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Sohal

HYDRAULIC METAL GATHERING MANUAL

INDEX:-

BASIC THEORY OF METAL GATHERING

Heat the metal to its plastic state then apply a force to gather it.

HOW ELECTRICAL METAL GATHERING WORKS

Electric powered metal gathering heats the iron road on the principle of $E = IR^2$. Where E is energy (need to heat the work piece), I is supplied current and R is resistance of workpiece measured between electrodes.

The transformer in the machine converts the input electric supply to low volts and high current source, which is suitable for heating the rod. When a high current follows through the rod it will heat up. Simultaneously the rod is pushed from another side to the direction of heating zone . By the combination of heating and pushing it gets a shape of gathered bulb.

Positioning & Mounting

Mount the machine straight. The machines is designed to work only in vertical position. Keep a minimum of 1.5 feet free space around the machine, It helps in cooling, maintenance and daily check the devices attached outside the machine. Position the machine under-roof to prevent it from rain, moisture, sun-heat etc. Never fix Main's Power ON-OFF switch on the machine, it's dangerous. Place the power switch on wall or on a stand near the machine to give ease to operator to switch off the power when machine malfunction. Proper electrically ground the machine. Never mount it near grinder, buffing machine etc. Because these produces metal dust that gear reduction in machine's life and sometimes make short circuit in switches, terminal strips or transformer etc. That results in damage of parts or make dangerous electric spark .

INSTALLATION

Quick Note for required items for installation:

30 KVA Metal Gathering

- Main Supply Cable : Copper Cable (10 or 16 $mm^{2)}$)single core or 2-Core for 2-Phase Supply
- Power Pack Motor Drive Cable : Copper Cable 1 mm^2 3-Core for 3-Phase Supply
- Cooling Circulation : By 1 H.p or 1.5 H.p Water Pump
- Hydraulic Oil. : 160 liter ISO68 Hydraulic Oil

45/50 KVA Metal Gathering

- Main Supply Cable : Copper Cable 25mm^2 single core or 2-Core for 2-Phase Supply
- Power Pack Motor Drive Cable : Copper Cable 1 mm^2 3-Core for 3-Phase Supply
- Cooling Circulation : By 1 H.p or 1.5 H.p Water Pump
- Hydraulic Oil. : 160 liter ISO68 Hydraulic Oil

Connecting Water :

Connect the water supply at input barrel and connect a drain pipe to water output tank. Open the water valve. Switch-on the pump. Wait for a minute and watch all the water outlets, fixed above water out tank , if water falls from all out-lets then it means water circulation is correct.

Note: Always check water circulation before operating the machine

Fill the Hydraulic Oil :

The machine is equipted with hydraulic power pack. Fill the oil tank up to High mark with ISO68 hydraulic oil or equivalent. Tank Capacity: 160 liter.

Connecting Supply :

Connect Electric supply from electric source at the back of machine. Don't forget to connect ground the machine, if grounding bolt has not provided, then open any window bolt near the bottom of machine , Scratch paint around it and tighten the ground wire down the bolt.

Input : 415 - Volts +- 10%, 2-Phase, 50-Hz.

Recommended things :

Cable & Switch according to machine KVA

Voltage : We give no guarantee of machine to work at lower voltages, But the machine is capable to work from 350 volts with some loss in output KVA.

Frequency : The machine is designed to give is optimum performance at 50-Hz supply. In case if you connect it to a 60-Hz source, it will work without any problem but shows some change in current (heat) setting, that is its minimum and maximum current will be little lower.

Press the power on switch on the control panel, be sure heat-on switch is at off position. An indicator if mounted or a voltmeter or a counter indicates the power is connected.

Switch off control panel then switch off the power switch. The power testing is done.

BRIEF DESCRIPTION OF ALL PARTS:

Front Overview:

Back Overview:

Left Overview:

Right Overview:

1. Hydraulic Cylinder: When operation starts it comes down after LS (item 10) pressed and when job starts heating and LS (item 26) triggered it starts moving backward at a speed set from flow control (item 16). Higher the speed lower the diameter of gathered head and vice-versa.

2. Adjustment: Set a gap between upper and lower electrodes according to diameter of job. Minimum is 0.5 inches between upper electrode and lower electrode base plate to prevent short circuit between electrodes Or 2X diameter of job, whichever is grater. Maximum according to requirement or possible in machine.

3,9,13: Slides, Oil these daily.

4. Upper electrode: It holds the work piece from top and supplies current to workpiece. When machine is in production after some time a dump is produced in electrode, if needed rotate the electrode. When electrode would worn replace it with new one.

5. Limit Switch: This is the signal to inform circuit that upper electrode has been come down. When this switch pushed then bottom cylinder (item 22) starts moving upwards.

6. Side Cylinder: It clamps the workpiece.

7. Spring: Helps to return side cylinder before bottom cylinder (item 22). It is needed to quick de-clamp and removal of job.

