



**SUNRISE Fluid Power Inc.**

No. 7, Road 12, Industrial Zone, Taichung City 407, Taiwan

Tel: 886-4-2359-1190

Fax: 886-4-2359-3409

sales@sunriseiw.com.tw

www.sunriseiw.com.tw

# **SUNRISE HYDRAULIC BENDING MACHINE**

**HBM-40NC  
HBM-75NC**

**OPERATION &  
MAINTENANCE MANUAL**

**Original Instructions**

**OMEG072**

**2011/12**



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## **INTRODUCTION**

The Sunrise Bending Machine is a hydraulically powered metal bender for thick material. There are many bending tooling available for a wide range of bending operation. Furthermore, optional accessories such as Plate Shearing, Punching and Profile Strengthening tool can increase the versatility of the machine. This multi-function aspect allows the Sunrise Bending Machine to meet the diversified needs of the metal forming industry.

Each machine has been individually tested in the factory and under-gone an extensive pre-delivery check to ensure that the machines meet the highest quality standard. The bending machine has been designed to be a reliable and dependable machine with excellent performance. We know the working quality of the machine will confirm that you have made a good choice by selecting Sunrise products for your facility.

In order to have a better understanding of the operating procedures, to obtain maximum benefits from the machine, and to minimize the maintenance cost of the equipment, please have the operators and engineers read this Manual thoroughly and carefully before operating the machine.

The machine is only suitable for bending material under 1 meter in length.



## **SAFETY PRECAUTIONS**

### **IMPORTANT:**

**It is the duty of both employer and employees to acquaint themselves with the safe working practices contained in this manual and ensure that all operators adopt these practices.**

To ensure safe operation, two-hands switch should be used to avoid accidents of hand/finger injury. The foot paddle is also provided as an option to be used only by authorize personnel and with safety guards installed.

This equipment, if not operated and maintained properly, has the potential to cause serious injury or death. A thorough knowledge of the machine and operating with carefulness is the best protection against accidents.

The operator should be familiar with the control and function of the switches before perform the operation.

Warning labels are fixed on the machine. **NEVER REMOVE THESE LABELS.**

Be sure to follow these warnings to avoid injury.

Please also pay attention to the following general rules:

1. Only one operator is allowed to operate on the HBM bending machines. Before each operation, make sure no other person is near the machine.
2. Operator must wear Protective Glasses during operation to protect the eyes.
3. Use of optional attachments/tooling should have proper guards installed.
4. Any maintenance/repair of electrical/hydraulic circuit; change/adjust of tooling should be done only by qualified engineers or personnel.
5. Always turn off power and disconnect electric supply before doing any tool change or maintenance work.
- 6. Keep hands clear of all moving parts at all times.**
7. Do not bend, punch, or shear parts that are too small for safe operation.

8. If any problem or abnormal condition arises during operation, stop the machine immediately(push the emergency button) and report to a supervisor. Do not turn on the machine again until the problem is rectified by qualified personnel.
9. The machine should never be left under power when not in operation or unattended. After completing of work, always isolate the machine power supply after turned the power off.
10. After completion of operation, all slugs and waste materials must be cleaned away from the machine.
11. Regularly check tooling for defects and wear to ensure safety and maintain good condition.
12. Use handling equipment when lifting heavy tooling and materials.
13. Never exceed the rated capacity of the machine. Refer to the specification chart for details.

**The manufacturer shall not be held any liability for damages/body injuries or other consequences to machine, material, and persons caused by the non-compliance of the above safety precaution procedures, in particular for the following situations:**

1. **Non-use of the two-hand switches or use of foot switch without safety protections.**
2. **Did not wear protective glasses for the eyes.**
3. **Did not interrupt the main electric power supply before any maintenance work.**
4. **Damage of electric parts due to incorrect electric power supply.**
5. **Warning sign as follows**





**6. Proper environment condition**

a. Ambient temperature: 0~50°C

b. Relative humidity: 20~85%

c. The required space around the machine is at least 1000 mm.

## **DANGER**

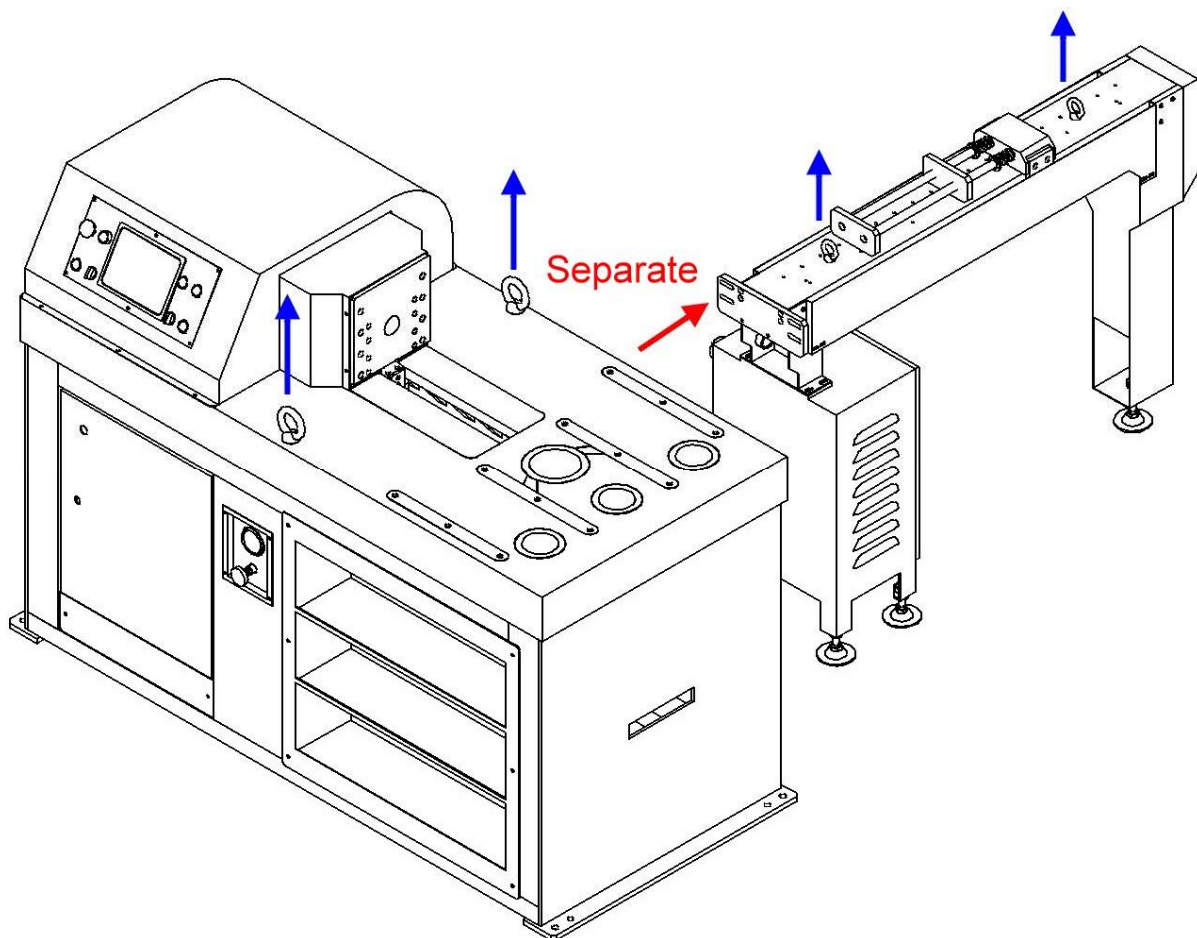
- **KEEP HANDS CLEAR OF ALL MOVING PARTS.**
- **ALL GUARDS AND HOLD-DOWNS MUST BE IN POSITION BEFORE OPERATING THE MACHINE.**
- **ALL SAFETY PROTECTION MUST BE IN POSITION BEFORE OPERATING THE MACHINE.**

## **CAUTION**

- **THOROUGHLY READ THE OPERATION MANUAL BEFORE OPERATION.**
- **TURN OFF POWER AND ISOLATE THE MACHINE WHEN CHANGING TOOLING OR DOING MAINTENANCE.**
- **ALL MAINTENANCE/REPAIR WORK MUST BE DONE BY QUALIFIED PERSONNEL.**
- **IF ANY PROBLEM OR ABNORMAL CONDITION OCCURS, STOP THE MACHINE IMMEDIATELY. DO NOT OPERATE THE MACHINE AGAIN UNTIL THE PROBLEM IS FIXED.**

## TRANSPORT

When transporting the machine by a crane, hook the crane to the two eye bolts provided for the machine. **Do not use slings under the machine.** Pay special care if lifting / transporting the machine with forklifts. The forks should extend fully to cover the width of the machine.



