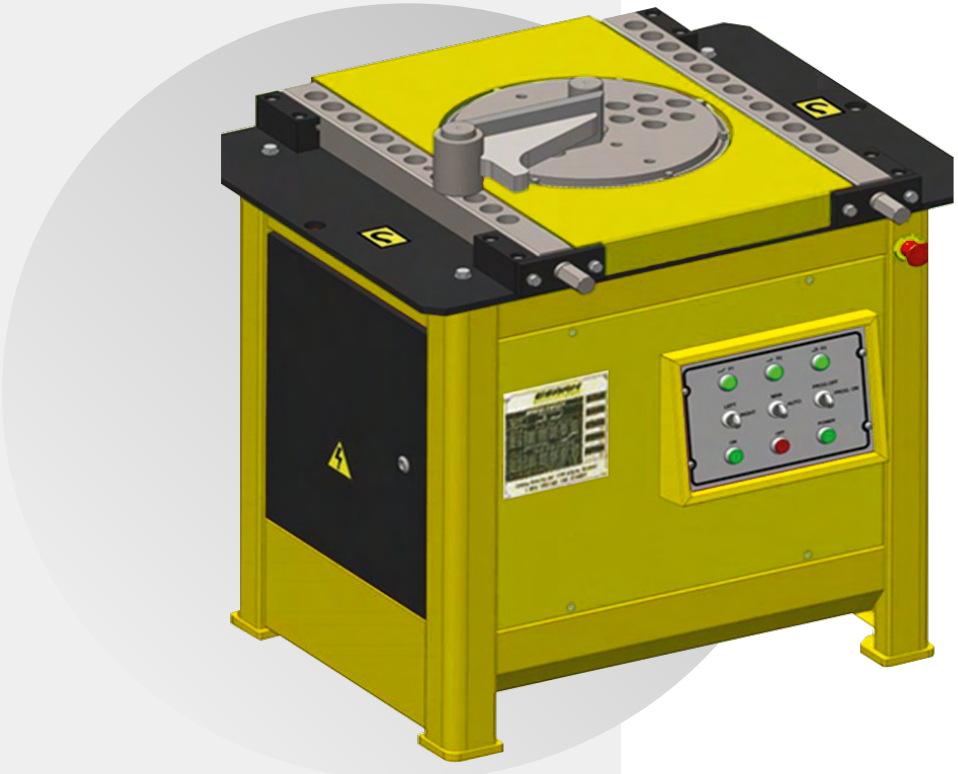
Mechanical rebar bending machine
operating & maintenance manual

Esbjerg
Armering ApS

www.esarm.dk

ESARM BENDING USER MANUAL



ESARM

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IMPORTANT WARNING

- User's and maintenance manuals must be read.
- When adjustments such as controlling, maintaining, lubing are being made electricity of the machine must be cut off.
- All of the explanations given under user's and maintenance manual must be complied.

INTRODUCTION

1. INTRODUCTION

Mechanical Rebar Bending Machine is made only with the purpose of steel material bending. Using other than the indicated purposes are prohibited. It is possible to mount various apparatuses on the machine optionally for bending in different shapes.

In order to obtain the best yield from the machine it should be in a situation so that it can be worked easily and in a position that more productivity might be obtained from the operator. Because of this the location where the machine is operated should be close to the rebar stocks.

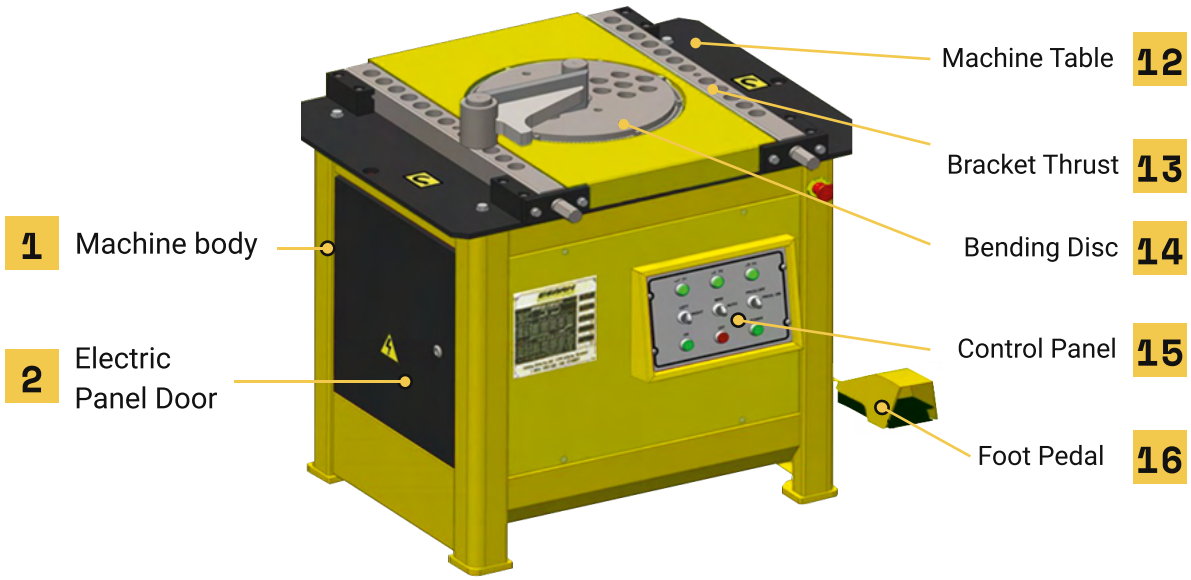
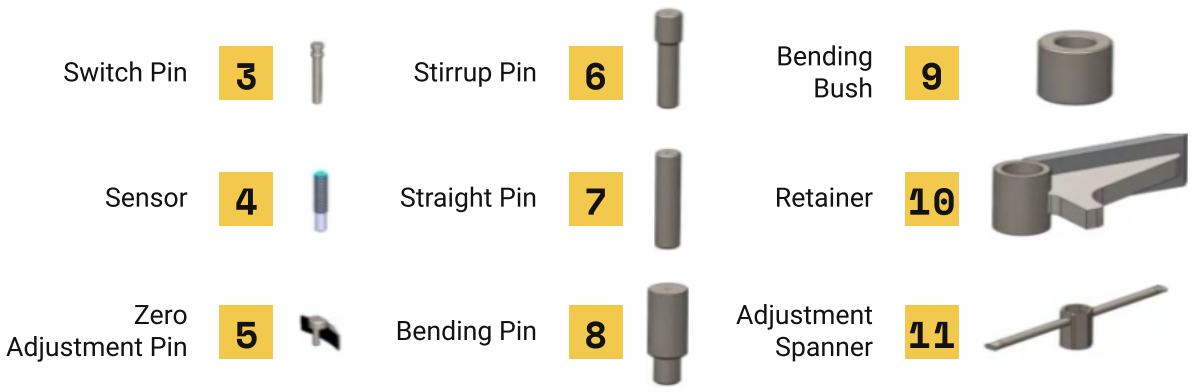


