nearest appropriate M20 hole then fine adjustment is made via the knurled jacking screw.

To Fit & Adjust A Vice Jaw

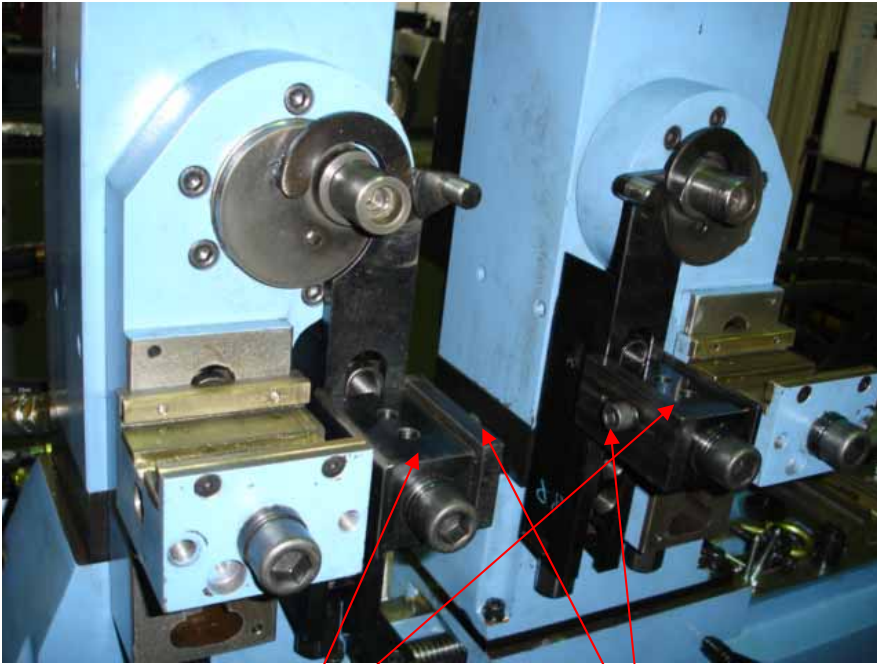
Lower the Vice carrying bracket until the vice jaw can be located onto the bracket, but do not clamp into position at this stage.

Place a short length of tube on to the jaw and adjust the bracket upwards by using the jacking screw. Obviously, the bracket retaining screw should be slightly loosened at this stage.

The adjustment is correct when the gap between lands on vice jaw and bending former is approximately 1.0mm.

NOTE: Slightly more tension may be needed for Single Module applications. **DO NOT OVER TENSION !!**.

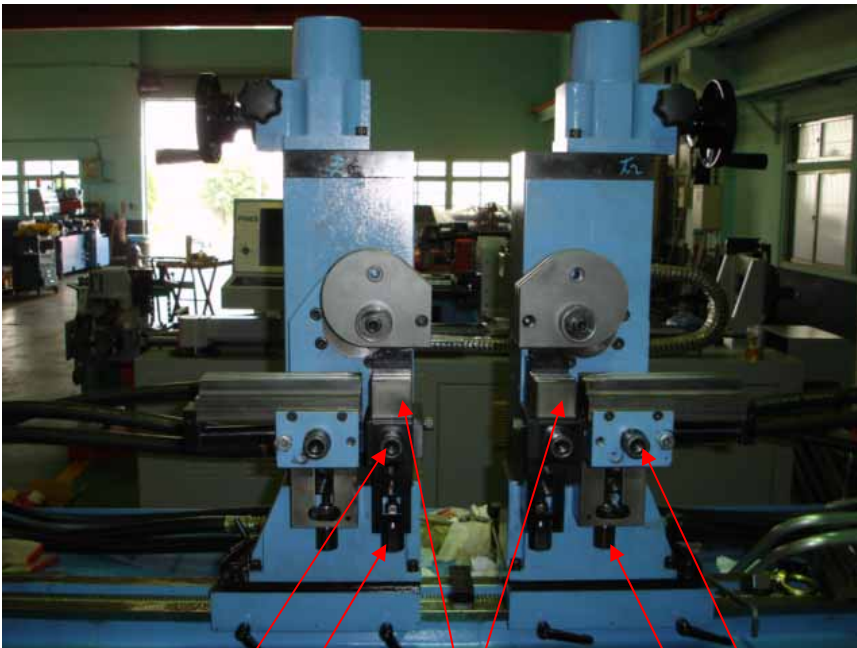
Now, tighten the M12 jaw fixing screw and also the M20 cap headed screw.