Model	HBM-40NC	HBM-75NC	NC backgauge
Machine Weight (kg)	1030	2080	170
Crane/Forklift (kg)	> 1030	> 2080	> 170



## **INSTALLATION**

The machine only requires the normal industrial concrete foundation. If the ground is uneven and the machine vibrates during operation, use foundation bolts to tighten the machine firmly to the ground or alternatively mount the machine on anti-vibration pads.

### **IMPORTANT:**

- Maintain a spacious working area around the machine for safety.
- Have the work area well illuminated with proper lighting.
- Clean the scraps and waste materials regularly, and make sure the work area is free of obstructing objects.
- Keep the ground free of oil and make sure it is not slippery.
- If long lengths of material are to be fed into the machine, make sure that they will not extend into any gangways.

*Crowded, poorly illuminated or slippery areas are often causes for accidents.*

Remove all anti-corrosion grease after installing the machine. Check that the oil reservoir, located in the machine base, has been properly filled. When refilling oil, use recommended oil and fill the reservoir to the upper level of the oil level gauge.

### **Connecting Power Supply**

Electrical wiring must be done by a qualified electrician. Before connecting the electrical supply, make sure the voltage and current is compatible to the electrical components in the machine. Check the data shown in the electrical control box.

**IMPORTANT: Turn off Supply Electricity at your facility's circuit breaker before making electrical connections to the machine.**

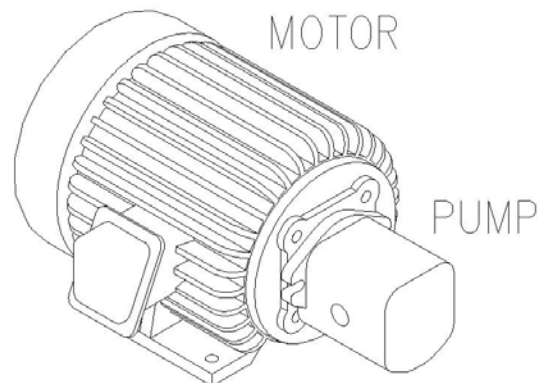


To connect the power cord

- 1) Open the electric box.
- 2) Remove the small panel under the electric box.
- 3) Insert the power cord through the entrance hole on the base of machine, and then through the base of electric box.
- 4) Connect the three phase wires to the power terminal strip in the electric box.
- 5) Also make sure to ground the machine properly.
- 6) Check that the power cord surface is not damaged, scratched or cut during installation.
- 7) Reinstall the panel and close the electric box.

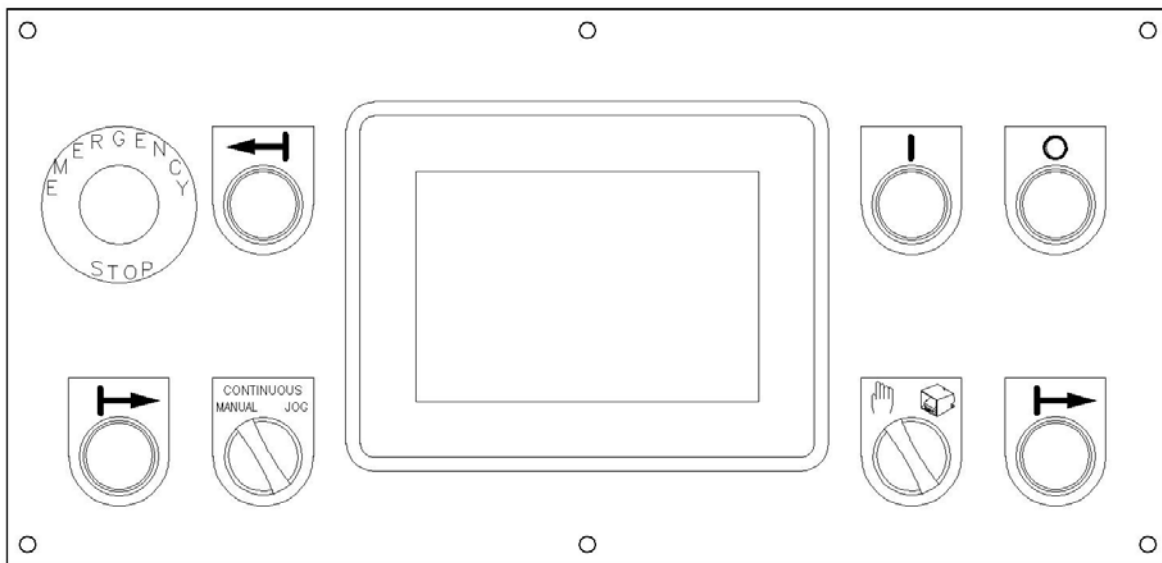
To check the correct rotation of the motor.

- Remove the back cover.
- Briefly start and stop the motor and check that the motor rotates in the same direction as the arrow indicated on motor. **Improper rotation can severely damage the pump.**
- To change the motor rotation, first make sure the power is disconnected, then reverse any two of the three phases of the electrical power supply.



## CONTROL PANEL

**ISOLATOR Switch** - This switch controls the main electric source. It also functions as a lock for the electric box. At the ON position the switch locks the electric box and enables you to start the machine. At the OFF position, the power is cut off and the electric box can be opened.



**EMERGENCY STOP** - Use the EMERGENCY STOP button to stop the machine in an emergency. The Emergency button must be released before the PUMP ON button will function. To release it, turn knob slightly to the right.

**I (PUMP ON)** - Push this button to turn on the machine. The EMERGENCY STOP button must be released before the PUMP ON button will function. The green POWER LIGHT stays on when the machine is turned on.

