SMG BarCraft 3000XA NC Three in One Busbar Processing Station

Operation Manual



Table of Contents

SMG BarCraft 3000XA NC Three in One Busbar Processing Station 1
Operation Manual 1
1. OVERVIEW 3
2 . BASIC PARAMETERS 3
1. Parameters 3
2. Punch Function 4
3. Cut Function 4
4. Bend Function 4
3. PURPOSE AND CHARACTERISTICS 4
4. STRUCTURE AND WORKING PRINCIPLES 5
5. PRECAUTIONS BEFORE INSTALLATION AND START-UP OF THE MACHINE 5
Installation of the machine 5
Precautions before starting 5
6. HOW TO USE EACH UNIT 6
How to use the punching unit and replace the punch and dies: 6
Punch and Die Changing Method: 6
How to use the shearing unit: 7
How to use the bending unit: 7
Follow these steps when performing bending processing: 7
2. U-Shaped Bending (Mandrel Type) {#u-shaped-bending-(mandrel-type)} 8
3. Embossing 9
4. Reverse Flattening 9
7. MACHINE HYDRAULIC SYSTEM 11
Hydraulic principle diagram of the machine (see Figure 8-1) {#hydraulic-principle-diagram-of-the-machine-(see-figure-8-1)} 11
The action sequence table of the machine 11
Hydraulic components list 11
Evaluation Method of Hydraulic Oil 12
8. MACHINE OPERATION 12
Electrical Control System 12
Operator Guidelines 12
1. Cutting Station 12
2. Punching Station 13
3. Bending Unit Operation 13
4. Maintenance & Precautions 17

1. OVERVIEW

The CNC busbar processing machine is a high-performance bending unit designed with advanced CNC technology. Equipped with three key stations—punching, shearing, and bending—it seamlessly handles the complete processing of busbars. With interchangeable molds, the machine is capable of punching round, oblong, and square holes, as well as performing flat and vertical bending, embossing, flattening, twisting, and crimping terminals. These three stations operate simultaneously and independently, significantly enhancing efficiency, simplifying usage, and reducing labor intensity.

The bending unit utilizes a horizontal processing method to ensure robust structural integrity, delivering consistent performance in flat bending and embossing tasks. This design greatly improves repeat positioning accuracy during mass production and extends the machine's service life. Beyond the standard features of conventional models, the CNC busbar processing machine offers the following advanced functionalities:

1. **CNC-Controlled Bending Unit**: Users can input busbar thickness and desired bending angles directly into the system. The CNC system automatically calculates the required specifications, generates precise data for bending, and uses a grating ruler to accurately control stroke length.

2. **Integrated Punching and Shearing Control**: Operators can manage the punching and shearing units while storing on-site workpiece data in the system. The machine also allows parameter adjustments and compensation for enhanced precision.

3. **Advanced Touch-Screen Interface**: Featuring a 5.7-inch color touch screen, the intuitive display makes operation simple. Users can modify data as needed, even for non-standard workpieces, ensuring versatility for custom applications.

The CNC busbar processing machine is easy to use, highly precise, and built to last, making it an efficient and reliable choice for busbar processing.

2 . BASIC PARAMETERS

1. Parameters

PUMP AND MOTOR	Power	KW	4 KW × 3
Dimensions	L×W×H	mm	1688 × 1310 × 1520
Weight		kg	1250
Motor current		A	16.5
Voltage	415V AC	V	
Origin	China hydraulic motor		

2. Punch Function

ITEMS	UNIT	MATERIALS	THICKNESS × WIDTH	PUNCH RANGE
Punch Capacity	mm	Cu（Al）	15 x 160	φ4.3 x φ34
Max. Cut	kn	300		
Cylinder Stroke	mm	45		

3. Cut Function

ITEMS	UNIT	MATERIALS	THICKNESS	WIDTH
Cut Capacity	mm	Cu（Al）	12	150
Cylinder Stroke	mm	45		

4. Bend Function

ITEMS	UNIT	MATERIAL	THICKNESS	WIDTH
Horizontal Bend	mm	Cu（Al）	15	160
Vertical Bend	mm	Cu（Al）	12	120
Max.Bend	KN	300		
Cylinder Stroke	mm	240		

3. PURPOSE AND CHARACTERISTICS

This machine is designed to process copper and aluminum busbars of different sizes. Users can punch, shear, and bend the busbars using the relevant processing units. It offers high production efficiency and is ideal for the high and low voltage electrical appliance manufacturing industry.

This machine comes with the following key features:

1. It has three processing units for punching, shearing, and folding busbars. Each unit works independently, making production faster and more convenient compared to traditional busbar processing equipment.

2. The working stroke of each unit is adjustable within its stroke limit, reducing processing time and increasing efficiency.

3. By changing the mold, the machine can perform multiple functions like vertical bending, embossing, and counter-pressing.