Figure 1.Main Parts



MACHINE ASSEMBLY

									
ESARM-26	1	1	5	50,60,70,90,110	1	6	1	1	1
ESARM-36	1	1	5	50,60,70,90,110	1	6	1	1	1
ESARM-46	1	1	5	60,80,110,150,180	1	6	1	1	1
ESARM-50	1	1	5	60,80,120,150,200	1	6	1	1	1

Table 1. Bending Apparatus Detail.

2. MACHINE ASSEMBLY

Machine should be leveled on a solid ground.
Electricity connection of the machine should be made by competent technicians.

Electricity Connection

For main electricity connection plug should be connected to supply line with a 5x4 mm² isolated cable and then plugged into power outlet. Grounding connection should be made for safety. Machine shouldn't be perated without making grounding connection.

Connection of grounding line

The following procedures should be followed for this system. Connect one end of the grounding to a copper wire (minimum 16 mm²) as it will enable electrical conductivity. The other end should be either connected with a pipe that has a conductivity capacity immerged into the ground (preferably into a humid ground) or the copper plate should be buried into the ground as much as deep.

WARNING

Machine should be moved without any vibration. Machine shouldn't be run in a wet envrebarment. If there are any lost or damaged parts during the handling, they should be reported to the manufacturer.

- When using the lifting and carrying equipment their maximum loading capacities should be taken into consideration.
- During the lifting equipment's center of gravity should be taken into consideration.

Warning signs on the carrier equipment should be taken into consideration.

MACHINE WORKS

In order to carry the machine forklift, mobile crane or a hoist should be used. When lifting the machine steel cable, chain or fiber sling should be used. When lifting out of the chest lifting lugs on the machine should be used. During the lifting operations experienced expert staff and subcontractors should be assigned.

Figure 2. Handling Machine.

3. MACHINE WORKS

Be sure that the machine is assembled in conformance with the Machine Assembly procedures.

If there is any object on the machine (including the bending apparatus) they must be removed.

LEFT-RIGHT switch on the control panel of the machine is turned to LEFT or RIGHT position, MAN AUTO switch is turned to MAN position and machine turning direction is confirmed by pressing on the foot pedal.

Rotation direction is approved by taking the front of the machine as reference (Control pane side) the clockwise as right and counter-clockwise as left. If the machine is rotating reverse of the switch it means phases of the electricity supply are feeding reversely. This situation doesn't affect the running system of the machine. In such case LEFT-RIGHT switch might be turned to the other side or competent electricians might change the directions of the phases. After fixing the direction of rotation bending adjustments should start.