**O (PUMP OFF)** - Push this button to turn off the machine.

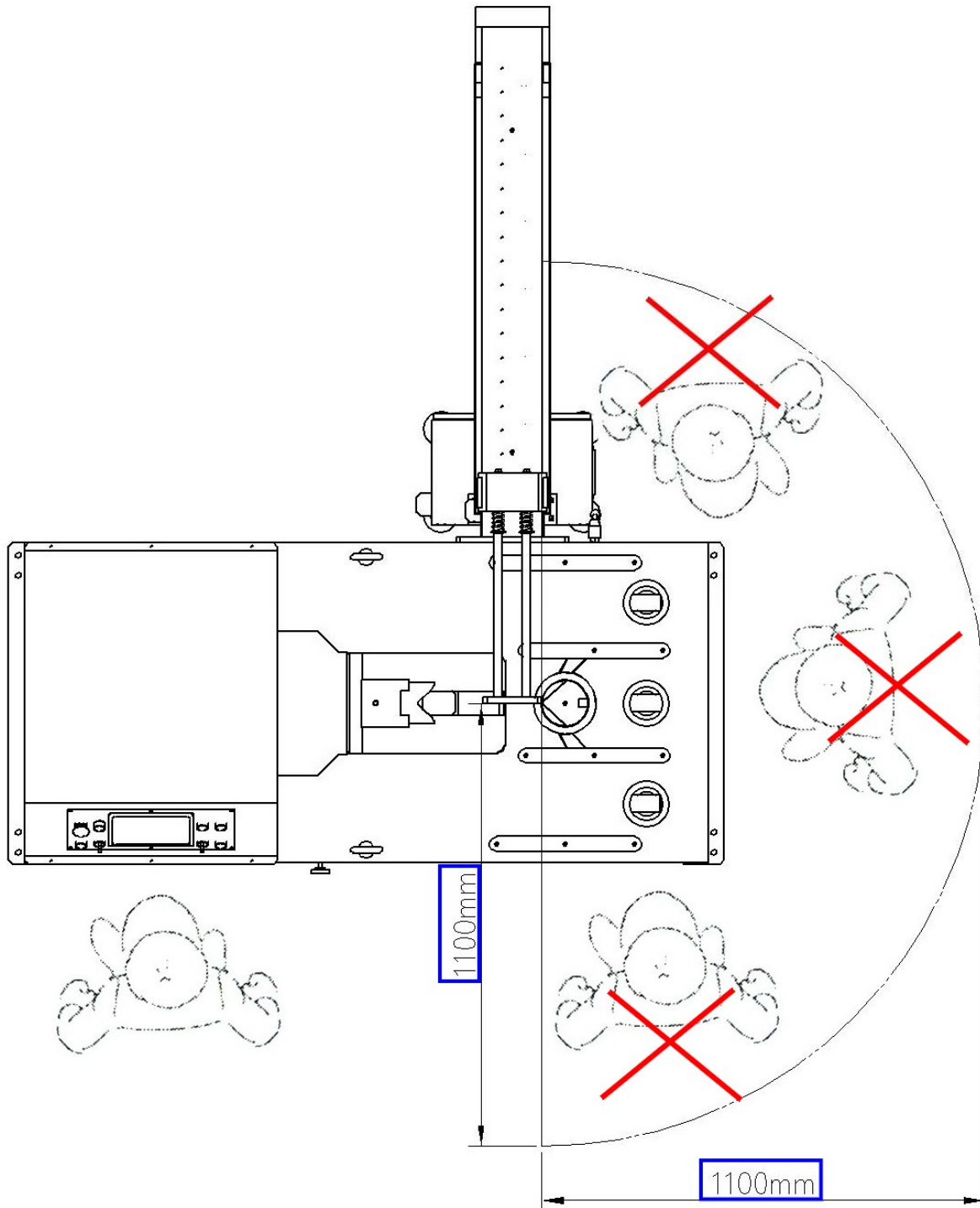
**FORWARD (TWO-HAND SWITCHES)** – Use these switches to operate the machine cylinder movement. Both switches must be pressed at the same time for the cylinder movement. **NEVER has one operator hold the material and another operator operating the machine.**

**BACK** – Use these switches to move the cylinder backward in JOG mode.

**HAND/PADDLE** - Use this switch for choosing operation by the two-hand switches or with foot paddle.

**Manual/Continue/JOG** – Use this switch to choose the three operating modes.

**Operators's working positions:**





## **OPERATING MODES**

**In MANUAL mode**, press the two-hand switch together for the forward motion of the cylinder. The cylinder slows down at the Slow position and stops at the Forward position. Releasing the switches and the cylinder retract to the Back position, and the controller moves to the next Step in the Program. After finish the last Step set by the End parameter, the controller moves back to the first Step in the Program. Place the next work piece and start from the first step(bend).

**In AUTO mode**, press the two-hand switch together and hold. The cylinder will move back and forth between the Back and Forward position. Releasing the switches and the cylinder retract to the Back position. The controller does not move to the next Step in this mode.

**In JOG mode**, press the two-hand switch together for the forward motion of the cylinder. The cylinder goes only forward and does not retract. Press the BACK button for the backward movement of the cylinder. This mode is useful to set the required cylinder stroke length for the required bend.

### **PRESSURE SETTING**

In certain work job, the pressure of the cylinder need to be adjusted to a lower level, the pressure can be adjusted by the pressure value in the machine base. A pressure gauge is included to indicate the pressure.



## **TWO HAND SWITCH / FOOT PADDLE**

The machine uses two-hand switches for operation. **NEVER has one operator hold the material and another operator operating the machine.** The use of foot paddle is only by authorized personnel. It is provided as an option only for the cases when the operator cannot use the hand switches.

The key of the Hand/Paddle selector switch must never be left on the machine. The key should be kept in a safe place by the authorized officer of the company.

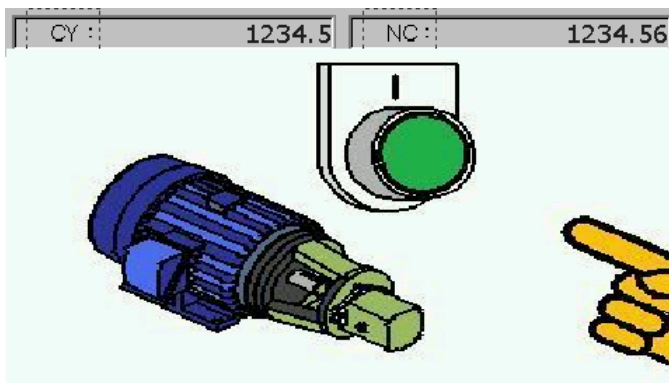
When using the foot switch mode, the operator understands and accepts the potential risk of body injuries, and should use extra caution when use the foot switch. **NEVER has hands/fingers in between the top(left) tool and lower(right) tool.** Hence the manufacturer should not be held responsibility and liability of damages and/or body injuries by the non-compliance of the operator to the safety warnings stated in this manual.

## CONTROLLER OPERATION

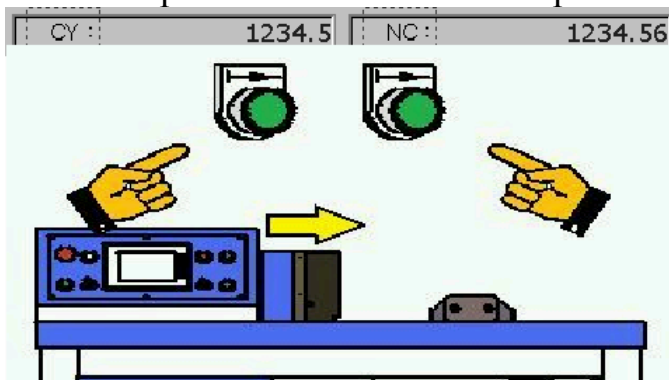
- 1) Turn on power. Be sure the emergency button is released. Screen will be on after a brief self-check.



- 2) Press Pump ON to start the motor



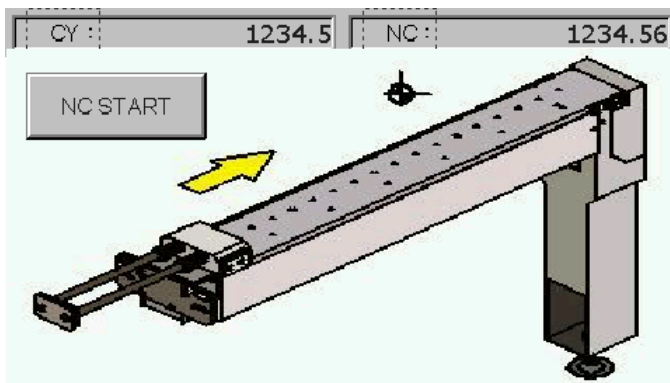
- 3) If the current cylinder position is in the back, the screen will ask you to press the FWD button (both button simultaneously) to move the cylinder forward. Note: if the cylinder position is already at an extended position, the screen may just show press BACK as in next step.



- 4) When the screen shows press the BACK button, press BACK to move the cylinder back for completing the calibration.



- 5) After the cylinder calibration is done, the controller will ask you to calibrate the NC stopper:



Press the **NC START** for 2 seconds to do the NC stopper calibration.

- 6) After the cylinder and NC stopper calibrations, the screen switches to the program mode.

CY :	123.4	NC :	1234.56		
PROGRAM :	##	+	-	PCS	###
STEP :	##	+	-	END	##
BACK :	###.#			NC GAUGE OFF	
SLOW :	###.#			NC START	
FORWARD :	###.#				
GAUGE :	####.##				
PROGRAM (F1)		SAVE (F2)		MANUAL (F3)	
				SETUP (F4)	



## The Programming Screen

CY :	123.4	NC :	1234.56		
PROGRAM :	##	+	-	PCS	###
STEP :	##	+	-	END	##
BACK :	###.##			NC GAUGE OFF	
SLOW :	###.##			NC START	
FORWARD :	###.##				
GAUGE :	####.##				
PROGRAM (F1)		SAVE (F2)		MANUAL (F3)	
				SETUP (F4)	

The top of the screen show the current Cylinder position and the NC stopper position.