4. It offers two operation modes: a manual button and a foot switch. The machine is simple, flexible, and easy to operate, even for workers with basic skills.

4. STRUCTURE AND WORKING PRINCIPLES

1. The machine is made up of several key parts: a frame, a punching unit, a shearing unit, a bending unit, a hydraulic station, an electrical system, and a mold.
2. The frame, built from welded square steel pipes, provides strength and rigidity. The punching, shearing, bending units, and electrical components are mounted on the frame, while the hydraulic station is housed inside it.
3. Here's how the machine works:

- The motor powers the pump, which generates high-pressure hydraulic oil.
- The overflow valve controls the pressure.
- The electromagnetic reversing valve directs the high-pressure oil to the cylinders.
- The cylinders then perform punching, shearing, and bending operations.

When the motor runs, it powers the oil pump to create high-pressure oil. If the reversing valve isn't active, the oil flows back to the tank. When the valve is active, it directs the oil into specific chambers of the cylinders, allowing them to move back and forth to complete the required operations.

5. PRECAUTIONS BEFORE INSTALLATION AND START-UP OF THE MACHINE

Installation of the machine

1. Use the lifting angles to attach ropes when hoisting the machine for transportation or installation.
2. Install the machine on solid, flat ground.
3. Set up the machine in a spacious area to ensure it has enough room to operate properly.
4. Check if the machine is level. If needed, adjust the four leveling screws to ensure it is horizontal.
5. Connect the power cord securely, making sure it doesn't interfere with the work area.
6. The machine requires a three-phase, four-wire 380VAV+PE power supply.

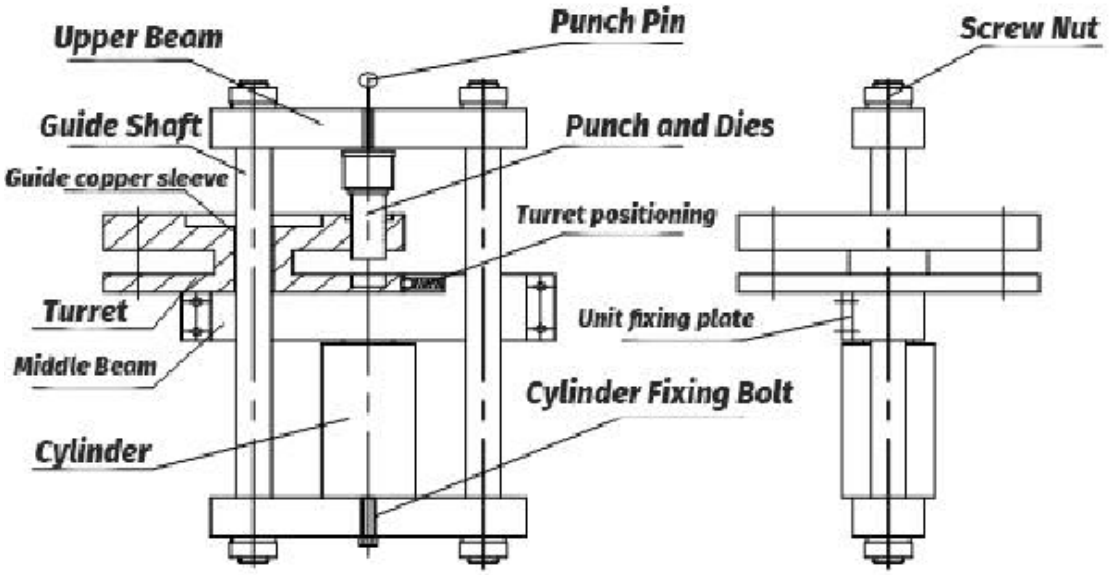
Precautions before starting

1. Before starting, make sure the motor's rotation matches the specified direction and aligns with the pump's rotation.
2. If the indoor temperature is below 10°C, let the oil pump run idle for 5 minutes before starting work.
3. If the oil temperature reaches 55°C or higher, chemical changes in the oil additives can cause valve or pump failure. High temperatures also shorten the lifespan of the seal ring, leading to leaks. If the temperature exceeds 55°C, stop the machine for at least 5 minutes to let the oil cool before restarting.
4. To ensure smooth operation, keep all sliding parts clean and well-lubricated. Proper lubrication minimizes friction and helps the sliding surfaces move smoothly during operation.

5. Excessive pressure can loosen the screws on the fixing device. Check and tighten them regularly (recommended every month).