MACHINE WORKS

3.1 Control Button

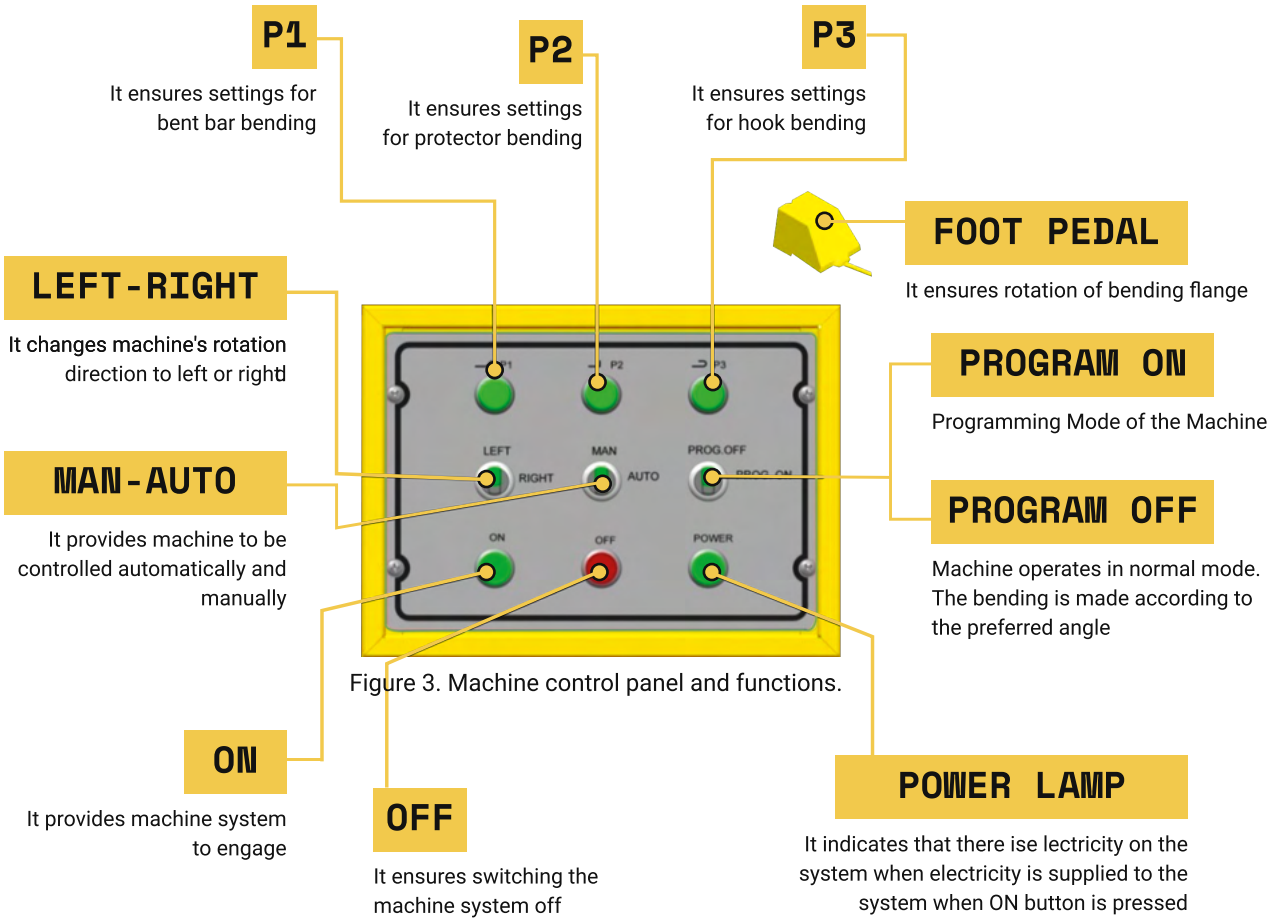


Figure 3. Machine control panel and functions.

3.2.THERMAL FLOW SETTING RANGE AND MOTOR PROTECTION SWITCH

A motor is set by machine manufacturer. It is not appropriate for user to change settings. Motor protection switch is mounted to the machine in order to prevent damage on the system by cutting the electricity current when excessive current is drawn by the system. If the switch is tripped switch should be turned on by turning the button to position 1. Motor protection switch should never be disassembled.

TECHNICAL DATA

4.TECHNICAL DATA

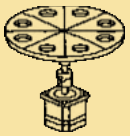
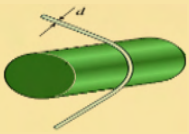
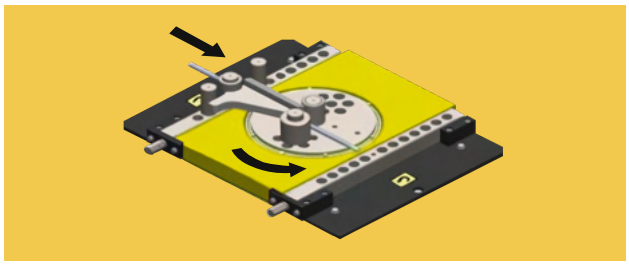
														
	kw	hp	rpm	45kg/mm2			65kg/mm²			85kg/mm²			W*L*H	KG
MODEL				1	2	3	1	2	3	1	2	3		
ESARM-26	1,5	2	9	26	16	12	20	14	10	18	12	10	73*78*88	260
ESARM-36	3	4	9	36	20	18	32	18	16	26	16	14	80*92*88	350
ESARM-46	4	5,5	9	45	30	22	40	26	20	32	20	18	84*111*88	430
ESARM-50	5,5	7,5	9	50	32	24	45	30	2	36	28	20	89*125*88	580

Table 2. Bending Technical Information.