CY :	123.4	NC :	1234.56		
PROGRAM :	##	+	-	PCS	###
STEP :	##	+	-	END	##
BACK :	###.##			NC GAUGE OFF	
SLOW :	###.##			NC START	
FORWARD :	###.##				
GAUGE :	####.##				
PROGRAM (F1)		SAVE (F2)		MANUAL (F3)	
				SETUP (F4)	

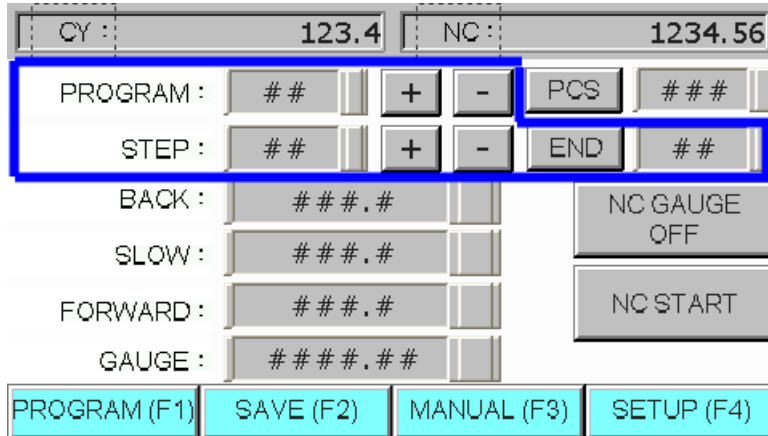
The bottom of the screen are the Function Keys:

PROGRAM: program mode (the current screen)

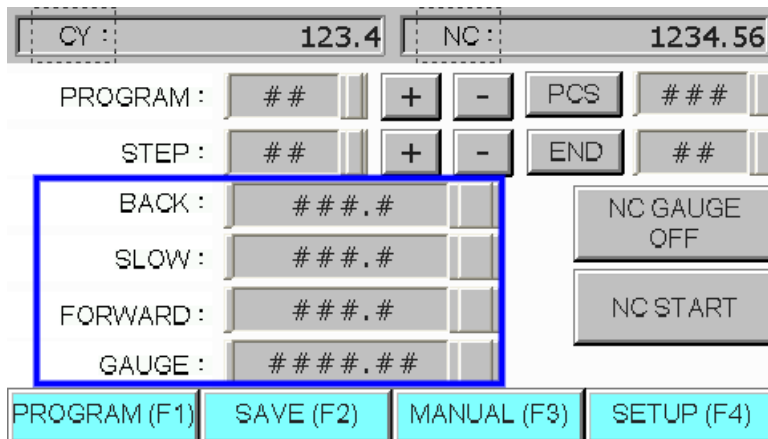
SAVE: save the current program

MANUAL: go to the manual mode to manually move the NC gauge.

SETUP: go to the Setting screen



The controller can store 50 programs, and each program can have up to 10 steps. A program can be considered as a working job, and a step is one bending operation. The END informs the controller the last step of the program. Example, if END=2, then only step 1 and 2 in the program will be executed.



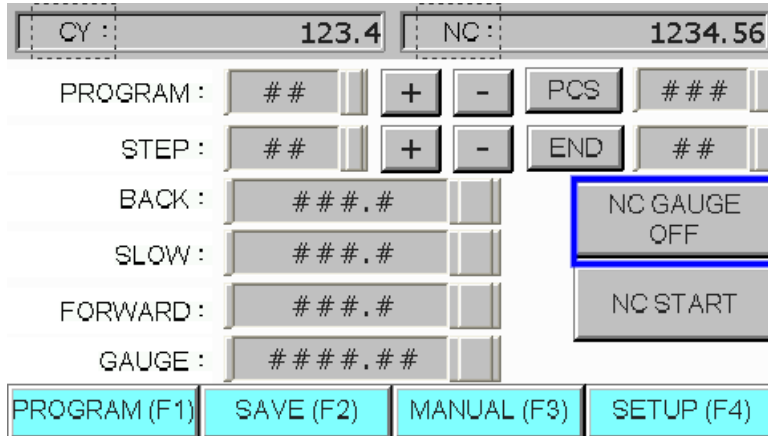
For each STEP, there are 4 parameters:

**BACK:** the back position of the cylinder when retracted.

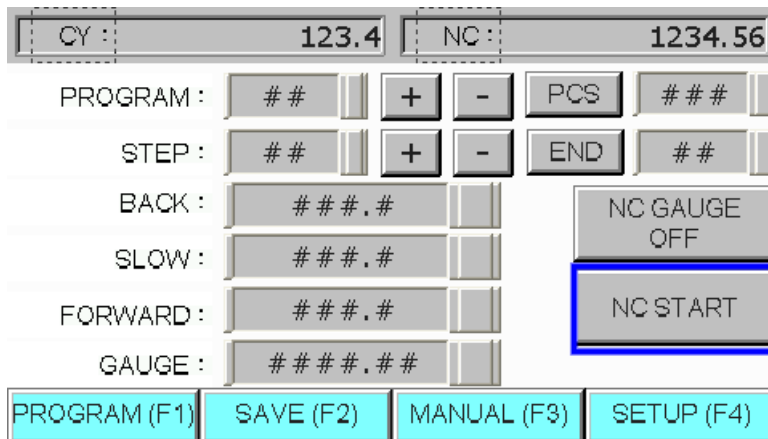
**SLOW:** when moving forward, the cylinder first moves at fast speed and low pressure. When SLOW is reached, the cylinder turns to slow speed and high pressure. The cylinder should be in slow speed before the bending starts. The SLOW position is also the reference point for the NC stopper to retract right before the bend starts (refer to NC stopper section for more detail).

**FORWARD:** The cylinder stops at the FORWARD position. Adjust this position for the angle of bend.

**GAUGE:** This is the position of the NC stopper when the NC gauge function is turned ON.



The NC stopper function can be turned off. By press the NC gauge button for 2 seconds, the NC function is turned to OFF and the stopper moves back to the origin position. Press for another 2 seconds to turn the NC function back ON, but the stopper stay at origin position.



If the NC Gauge function is turned ON, press the NC start button 2 seconds and moves the NC stopper to the position set by STEP 1 GAUGE. Then press the two forward buttons or the foot paddle to execute the STEP 1 bend. After STEP 1 is completed, if there is more steps, the NC stopper will move automatically to the position set by STEP 2 GAUGE. The NC START is only for the first STEP.



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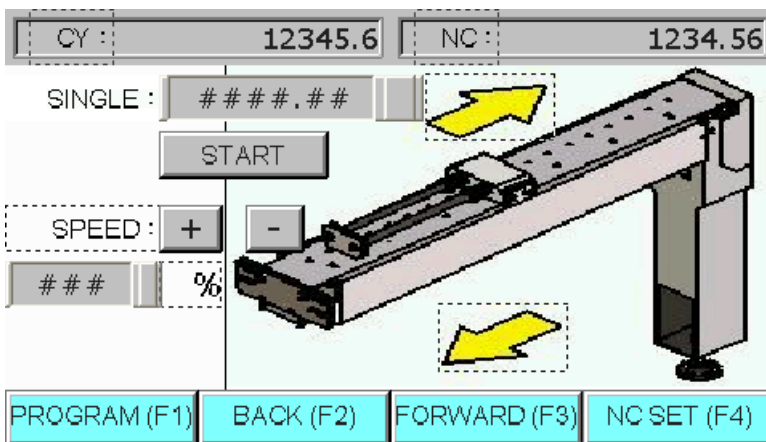
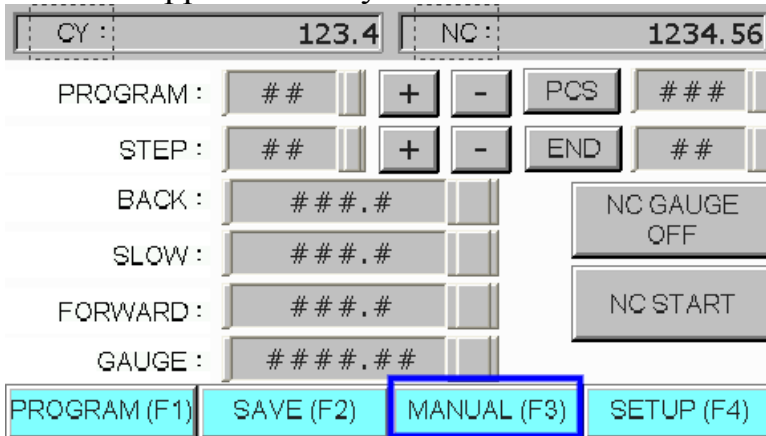
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CY :	123.4	NC :	1234.56		
PROGRAM :	##	+	-	PCS	###
STEP :	##	+	-	END	##
BACK :	###.##			NC GAUGE	
SLOW :	###.##			OFF	
FORWARD :	###.##			NC START	
GAUGE :	####.##				
PROGRAM (F1)	SAVE (F2)	MANUAL (F3)	SETUP (F4)		