6. HOW TO USE EACH UNIT

How to use the punching unit and replace the punch and dies:

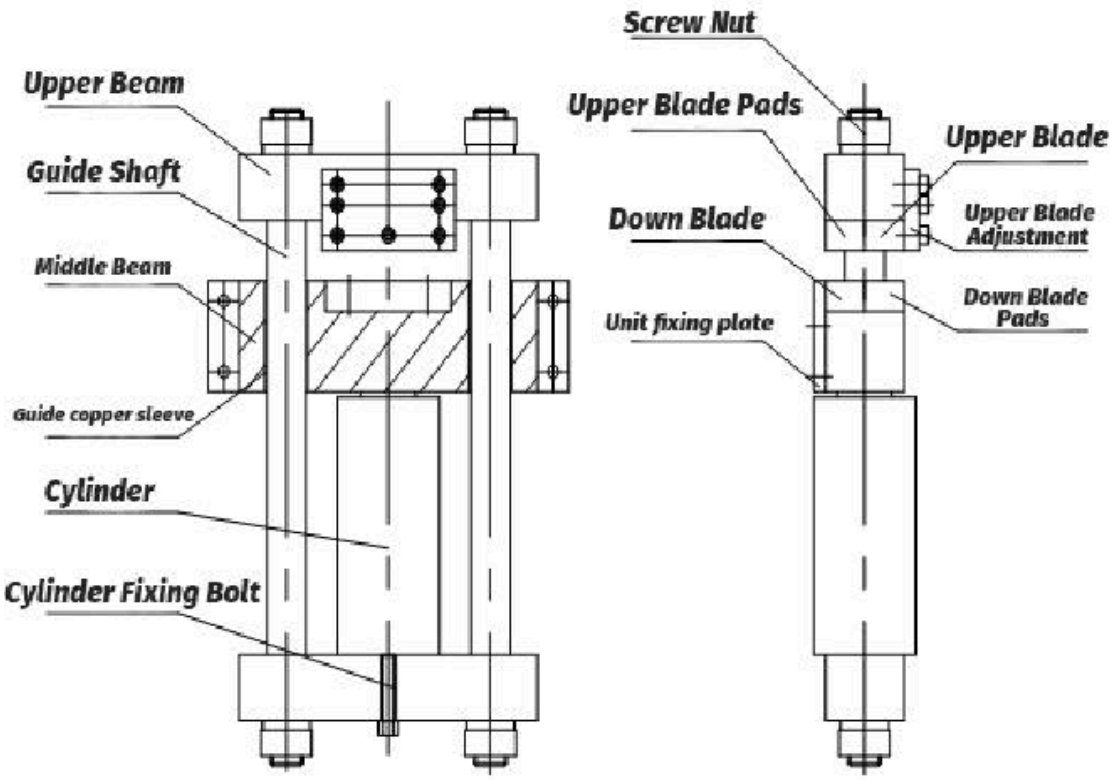


1. Always oil the moving parts of the machine before punching.
2. Keep the material flat during punching to ensure proper processing.
3. The punching device can handle large forces, but avoid offset loads, as they can damage the mold. **(Important: Never use round dies to punch oval holes to prevent injuries and mold damage.)**
4. Be aware that material defects can also lead to mold damage.
5. After punching, ensure the material remains balanced as the machine returns to its starting position.
6. Use an appropriate mold for the task, and double-check compatibility when changing molds.
7. Always perform punching on the workbench.

Punch and Die Changing Method:

1. To replace the mold, first rotate it outward to ensure easy and efficient access for the replacement process.
2. Remove the upper mold assembly, position it correctly, and place the required new upper mold.
3. Remove the lower mold, replace it with the matching lower mold, and move the replaced mold to the punching position.
4. Use the “button switch” or “foot switch” to check the alignment of the upper and lower molds by moving “up” and “down” on the screen.

How to use the shearing unit:



1. Oil the moving parts of the machine before starting any cutting.
2. Keep the material flat during cutting to ensure proper processing.
3. Position the workpiece using the scale on the table. The blade position is set to 0. Adjust the scale to the desired length, then use the foot switch or manual button to complete the cutting.

How to use the bending unit:

Follow these steps when performing bending processing:

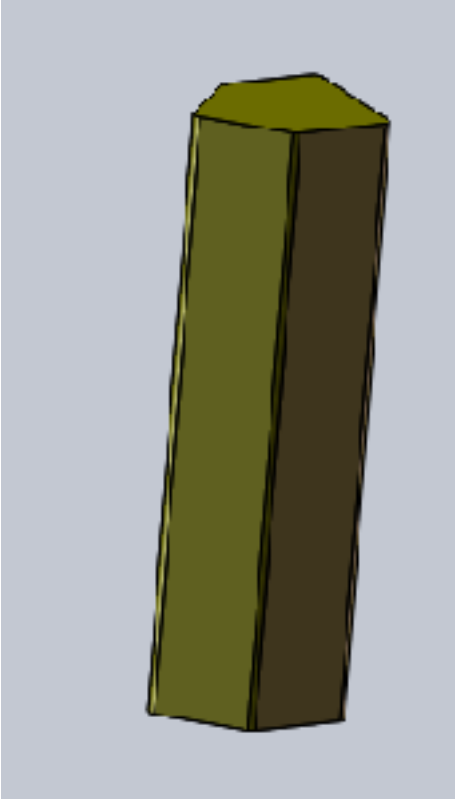
1. Lubricate all moving parts.
2. Choose the correct male and female molds based on the material's width, thickness, and angle.
3. Select the mold opening according to the material specifications. If no specific requirements are given, the equipment comes with a 70mm female mold opening and R10 and R5 male molds by default.
4. For Z-shaped bending, you may need a smaller R3 mold.
5. Additional functions can be added as optional features:

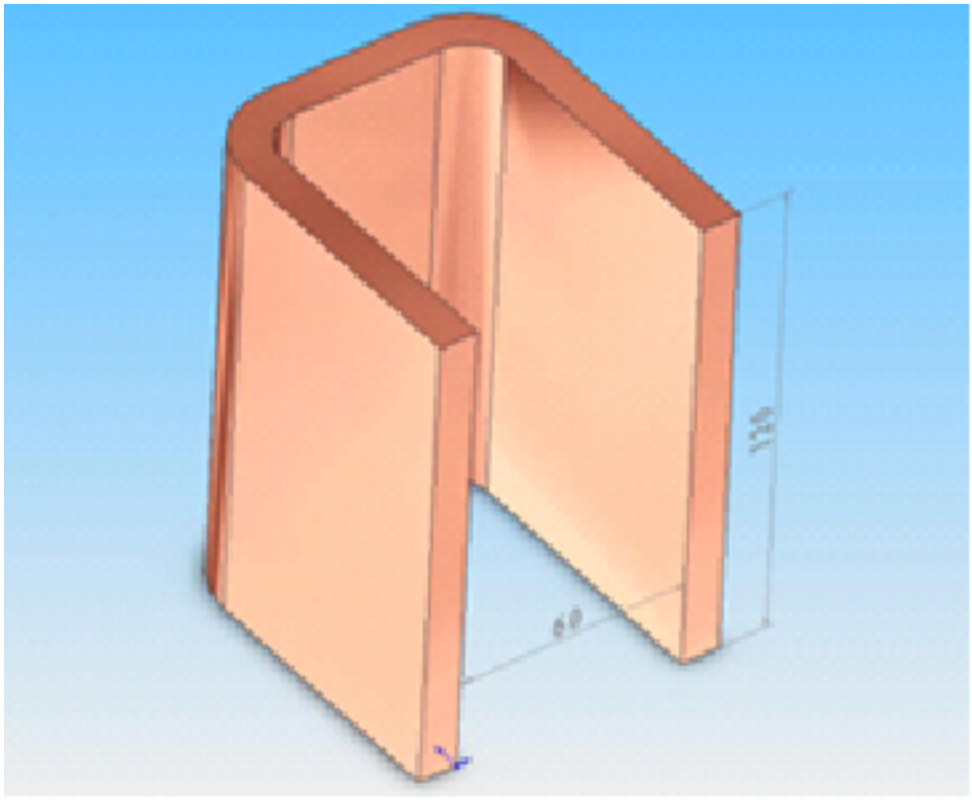
1. **Vertical Bending**

Also known as side bending. To perform vertical bending, replace the vertical bending mold, place the motherboard into the middle opening of the male mold, and press the “foot switch.” Start with small adjustments (jogging) until the desired angle is achieved. For batch operations, adjust the detection piece to the required position after the first stroke. The vertical bending die is shown in Figure 7-4.

2. ***U-Shaped Bending (Mandrel Type)*** *{#u-shaped-bending-(mandrel-type)}*

The mandrel-type punch has a bending radius that matches the plate thickness of a standard bending die, with a maximum bending height of 120mm. The minimum inner width for U-bending using a standard mandrel punch is 60mm. See Figures 6-1 and 6-2 for the punch structure and U-bending schematic diagrams.
If you need to process a U-bending workpiece with an inner width of 40mm, a custom (non-standard) mandrel punch must be ordered. In this case, the copper bar thickness must not exceed 8mm, and the maximum bending height remains 120mm. The bending radius size can be customized according to user requirements.