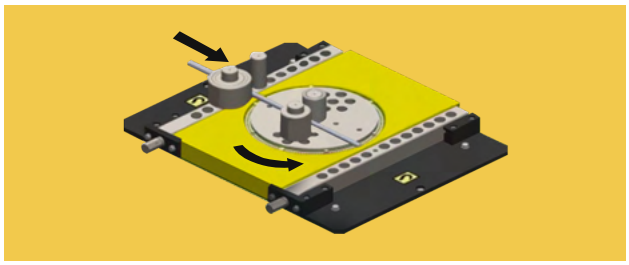
5. USING THE MACHINE

5.1. CONNECTION AND PLACEMENT

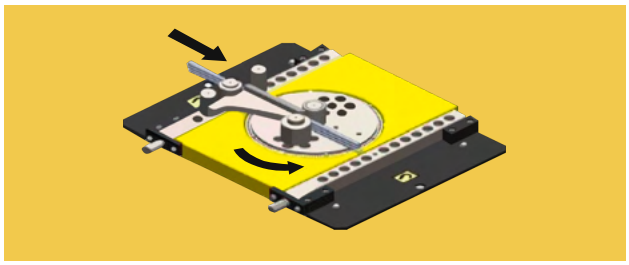
5.1.1. CORRECT CONNECTION OF THE REBARS ON THE MACHINE



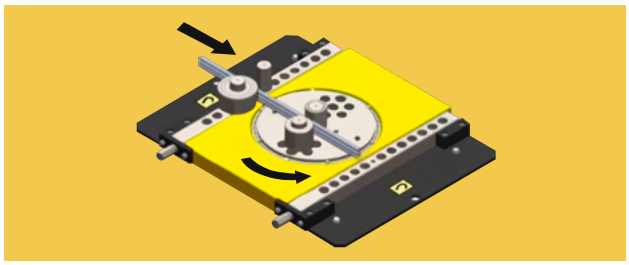
(4a) Fixing the rebar to be bent on the machine with the help of retainer.



(4b) Fixing the rebar to be bent on the machine with the help of bending sleeves.



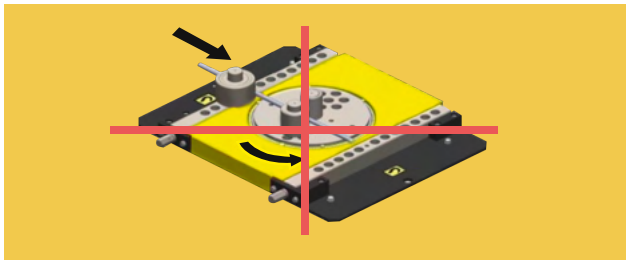
(4c) Fixing the rebars to be bent on the machine with the help of retainer in multi-rebar bending.



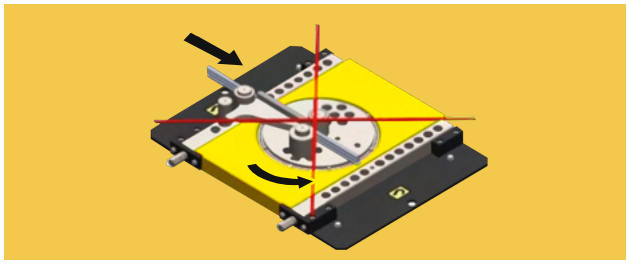
(4d) Fixing the rebars to be bent on the machine with the help of bending sleeves in multi-rebar bending.

Figure 4 (a,b,c,d): Placing the rebars on the machine correctly.

5.1.2. INCORRECT PLACEMENT OF THE REBARS TO BE BENT ON THE MACHINE



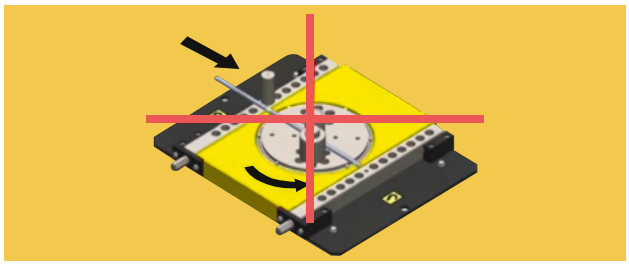
(5a) Incorrect placement of a single rebar to be bent with bending sleeves.



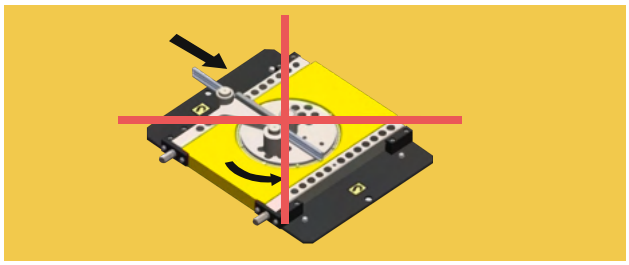
(5b) Incorrect placement of a single rebar to be bent with retainer.

Figure 5 (a,b): Incorrect connection of the rebars on the machine.