This is the counter function. Each time a program is executed and completed, the PCS number increase by one. Press the field and enter zero to reset the counter, or any other number if desired.

**MANUAL mode for the NC stopper:**

Press the Manual button under program screen will go to the manual screen to move the NC stopper manually:



In this mode, you can either use the cursor keys (arrows or the function buttons BACK/FORWARD) to move the NC stopper, or enter a value at the SINGLE field and press START to move the NC stopper to a specific position.

The SPEED field adjusts the speed the NC stopper travels. Either enter a % value, or use the + and – button to change by increment of 10%.

The NC value at the upper right corner of screen shows the current position of the NC stopper.

### Setting Screens:

In the setting screen, the Function key allows switching between the NC SET (NC backgauge setting parameters) and CY SET (cylinder setting parameter). Press the PROGRAM button goes to the program screen.

CY :	1234.5	NC :	1234.56
NC GAUGE SET :		V.:	
		12345678	
ORIGIN SET :	###.##		
STROKE MIN :	###.##		
STROKE MAX :	###.##		
NC SPEED :	#####		
NC BACK AMT :	###.##		
PROGRAM (F1)	SAVE (F2)	CY SET (F3)	NC SET (F4)

### CY SET SCREEN

CY :	1234.5	NC :	1234.56
CYLINDER SET :		V.:	
		12345678	
HOLD TIME :	##.##		
ORIGIN SET :	###.##		
Δ FORWARD :	###.##		
Δ BACK :	###.##		
NC RETRACT :	###.##		
PROGRAM (F1)	SAVE (F2)	CY SET (F3)	NC SET (F4)

**HOLD TIME:** In CONTINUOUS mode, the cylinder moves back and forth between the FWD and BACK positions. At the FWD position, the cylinder can hold for a while before moving back. The hold time set this temporary pause time at the FWD position. If set to zero, the cylinder moves back immediately.

**ORIGIN SET:** the origin position of the cylinder after calibration. Adjust this parameter if the cylinder position is off.

**Δ FORWARD:** If the Forward position is off from the set value, use this field to fine adjust the difference.

**Δ BACK:** If the BACK position is off from the set value, use this field to fine adjust the difference.

NC RETRACT: Right before the bend, the NC stopper retract slightly to protect the stopper from damaged by the bended material. The timing of the retract is a referenced by the SLOW value. If the NC RETRACT is set at zero, thn retract happens at the same time the cylinder reach SLOW position. Enter a positive or negative value here to have the NC stopper retract earlier or later than the SLOW position. **Retract should happen before the bending started.**

**NC SET SCREEN**

CY :	1234.5	NC :	1234.56
NC GAUGE SET :		V :	12345678
ORIGIN SET :	###.##		
STROKE MIN :	###.##		
STROKE MAX :	###.##		
NC SPEED :	####		
NC BACK AMT :	###.##		
PROGRAM (F1)	SAVE (F2)	CY SET (F3)	NC SET (F4)

ORIGIN SET: the origin position of the NC stopper after calibration. Adjust this parameter if the NC stopper position is off.

STROKE MIN: the MIN position of the NC stopper travel. Be sure not to enter a number too small that the NC stopper can be damaged by the bending tool.

STROKE MAX: the MAX position of the NC stopper. This should be smaller than the hardware limit of the machine to provide software limit protection.

NC SPEED: Set the speed the NC stopper travels

NC BACK AMT: Right before the bend, the NC stopper retract slightly to protect the stopper from damaged by the bended material. Set the amount of the retract in this field.

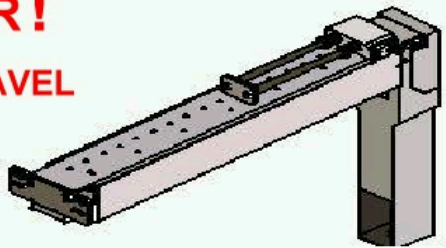
## ERROR MESSAGE

### OVER SOFTWARE MAX. TRAVEL

CY :	123.4	NC :	1234.56
------	-------	------	---------

**ERROR !**

**OVER-TRAVEL**



PROGRAM (F1)	MANUAL (F3)	NC SET (F4)
--------------	-------------	-------------

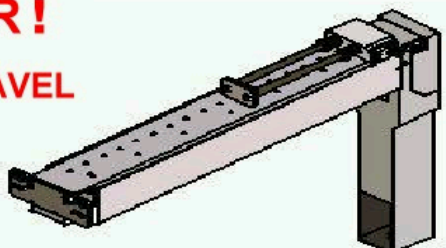
The NC gauges has reached the maximum travel range set by the software max. limit. Use the manual mode to move the NC gauge forward.

### OVER SOFTWARE MIN TRAVEL

CY :	123.4	NC :	1234.56
------	-------	------	---------

**ERROR !**

**OVER-TRAVEL**

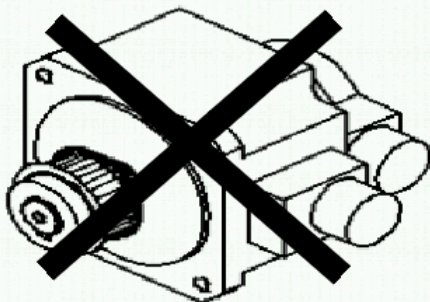


PROGRAM (F1)	MANUAL (F3)	NC SET (F4)
--------------	-------------	-------------

The NC gauges has reached the minimum travel range set by the software min. limit. Use the manual mode to move the NC gauge backward.

### SERVO MOTOR ERROR

CY :	1234.5	NC :	1234.56
------	--------	------	---------



The Servo motor driver sense an error at the servo motor. This may be caused by torque exceeding the motor limit, or a hardware error. Check the motor for cause of problem. If unable to solve the problem, contact Sunrise dealer for service.