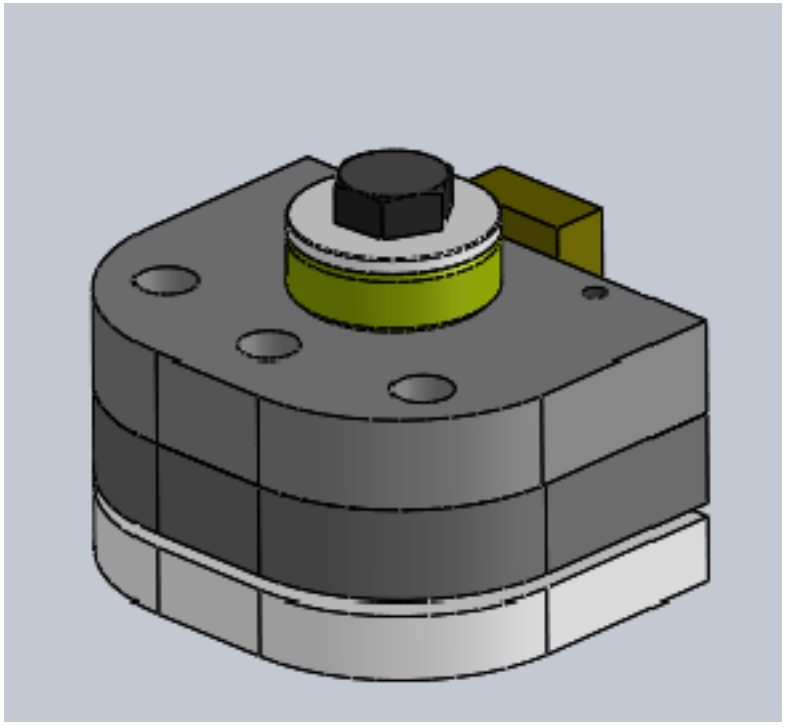
3. ***Embossing***

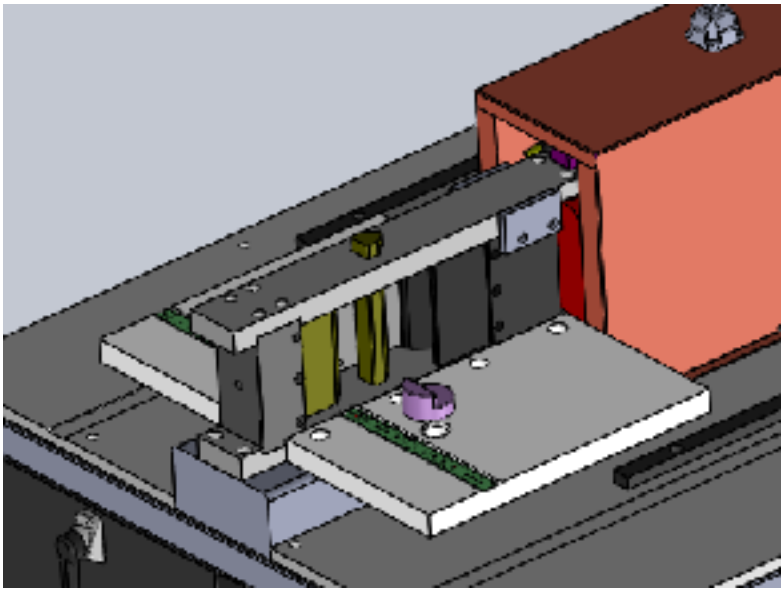
Embossing can be achieved by replacing the die with an embossing die.

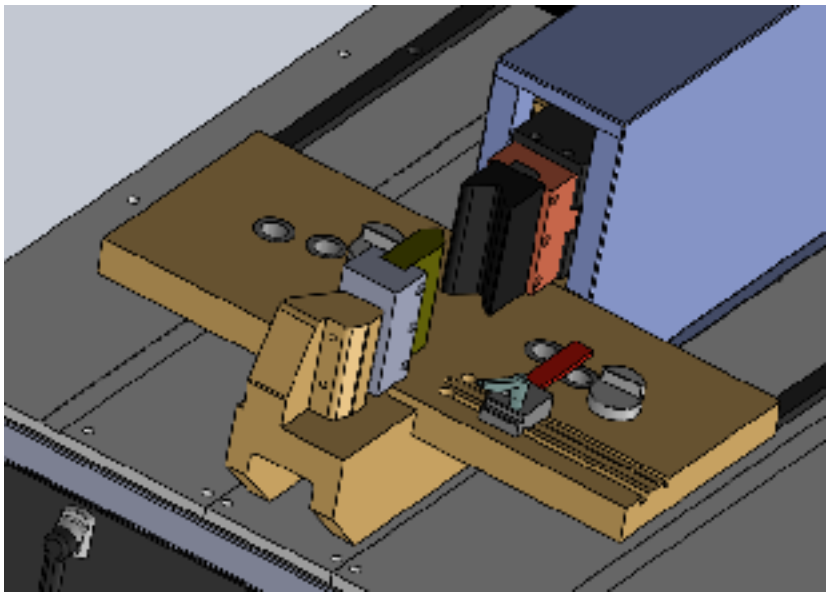
4. ***Reverse Flattening***

If the angle becomes too large due to an error in operation, reverse flattening can be used to correct it.

See Figure 7-5 and Figure 7-6 for the schematic diagram of the bending unit.







