

ASYMMETRICAL 3 ROLLER BENDING MACHINE PBR USER MANUAL



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MORGAN RUSHWORTH

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1. WARRANTY

- This warranty is valid for 12 months.
- This warranty is valid for the part changing or repairing those results from failures due to inaccurate material or manufacturing.
- Transport, travel and labor costs of the parts that is required for renewing and repairing are not recompensed by this warranty.
- This warranty is completely invalid in conditions which include modifications on the machine without written permission or any damage caused by careless usage.
- This warranty is invalid for the parts depreciated in normal working condition.
- This warranty is invalid for frayed parts under normal conditions.
- This warranty is invalid, if the machine is used for different operations, except the operations that it has been designed and manufactured for.

Morgan Rushworth provides assistance to the customers, when a problem occurs about operation and repair of the machine. You may contact us via e-mail, telephone and fax.

2. INTRODUCTION

This manual includes commissioning operation, usage, safety rules, maintenance, technical specifications, and spare parts list of Asymmetrical 3 Roller Bending Machine.

There may be some difference between the manual and the machine because of changes and developments. Please contact the Seller Company for these differences. Use and keep this manual for commissioning, running, maintenance. Keep this manual close to the machine.

ATTENTION!

The machine should be operated by trained staff only.

Any modification on the machine without written confirmation from BENDMAK is strictly forbidden as such changes on machine, may cause damage or injuries.

Working area of the machine should be away from flammable and explosive materials. It should be closed and should not be effected from air conditions.

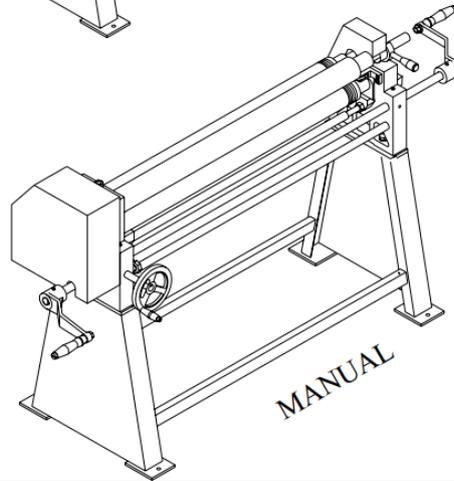
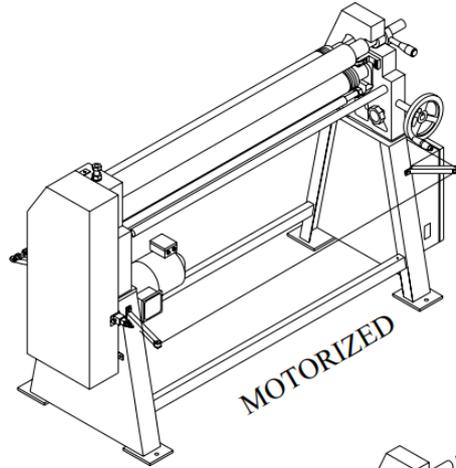
Each time operator leaves the machine away, he should turn the main switch to position "0" and should take out the switch key and keep it with him.

Do not take off and disable the safety covers from the machine.

The operator who will use this machine should confirm that he read the instruction manual and understood everything.

Operator Name And Surname	Signature	Date	Employer Or Responsible Signature

3. MACHINE'S DIMENSIONS



S.N.	Model	Çalışma Boyu (mm) Working Length (mm)	Ön-Bükme Max (mm) Pre-Bending (mm)	Maks. Kalınlık (mm) Max. Thickness (mm)	Üst Top Çapı (mm) Top Roll Diameter (mm)	Alt Top Çapı (mm) Lower Roll Diameter (mm)	Yan Top Çapı (mm) Side Roll Diameter (mm)	Azami Bükme Çapı (mm) Min. Bending Diameter (mm)	Motor Gücü (KW) Motor Power (KW)	Uzunluk (mm) Length (mm)	Yükseklik (mm) Height (mm)	Genişlik (mm) Width (mm)	Ağırlık (kg) Weight (kg)
1	CY 70-10/1.8	1050	1.5	1.8	70	70	70	105	1.1	1300	1100	700	320
2	CY 90-10/3.3	1050	3	3.3	90	90	90	130	1.1	1750	1200	850	500
3	CY 75-12/2.0	1250	1.5	2	75	75	75	117	1.1	2000	1100	850	460
4	CY 90-12/3.0	1250	2.5	3	90	90	90	130	1.1	1950	1130	900	570
5	CY 70-15/1.2	1550	1	1.2	70	70	70	105	1.1	2000	1100	700	450
6	CY 90-15/2.5	1550	2.2	2.5	90	90	90	130	1.1	2250	1130	850	600
7	CY 95-20/1.8	2050	1.5	1.8	95	95	95	135	1.1	3030	1130	850	635

Performance Limits

The machine performance limits change according to:

- The kind of material (mechanic characteristics, hardness, yield point, etc.)
- The diameter to be bent
- The plate width

4. MACHINE INFORMATION

4.1 Standard Equipment and Optional Extras

Standard and special equipment's of the machine are listed below. Standard equipment's already exist in all the machines. ✓ Symbols are in the boxes next to special equipment's that are included in the machine you bought.

Standard Features

- Cast iron body
- Manual bending (by hand wheel)
- Upper shaft can pivot to side
- Cone bending device
- Hand wheel for up and down motions of lower and back rolls
- Separate moving control panel and foot pedal (when the option of electric motor purchased)

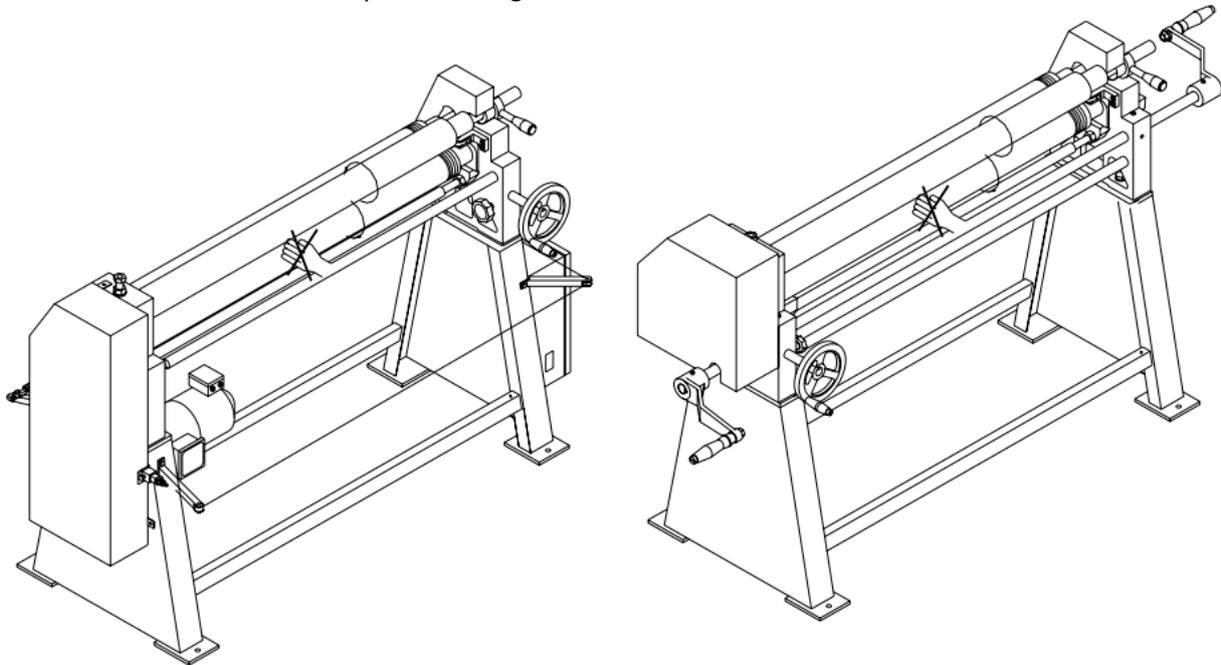
Optional Features

- Motorized back roll (up and down motion)
- Hardened rolls
- Digital display for back roll
- Body cover (panel)

5. SAFETY FACTORS

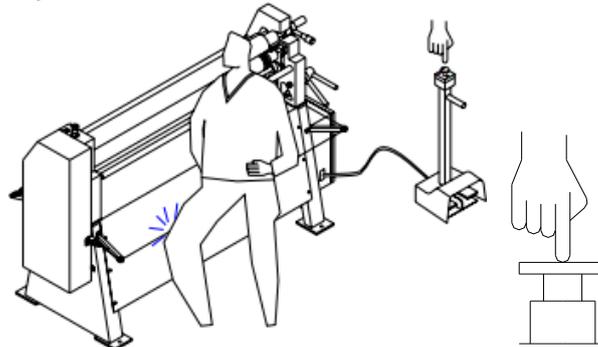
5.1 Dangerous Areas of the Machine

The 3 Roller Bending Machine has upper and lower rolls rotating. Between those rolls, operator's hands or fingers may be trapped. Be careful to not allow any of your clothing or hands between these rolls while they are rotating.



- Do not do maintenance when the machine is working.
- For any cases; be sure that the machine is turned off before you take off the covers.
- After closing the covers, control safety rope carefully.

PRESS THE EMERGENCY BUTTON AT ANY DANGER OR STEP ON THE SAFETY ROPE.



- In an emergency state, the first thing to do is to press emergency-stop button on the panel or to step on the safety rope surrounding the machine.
- Stop the machine before maintenance, repairing and cleaning.
- Never take off the safety equipment's (safety ropes, emergency stop button) from the machine.

MANUAL TYPE MACHINE: Do not let any other person to enter the machine's working area.

MOTORIZED TYPE MACHINE: The first action to do in any danger or accident is stopping the machine by pressing the emergency stop switch or stepping on emergency stop wire. Turn off the machine before the maintenance, cleaning and repairing. Don't remove the safety components of the machine (rope switch, emergency switch, and etc.)

5.2 Possible Dangers on the Machine

On the 3 Roller Bending Machines, safety measures against dangers are taken. For example: The electric installation has a metal closure. Other dangerous area is where the rolls are rotating. Even all preventions are set, by wrong and careless usage, dangerous situations may be seen. During working, safety rope is mounted around the machine against accidents.

POSSIBLE HARMS/DAMAGES FOR WRONG USAGE

- User operator's fingers or hands
- User operator's clothes or other subjects
- Deformed work piece
- The third person when material is bending
- Machine bending equipment.

All staff who are responsible with commissioning, running, maintaining the machine are responsible to read the warnings and apply the instruction manual. Do not attempt to bend hard materials except form metal or aluminum sheet. You may give harm to either the machine or yourself. Making modifications on the machine is forbidden because of safety and efficiency. Working, maintenance and safety factors in the instruction manual are supposed to be obeyed and applied.

5.3 Functions of the Machine

Asymmetrical Bending Machines are produced to shape material and their functions are shown below. This machine has the ability to bend closed and semi-closed pipes and conics. Our machines are produced in different capacity and dimensions depending on the thickness of the material bent. Check sheet thickness on capacity data before starting to bend material. Do not attempt to bend material that is thicker than indicated sheet thickness or quality.

To identify the Asymmetrical Bending Machines, roll diameter, width of the bending material and thickness of it are indicated.

For example: CY 90 - 15 / 2.5

CY = Machine Type

90 = Roll diameter

15 = Work Piece max width (10=10500mm, 15=1550 m 20=2100 mm)

2.2 = Thickness of material (mm) that can be bent to the diameter that is 1.5 times of roll diameter.

These values are valid for materials in ST-37 quality.

These values changes if the material yield point (quality) is different than ST-37.

5.4 Appropriate Usage of the Machine

All bending process should be done in front of the machine where control panel takes place and only one person should operate. When placing work piece to the machine, another personnel shall help, other bending process shall be done only by the operator himself. Therefore, operator has to read user manual carefully and understand it. Operator should take all safety precautions and he shall do controls completely in each step.