(1) vice jaw seat

(2) countersunk screw

Put the vice jaw on the vice jaw seat (1). Let the groove of the vice jaw is opposite to the groove of the bending former. Then tighten the countersunk screw (2), shown as below:



(3) (4)

vice jaw

(4) (3)

Slightly loosen the bracket retaining screw. Place a short length of tube on to the jaw and adjust the bracket upwards by using the jacking screw (4). The adjustment is correct when the gap between lands on vice jaw and bending former is approximately 1.0mm. Then tighten the bracket retaining screw.

NOTE: Slightly more tension may be needed for Single Module applications. **DO NOT OVER TENSION.**

5-3 Slipper Tooling Installation and Adjustment

Description :

The slipper is carried on the slipper carrying box on non ferrous wearing strips. The box is attached to the bending arm by a M20 cap head screw, the height of which may be adjusted by moving the slipper box to the next hole and fine adjustment can be made via a knurled jacking screw.

Slippers are available in two lengths depending upon the radius and angle of bend. Each length requires the correct spring assembly. The lengths are 200mm and 300mm. The machine is supplied with slipper spring return rods of both two lengths.

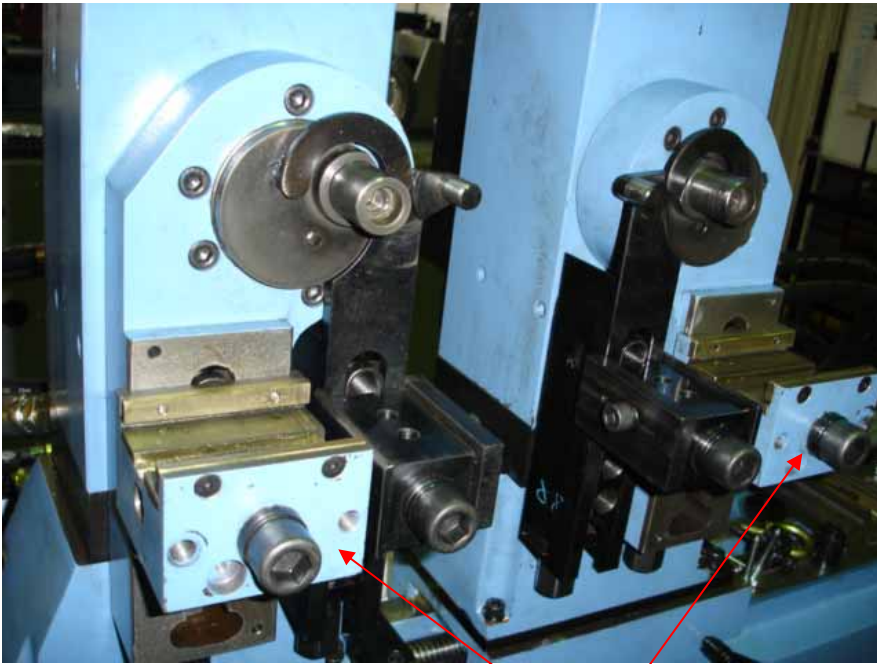
To Fit & Adjust Slipper

To remove a slipper, unscrew the bolt which retains the spring carrying bar. The bar may now be extracted along with the slipper and spring. Grease the wearing strips before fitting the slipper and reverse the procedure to refit.