7. MACHINE HYDRAULIC SYSTEM

Hydraulic principle diagram of the machine (see Figure 8-1)
{#hydraulic-principle-diagram-of-the-machine-(see-figure-8-1)}

The action sequence table of the machine

		YV1	YV2	YV3	YV4	YV5	YV6	YV7	YV8	YV9	M1	M2	M3
Start Up													
BEND	**Forward**	+			+						+		
	Back	+				+					+		
PUNCH	**Down**		+				+					+	
	Up		+					+				+	
CUT	**Down**			+					+				+
	Up			+						+			

Hydraulic components list

No.	Name	Model	Quantity	Specification	Remark
1	Oil Tank		1		Self Made
2	Oil Filter	WU63-100-J	1		
3	Oil pump and motor	HGP-3A-F11, P208	3	Couplings NL25×40/NL 38×80	
4	Relief Valve	DG-02H	3	6LA	
5	Solenoid Reversing Valve	DSG-02-3C60-A C220	3		
6	Liquid Level Gauge	YWZ—80T	1		

No.	Name	Model	Quantity	Specification	Remark
7	Filters	EF2—40	1		
8	Cylinder		3		Self Made

Evaluation Method of Hydraulic Oil

Oil Phenomenon	Smell	Condition	Solutions
Transparent or no change in color	Good	Good	Available
Transparent or very light color	Good	Mixing with other hydraulic oils	Available
A little change	Good	Bubbles or water	Separation of water
Turns brownish black	**Bad**	Oxidized or heated	Replace hydraulic oil
Transparent with small black impurities	Good	External substances	Available after filtering

1. When the fluid level is too low, add hydraulic oil.
2. It is recommended that the machine use N46 anti-wear hydraulic oil

8. MACHINE OPERATION

Electrical Control System

- Includes **main control system** and **hydraulic control electrical system**.
- Systems operate **independently** for: **Punching | Shearing | Folding**.

Operator Guidelines

- **Read the manual carefully** before operating.
- **Understand all operating steps**.
- **Familiarize yourself** with: **Buttons | Switches | Indicator lights**.

1. Cutting Station

```
**Set the Cutting Length**
```

- Set the length stop on the machine.
- Move the length stop to the desired measurement.
- Lock the length stop securely in place.

Place the Bar

- Carefully slide the busbar into the machine until it touches the length stop.

Make the Cut

- Use either: foot pedal or push button.

- Activating either control will start the hydraulic pump and perform the cutting action.

2. Punching Station

```
**Select Hole Size**
```

- Choose the required punch size (sizes labeled on top of each punch).
- Rotate the turret until the correct punch is in position.

Set the Guides (Gauges)

- Adjust width guide: position hole across the bar (typically centered).
- Adjust length guide: position hole along the bar's length.

Place the Material

- Slide the busbar into the machine.
- Ensure it is firmly pressed against the guides.
  Punch the Hole
- Press down on the foot pedal.
- Hydraulic pump activates and punches the hole.

3. Bending Unit Operation

```
**Initial Setup**
```

- Turn main power ON.
- The touch screen controller will boot up.

Access Admin Settings

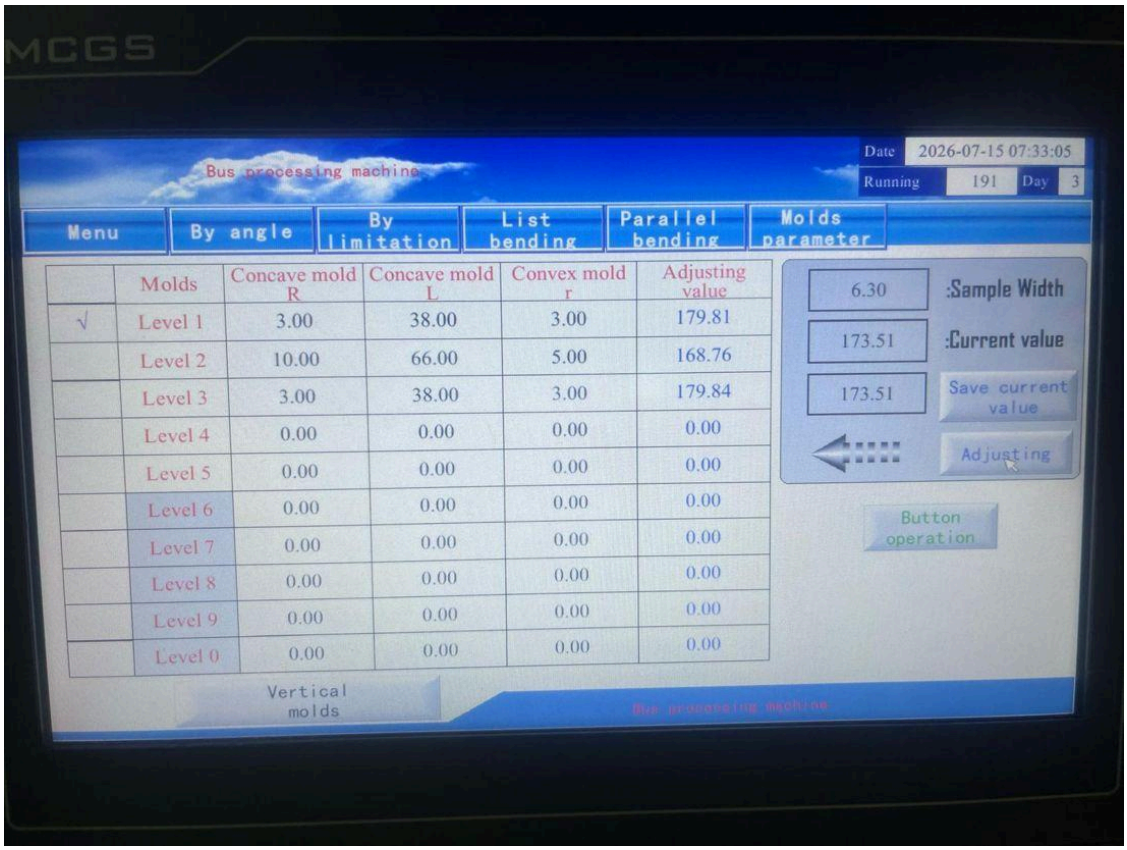
- On Home Screen, press Open Password.
- In the User Password field, type `1234`, then press Enter.
- Tap Login.