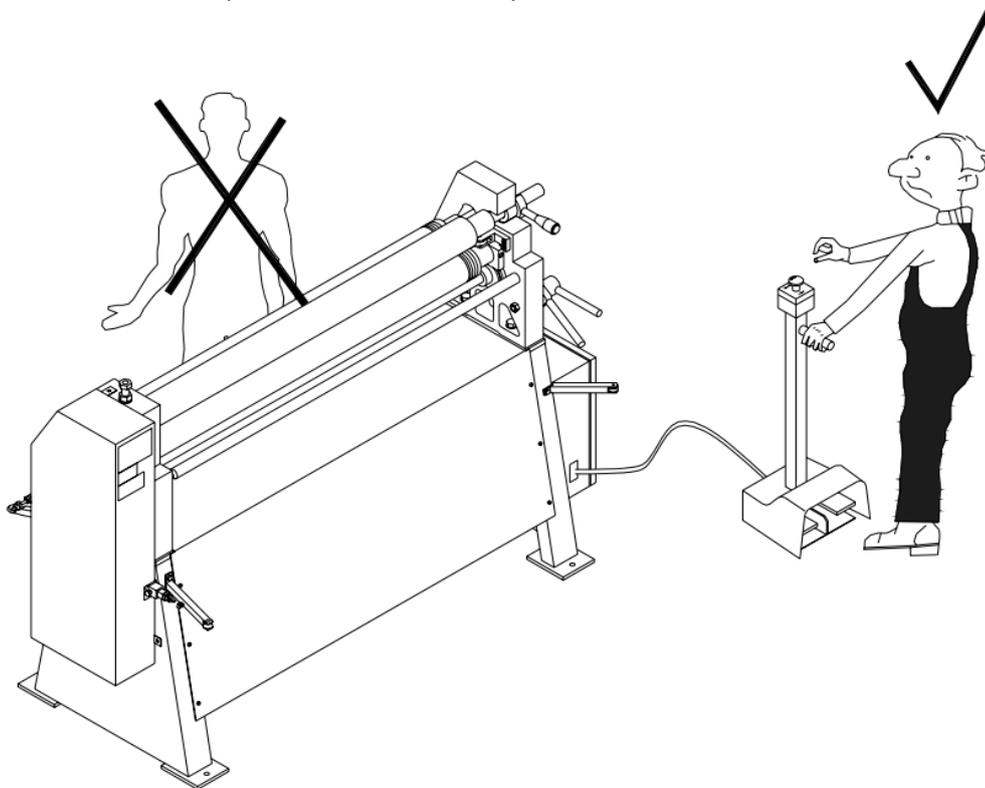
Around the machine, there should be a secure area where max bending material can fit. And no one shall be allowed to enter this area except the operator.

5.5 Inappropriate Usage of the Machine

There should be no one in working area during bending process.

During maintenance electricity connection must be unplugged.

No-one shall be allowed to step on the machine on any condition



5.6 Suitable Operator

People younger than 16 years old is not permitted to run 3 Roller Bending Machine. The operator who will run this machine should confirm that he read instruction manual and understood everything to the employer.

5.7 Operator Protection

When the machine is working under normal conditions, operator shall not need any other preventions. Anyway because of the danger of dropping working material, personals shall wear steel nosed shoes and when handling hard and sharp working work piece they shall wear work gloves. For machine repairs and maintenance expert staff shall have the right equipment.

- Allen key set
- Oiling gun
- Spanner Set
- Protective gloves
- Steel tip protective shoes
- Screwdriver set

5.8 Safety Factors When Setting Up the Machine

Machine shall be positioned on solid and flat surface. (Check the ground plan). There is overturn possibility for the machines which ground connections has not done, this can cause serious damage and accidents. Machine has to be fixed as shown in ground plan. With the machines which are not correctly fixed to the ground, the work piece cannot bent properly. There will be damages on the machine from vibrations.

If the machine is going to hold in storage for a while before running, it shall be covered with a water proof awning and shall be protected from dust.

5.9 Safety Equipment

Safety Equipment's protect operator from machine's working parts and prevents possible accidents from wrong usage. Asymmetrical 3 Roller Bending machine safety equipment's are listed and a CHECK LIST for these equipment's are included in this manual.

Check These Safety Equipment's

- Control those equipment's for each working shift
- Please, check the safety equipment's once a week periodically
- After every service intervention and maintenance, control those safety equipment's

Care Points for the Checks

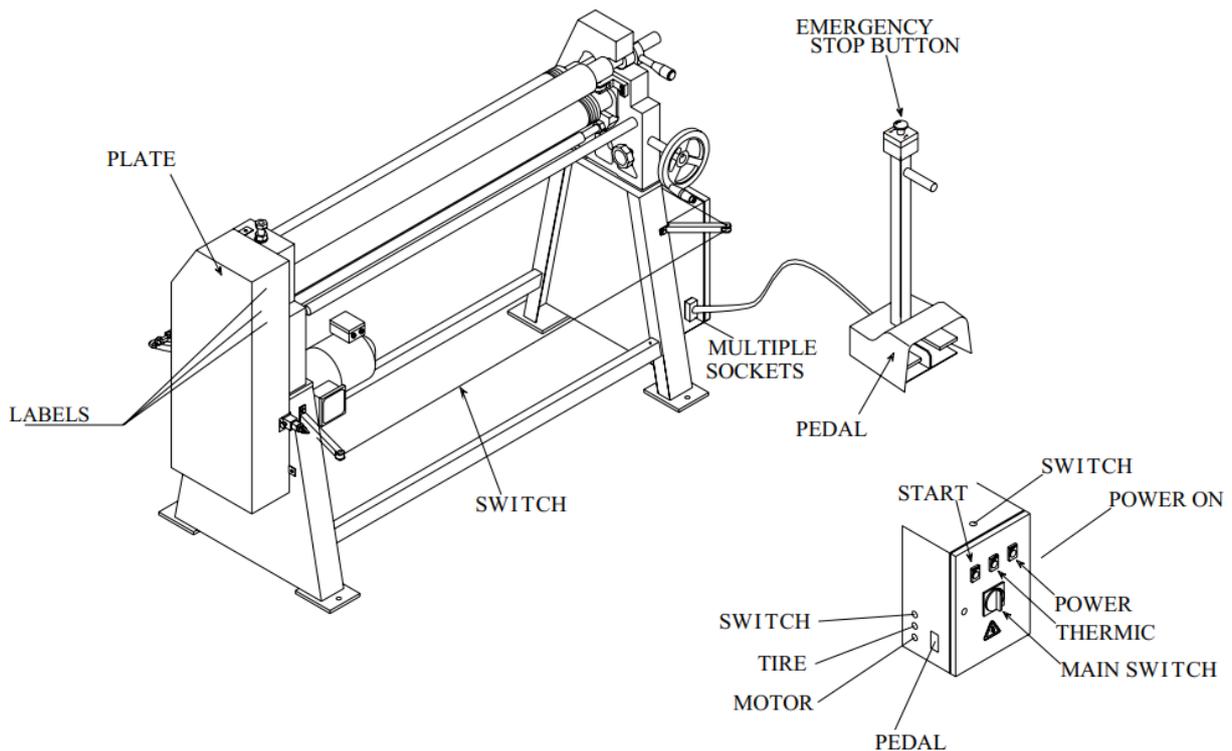
- Check if the equipment is in the correct location
- Check if the equipment is sturdy
- Check if the machine functions correctly.
- Check if the machine is mounted safety.

Fix any problem or failure before running the machine. Stop the machine immediately if you see any problem when the machine is running and contact with the salesman.

Do not take off /disable the safety elements that are mounted on the machine, weather the machine is running or before the any maintenance.

Safety Features

1. Protection plates
2. Switch on electric panel
3. Energy indicator on electric panel that shows there is electric power
4. Thermal indicator on electric panel.(indicates overload trip)
5. Emergency-stop button on the control panel
6. Key switch on the control panel
7. Displays on the control panel
8. Other buttons on the control panel
9. Warning labels
10. Stiffness of the energy cable.
11. Connection cables of the control panel
12. Manuel lubrication has been done or not
13. Safety rope



5.10 Check List of Safety Precautions

Photocopy this check list in each control and use it. Confirm each point which functions correctly by putting a **✓** (THICK SYMBOL) and save it in case of a failure arise.

CHECK LIST	
MACHINE NAME and SERIAL NUMBER	
CONTROLLER	
DATE	

- PROTECTION PLATES: They should be mounted and screwed.
- ELETRIC MAIN ISOLATING SWITCH: It should be assembled and it should be checked if it is working or not
- POWER LAMP: It should be assembled and when there is power the lamp should be checked if it's on or off. Check it against bulb failure.
- THERMAL LAMP: It should be assembled and when the thermal overload is tripped it should turn on.
- EMERGENCY STOP BUTTON: It should be assembled on panel check if it does its functions stops main motor.
- SELECTIVE KEY SWITCH (0-1): It should be assembled on panel. It should function to switch on the display and control circuits.
- DISPLAYS: Should be assembled and when there is power the display should be on. Check this function.
- ALL OTHER PANEL FUNCTION BUTTONS: Should be assembled in and function correctly
- WARNING LABEL: It should be fixed securely and it should be in a place that can be seen easily. If labels is missing or unreadable absolutely contact with BENDMAK company.
- POWER CABLE: It should be fixed securely to machine. It should not be broken and or stripped. It should have safety protection against mechanical damage.
- CONTROL PANEL CONNECTION CABLE: It should be assembled and the flexible outer cover should be checked for damage.
- OIL CONTROL: Machine's oil level should be checked and manual lubrication should be controlled.

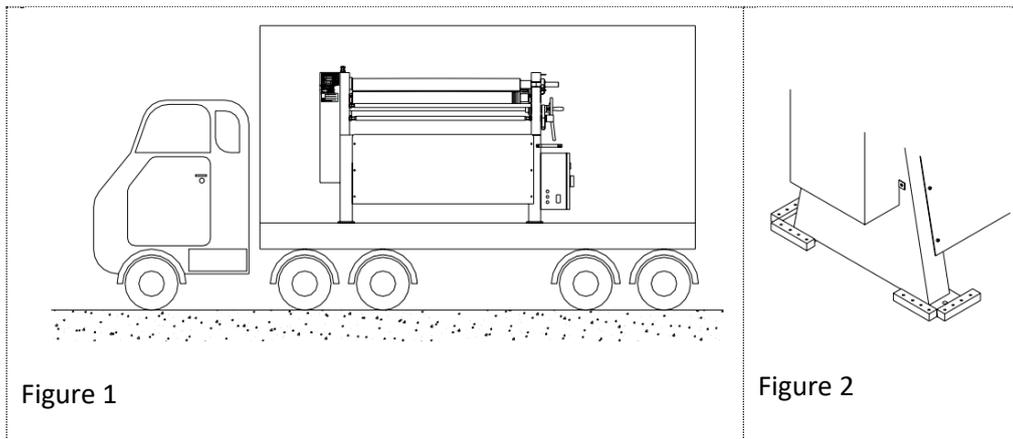
6. COMMISSIONING

6.1 Transport

It is suggested that the machine is transported with a covered waterproof folio not to be effected from air conditions.

Place the heavy part (reducer side) of the machine to the front part of the truck. So, normal driving balance is adjusted by preventing to put the weight to the back side of truck. Figure 1 after the machine is loaded, be sure that the machine is positioned correctly. If needed put supporting legs to moving parts.

As shown on figure 2, fix the machine to the ground from 4 edges with wooden pieces nailed to the base.



6.2 Handling and Leveling the Machine

Always use high capacity quay and synthetic rope to lift the machine. Check lift capacity of ropes and compare them with the machine's weight on [page 6](#). Pick up rolls and pin together as figure 3. It is suggested that ropes are tightened first and then you lift the machine in balance, because dominant weight is on the reducer side (not on the roll) it is required to never loosen the ropes. Otherwise the machine may slide and tilt.