To adjust the slipper height, slacken the M20 cap headed screw which retains the slipper carrying box and use the jacking screw located in the bottom of the bending arm until the correct clearance is obtained. Check the clearance after re-tightening the M20 screw. Initially set a clearance of approximately 1.0mm. **Refer to the next paragraph on Bending Problems if the bend quality is unsatisfactory.**

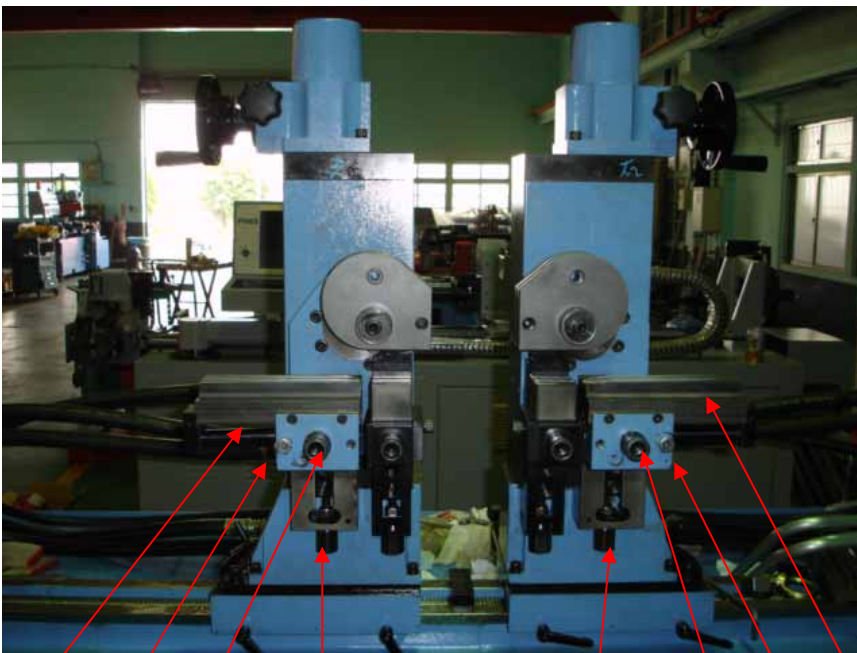
Bending Problems: Flatting or Creasing

Without tube, operate the machine until the bending arm has rotated through approximately 45 degrees and release hand control buttons. Switch off motor. Check gap between slipper and bending former. If greater than 1mm. adjust until correct and re-test. If there is no improvement, reduce the gap to 0.5mm and test. Should flatting or creasing still occur, reduce the gap to 0.1mm. The gap should not be reduced below 0.01mm and must always be adjusted with the bending arm in the 45 degrees position. If the bend is still unsatisfactory, check vice jaw adjustment to ensure that the tube is not slipping during the bending cycle. Do not reduce the clearance between bending former and vice jaw below 0.1mm. Finally, if the bend quality is still poor, check that the tools are in good condition and that the grooves are not worn over width.