**※Input Layout List:**

INPUT	Description	Memo
X00	Servo Motor Z value	
X01		
X02	Optical gauge Z value	
X03	Optical gauge A value	
X04	Optical gauge B value	
X05		
X06	NC origin sensor	
X07	Servo Motor Ready	
X10	CYLINDER BACKWARD	
X11	CYLINDER FORWARD BUTTON 1	
X12	CYLINDER FORWARD BUTTON 2	
X13	CYLINDER FORWARD FOOT SWITCH	
X14	PUMP ON	
X15	CONTINUOUS mode	
X16	JOG mode	
X17	MANUAL mode	
X20	NC Max. limit switch	
X21	NC Min. limit switch	
X22	FOOT operation mode	
X23	HAND operation mode	
X24	Cylinder origin position sensor	
X25		
X26		
X27		



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**※Output Layout List:**

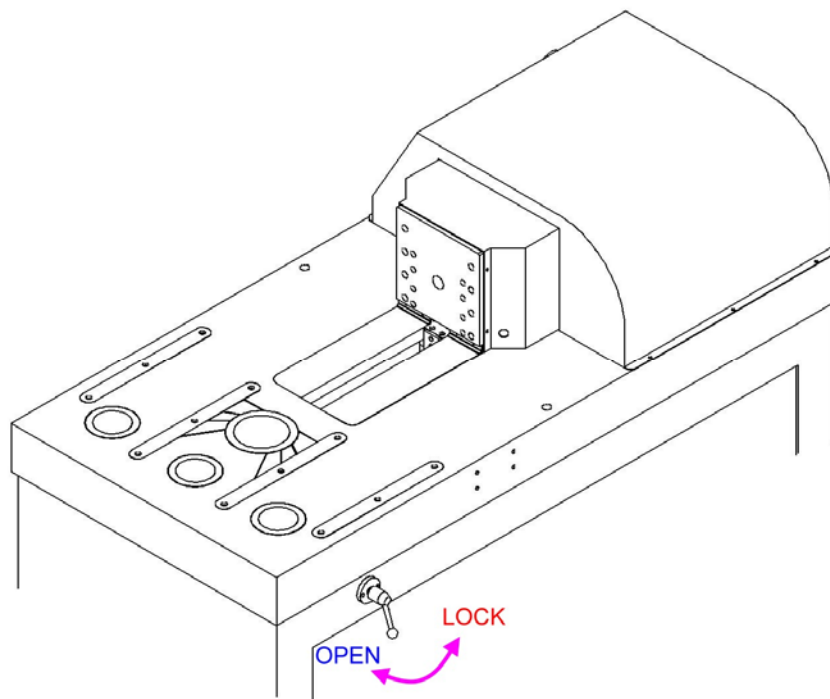
OUTPUT	Description	Relay
Y00	Servo motor turn	
Y01		
Y02	Servo motor turn	
Y03		
Y04	Cylinder foward	SSR1
Y05	Cylinder backward	SSR2
Y06	Cylinder fast mode	SSR3
Y07	Pump ON	KA1

## OPTIONAL TOOLING

The bending machine can be used with a variety of optional tooling including various bending tool, punching, shearing, profile strengthening, and well as many custom made tooling.

Depend on the tooling, the upper die set is fixed at the cylinder head block, and the lower die set is fixed using one or combination of the  $\varnothing 83\text{mm}$  and  $\varnothing 58\text{mm}$  fixing holes. The  $\varnothing 83\text{mm}$  fixing hole has a handle on the backside of the machine for lock up the tool. After install the tooling, turn the handle to right to lock the tool. Lose the handle to left before uninstall the tool.

Because this manual cannot cover all the possibility of the optional tooling, the user should refer to the appropriate instruction for the specific tooling for installation, operation, and maintenance.



## MAINTENANCE

### 1. **Before operating the machine:**

Routinely check the electrical power cable and the foot switch cable for any loosening or damage.

Clean all slugs, cut off pieces, and other waste material from and around the machine.

### 2. **Filter and Oil Change:**

Take off and clean the suction filter inside the oil tank every time when changing oil. The first oil change should be performed after approximately 600 operating hours. Further oil change is needed for every 1200 operating hours. A drain outlet is located at the base of the oil tank.

Screw back the cleaned suction filter after the draining the oil. If the suction filter is damaged or clogged, replace the suction filter. Do not mix different brands of oil.

Hydraulic Fluid (or equivalent)

Mobil	DTE 46
Esso	Nuto H46
Shell	Tellus 46 or Hydraulic oil 46
B.P.	Energol HLP 46
Castrol	Hyspin AWS 46 6018

### 3. **Oil level:**

Make sure the hydraulic oil level is in the range indicated on the oil level gauge. It is better to keep the oil level close to the high mark indicated on the gauge.

**4. Oil temperature:**

The oil temperature should be under 50 degrees Celsius. If the upper/lower limit switches are not set correctly for unloading of the pump, the oil temperature can raise quickly. Adjust the limit switches so the pump will be in the unloading condition.

**5. Hydraulic pressure:**

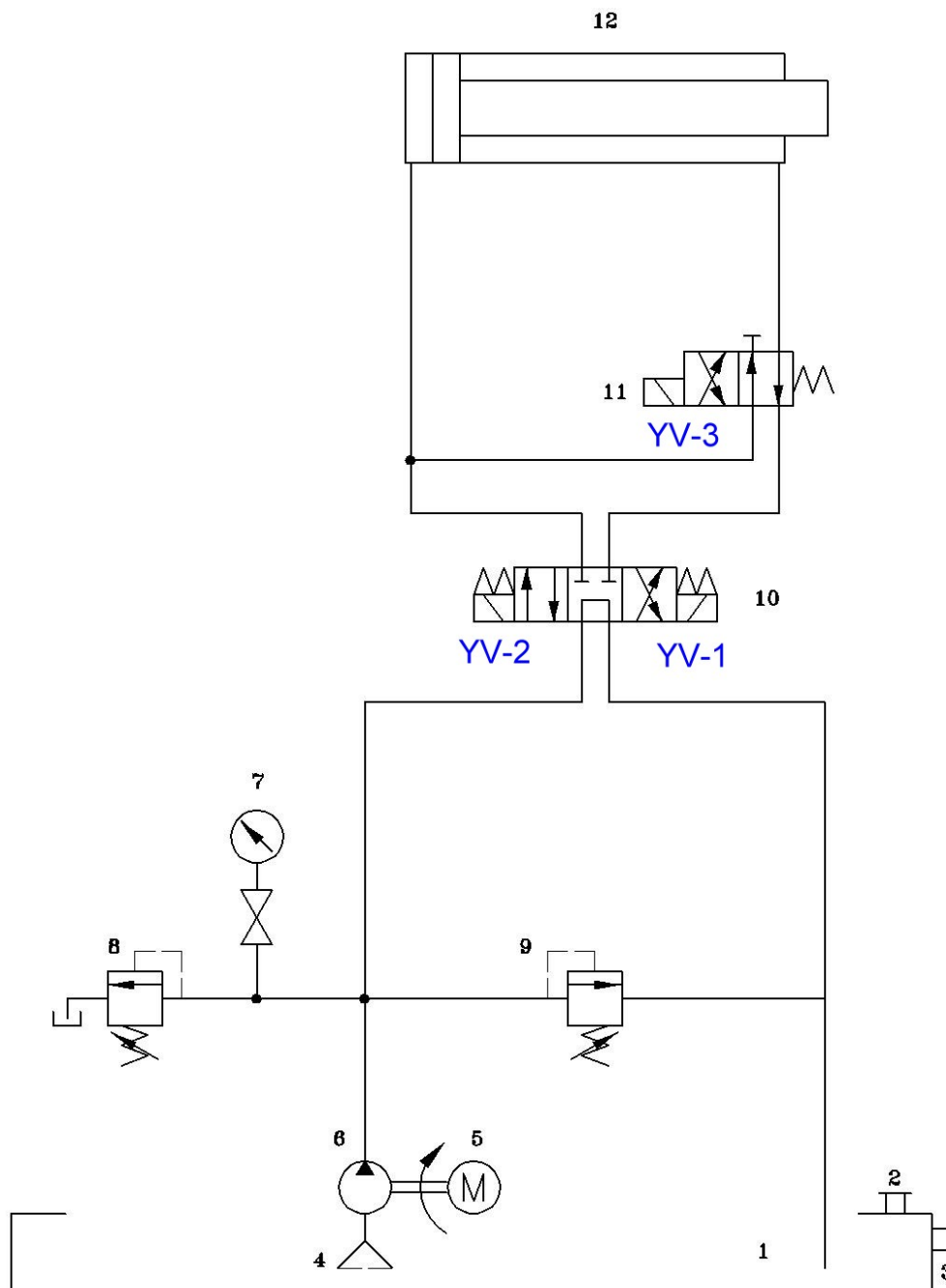
The working pressure of the hydraulic system is pre-set in the factory. There is a pressure gauge to indicate the working pressure of the machine. The pressure gauge should normally be closed and be used only during service/maintenance work.