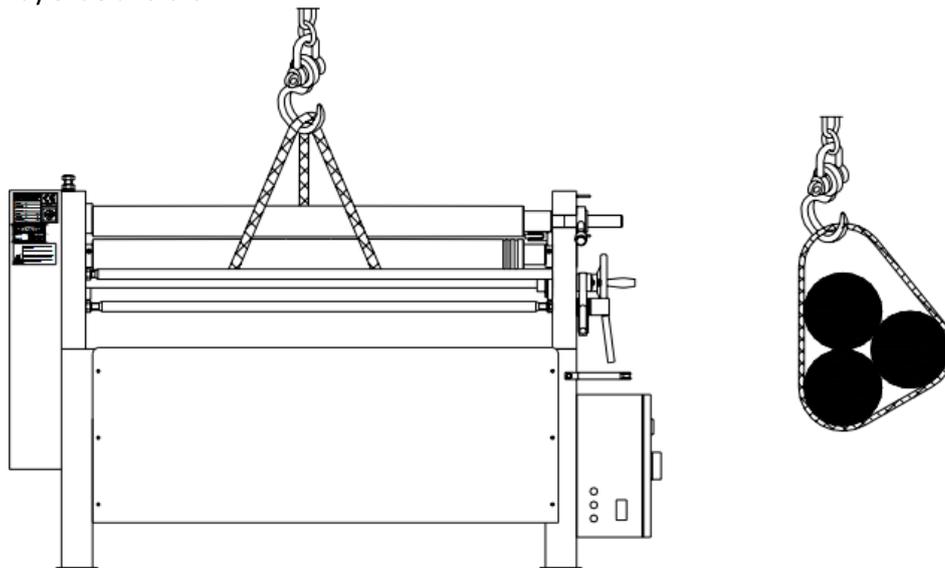


Figure 3

6.3 Unpacking

Asymmetrical Bending Machine are oiled and covered with waterproof folio to protect machine from weather conditions during transport. During transport (in open vehicles) use suitable tarpaulins or other covers additional to above films to protect from weather. At unpacking, if you see any transport damage call the transporter or seller at once.

Disposing the packaging must be done safely, use gloves when unpacking. Unpainted surfaces are protected with oil for transport. Clean this off with "Kerosene" use gloves, dispose of waste wipers safely.

Cleaning of the machine that is oiled with protective oil is as follows,

- Rolls and bright wrought surfaces are cleaned with thinner
- Painted surfaces are cleaned with a mixture of diesel oil and water

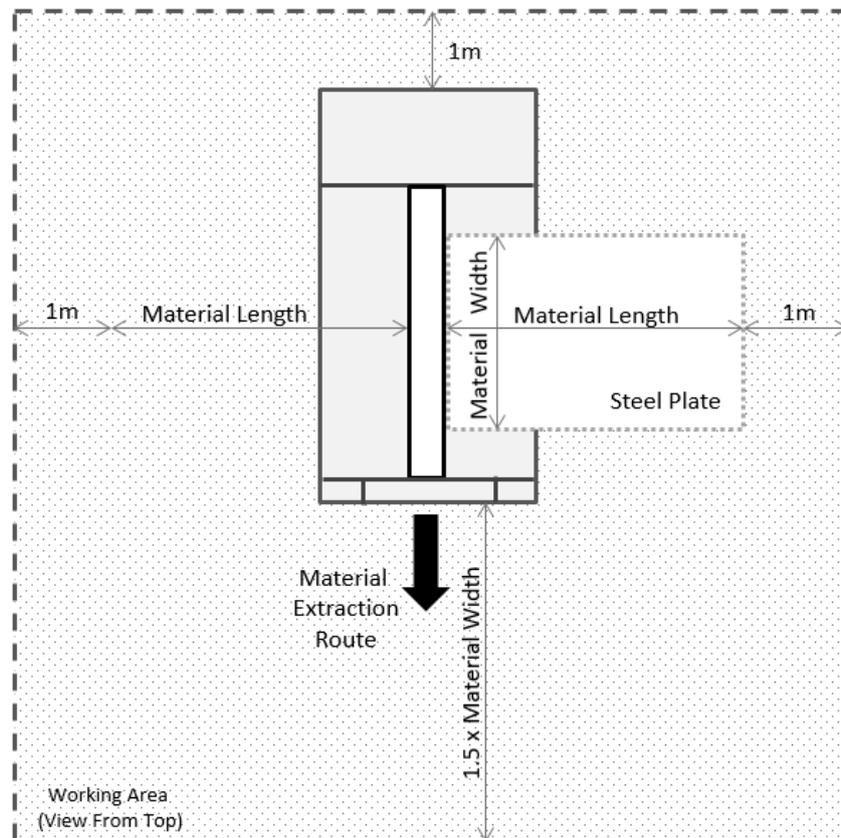
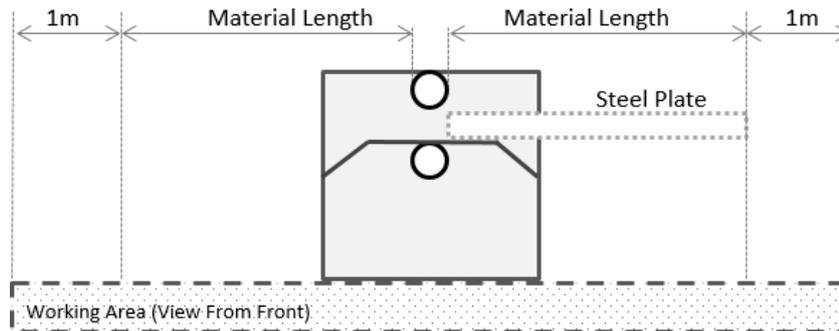
6.4 Machine Grounding Mounting Plan

Machine mounting area should be arranged in accordance with mounting information and mounting plan. After controlling the machine's position if balanced or not, it should be fixed. Decimal balance device should be used to position the machine correctly and connection nut tightening should be checked.

6.3 Mounting Information

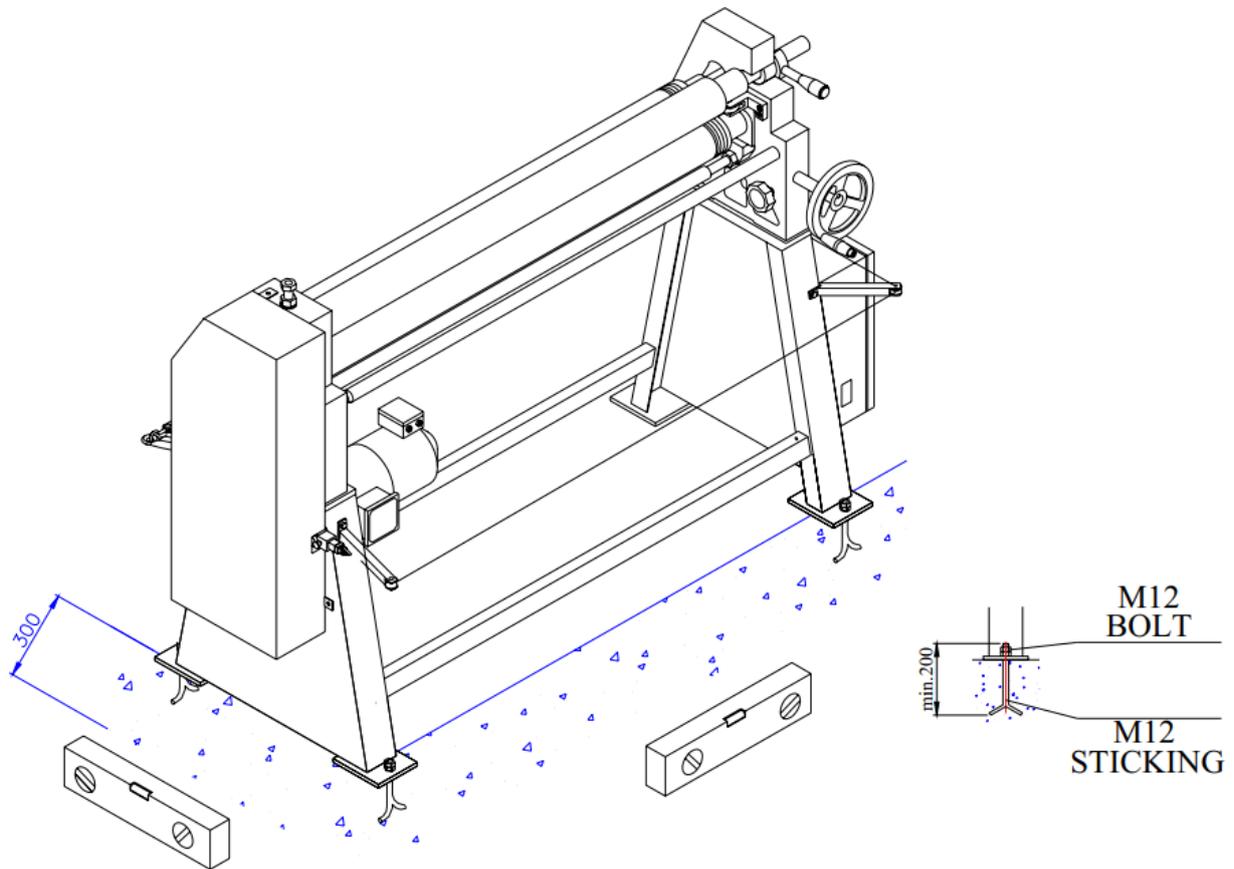
Before commissioning the machine, pay attention to dimensions on Technical Specification Page and explanations below. (Please check recommended working area plan)

- 1- Enough space should be left around the machine to reach every side of the machine for maintenance.
- 2- On the front side of the machine, there should be space that is 1.5 times of sheet length (Lx1.5) to take off the material easily.
- 3- There should be enough space on both sides of the machine to bend material easily and after this space; 1 meter walking area should be left.



6.6 Ground Plan

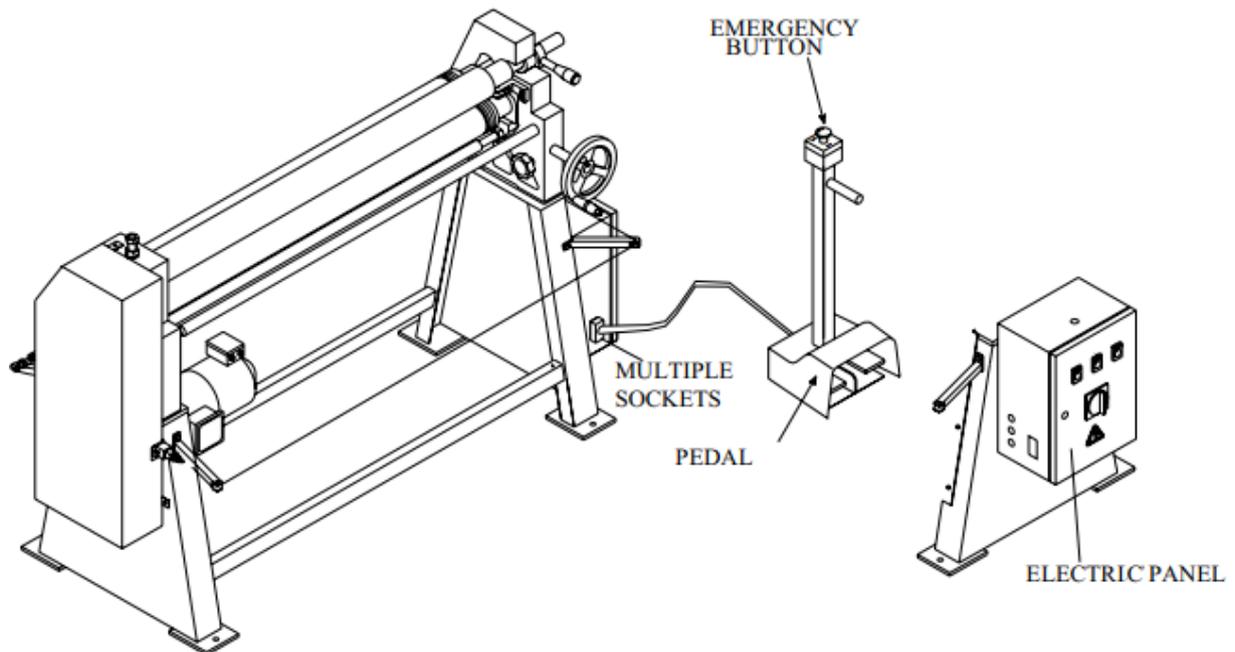
This machine should be positioned on a hard and proper ground to run it safely. Ground's concrete quality should be suitable for machine's weight. Machine should be placed on the ground after 72 hours later concreted fillet to the ground.