5.1.3.INCORRECT PLACEMENT OF THE REBARS TO BE BENT ON THE MACHINE



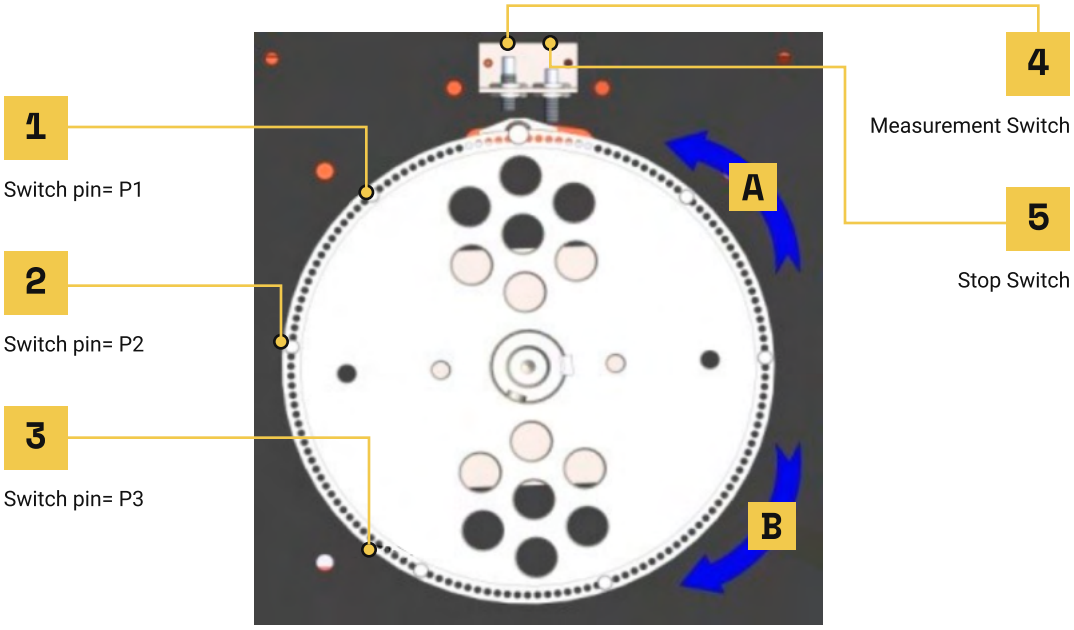
(6a) Incorrect connection of multi-rebars to be bent on the machine with bending sleeves.



(5b) Incorrect connection of multi-rebars to be bent on the machine with retainer.

Figure 6 (a,b): Wrong placement of the rebars on the machine

USING THE MACHINE



After the setting procedure is completed the rebar for bending and bending equipment must be put on the machine and it should be available for bending as it is shown in Figure 4a-4b-4c-4d. It should be mounted according to the diameter (if it is smaller than 16 mm the retainer and if it is bigger than 16 mm the appropriate bending sleeve) of the rebar to be bent (Figures 4a-4b-4c-4d). Lastly when the bending disc returns after bending the rebar it should be mounted on the bending plate on the front side of the rebar for safety to prevent any injury due to movement of the rebar). Setting process should be completed by ensuring the rebar to be bent (Figures 4a-4b-4c-4d) positioned parallel by moving bending plates backward and forward with the help of the adjustment spanner. (Figures 4a-4b-4c-4d)

For serial bending, machine should be taken to AUTO position and then bending should be made.

NOTE: When the machine is at the MAN position the bending disk revolves, after bending is completed and the machine is on the holding position it stops. When the machine is at the AUTO position bending disk stops at holding position by completing the bending just pressing the Foot Pedal only once. When the machine is at the AUTO position, the machine can be stopped by pressing the foot pedal as the bending process is started. The stopped machine might be turned to the starting point back manually by continuously pressing the Foot Pedal and it is ensured to be turned to the automatic mode again. Furthermore when the machine is at the AUTO position, Bending Disc might be stopped by holding the Foot Pedal pressed while returning, after the bending process is completed.

When the foot pedal is released the machine restarts moving on the direction it stopped and stops at the zero point.

The specifications indicated for dangerous cases are used for Emergency stop and it is ensured to protect the operator from the danger.To change settings, bending process of the machine should be completed (zero point) in the cases where the setting change is required by pressing P1-P2-P3 buttons and then the button required to change the settings should be pressed. Otherwise settings aren't changed when the buttons are pressed.

IMPORTANT WARNING

When bending the rebar the rebar should be bent on bending apparatus with 5 times larger than the diameter of the rebar to be bent.

5.2 .BENDING MODELS

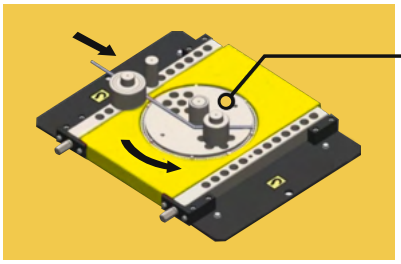
5.2.1. BENT BAR BENDING SETTING (45°)

Prog. Off Normal Bending Setting Systems.

Before starting angle setting, it should be ensured that there is no any material on the machine other than the bending equipment.The Switch button should be taken to OFF position and P1 button should be pressed.

There are 3 Switch Pins with same heights on the bending disc. Rotation direction should be controlled by taking the machine to MAN position. Appropriate bending angle for venting should be set by trying the switch pin (P1) (Figure 1-3) throughout the holes on the bending disc (A and B directions). As long as the switch pins (A and B) are taken closer to the measurement sensor (Figure 1-4) from both sides, the bending angle decreases. Conversely as they are taken away from the measurement sensor the bending angle increases.

NOTE: For P1 button Switch pin=1; For P2 button Switch pin=2; For P3 button Switch pin=3 are used to set the angle.