Model	<b>HBM-40NC</b>	<b>HBM-75NC</b>
Max Pressure	210 Kg/cm <sup>2</sup>	210 Kg/cm <sup>2</sup>

**AIRBORNE NOISE**

The continuous airborne noise level of the machine under normal condition is approximately 75 dB ± 5 dB.

## Hydraulic Circuit HBM-40NC , HBM-75NC



6203201 03/2005

**SUNRISE Fluid Power Inc.**

No. 7, Road 12, Industrial Zone, Taichung City 407, Taiwan

Tel: 886-4-2359-1190

Fax: 886-4-2359-3409

sales@sunriseiw.com.tw

www.sunriseiw.com.tw

## Hydraulic Circuit Parts

### HBM-40NC

No.	Description	Qty	Specification / Part No.
1	Tank	1	6102910B
2	Breather & Filter	1	OLHW-HY-08A
3	Oil Level Gauge	1	OLHW-LG-4
4	Suction Oil Filter	1	OLFL-MF-086
5	Motor	1	5 HP (3.75 kW)
6	Pump	1	Gear Pump
7	Pressure Gauge	1	OLOV-35DSK
8	Relief Valve	1	OLOV-DG-02-H-22
9	Relief Valve	1	OLOV-RPEC-FAN
10	Solenoid Valve	1	OLSV-DFA-02-3C60
11	Solenoid Valve	1	OLSV-DFA-03-2B3
12	Cylinder	1	6103900C

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## Hydraulic Circuit Parts

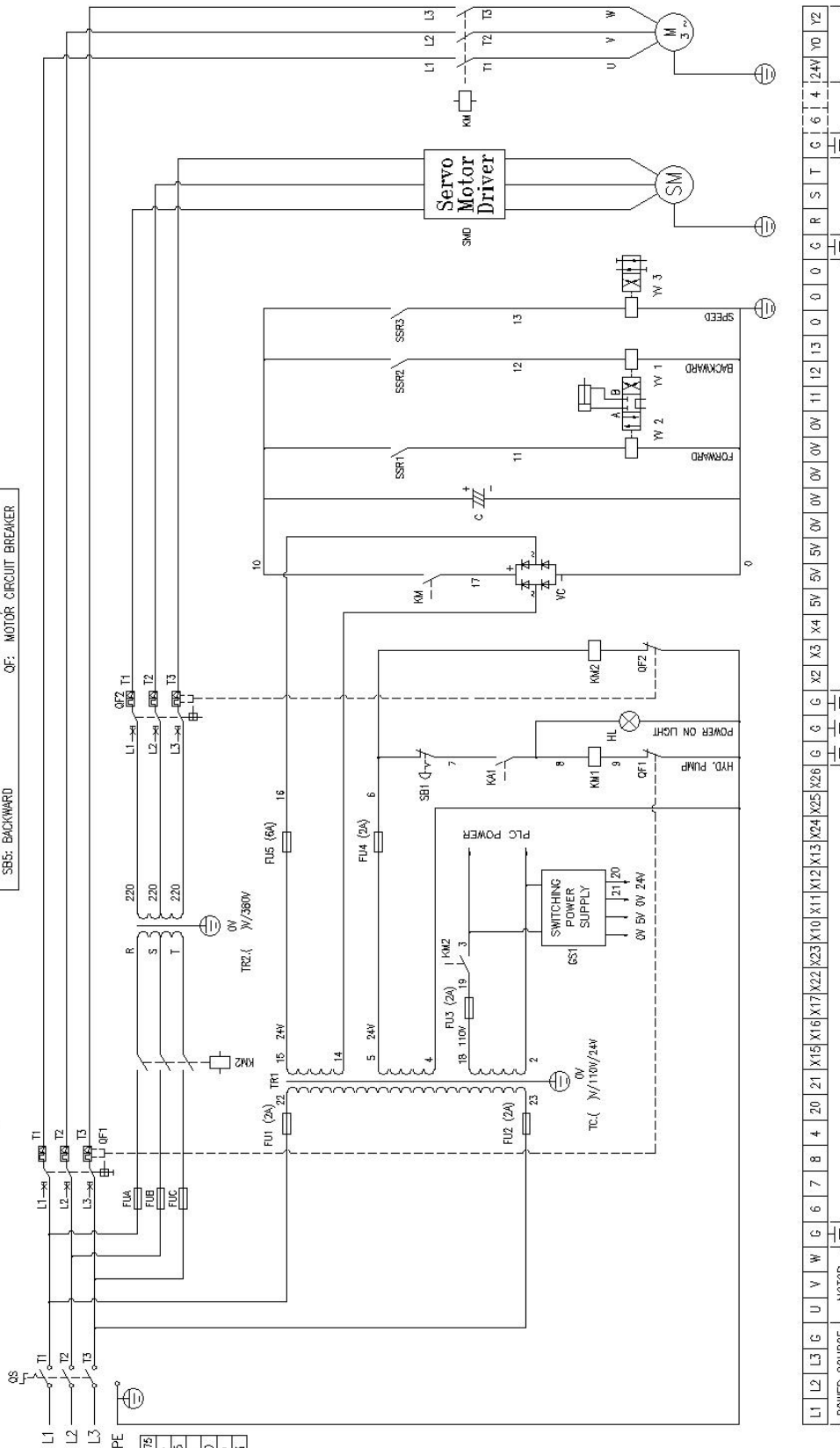
### HBM-75NC

No.	Description	Qty	Specification / Part No.
1	Tank	1	6202910
2	Breather & Filter	1	OLHW-HY-08A
3	Oil Level Gauge	1	OLHW-LG-4
4	Suction Oil Filter	1	OLFL-MF-086
5	Motor	1	7.5 HP (5.625 kW)
6	Pump	1	Gear Pump
7	Pressure Gauge	1	OLOV-35DSK
8	Relief Valve	1	OLOV-DG-02-H-22
9	Relief Valve	1	OLOV-RPEC-FAN
10	Solenoid Valve	1	OLSV-DFA-02-3C60
11	Solenoid Valve	1	OLSV-DFA-03-2B3
12	Cylinder	1	6203900B

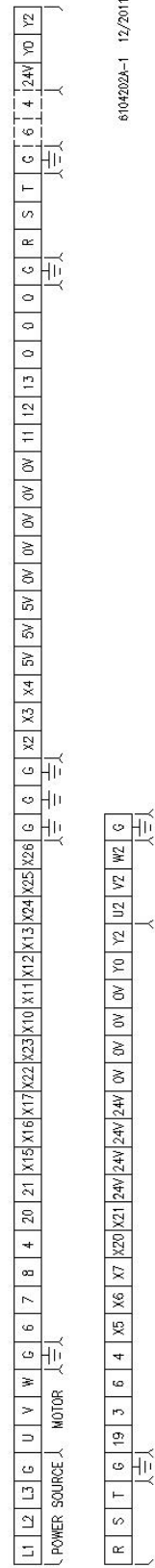


**Electrical Circuit**  
**HBM-40NC, HBM-76NC**

- SB1: EMERGENCY STOP
- SB2: PUMP ON
- SB3: FORWARD
- SB4: BACKWARD
- SB5: PUMP OFF
- FS: FOOT SWITCH
- SA1: MANUAL/CONTINUOUS/JOG
- SA2: HAND/FOOT
- QF: MOTOR CIRCUIT BREAKER