6.7 Electric Connection

Electric connection should be done by an experienced electrician. Before making connection, the values should be checked on the label in electric box and electric connections should be done according to these values.

Push the energy cable in to the hole on the side of the machine. Connect energy cable to the electric box through tube which is between electric box and hole. Connecting cable that is between the machine and control panel is screwed off separately. Attach the multiple plug to socket.



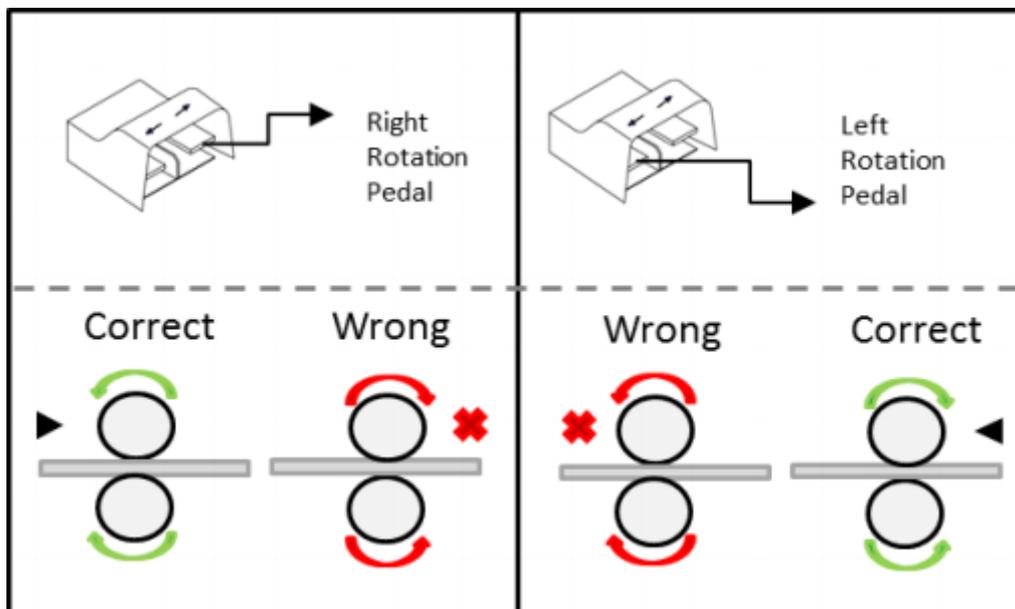
6.8 Electric Motor Rotation Direction Control

After electric connection is done, operator should control motor rotation direction control. For this follow the instructions below.

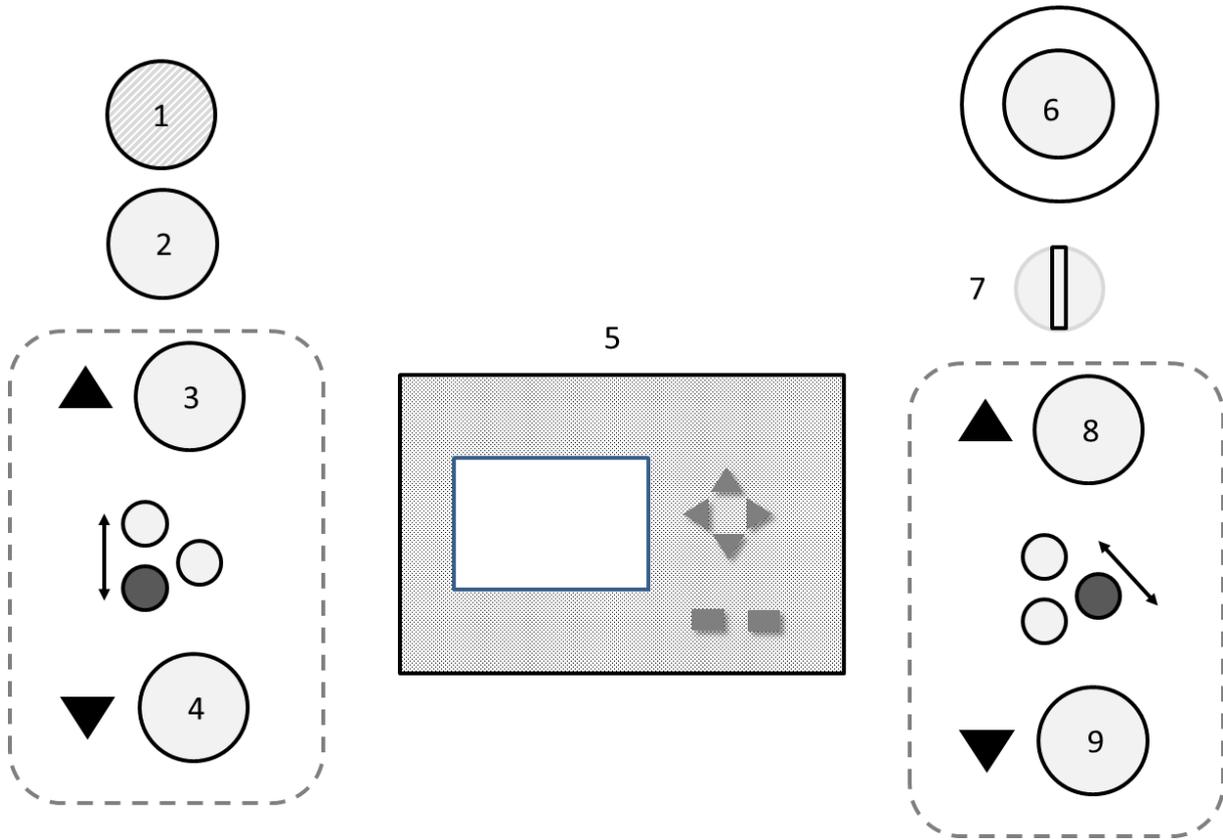
- 1- Rotate the main switch on the electric panel to the position 1
- 2- Rotate the selective key on control panel to the position 1
- 3- Be sure that "electric is on" lamp is lit. If not functioning, check electric connection, emergency stop button and safety rope.
- 4- Push start button.
- 5- Control the rolls whether they are functioning or not. For this: If upper and lower rolls rotation direction is same with arrow direction, when you press buttons, you can go on working.

If upper and lower rolls rotation direction is not same with arrow direction, stop the machine immediately by pressing emergency stop button.

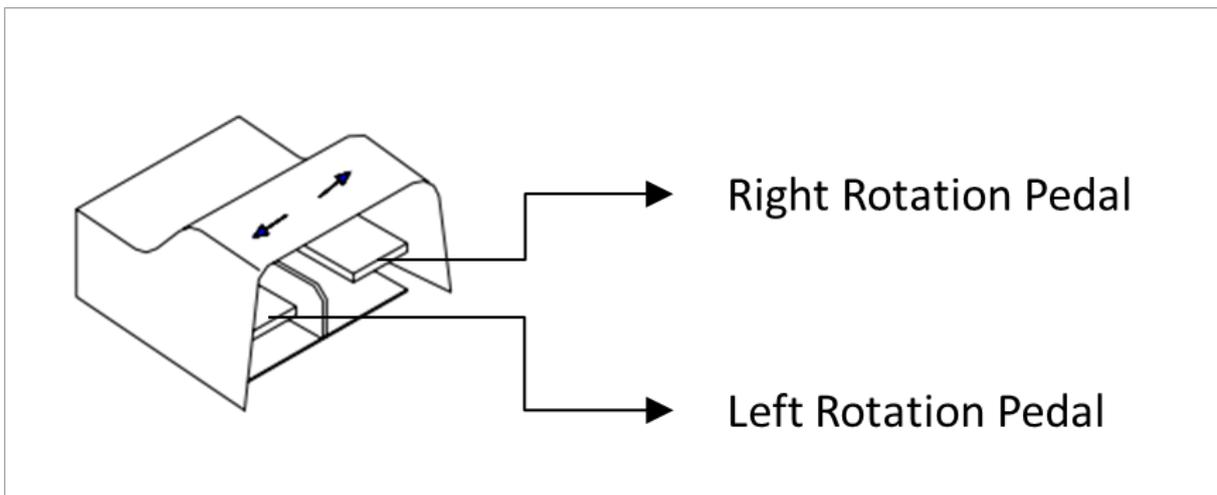
If electric connection is wrong, pull off the plug from the socket and cut electricity. Switch the R and S phase's connections and try the procedure once more.



6.9 Control Panel



- 1: Power Lamp
- 2: Start/Stop
- 3: Rise Bottom Roll
- 4: Lower Bottom Roll
- 5: Digital Display for Current Roll Positions
- 6: Emergency Stop Button
- 7: Key Switch
- 8: Rise Back (Side) Roll
- 9: Lower Back (Side) Roll

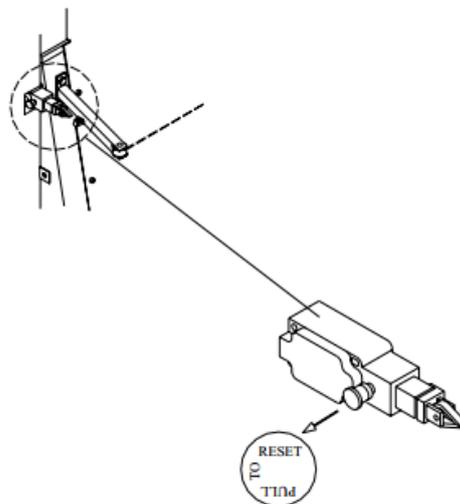
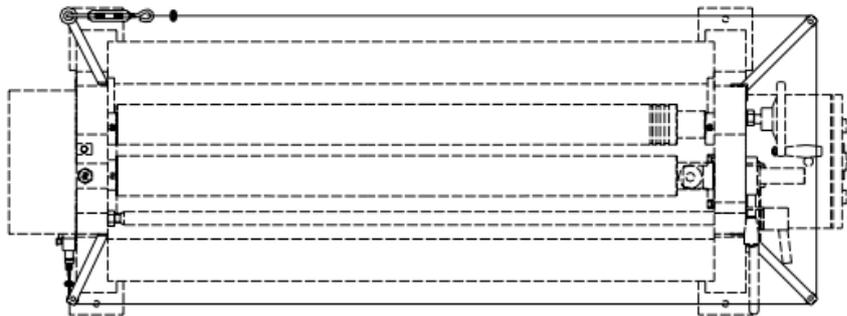
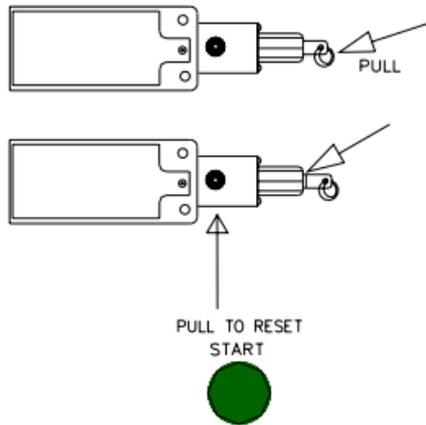


Control panel must be in front of the machine to understand directions than can be used in other safety places.