8. Spring Tension adjustment: Increase spring tension if bottom cylinder goes down before opening clamping by side electrode.

10. Limit Switch: When this limit switch is pushed by clamping operation, the upper cylinder starts moving down.

11. 12: Side Electrodes: These both make a second electrode against top electrode (Item 4) and used for supply current to workpiece

14. Center Adjuster: Use this adjustment to place or clamp workpiece vertically straight and alined with guide (item 20).

15. Lock Nut: After adjusting Item15 . This nut is used for lock the adjuster.

16. Adjuster: Use this adjustment to set the gap between workpiece and left side electrode, before clamp.

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17. Flow Controller: It controls the backward movement of upper electrode. Lower the speed wider the resultant gathered head, Increase in speed results in longer gathered head.

18. Flow Controller: Adjusts the force and speed of bottom cylinder. if job is being white hot or melts. Increase it's speed. If it is observed that gathering process is going at lower temperature than forging temperature decrease its's speed. Otherwise no effect of increased speed.

19&19a. Shafts: Guide the workpiece holder.

20. Workpiece Holder: It holds the work piece. If the workpiece is thin assume 8mm and it bends during operation, use a long holder to support it. Remove it if creating problem in placing long ro.

21& 21a. Oil cups: Fill with lubricator daily to lubricate shafts.

22. Gathering Cylinder: Hydraulic Cylinder apply necessary force on workpiece to gather it.

23. Adjuster: Set the workpiece holder height according to length of workpiece.

24. Control Panel: All electrical controls are placed on It and control circuit is inside it.

25. Limit Switch: When this switch triggers gathering operation stops and workpiece will be free to remove from machine.

26. Limit switch: When this switch triggered top electrode starts moving upwards. Set it as it will be triggered after moving of bottom cylinder 0.5 inches or more. see line 1

28. 29. Lifting Hooks: Machine is balanced on these hooks, use these to lift the machine.

31. Supply Cover: A connection plate and Insulators placed under this cover for connecting Power Supply. Please Note, Behind connection plate SCR are placed whether on cooling fills or a Water Cooled SCR assembly booth these components carry supply voltage and are bare without any safety insulation.

41. Hydraulic Power Pack:

51. Water Inlet: Connect cooling water at Inlet.

52. Water Outlet: The water out from all pipes fall in this tank. A plug is provided at bottom of it to connect drain pipe. Note: Check daily that water comes out from all pipes. If water is not coming from some pipes the input water pressure or flow of water is low. Correct the water supply. A quarterly cleaning (de-scaling) of water pipes is necessary by sulfamic acid (H3NO3S) or approved de-scaling chemical in your country. Please make contact with a service provider that provide cleaning service for dyeing plants for de-scaling machine pipes. De-scaling is necessary if you are using normal water. otherwise you may use distilled water.

53. MCB: Connect 3 phase power supply here for hydraulic power pack motor.

Start operating Machine

Initialize:
Open the cooling water.
Switch On Hydraulic Power Pack Motor.
Switch on the mains.
Switch on the power on switch on the control panel.
A indicator or a meter lights shows power is on.
Check Heat On switch should be On.