Set Bending Reference Position

1. On Home Screen, press Mould Parameter.
2. Check tooling numbers on Bending Punch and Vee Die (e.g., Punch: 1R3, Die: 1R3).
3. In the Mould Table:
   - Tick the box for the correct tool.
   - Verify data (Radius, Vee size, etc.).

4. Measure sample bar or spacer thickness. For the best result, measurements must be accurate; please use a vernier if available. Enter thickness in the Sample Width field.
5. Place the sample bar/block into the bending area. Carefully move the tool close with the manual buttons until it just touches the bar/block.
    - Important: Use manual buttons only, not the foot pedal.
6. On touchscreen:
    - Press Save Current Value and confirm field updates.
    - Press Adjusting to store the reference value.

If required, please refer to the help and training videos under Resources on capitalmachinery.com.au: https://www.youtube.com/watch?v=exLIel5joqs



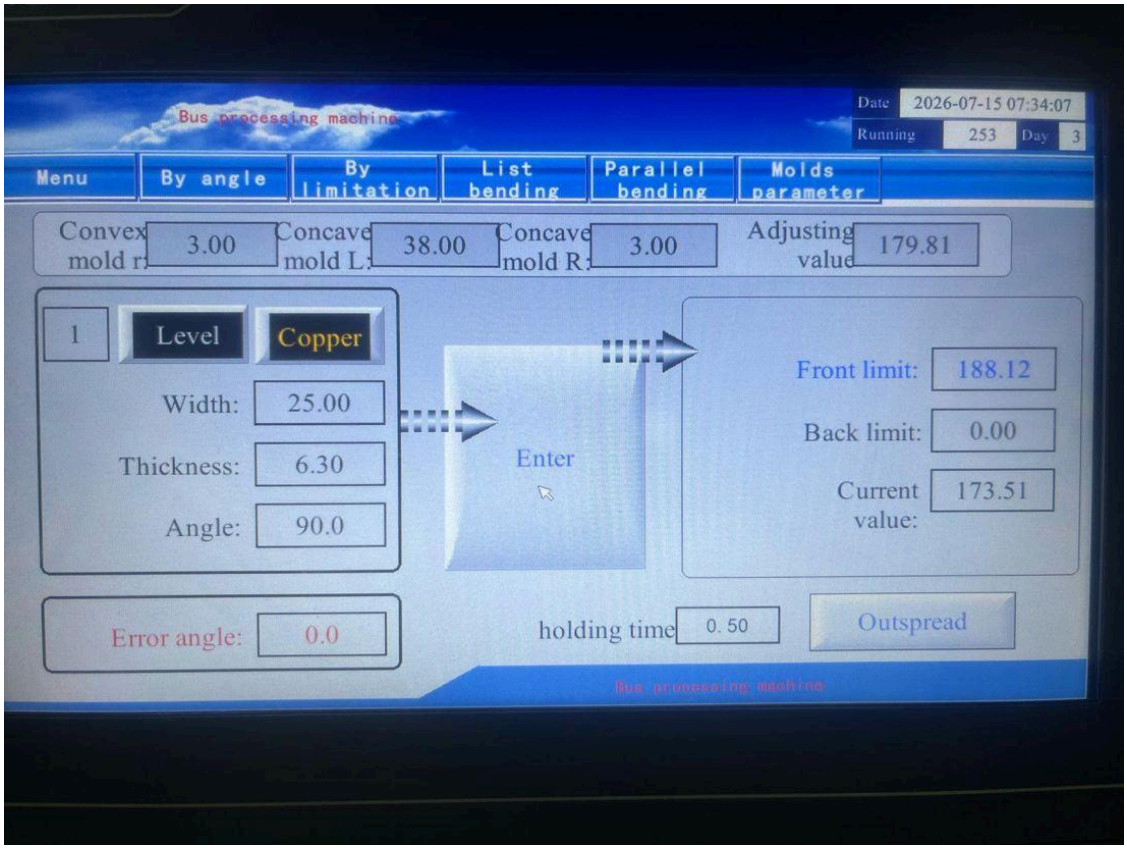
Molds Parameter screen — field reference