6.10 Safety Rope

Safety rope; which is mounted around the machine, is taken off during transport (depending on machine dimensions and holding). This should be done after ground mounting. Safety rope is mounted on the three side of the machine. Angular devices are used to strengthen the rope. Screw these devices around the machine. Mount the rope round pulley wheels and tighten them.

Safety rope is mounted in case of emergency. It is enough, touching smoothly on the rope to stop the machine. To make the machine go on running, you should pull the button.



6.11 If Machine Does Not Start

- Check Emergency Stop button if locked (pressed), or not. To unlock this button rotate clockwise.
- Check Safety rope tightening setting, and pull reset switch.
- Check if thermic has failed or not.

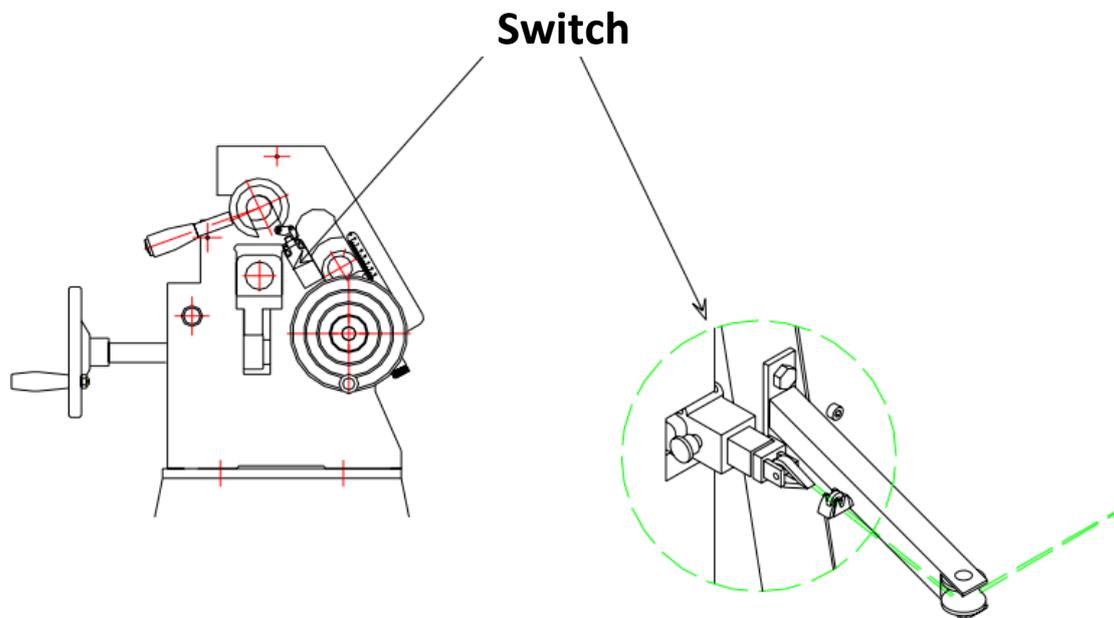
6.12 Thermic Magnetic Switch

This switch is inside the electrical panel. This switch is used for every electric motor for the machine. When extra current transferred to motor this switch cuts the electric for preventing the possible motor damages. In normal conditions this switch is at (I) position. When thermic protects the engine, switch changes position to (=). To change position to (I) wait for a while for thermic cools itself.

6.13 Safety Switches

Safety switches are used to run the machine safely on behalf of the operator. There are five safety switches, one of them is standard; the other four are applied according to machines additional features.

1- "Upper roll is locked safety switch" is used to check whether upper roll is replaced to its place or not after material (bent) is removed. Machine does not work unless upper roll is replaced properly.



2- "Side roll up and down safety switch" if your side roll's movement is motorized, two switches were put to limit "Side roll's up and down movement ". If the side roll is motorized and has a digital display, the maximum and minimum positions are adjusted as from digital panel.

3- "Bottom roll up and down safety switch" If your bottom roll's movement is motorized, the switch was put to limit the minimum position of the bottom roll.

7. MACHINE USAGE

7.1 General Info's

To get high productivity, correct usage, correct maintenance and regular cleaning should be done. Material should be prepared before bending due to its structure. For this:

- 1- Clean burrs which is on the edges of material cut with oxygen.
- 2- Clean all the spurs, rust, and cinder. These may give harm to rolls, even if rolls are hardened.
- 3- Clean both sides of the sheet.
- 4- Before starting to bend, check the sheet again. If there is a problem, clean again.

Physical condition of the sheet effects quality of material bent. If the face of the material is dirty, the sheet may be grained.

7.2 Quality of Material

You know that semi-quality material, which is to bend, is delivered in different qualities. Multiple bending materials cannot give the same result because of the difference between material qualities.

The most important factor that effects bending quality:

- 1- Sheet quality
- 2- Flow limit
- 3- Elasticity limit
- 4- Material direction
- 5- If thickness is same on all surfaces of sheet or not; thickness homogeneity

These factors are so important that if one of them is changed, you cannot get the dimensions you bent. For example, when you want to bend a material whose elasticity factor is high with the same machine adjustment, diameter obtained will be different.

You might obtain different results, if you want to bend material in one step rather than in two steps. Because, in two step procedure, flow limit might have changed after the first step

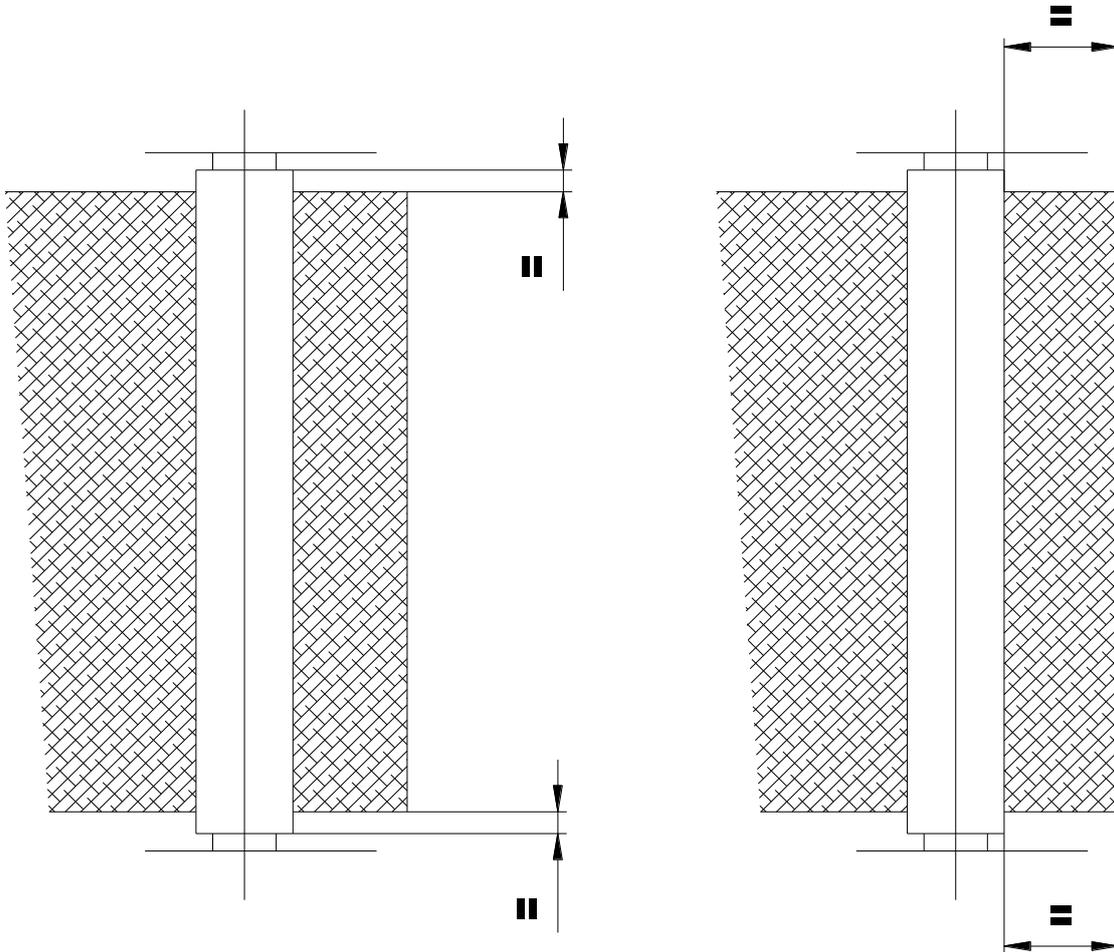
These factor differences are faced (met) often even in the same material groups. Therefore, you must use high quality material.

Another bending fault occurs while bending big diameter material. While bending this kind of material, it is bent correctly at the beginning. In the middle, it is sagged due to its weight and spoils the radius. To prevent this, central and side guides should be used.

7.3 Placing Material

After doing all the safety factors on “Check List of Safety Precautions”, you can start to bend material. First step of bending process is to place material. To obtain a high quality material bent, you should push and position correctly the material that is squeezed in to rolls. Initial steps of this process are:

- 1- Material should be placed into the rolls on any condition.
- 2- Material should be placed parallel to rolls axis.



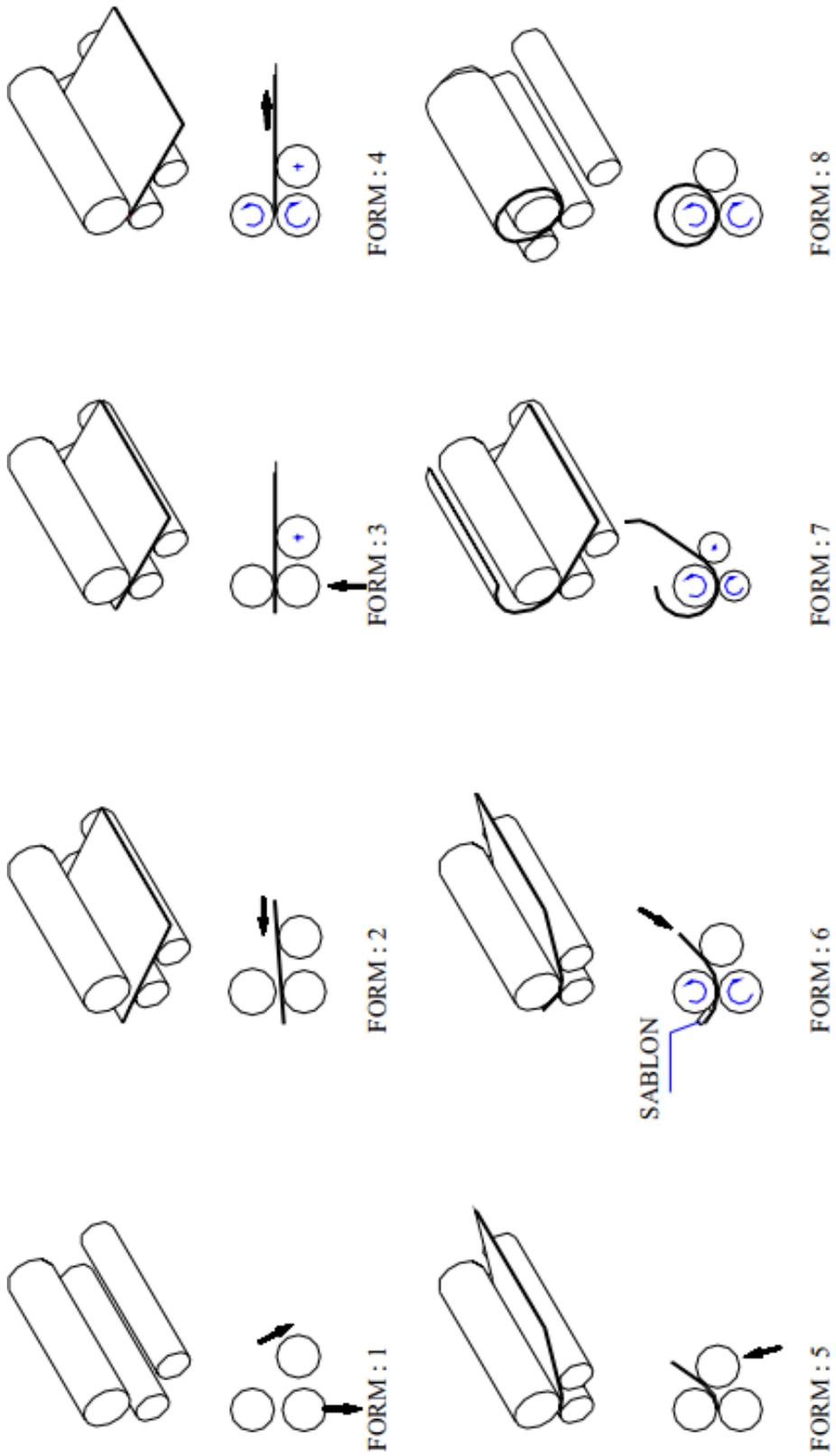
7.4 Bending Process

First step is to give power to the machine. Steps are as follows

- 1- Take the switch on the electric panel to position 1
- 2- Take the selective key on the control panel to position 1
- 3- Be sure that power lamp is on. If not, check safety rope and emergency stop button.
- 4- Push start button.