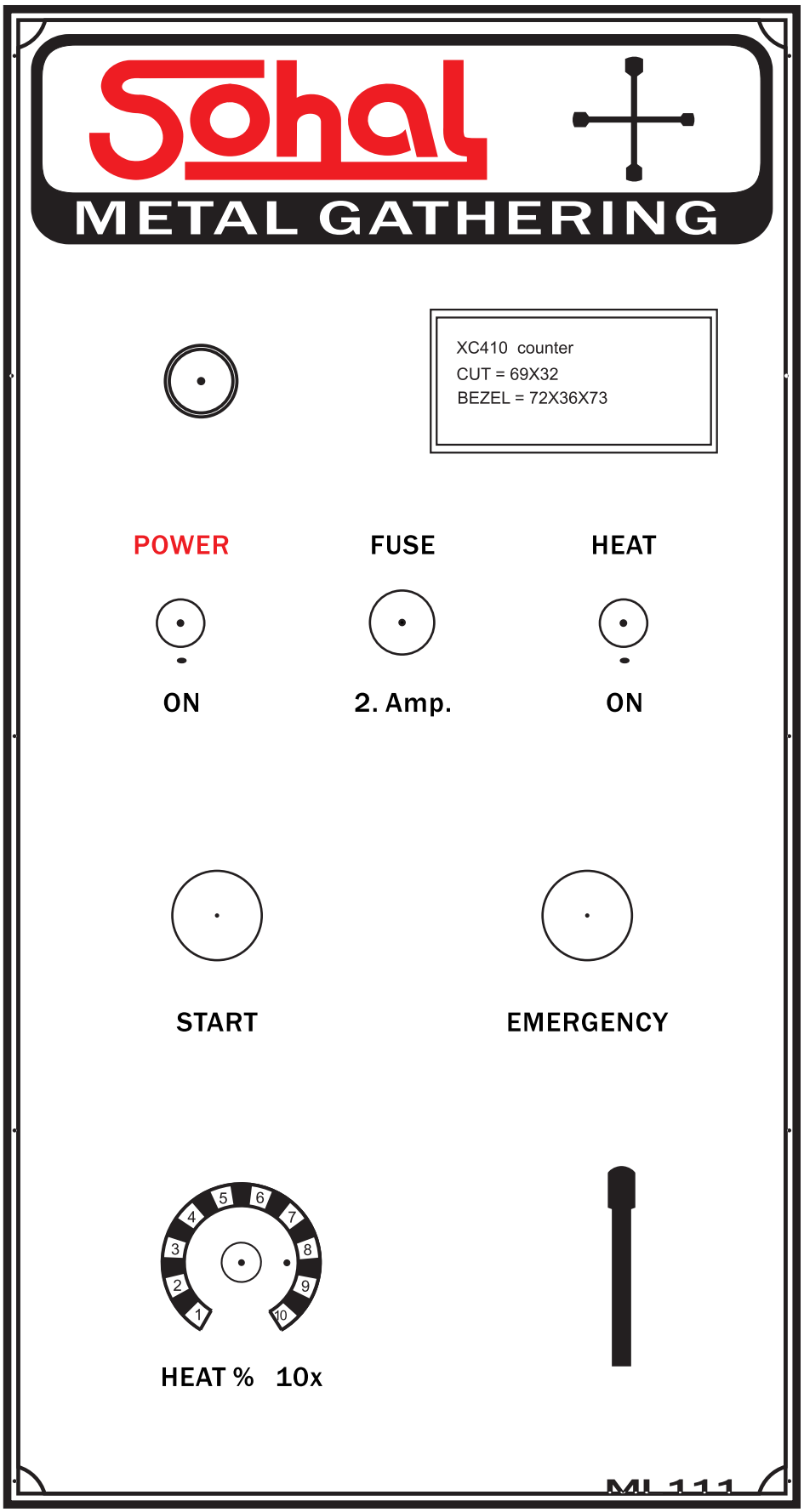
Start Operation:
Put a rod on stay plate, the gap between rod and upper electrode should be in-between 0 to 5 mm, according to rod length adjust the stay plate up or down. And set limit switches accordingly.

Command
Push the start button.

Action
The rod will be clamped and confirmation switch (item 10) pushed. After that Upper electrode will comes down and confirmation switch (item 5) pushed. After that bottom cylinder starts pushing the rod upwards and also heating current is on with in 0 to 2 seconds. (set from timer inside panel). and it triggers the switch(item 26). Triggering of switch starts upper cylinder moving back. The gathering operation will be in progress. After a set limit from Limit switch (item 25). Rod will be de-clamped and ready for next process. Both cylinders will come back to their home position. And Limit switch (item27) will be pushed and it free the hydraulic load. Machine is ready for next operation.

Note:
Press EMERGENCY button any time in-between gathering process to stop gathering.

LAYOUT OF CONTROL PANEL



ADJUSTMENTS

Hydraulic Pressure : Idle between 35 to 60 Kg/cm square.

Flow control item 17 : Set the speed of upper electrode, so that it moves back (up-side) slower or fast.

Flow control Item 18 : It controls the lower cylinder speed. Operator can set it to maximum speed, if rod will not be bent by lower cylinder's excessive force. Please note cylinder speed can only be seen, if you operate the machine with-out rod (work piece).Much lower set speed stops the up-wards movement of rod hence stops gathering process and a little blast can be happened between upper and clamping electrodes. But it has no bad effect or damage to machine.

Heat (Current) : Maximum the heat maximum the gathering speed and maximum load on electric supply.
Lower current setting stops the gathering process or much lower gathering speed and insufficient heat for forging.
Excessive current put the material out from rod and over heats the rod.
Adjust the speed so the rod will gather with in 15 to 45 seconds. As suitable for your job.

Connection Diagram

APPENDIX A

Forging Temperature for Iron = 1230 degree Celsius.

Supply Formulas for (1 or 2 phase load) :

$$KVA = \frac{\text{Supply Volts X Current}}{1000}$$

KW = KVA X P.F.

If P.F. can not measured assume it 0.8, because it is average power factor of good quality machines.

Calculation of electricity cost :

Cost = KW X Machine load Time (in hours) X cost per unit

Note 1 : load lime is the time for which machine actually consume electricity, when machine is On but not gathering work piece that time can not be included in load time.

Note 2 : 10 minute = .166 hours
30 minute = 0.5 hours

APPENDIX B

Cracking: If a crack or flaw is seen after forging or in finished product. There is no role of machine, these cracks was in your raw workpiece (rod). Use another testing method to find cracks in rod without gathering it.