- **Molds table (Level 1–0):** ten storage slots (Level 1 through Level 0), each holding a full set of tooling data — Concave Mold R, Concave Mold L, Convex Mold r, and Adjusting value. A √ in the left-hand column shows which Level is currently active; only one Level should be ticked at a time.
- **Sample Width:** the measured thickness of the sample bar/spacer used to set the reference position for the ticked Level.
- **Current value:** the live position reading from the grating ruler as the tool moves.

- **Save current value:** copies the Current value into the Adjusting value field for the ticked Level.
- **Adjusting:** enters jog mode so the tool can be moved manually (via Button operation) to touch the sample bar before saving.
- **Button operation:** switches control to the manual up/down buttons, used during setup instead of the foot pedal.
- **Vertical molds:** opens the equivalent parameter table for the vertical bending tooling.

Test Bending

1. From Home Screen, go to the By Angle menu.
2. Enter: material width, thickness, and desired bending angle.
3. Ensure Error Angle = 0.0.
4. Press Enter to transfer value.
5. Using the foot pedal, perform a test bend.
   Warning: Setup buttons will not function during bending.
6. Check the bend angle with a gauge.
7. Adjust Error Angle Correction (+/- degrees) if needed and repeat until accurate.



By Angle screen — field reference

- **Level / Copper:** shows which Molds Level is loaded and the material type selected for the bend.
- **Width / Thickness / Angle:** the bar width, bar thickness, and target bend angle entered for this job.
- **Enter (arrow):** transfers the Width, Thickness, and Angle values into the CNC bending calculation.
- **Concave mold R/L, Convex mold r, Adjusting value:** read-only, mirrored from the ticked Level on the Molds Parameter screen — use these to confirm the correct Level is loaded before bending.

- **Front limit / Back limit / Current value:** the calculated stroke limits and the live position of the bending tool from the grating ruler.
- **Error angle:** the correction offset applied after test-bend measurement; should read 0.0 until a correction is needed.
- **holding time:** how long (in seconds) the tool dwells at the bend position before retracting.
- **Outspread:** retracts/returns the tool to its home position.

Switching Between Bar Thicknesses (Preventing Overbend Faults)**

Each mould Level stores its own Adjusting Value, and that value is only correct for the specific bar thickness it was calibrated against. Overbending most commonly happens when the operator changes to a new bar thickness but the machine is still reading the Adjusting Value from a different Level.

Before bending a new thickness, always confirm all of the following:

1. On the **Molds Parameter** screen, tick (√) the Level that matches the mould set you have physically installed for this bar. Do not assume the ticked Level is already correct — check it every time you change bar size.
2. On the **By Angle** screen, check that the Concave Mold R/L and Convex Mold r values shown match the ticked Level. If they do not match, the wrong Level is being read and must be reselected.
3. Check that **Sample Width** on the Molds Parameter screen matches the actual thickness of the bar you are about to bend. If it does not, follow the Adjusting procedure below to recalibrate for the new thickness.

Recalibrating a Level for a new thickness:

1. Set **Sample Width** to the actual bar thickness (measured with a vernier).
2. Press **Adjusting**, and manually jog the tool until it just touches the bar (buttons only, never the foot pedal).
3. Press **Save Current Value**. This updates the Adjusting Value for the currently ticked Level only.

4. Confirm the new Adjusting Value now matches on both the Molds Parameter screen and the By Angle screen.

Recommended practice: rather than overwriting Level 1 every time the bar size changes, assign each recurring thickness its own Level (Levels 4–9 are usually free). Selecting the correct Level then becomes a single tick, with no recalibration needed and no risk of an old Adjusting Value being carried over to the wrong bar size.

If overbending occurs and the Sample Width and mould values already appear correct, this indicates the Adjusting Value stored against that Level is stale (calibrated for a different thickness) and must be re-saved using the steps above.

4. Maintenance & Precautions

1. Keep the machine clean.
2. Inspect blades and tooling for damage or wear before use.
3. Check oil levels every 3 months.

Connecting Power Supply User Guide

Connect Machine Power Supply Connect the live wires marked L1, L2, L3 and neutral wire N.