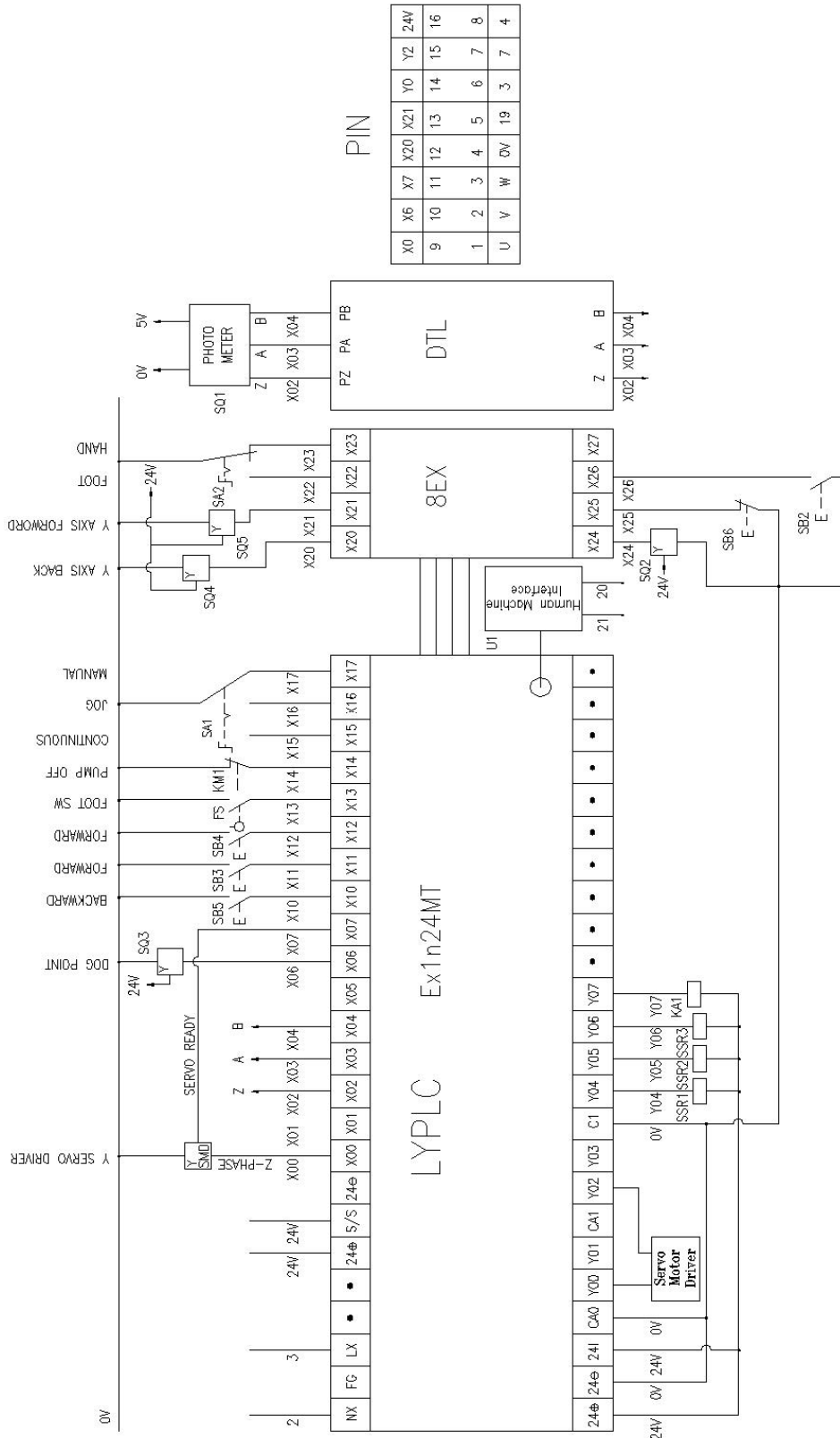
Model	HBM-40	HBM-76
HP	5	7.5
KW	3.75	5.625
Phase	3	3
V	380	380
Hz	50	50
AMP(S)	8	12.3



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## PLC I/O layout

*Electrical Circuit*  
HBM-40NC, HBM-75NC



## Electrical Parts

### HBM-40NC, HBM-75NC

Code	Description	Maker	Model	Specifications
QF	Motor Circuit Breaker	TE	GV2-ME14	6-10A
FU1,FU2,FU3 FU4	Fuses	Bussmann	FUSE-2A	2A
FU5	Fuses	Bussmann	FUSE-6A	6A
QS	Isolator Switch	ABB	OT16F3	Circuit Interrupter
SB1	Push-Lock Push Bottom	TE	XB5AS542	Emergency Stop
SB2	Flush Push Bottom (Green)	TE	TEXB5AL42	Pump On
SB3+SB4	Two-hand Push Bottoms	TE	ZB5-AA3	Forward
SB5	Push Bottom	TE	ZB5-AA2	backward
SA1	Selector Switch	TE	ZB5-AD3	MANUAL/CONT/JOG
SA2	Selector Switch	TE	ZB5-AG2	HAND/FOOT
FS	Foot Switch	SSUPOU	YC-135N/1A1B(BNA)	Foot Switch Control
KM1	Magnetic Switch (Contactors)	TE	TENLC1D25B7	25A/ AC24V
VC	Bridge Rectifiers	FY	KBPC2506	KBPC2506
TC	Transformer	SUENN LIANG	SP-TBSW-1025D	(CE)350VA secondary instrument:110V(1.5A)24V(6A) 24V(1A)
SSR1	Solid Relay	FOTEK	SSR-10DD	Forward
SSR2	Solid Relay	FOTEK	SSR-10DD	Backward
SSR3	Solid Relay	FOTEK	SSR-10DD	Slow
<b>YV1 / YV2</b>	Solenoid Valves Coil	Dofluid	DFA-02-3C60-DC24V-35	Forward / Backward
<b>YV3</b>	Solenoid Valves Coil	Dofluid	DFA-03-2B3-DC24V-35	Slow
SQ1	Photo Meter	Mitutoyo	AT216-250T / AT216-350T	Stroke gauging meter
PLC	PLC	LIYAN	EX1N24MT	PLC controller
U1	Human Machine Interface	DELTA	DOP-B05S100	Interface Screen
<b>GS1</b>	Switching Power Supply	<b>MW</b>	52201NED35B	For Photo Meter and Interface
SB6	Flush Push Bottom (Red)	TE	XB5-AL42	Pump Off
<b>SQ2</b>	<b>SENSOR</b>	<b>OMRON</b>	<b>TL-Q5MC1-Z (NO)</b>	<b>Cylinder origin position sensor</b>
<b>SQ3</b>	<b>SENSOR</b>	<b>OMRON</b>	<b>TL-Q5MC1-Z (NO)</b>	<b>NC origin sensor</b>
<b>SQ4</b>	<b>SENSOR</b>	<b>OMRON</b>	<b>TL-Q5MC2-Z (NC)</b>	<b>NC Max. limit switch</b>
<b>SQ5</b>	<b>SENSOR</b>	<b>OMRON</b>	<b>TL-Q5MC2-Z (NC)</b>	<b>NC Min. limit switch</b>
SM	Servo motor	Mitsubishi	52305HFKP43K	Servo motor
<b>SMD</b>	<b>Servo motor driver</b>	<b>Mitsubishi</b>	<b>52501MRJ340A</b>	<b>Servo motor driver</b>
8EX	PLC expander	LIYAN	EX1S08EX	EX1S08EX

## Annex 1

### Specifications

Model	HBM-40NC	HBM-75NC
Cylinder Force	40 Ton	75 Ton
Cylinder Stroke Length	250 mm	350 mm
Forward Speed (Low Pressure)	28.19 mm/sec	29.6 mm/sec
Forward Speed (High Pressure)	9.59 mm/sec	7.4 mm/sec
Return Speed	14.54 mm/sec	9.87 mm/sec
Fixing Holes	Ø83 mm x 1, Ø58 mm x3	Ø118 mm x 1, Ø83 mm x 3
Bending Punch Height	200 mm	300 mm
Bending Capacity (Single-V Die)	200 mm x 12 mm	300 mm x 12 mm
Optional Tooling		
Punching Tool Capacity	Ø30 x 9	Ø30 x 15
Flat Plate Shear (W X T)	175 x 12	175 x 16
Pipe Bending Range (90° Bend)	Ø3/8"~Ø2"	Ø3/8"~Ø2"
Straightening Tool (Max Profile)	200 mm	300 mm
Working Height	930 mm	950 mm
Electric Power	5HP	7.5HP
Net Weight	880 kgs	1880 kgs
Gross Weight	1030 kgs	2080 kgs
Machine Dimension (Apr. mm)	1340 x 640 x 1185	1780 x 800 x 1250
Packing Dimension (Apr. mm)	1610 x 800 x 1465	2050 x 960 x 1530



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