



CT-R04

SMT HOT AIR REFLOW M/C

USER'S MANUAL

WAH LUEN ELECTRONIC TOOLS CO., LTD

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Brief introduction

The CT series reflow m/c that produced by our company is applying to SMT machining industry widely. As the newest high efficiency and save energy far infrared hot air reflow M/C, has the advantages of heat exchange, convection and radiation. Adopt heat directly far infrared heater, which has high diathermanous efficiency and rapid respond speed. The wavelength of the peak value is 4mm, which belongs to far infrared, it has very low color selectivity. Equip round camber reflector can eliminate “Shadow Effect” basically. MJ series reflow m/c have many models can be chosen by clients, we also have made to order.

Characteristic of product:

- 1、 Carrying net-belt is made of stainless steel, working smoothly and unswervingly。
- 2、 The transmission of the carrying net-belt is drove by nonpolar speed adjusted motor.
- 3、 The working speed displayed by numbers (mm/min), directly and exactly.
- 4、 All of the temperature districts are adopt double display number type intelligent temperature controller.
- 5、 Heater is controlled by solid state relay, stable, reliable and no noise.

Equipment installation

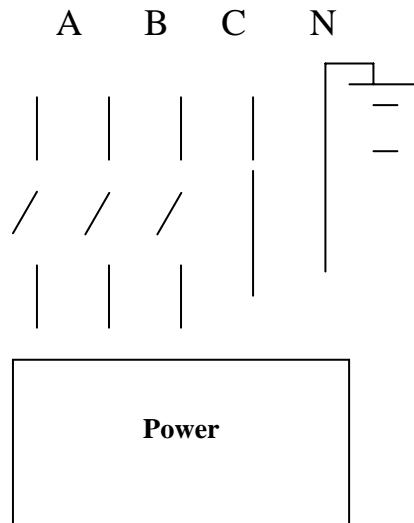
Machine installation

After make sure the putting place of the equipment, raise the four adjustable truckles of the machine and make them leave the floor by spanner, measure the height of the four corners is the same from the floor by tapeline, let the plane of the stainless steel carrying net-belt keep level. The purpose is let the tin-paste melted and by dint of the surface tensility and form the best figure.

Electric installation

All of the CT-R04 series reflow m/c apply from 220V /50HZ AC, the way of power supply is three-phase four-wire system, the picture of connecting wire as follows:

(Red) Red) Red) (Black) (Color)



OPERATION

1. Power on

After finishing the assembly of the machine and confirming the assembly correct, Power on step could be started. Here below are the specific steps:

Pressing the green “START” button, and the temp-controller indicates “ROOM TEMP”;

Tuning the speed knob to the recommended speed; then the conveyor will run normally;

Switching on all the yellow buttons (the LED lights),

When the temps (displayed in green) sensed by the temp-controller of all the heating zones equal the temps-value (displayed in orange), it means then the Power on operation finishes normally. It will take about 20 minutes or so to finish the whole Power on operation, and the status indicator will be lighting green.

2. Power off

When the machine is supposed not to be used for a period of long time, the Power off operation is recommended to be applied. Here below are the specific steps:

Switching off the yellow buttons of all the heating zones;

Pressing the red “STOP” key when the internal temp showed by the temp-controller is lower than 100°C; then the machine is in power off status.

Switching off the outer power supply (e.g. : pull out the plug of the machine)

3. Warning

When abnormal working status arise (temps of the heating zone are too low or too high), the working status indicator will flashing red.

CONVEYOR SPEED SETTING

The value displayed when the machine works means the length the conveyor passes in a minute (unit: mm). The conveyor speed has been pre-calibrated before the machine comes out from factory, and the conveyor speed can be adjusted by users according to their use.

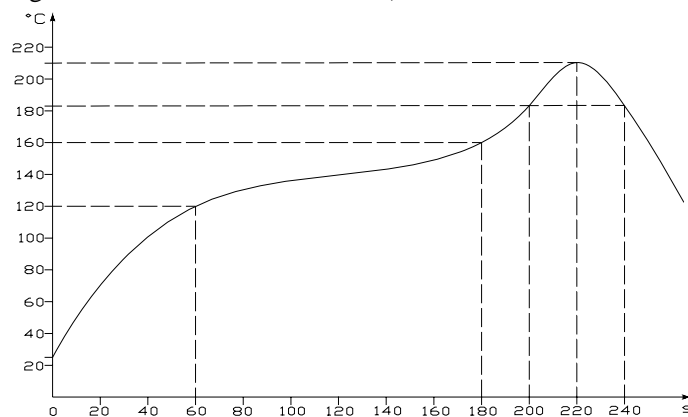
$$\text{Conveyor speed} = \frac{\text{Length of the heating zone (mm)}}{\text{Time used to pass the heating zone(min)}}$$

Model No.	Length of the heating zone (mm)
CT-R04	1000

NOTES: N/A for the Length of the heating zone of the machine of special specification.