Machine is now ready to run. You can start to bend material in accordance with the steps indicated on Bending Section of User Manual.

7.5 Steel Bending Method



7.6 Bending Process Sequence

FIGURE 1: Move down bottom and back rolls depending on the material thickness.

FIGURE 2: Push the material in to rolls.

FIGURE 3: Place the material in to rolls as shown on page 22 and move up bottom roll and

FIGURE 4: Pull the material to parallel of rolls as near as possible

FIGURE 5: Move up back roll depending on desired diameter to make pre-bending.

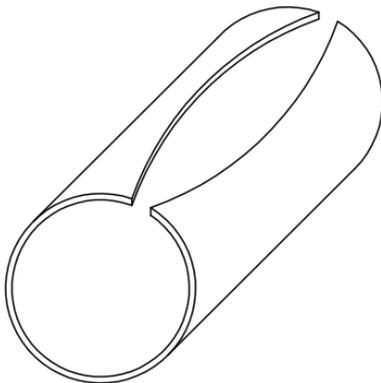
FIGURE 6: Push moving right or left button and turn the material to some degree. Check pre-bending by means of gauge depending on desire diameter. If pre-bending is correct, then apply same process to opposite edge by reversing material.

FIGURE 7: Move "side roll" upwards till desired diameter obtained, then rotate rolls.

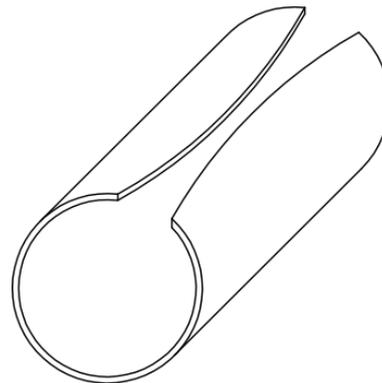
FIGURE 8: When desired dimension is obtained, calibrate the material, rotating once and more

Other important point on bending properly is angle location of material. Material should be Compression of bottom and upper rolls are done manually in standard machines. Yet, if special equipment is desired, this compression is done by means of motor.

If roll compression force is bigger than desired, sides of material bent becomes adjacent, and middle part of material becomes distinct. This is called "barrel fault". If roll compression force is smaller than desired, material slides through rolls and sides of material bent becomes distinct, middle part of material becomes adjacent. This is called "anti-barrel fault".



Barrel Fault



Anti-barrel Fault

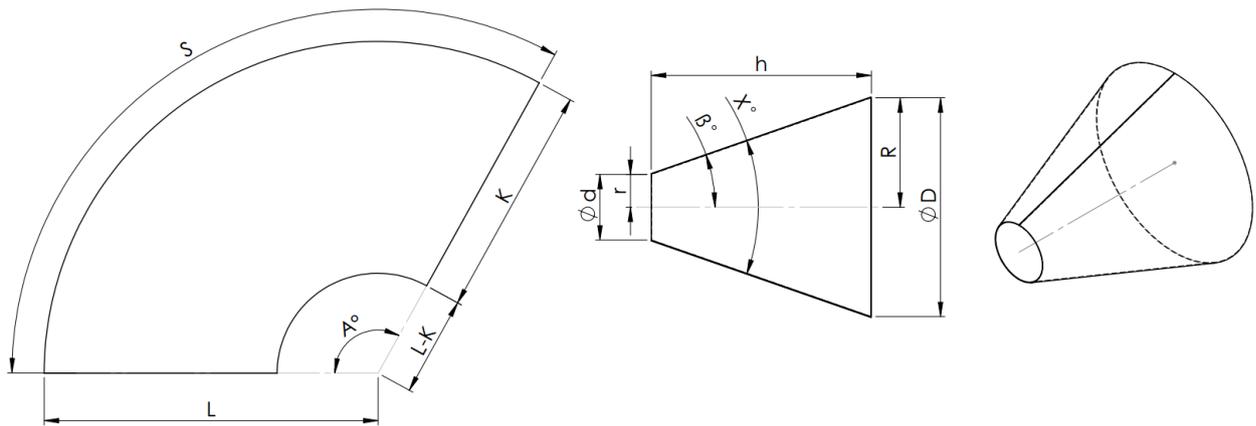
7.7 Conical Bending Plate

Conic bending process is done by means of conic bending system in our machine. Conic bending is the most difficult operation among bending types. Therefore, operator needs too much experience. Now that this operation is difficult;

HALF OF MACHINE'S CAPACITY SHOULD BE USED.

This means that, our machine can bend half of its capacity that's 1000mm x 3 mm, if its total capacity is 2000x6 mm.

If you want to get cone as shown on figure, you should prepare angle location of material depending on diameter and length this angle location should be prepared in accordance with formulas below.



$$K = \sqrt{h^2 + (R - r)^2}$$

$$D = 2 \times R$$

$$S = 2 \times \pi \times R$$

$$d = 2 \times r$$

$$S = \frac{A^\circ}{360} \times 2 \times \pi \times L$$

$$h = \sqrt{K^2 - (R - r)^2}$$

$$\text{(Radian)} \beta = \text{atan}\left(\frac{R-r}{h}\right)$$

$$A^\circ = \frac{S \times 180}{L \times \pi}$$

$$\text{(Degree)} \beta^\circ = \beta \times \frac{180}{\pi}$$

$$L = R \times \left(\frac{360}{A^\circ}\right)$$

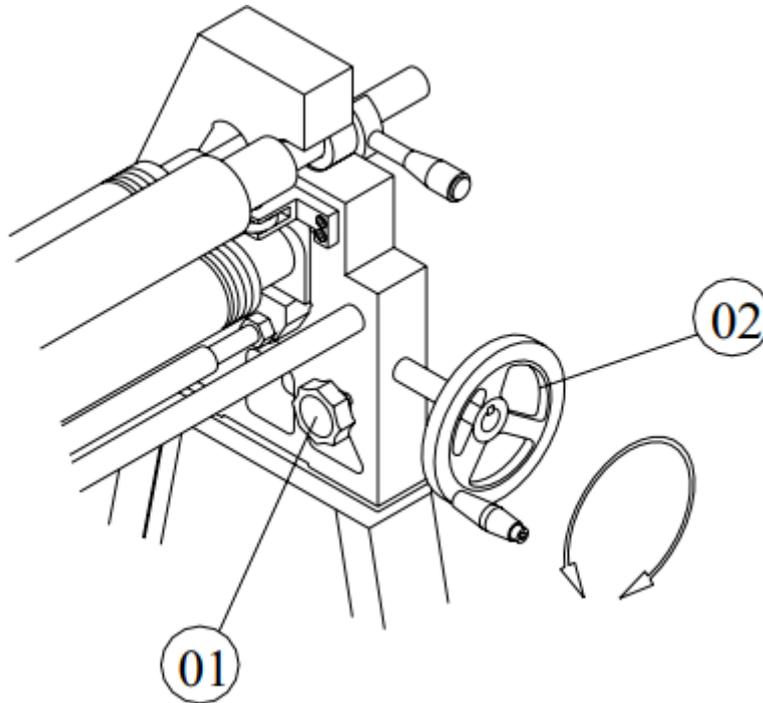
$$X^\circ = \beta^\circ \times 2$$

D, d, R, r the average diameters.

7.8 The Bottom Roll Plate Compression (Upwards Downwards Moves)

For this process;

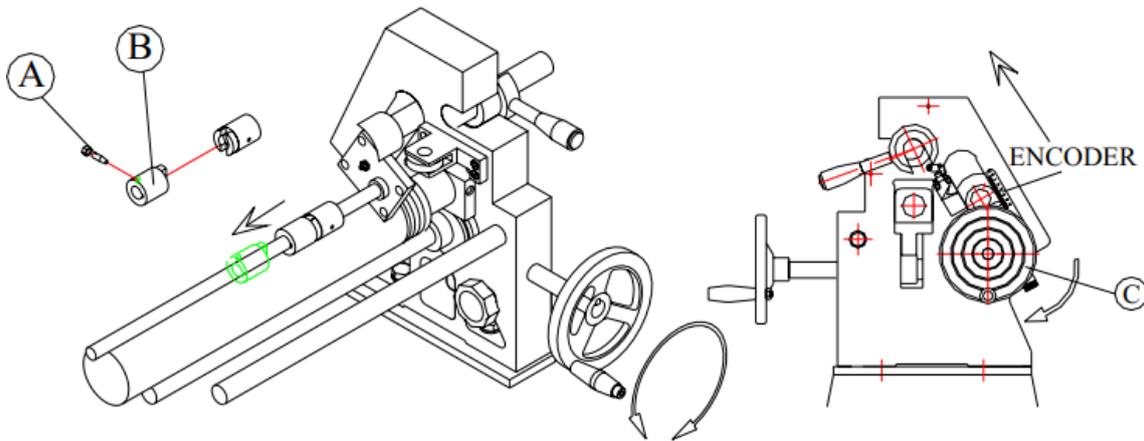
- 1- Loose the handle number 01.
- 2- Rotate the handle number 02 and pull the bottom top rolls up.
- 3- After the material is pressed by bottom and upper roll, Tighten the handle number 01.
- 4- To take out the work piece bottom roll must move down. For this reverse the operation steps.