slipper carrying box

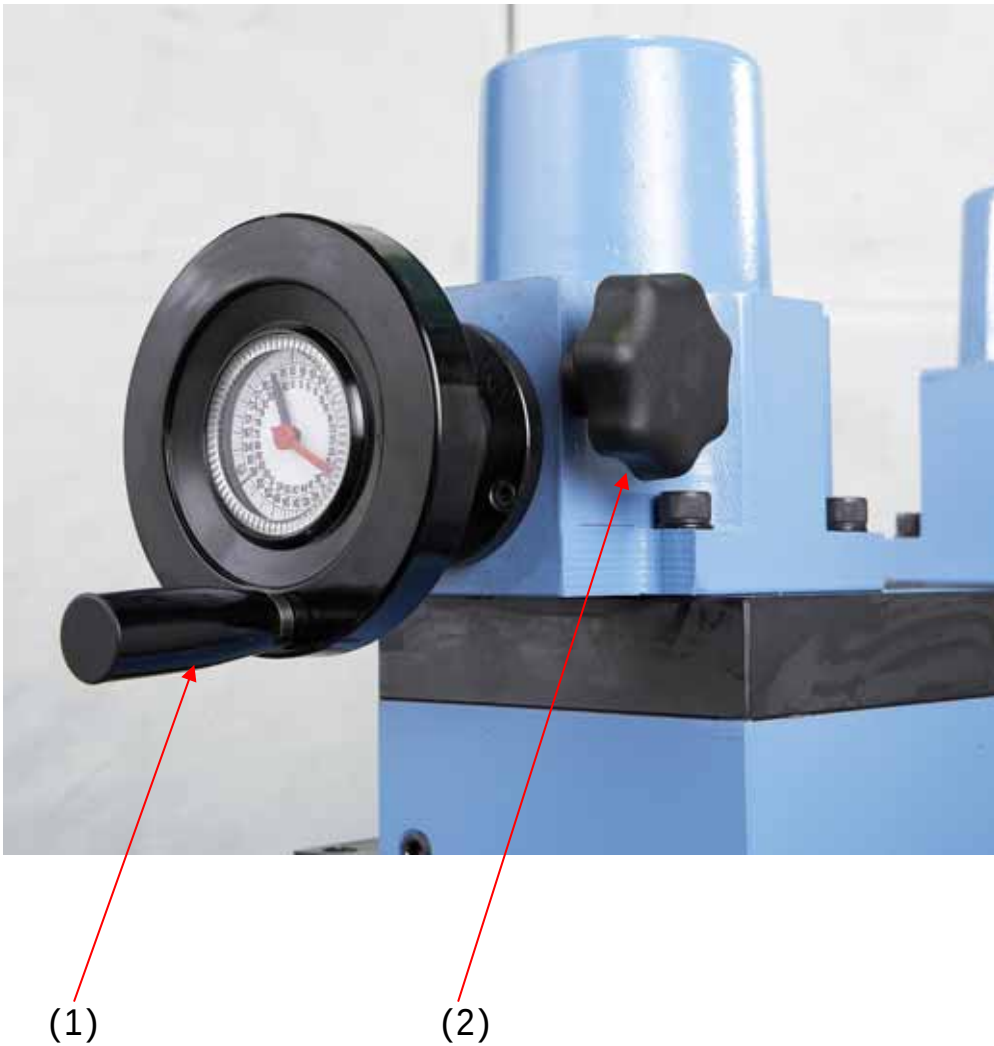
Put the slipper tool into the slipper carrying box, shown as below.



(1) (2) (3) (4) (4) (3) (2) (1)