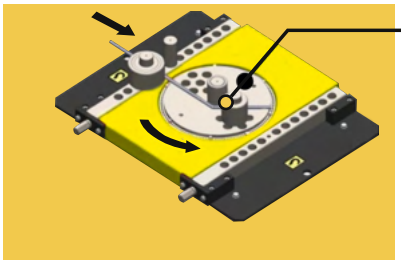
BENDING PIN MOUNTED WITH SAFETY PURPOSE

Figure 7: Bent bar bending indicator.

5.2.2. Protractor Bending Setting (90°)

It is set with the same method carried out in bent bar bending by pressing the P2 button on the control panel.

NOTE: The required angle is set for P2 BUTTON by moving the figure: 10 switch pin 2 to left and right.



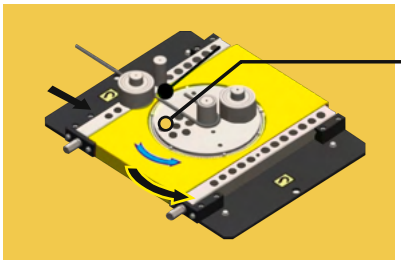
BENDING PIN MOUNTED WITH SAFETY PURPOSE

Figure 8: Representation of Protector Bending.

5.2.3. Hook Bending Settings (180°)

It is set with the same method carried out in bent bar bending by pressing the P3 button on the control panel.

NOTE: The required angle is set for P3 BUTTON by moving the figure: 10 switch pin 3 to left and right.



BENDING PIN MOUNTED WITH SAFETY PURPOSE

Figure 9: Hook Bending demo.

5.2.4. Stirrup Bending

Prog. On Stirrup Bending Setting Systems.

PROGRAM OFF-ON SWITCH BUTTON should be at program ON position. 90° angle which is used in stirrup bending should be set to P2 button before the

program is taken to ON position, the SWITCH BUTTON should be turned to program non position (clockwise) after the stirrup tip bending with 135° are set to P3 button. After turning the SWITCH BUTTON, P1 button should be pressed once. Afterwards P1-P2-P3 buttons will blink only once. This warning indicates that the machine is ready for programming. After this process, programming starts according to the required bending angle. For example: Programming for performing stirrup bending shape is described below.

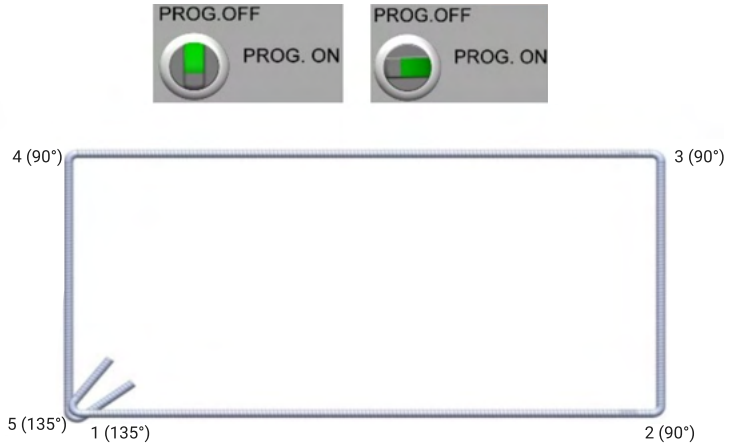


Figure 10: Stirrup bending shape.

Programming the described shape

a) Press P3 button for once for the 1st angle.

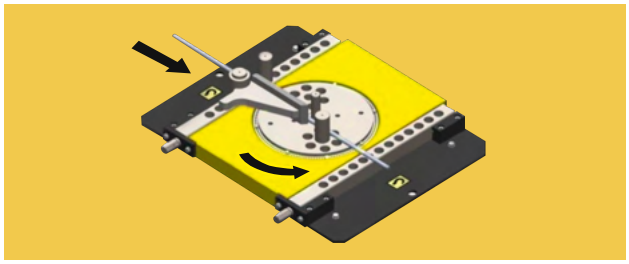
b) Press P2 button three times successively for 90° bending in 2nd, 3rd and 4th angles.

c) The programming process for the 5th angle made after pressing P3 button is saved to the memory by pressing the foot pedal and programming process is completed. After the setting procedure is completed (Figures 10a-10b-10c-10d-10e-10f-10h-10h) bending order is followed and Stirrup Bending should be completed.

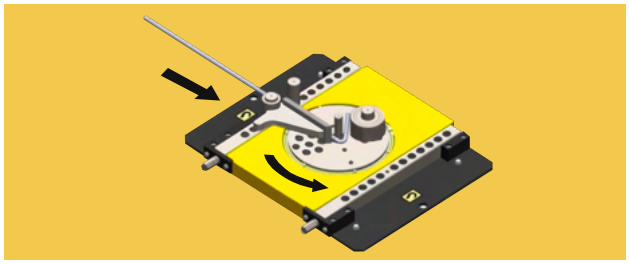
NOTE: When the program ON-OFF SWITCH BUTTON is turned to ON position program is reset and it must be re-programmed. The button should be switched to OFF position as long as it is not needed. In case it is turned, the program should be redone as it is shown in the example.