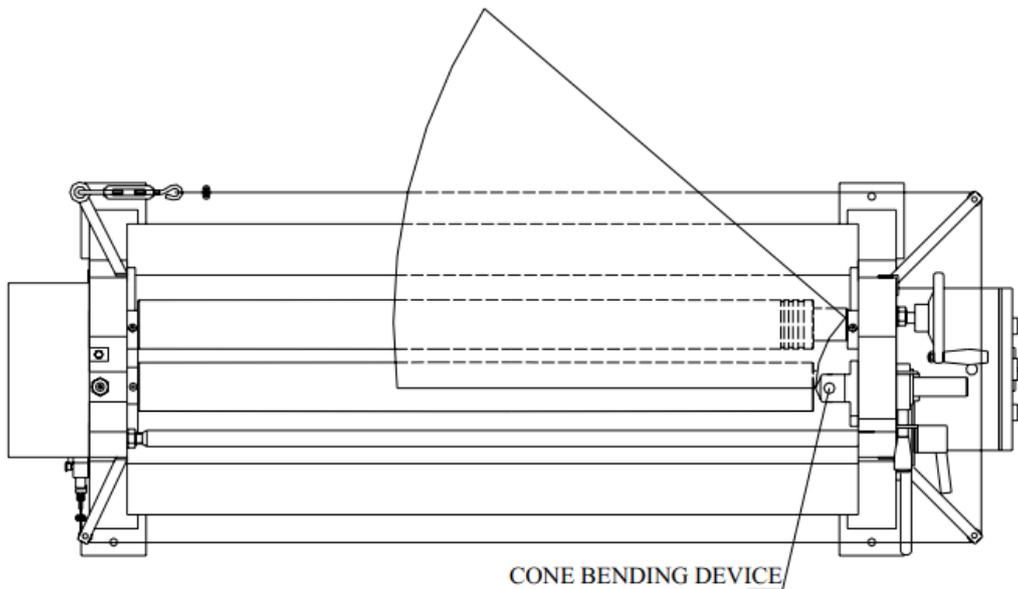
7.9 Cone Bending Process

Operation steps are given for Cone Bending Process:

1. Loose the setscrew bolt (A) on the clutch shaft to obtain the require cone bending. (See form 1 below).
2. Pull the clutch (B) through the arrow direction. (See form 1 below).
3. Rotate the rear shaft arm(C) and move up the rear shaft to the required dimension. Hold down the rear shaft opposite end according to the cone position. (Form 1).
4. When required dimensions are matched, move the rear shaft up, put back the clutch shaft and tighten the setscrew bolt. (Form 1).
5. Use conic ready work piece and support it to the cone bending device (form 2) Move the bottom roll up and start the bending operation.



FORM-1



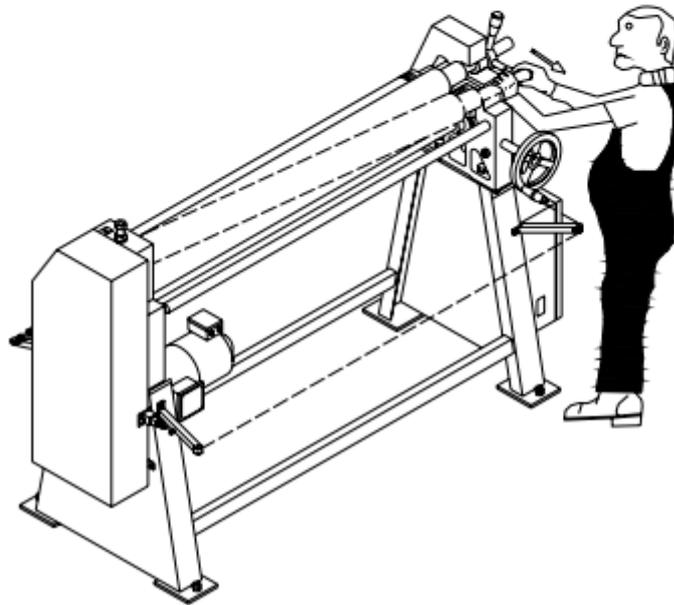
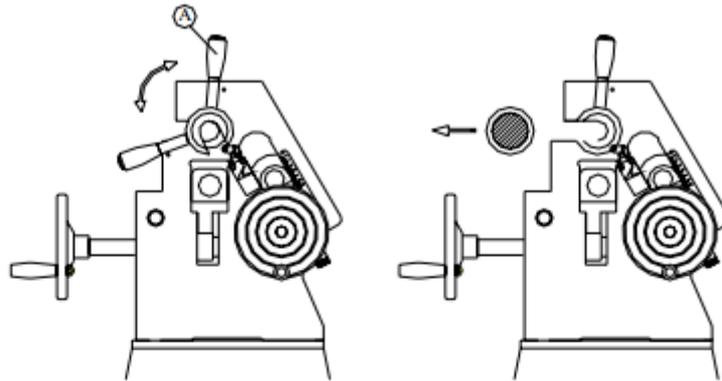
FORM-2

7.10 Taking off The Material Bent

After material is bent, move down the bottom roll to take off the material and;

1. Move up A part, rotate it 90°. So upper roll would be unlocked.
2. Rotate the arm 90° and so upper roll can be removed from its place easily.
3. Pull upper roll to yourself.
4. Remove the material from the opening.

Perform opposite of the procedure above to place the upper roll to its former place.



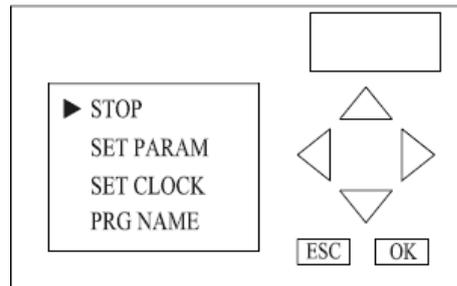
7.11 Setting Digital Display

ATTENTION!

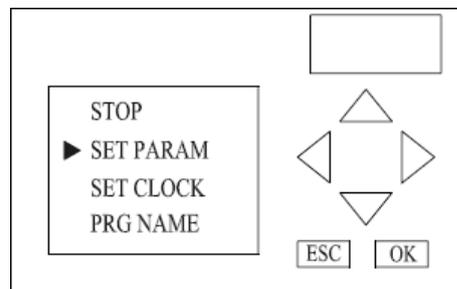
Before reading this manual section about digital displays and being sure about how to use the displays without an error, do not enter a value to digital display and press any button.

Bending (side) roll position is very important for cylinder bending machines. The bending diameter is depends on side roll's movement. Side roll's position is shown on digital display, if this value is noted you can use this value again to make same bending at a later time. These values will help your jobs done faster.

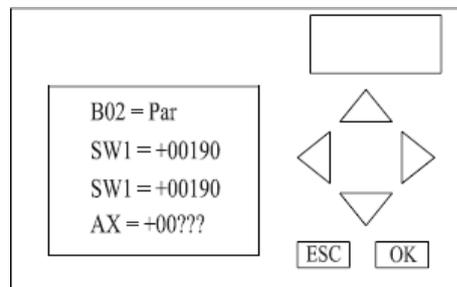
1-Press **ESC** button to open this menu



2-By the help of **▽** button; go to the SET PARAM line. Press **OK** button.



3- Press **OK** button to access Parameter Setting Menu



This menu will be seen. This parameter is side roll's top limit value.

Press **OK** button and SW=+00190 will flash.

By the help of **▷** button, go to the line that you want to change.

By the help of **△** button, set your desired value.

By the help of **▷** button, go to SW =+00190 line and set the same value.

Press **OK** button, now side roll's position is limited by this value.

Press **ESC** button two times at the end you will see the date and watch on the screen.

By pressing **△** button, you will complete the setting procedure.

8. MAINTENANCE

To get a higher productivity, it is necessary that correct maintenance and regular cleaning should be done;

We can divide maintenance process in two groups;

- 1- Protective maintenance
- 2- Repairing and maintenance as a result of a failure

8.1 Protective Maintenance

Protective maintenance is a series of precautions that are taken before failures take place.

These precautions are:

- Regular oiling and oil level check. (Reducer)
- Regular cleaning
- Cleaning of bending material
- Control of frayable parts (bearing, bushing, etc.)
- Control of nuts etc. against loosening.

8.2 Periodic Lubricating and Lubricant Level Check

Information was given widely about this item at Lubrication Section.

8.3 Periodic Cleaning

During bending, rust, dust and etc. adhere on rolls. Rolls should be cleaned after each bending process and its surface should be checked. Even if rolls are hardened, too hard materials should not be bent. Machine's working area should be far from dust and weather conditions. Another important point is that bottom and upper roll's gearbox screw. These screw should be checked, oiled and foreign components should be cleaned every day.

8.4 Control of Frayable Parts

List of parts used in the machine were given later pages. Operator should examine the parts carefully. If something goes out of normal, for example bad sound from the machine or working irregularity etc., he should inform maintenance personnel.

8.5 Control of Nuts Etc.

While machine is working, gearbox screws, strained on gearbox start, stop motion. BENDMAK Company has taken all the precautions against loosening these nuts by using locking washer and pasting agent. Yet, these nuts should be checked at least once a month in overloading and dense working times.

8.6 Repairing

When a failure occurs, machine should be off and electricity should be cut off. The machine should be repaired by a specialist personnel and should examine montage figures on later pages. And use Check List after the repair.

ATTENTION!

The machine should be off and electricity should be cut off in every maintenance or repairing applied.

9. LUBRICATION

Two types of oil are used in our machines.

- Grease (to oil bearing and bushing)
- Liquid oil for reducer

Brand names of oil and grease are given on Lubricant Table.

9.1 Oiling Bushing and Bearing

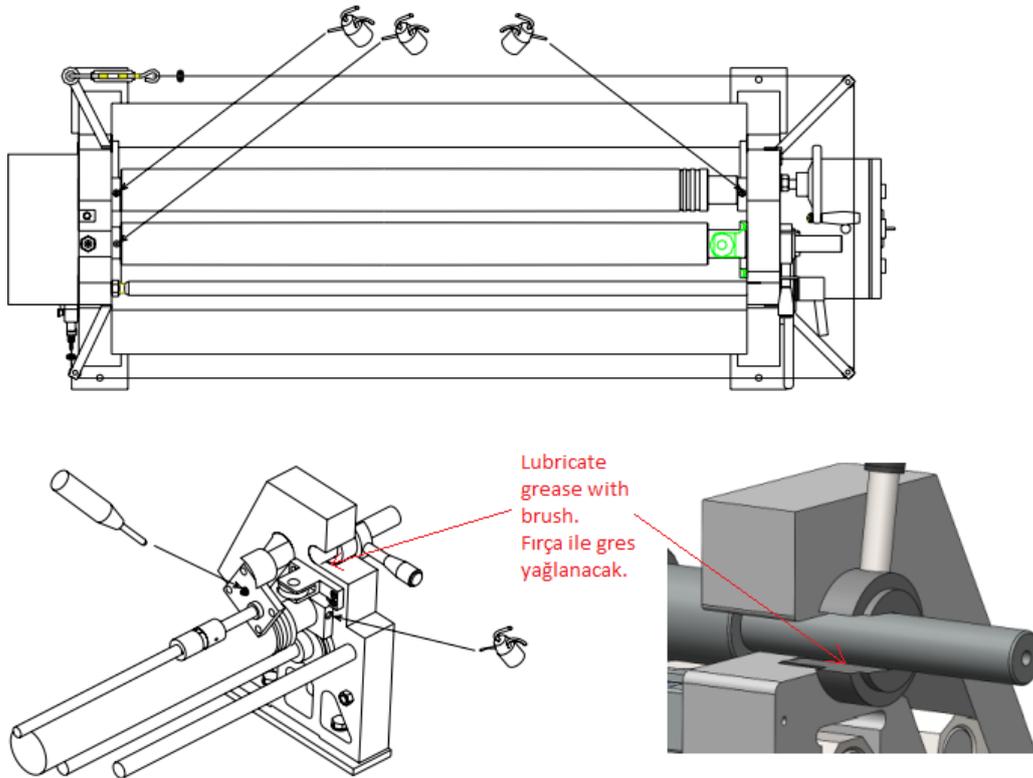
Carriers and bearings should be lubricated by grease gun or using a brush at lubricating points which is shown at later pages which has lubricated by grease gun should be checked monthly and lubricated with grease if necessary. Points which has lubricated by brush should be checked every day when the shift is began. Control can make by eye and if necessary lubrication can be done.

9.2 Filling Oil to Gearbox

Main reducer, used in our machine, is delivered with oil. Reducer's oil should be changed after each 2000-2500 working hours and twice a year. It is not advisable that different types of oils are mixed and put in the gearbox. Gearbox oil level should be checked once a month.

Open drain plug and empty old oil. Then close drain plug and open filling plug. Control oil level by means of oil level plug after you put oil. When oil is filled up to oil level plug level, then the process is over. Check whether all plugs are closed or not.