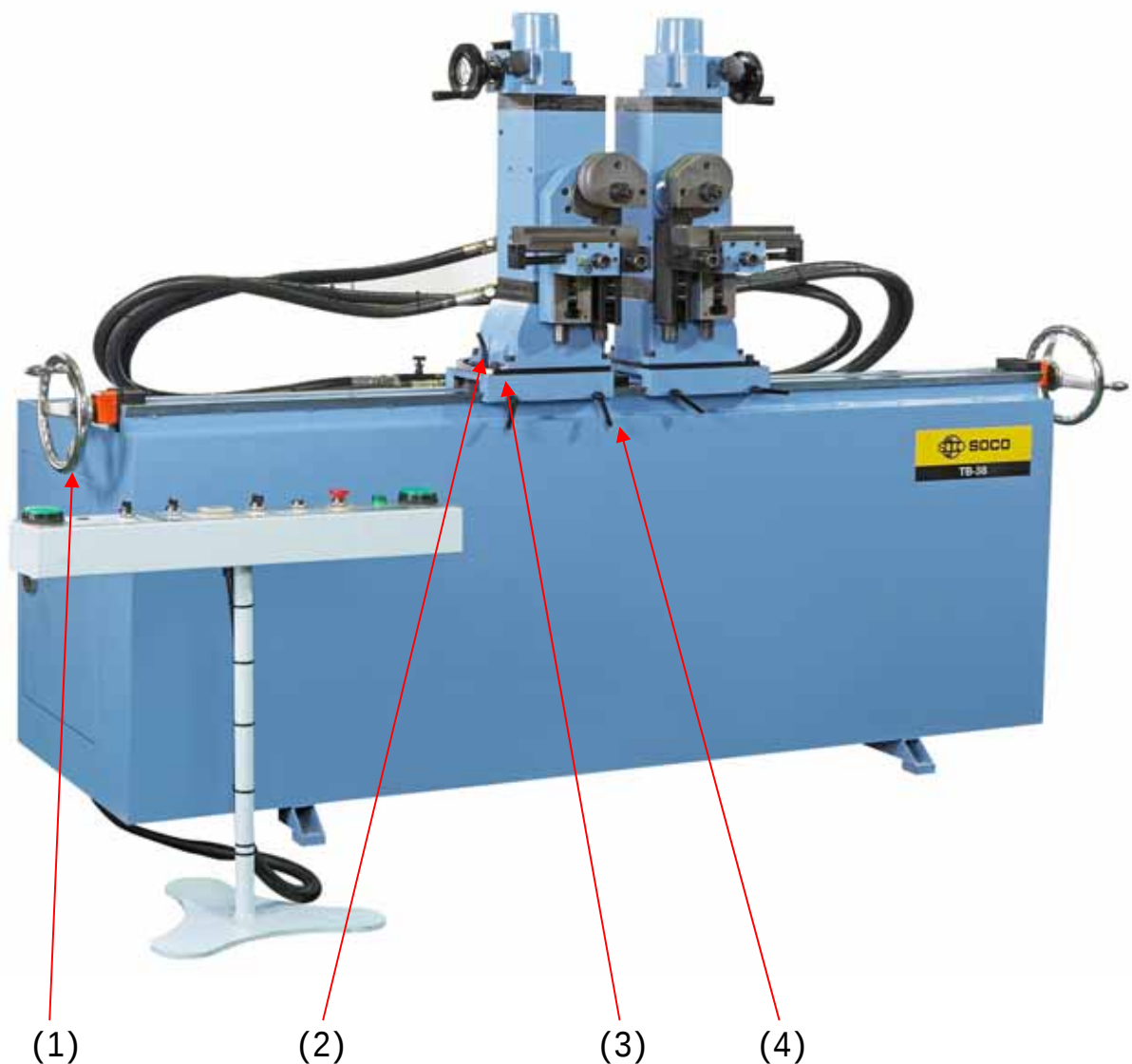
Put the slipper tool (1) into the slipper carrying box. Then tighten the screw (2) to fasten the spring carry bar. Loosen the M20 cap headed screw (3) and use the jacking screw (4) to move the slipper carrying box until the correct clearance is obtained.

5-4 Bending Angle Adjustment



The angle of bend control is located on the top of each bending module and is easily identified by the hand wheel (1) on the side. At the center of the hand wheel is a counter that reads the required angle. To adjust the bend angle loosen the knob (2) at the front of bend angle control assembly and turn the hand wheel either clockwise or anti clockwise to set the counter to the required bend angle, then tighten the knob. Final adjustments may be required after bending tube due to different material strengths.

5-5 The Adjustment of the Machine Head Angle and the Center Distance of the Two Machine heads



1. Adjust the machine head angle

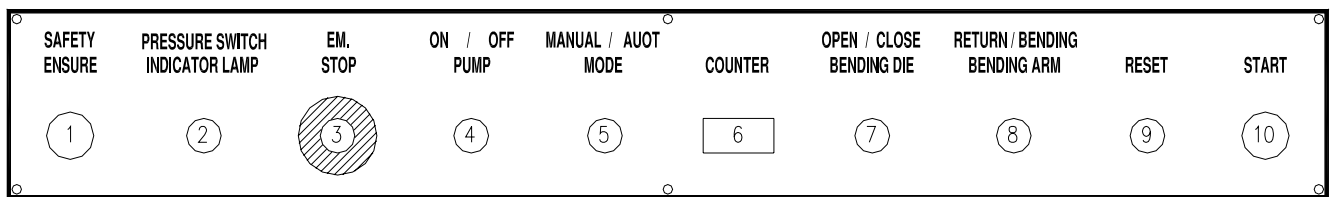
Slacken the cap headed screw (3) and remove the pin (2). Turn the machine head to the angle required. (Note: The position of the pin is suitable for 0° and 90° .)