USING THE MACHINE

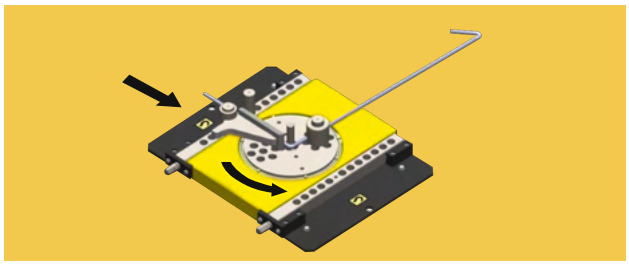
NOTE: Rebar that will be stirred up should be bent on an appropriate Bending Sleeve, Pin, Stir-up pin or straight pin with at least 5 times bigger than the bending rebar's diameter.



(10a)



(10b)



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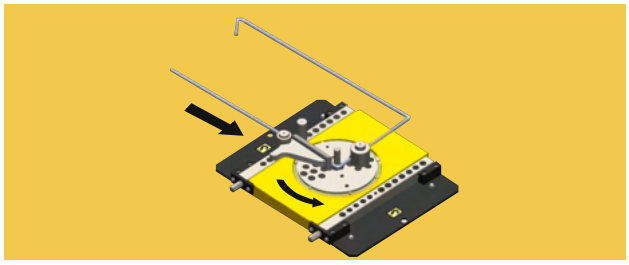
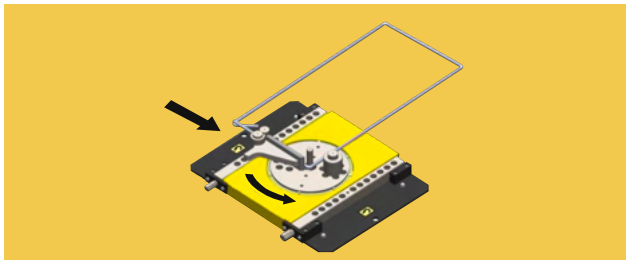
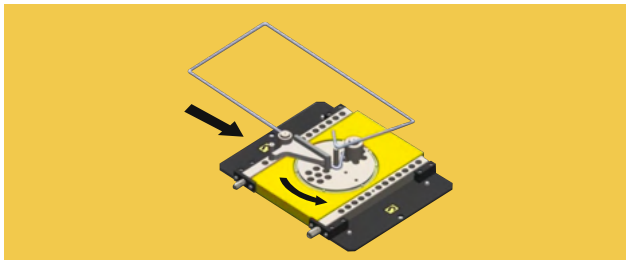


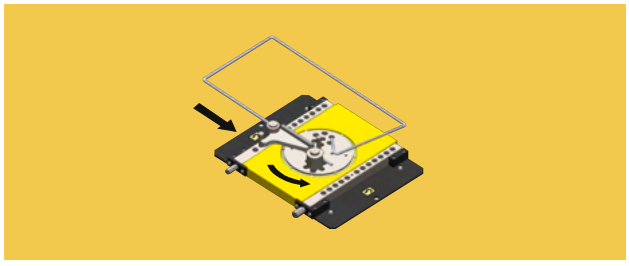
(10d)



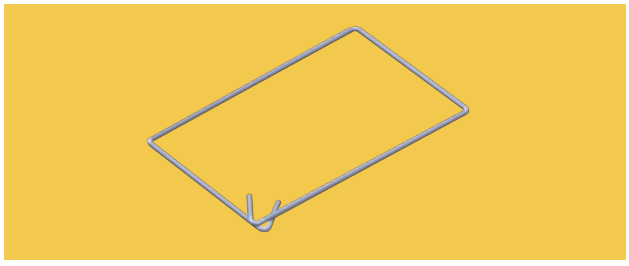
(10e)



(10f)



(10h)



(10g)

Figure 11: Stirrup bending demo.

USING THE MACHINE

Figure 12: Incorrect positioning of the person making bend.

PROHIBITED USAGE ON THE MACHINE

6.Prohibited usage on the machine

- When bending no one must stand in front of the machine and any one standing must be taken away.
- While the machine is running no any other construction material such as adze, hammer, meter, caliper etc. should be put between the bending apparatus other than the material that will be bent.
- Machine mustn't be run when it is wet.
- No any bending must be made other than the measurements, dimensions and units stated on the capacity plate.
- During the multi bending number of rebars stated on the capacity plate should be aligned one on top of the other and should be leaned to the retainer or bending rollers.
- No any other bending should be made other than this. Machine mustn't be run when the electricity Board Cap is open.
- Electrical settings made in the factory shouldn't be changed.
- Machine shouldn't be operated without making grounding connection.
- Machine shouldn't be operated when the housing covers are dismantled.
- Machine should be operated by instructed workers.
- Machine never should be run unlubricated.
- Warning plates attached on the machine mustn't be removed.
- No other parts should be mounted to the machine other than the ones manufactured by ESARM company.
- No bending should be made on the machine with bending apparatus which are deformed, cracked or have an increased hole diameter.
- No wrong bending should be made on the machine.
- Machine should be cleaned by air.
- In cases when electricity board cap should be opened, the cap mustn't be opened without cutting the power of the machine from the main switch.
- Rebars to be bent should be fixed on the machine correctly. Fixing with retainer bending sleeve and pins.

MAINTANCE AND LUBRICATION INSTRUCTIONS

7.Protectors

Protector apparel

- Helmet must be worn.
- Glasses must be worn.
- Boots with steel toe must be put on.
- Gloves must be worn.