To get the ideal reflow soldering effect, users can set-up the conveyor speed according to the below functional diagram provided by the tin supplier which indicates the functional relationship between the temp of the tin and the time consumption.

E.g. (functional diagram of some certain kind of tin)



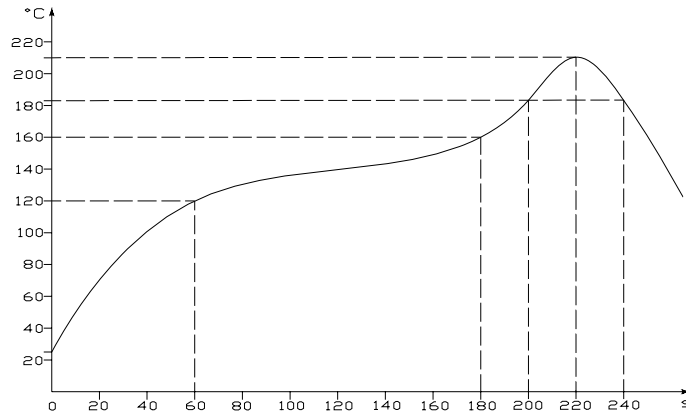
According to the diagram, a complete process of the tin reflow will take about 4 minutes, and apply the above format of conveyor speed; we can calculate the conveyor speed as below:

$$\text{Conveyor speed} = \frac{\text{Length of the heating zone (mm)}}{\text{T (min)}} = \frac{1000}{4} = 250\text{mm/min}$$

So the conveyor speed could be adjusted to around 250mm/min, and then users can take the real soldering effect for reference and thus make some tiny changes to the conveyor speed to obtain ideal soldering effect.

DRAWING THE FUNCTIONAL DIAGRAM

The functional diagram indicates the heating zone temp varying with the time consumption shown at the SMA points. According to the diagram, normally a whole process of reflow could be divided into four steps as shown below, i.e.: pre-heating, preserved-heating, reflowing, cooling.



Pre-heating: according to the difference of the tin used and the components applied on the SMA, the temp during this step generally should be at between 110°C to 130°C, and the temp rising speed should be not more than 3°C/S.

Preserved-heating: the general temperature is 140°C~160°C, the pre-heating time will be decided according to the area with heat voltage of the SMD、PCB in the component and the thickness of the PCB board, the tin plasm that is used.

Soldering: summit temp for soldering should varies with the tin used, normally, summit temp for soldering is recommended to be 20°C to 40°C higher than the melting point temp of tin.

E.g.: 63Sn/37 Pb, the melting point temp is 183°C, then the summit temp for soldering should be 210°C to 230°C, and the reflow soldering time consumption is 30s to 50s, and during the process, not more than 20s should be used for soldering when the temp is between 215°C and 225°C, while not more than 10s when between 225°C and 230°C.

Bubble-soldering will arise the short soldering time is applied to those components of high heat-resistance.

Cooling: the descending temp speed should be around 3 to 10°C/S, and the temp would be considered fine when it descends to around 75°C.

The exact heating zone will be different by the testing methods, places and the loading situations of SMA. The test of heating zone of reflow m/c, generally, K-type thermocouple is adopted to use to put in hearth together with SMA components for testing temperature curve line of the reflow oven, the diameter of the thermocouple should be 0.1—0.3mm. before testing, set the speed of the conveyor first according to the production output, but note that the speed of the conveyor can not exceed the maximum speed allowed by the reflow ovens, means it need to meet the pre-heating rising temperature rate $\leq 3^{\circ}\text{C/S}$. plus the soldering peak value and reflowing time. Set the temperature of each heating zone accordingly, after the stable temperature inside the oven is confirmed, then measure the temperature of the hearth., then the temperature curve line can be

trace out point by point. Compare the traced out curved line with the heating of tin slurry curved line provided by the supplier for the further correction of the hearth temperature curve line, then you can test the soldering effect of the PCB board attached with accessories when it basically inosculate and do the final correction of the hearth temperature curve.

ATTENTION

Heating temperature should be carefully set in accordance with the tin slurry heating chart before starting the machine and strictly supervised during the following jobs in order to get max output under a super-auto SMT production conditions. Wasted PCB will be suggested to assist the digital temperature monitor of the machines in use in order to get the tin slurry heating chart..

DESCRIPTION OF FUNCTIONS OF THE HEATING ZONES

HEATING ZONE 1 (PRE-HEATING ZONE)

Heating zone 1 is pre-heating zone, as well as temperature rapidly rising zone used to pre-heat PCB and improve the temperature of tin slurry to meet the boiling point. Heating zone is the key in the bottom heating policies. After the energy enters into the heating zone 1, generally there will be enough time to conduct and radiate to the PCB board so that the board heating will be balanced.

HEATING ZONE 2 (DRY ZONE)

The above heating zone is long heating zone, PCB will stay the longest time in the heating zone, after the rapid pre-heating in the pre-heating zone, when the PCB board passed by these heating zones, the impact of the PCB will be very small, under such conditions of almost balanced temperature, and the tin slurry catalyzed at high temperature, the individual physical and chemical reactions of all kinds of elements expeditiously happen, and apply PADS plated copper, tin to the PCB, well prepare for the following melting and reflowing of the applied tin slurry, and the applied tin slurry will be slowly dried.