9.3 Lubrication Diagram

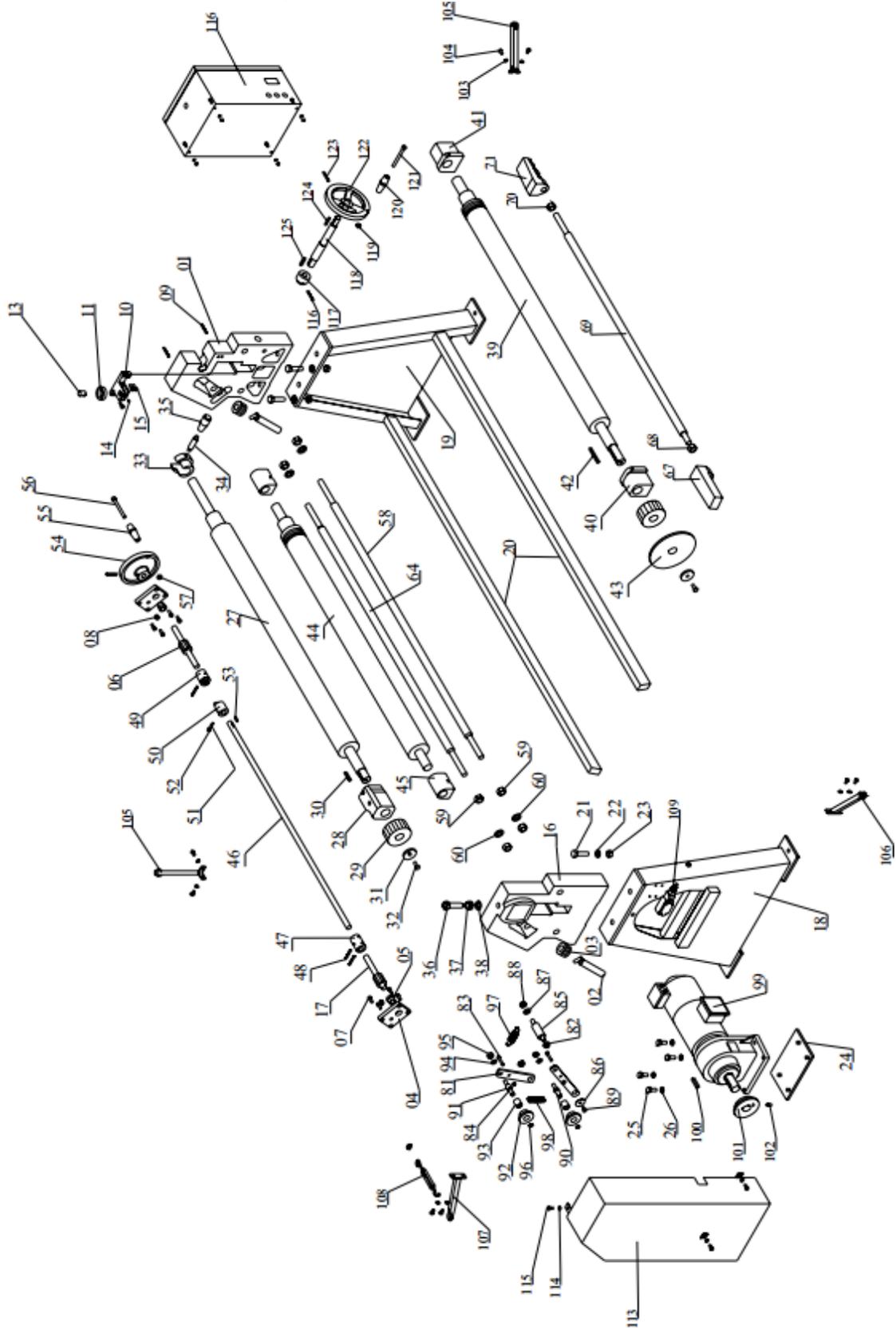


9.4 Lubricant Table

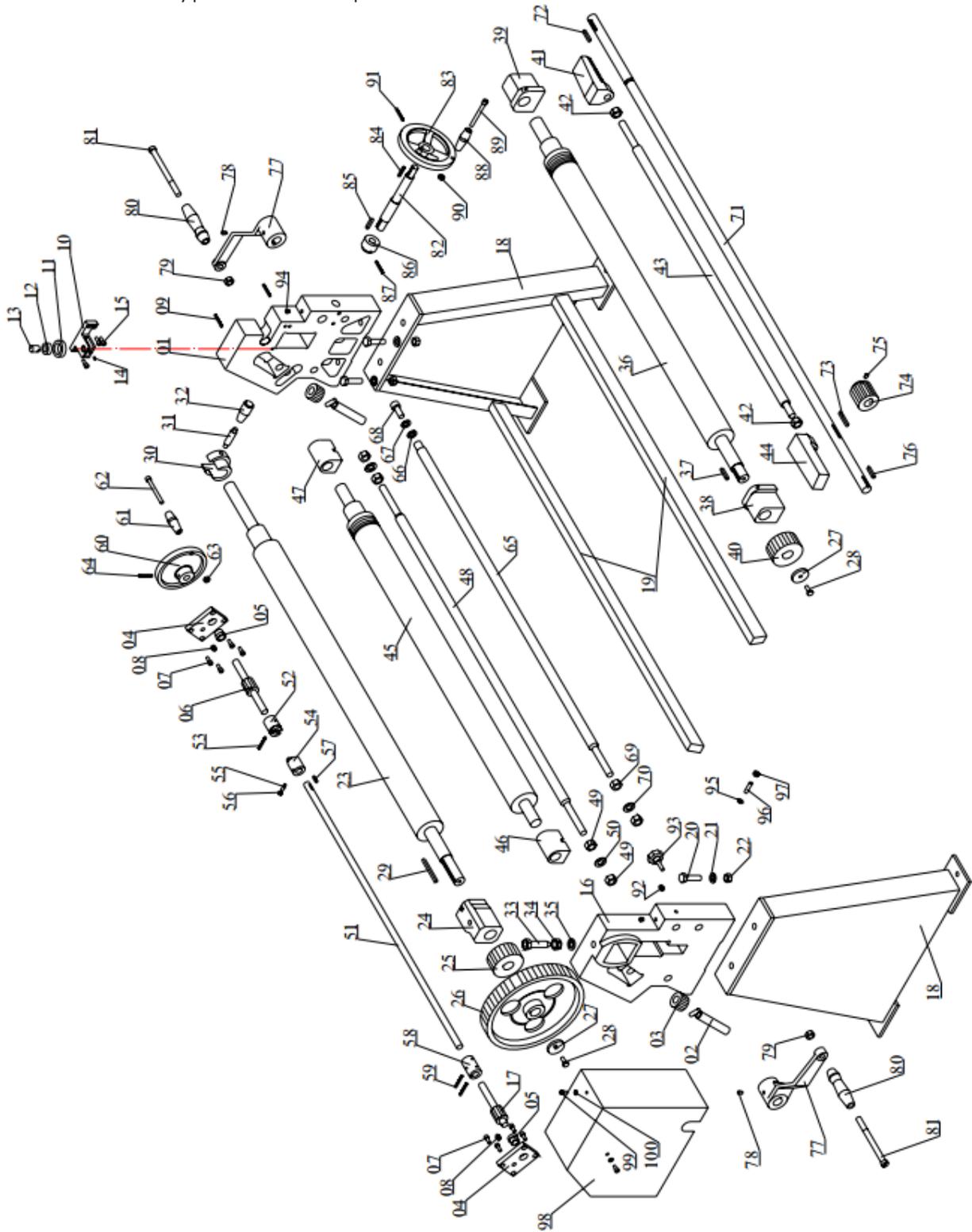
Brand	Lubricant	Planetary Gearbox
MOBIL	Kup Grease 2	Mobil Gear 629
BP	Energrease GP2	Energol GR-XP 150
SHELL	Livona 2	Omala Oil 150
CASTROL	Helvium 2	Alpha SP 150
TEXACO	-	Meropa 150
ELF	-	Reductelf SP 150
TOTAL	-	Carter EP 150
ESSO	-	Spartan EP 0
AGIP	-	Blasia 150
Q8	-	Goya 150

10. SPARE PART LIST

10.1 Motorized Machine Spare Part List

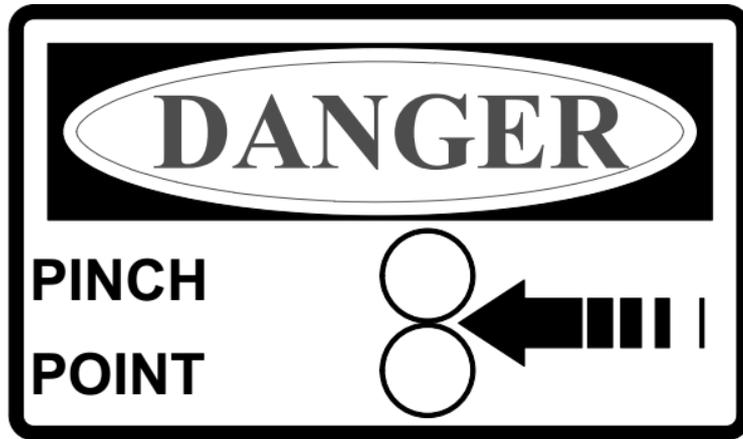


10.2 Manual Type Machine Spare Part List

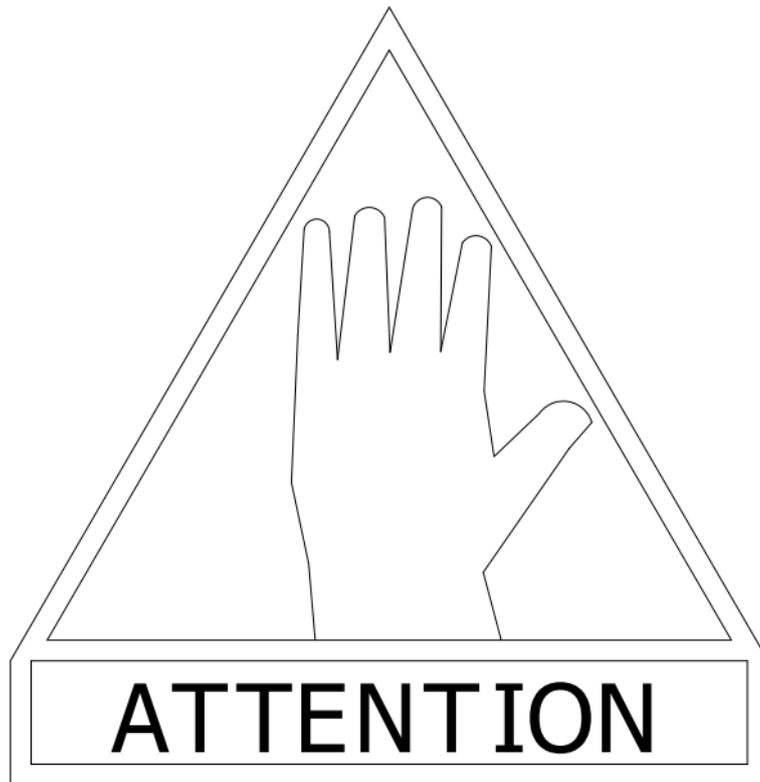


11. LABELS USED AT MACHINE

Danger



Danger



Warning



**MAKINA'YI SADECE YETİSMİŞ - USTA PERSONEL
KULLANABİLİR.!**

**ONLY PROPERLY TRAINED AND AUTHORIZED
PERSONNEL SHOULD OPERATE THIS MACHICE.!**

**DIE BEDIENUNG DER MASCHINE DARF NUR DURCH
QUALIFIZIERTES FACH PERSONAL ERFOLGEN.!**

**SEUL LE PERSONNEL FORME ET AUTORISE PEUT
UTILLSER CETTE MASCHINE.!**

Danger



Lifting Detail





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