The aforementioned protectors will be used. In case of not using these apparels there are risks of injury, cutting and trapping hands.

Work clothes

Inappropriate clothes against snatch or grip while working with the machine are listed below and in case of not conforming to this list might cause risk of injury.

Long hair, dress with long arms, bracelet, uniform with long skirt, any ornament leaning out.

8.Maintance and Lubrication instructions

It is important to make maintenance correctly in order to extend service life of the machine and to ensure safe bending. We suggest for each user to set up a secure system for control and maintenance of the machine. The following descriptions are given for reference. Number 140 gear oil is used in machine's reducer unit.

Daily maintenance of the machine

- Clean dust and scales on the machine with a brush.
- If the machine is running outdoors it must be protected from rain water when raining.
- Machine should be checked if there is extraordinary voice or not.

Weekly maintenance of the machine

- Parts driving machine bending plates should be cleaned and lubricated.
- Machine adjusting lever mechanism should be cleaned and lubricated.

PROBLEMS AND SOLUTIONS

Monthly maintenance of the machine

- Bending pins and bending plates should be checked and any cracked or skewed parts mustn't be used.
- Reducer should be checked if there is oil leakage or not.
- Machine's sensor display should be checked if it has dirt on it or not and also the lamp behind it should be checked if it is working or not.

Semi-annual maintenance of the machine

- All the bolt connections of the machine should be checked.

Annual maintenance of the machine

- Oil of the machine should be changed.
- If it is out of order seals and bearings should be changed.
- Any skewed, cracked, worn parts should be checked and replaced.

9.Problems and Solutions

Any faults those might arise when running the machine, and their causes and solutions are given in the table below.

FAULT 1: If machine isn't running.

	Description	Solutions
1	Missing phase might come to the electric supply system where the machine is connected.	Check the phases.
2	Emergency stop button might be pressed.	Check the button. If it is pressed open it by turning to the direction of the arrow on the button.
3	Motor protection switch might be blown.	Check the motor protection switch. If the switch is blown turn it to the position 1.
4	LEFT STOP RIGHT switch might be turned off.	Check the switch. If it is on stop position turn it to right or left positions.
5	Electricity Board Cap might be open or haven't been closed completely.	Check the Electricity Board Cap.

PROBLEMS AND SOLUTIONS

FAULT 2: If bending disk turning continuously.

	Description	Solutions
1	Sensor might be broken.	Check whether the sensor is working or not, if it isout of order replace it.
2	There might not be zero adjustment pin and switch pins over the machine flange.	Check the pins and if any of them is missing, add and complete it.
3	Direction contractors might be broken down.	Check the contactors.

FAULT 3: Motor protection switch is blowing continuously.

	Description	Solutions
1	Diode might me broken.	Check the diode.
2	Motor might be blown .	Check the motor.
3	If the machine is bending rebar over its bending capacity.	Check the bent rebar according to the material type and measurements on the capacity plate.
4	Missing phase might come to the electric supply system.	Check the phases on the electricity network.
5	Transformer might be blown.	Check the transformer.
6	There might be short circuit or wearing on the cables.	Check the cable and connections.

PROBLEMS AND SOLUTIONS

FAULT 4: Machine is not running although the foot pedal is pressed.

	Description	Solutions
1	The plug might be displaced.	Check the plug.
2	Pedal switch might be out of order.	Check the SWITCH. Change them if they are out of order.
3	Contactors in the electricity network might be out of order.	Check the contactors.

FAULT 5: Emergency Stop is not running.

	Description	Solutions
1	Bearings might be broken down.	Check the bearings.
2	Motor's propeller cap might be rubbing.	Check the propeller cap.
3	Gears might be broken down.	Check the gears.
4	There might be no oil in the reducer.	Check the reducer oil.
5	Missing phase might come to the electric supply system which the machine is connected.	Check the phases in the network.
6	Machine might have difficulty over its capacity.	Check the bent rebar according to the capacity plate.
7	Brake might not be released or brake lining might scrape after being broken down in the electromagneti Braked machines.	Check whether the brakes are running or not and the brake linings.

FAULT 6: Machine is leaking oil.

	Description	Solutions
1	Reducer ventilation cap might not be mounted.	Check whether the plug is mounted or not.
2	Motor seal might be leaking oil.	Check the motor from the propeller side. If there is oil change the motor seal.
3	Reducer connection bolts might be loose.	Check the connection bolts and if loose screw.

10.Safety

➢ This symbol is put before the articles giving warning explanations in order to draw attention of the trained operator to important functions.

€ This symbol is put before the articles giving warning explanations in order to draw attention of the trained operator to electrical issues.

⚠ This symbol is put before the sentences in order to draw attention of the trained operator to the master instructions and directive regarding to handling or safety.

TAGS USED ON THE MACHINE

ESARM	Logo plate of manufacturer company.
	Electricity panel warning tag.
B26,36,45,50	Model name tag of the machine.
CE	CE norm conformity tag.
	Plate on capacity and technical information of the machine.
	Machine user's and maintenance manual tag.
	Handling and carrying hook tag.
	Grounding output tag.

Mechanical rebar bending machine
operating & maintenance manual.

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