HEATING ZONE 3 (REFLOWING ZONE)

This heating zone represent the reflowing zone, the heating device in the heating zone 3 will provide more energy to the PCB, generally, the temperature pre-setting value in heating zone 3 is the highest, therefore, the PCB top can form to reflow.

HEATING ZONE 4 (AID HEATING ZONE)

This heating zone represents the aid heating zone, its purpose is to lessen the temperature difference between the top and the bottom of the PCB, so that the basis board will not warp and deform.

Note: the above function zones in the heating zones take the reflowing oven in heating zone 4 as an example, actually, the principle and distribution of machines with all kind of models of their function zone in heating zones are basically same as it.

SETTING OF THE HEATING ZONE

1. Set the temperature in the heating zone and speed of the conveyor at the starting value(usually given by the manufacturer when adjusting the device)
2. For cold oven, 15-25 minutes should be applied to pre-heat.
3. Heating curve line can be suitably adjusted according to the complex of the PCB, can be micro controlled by the speed of the conveyor(1—5% speed of conveyor),reducing the speed of the conveyor will improve the heating of the product, in the opposite side, rising up the speed of the conveyor will reduce the heating of the products.
- 4.Tips: generally, you can suitably adjust and put back to the reflow system for soldering when the PCB board attached with accessories pass through the reflow system without completely reflow, it will not cause bad influence to the accessories.
- 5.Usually temperature is set from low to high, if the heating temperature scope is much more than the reflow temperature, then you need to adjust by improving the speed of the conveyor or reducing the setting temperature accordingly.

Attached setting reference

Speed	Zone 1	Zone 2	Zone 3	Zone 4	Remark
250	220±15℃	180±10℃	230±15℃	170±15℃	Solder paste
300	200±5℃	150±5℃	150±5℃	150±5℃	Glue

It approximately take 4—5 minutes for the whole reflow, the setting of the temperature are only for reference, because different PCB board demands different heating time and quantity of heat given by the reflow ovens according to the different heat conducting rate quantity of heat sucked.

For double and multiple boards, more area and bonding board PCB, their setting temperature will be higher comparatively. But for single board or paper-tape or different area and less bonding board PCB, their setting temperature will be lower comparatively. On another side, they are also relative to the quantity of boards laid with unit time. But in the normal production, reflow ovens have their own adjustment system to transformation of the ordinary PCB boards, Reflow ovens could be normally operated at the recommended temperature during the training period, unless the sucking quantity of the heat of the PCB board changed particularly big, then that is the time to adjust accordingly.

DOUBLE-SIDED SOLDER

Hot reflow ovens can be used to the soldering of the double sides surfaces of the accessories. The double-sided solder design means the PCB' 2 sides have accessories attached to their surfaces and need to be soldered. Double-sided solder including two modes: double-sided tin solder, single-sided tin solder and the other side glue dried

Mode of single -sided tin solder and the other side glue dried will be much easier, just need to finish soldering one side, and dry up the glue on the other side at lower temperature, after finishing the double-sided SMT work, then go on with the plug-in units or application of tin.

Double-sided tin solder are usually done by the following process;

1. Finish the reflow solder of the accessories on side A according to the normal artwork.
2. Put the PCB up-side down, repeat the normal process and adopt top heating on the top policy to process the reflow soldering on the side B, and the up-side down side A have been reflow soldered with the side A because of the heating on top policy. The compounds in the tin slurry have been volatilized, the melting point (260) of tin is higher than that of tin slurry(183), therefore, it protect the accessories on side A from falling off.

The temperature setting of the soldering two sides is different when doing double-sided soldering. Setting for side A will be base on normal solder, but side B will base on the soldering on the top, the temperature of the heating zone on the top need to set higher, and the one on the bottom need to set lower.

BASIC MALFUNCTION TREATMENT

Defect	Reason	Solution
Excursion of accessories position	Solder paste sink Excursion of the installed accessories The stickiness of the solder paste is not strong enough The pressure of installing accessories is not enough	Change solder paste Pay attention to the accuracy of the installing accessories Choose the more stickier solder paste Adding pressure
Accessories floating	The line of the flat sealed accessories floats Solder paste sink Different melting time of solder paste Not enough printing quantity of solder paste	Increase the printing quantity of solder paste Change solder paste Adjust the soldering artwork Research the printing process
Bonding gap	Solder paste sink Excessive printing of solder paste	Change solder paste Adjust the printing quantity of solder paste
Having tin balls	Solder paste oxidation, mix with powder Solder paste turn bad, and sink Have burr Solder paste splashes	Change solder paste Change solder paste Use ball shaped solder paste Prevent the solder paste from sucking the humidity
No soldering tin	Solder paste with bad printing Bonding of soldering points	Research the printing process Use solder paste that will not sink