2. Adjust the center distance of the two machine heads

To adjust the position of a module on the bed there are two adjusting levers on the front of the module. Loosen the lever (4) and turn adjusting hand wheel (1) on the end of the bed to move head to the required position. The distance from the centre of the machine to the centre of the bend radius is shown on the indicators mounted behind the hand wheel. Tighten the two adjusting levers after the head has been set. Do the same for the other module.

NOTE: For minimum centre distance of radii, refer to the Technical Data section.

Chapter 6 Manual Operation



Turn the mode selection switch (5) to the manual mode and press the PUMP ON/OFF button to start the pump. Now the machine is ready in manual.

The function of each button is described as below:

1. SAFETY ENSURE button:

For safety other functional buttons will act only when the safety ensure button is pressed at the same time.

2. PRESSURE SWITCH INDICATOR LAMP:

When the hydraulic pressure reaches the setting value of the pressure switch, the lamp is on.

3. E.M. STOP button:

Press the emergency button immediately and turn off the power switch when abnormal phenomenon or malfunction happens on the machine

4. PUMP ON/OFF button:

press this button to start the pump. If press this button again, the pump is off.

5. MANUAL/AUTO MODE selecting switch:

Switch to manual mode, then the machine is in manual. If switch to auto mode, the machine is in auto.

6. COUNTER:

In auto mode, when the workpiece is finished, the value of the counter is plus one.

7. OPEN/CLOSE BENDING DIE selecting switch:

Turn this switch to the open position and press the safety ensure button at the same time. The bending die will move upward. If turn the switch to the close position and press the safety ensure button at the same time. The bending die will move downward.

8. RETURN/BENDING BENDING ARM selecting switch:

Turn this switch to the return position and press the safety ensure button at the same time. The

bending arm will moves backward. If turn the switch to the bending position and press the safety ensure button at the same time. The bending arm will move forward.

9. RESET button:

Press this button to unlock the safety device and restart the machine.

10. START button:

If the mode selection switch is turned to the auto position, press the button and the safety ensure button at the same time. A full cycle of the workpiece will be executed.

Chapter 7 Auto Operation

When the mode selection switch is turned to auto position, the machine is in auto mode. If the hydraulic pump is running and the safety ensure button and the start button are pressed. The machine will run through a CLAMP/BEND/BEND RETURN/UNCLAPM cycle.

Chapter 8 Maintenance

- (1) Keep the machine clean.
- (2) The system pressure of the machine should never exceed recommended maximum (150 kg/cm²).
- (3) Keep the hydraulic oil reservoir free of contamination.
- (4) Before operation, check the sight glass on the hydraulic oil tank to ensure the oil level at least 2/3 height position.
- (5) The machine elements that a relative motion existing must be lubricated to keep the machine life expectancy once per week. The temperature in the electric cabinet shall keep below 50°C. A temperature control device shall be installed in hot environment.
- (6) When maintenance service may be needed, the operator must turn off the power and lock the power switch for the machine to avoid any accidents.
- (7) The hydraulic oil of the oil tank is exchanged by new hydraulic oil every year.

Chapter 9 Trouble Shooting

Under the auto mode every step of a cycle is thought as finished by pressure switch. When the hydraulic pressure reaches the setting value, the pressure switch indicator lamp on the control panel is on. If any step of a cycle can't be finished, check the setting value of the pressure switch. (Refer to Chapter 4-3)

Other faults:

1. The motor overload has tripped.
 - Investigate the cause before re-setting.
2. The machine doesn't do anything though the hydraulic pump is on.
 - Wire broken in control circuit or motor rotating the wrong way.

Chapter 10 Hydraulic Circuit Diagram

Chapter 11 Electrical Circuit Diagram & Electrical components location diagram

Chapter 12 Part Lists and Fig.s