

# Lead-free Wave Soldering Machine

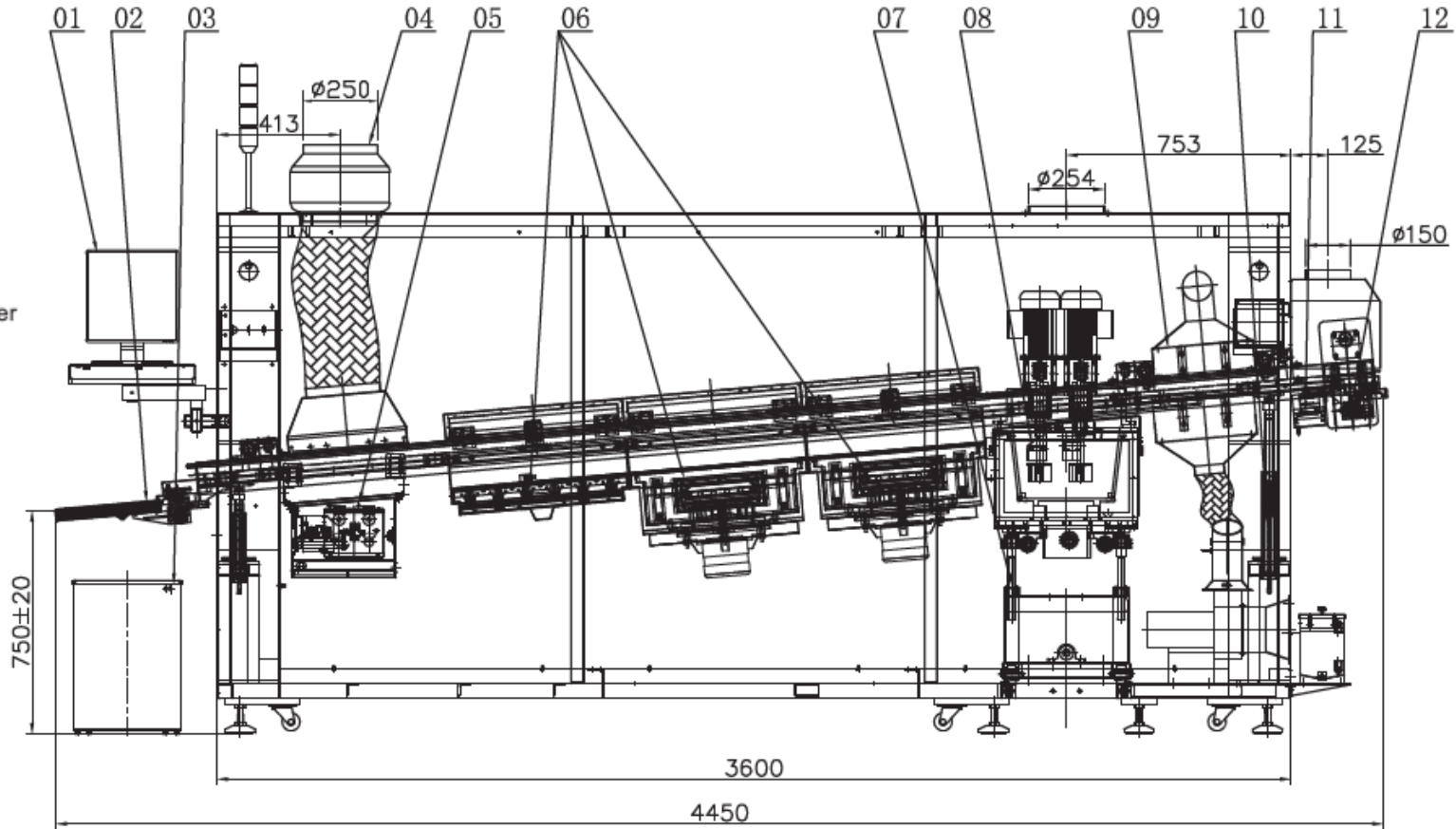
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Models: PEAK series



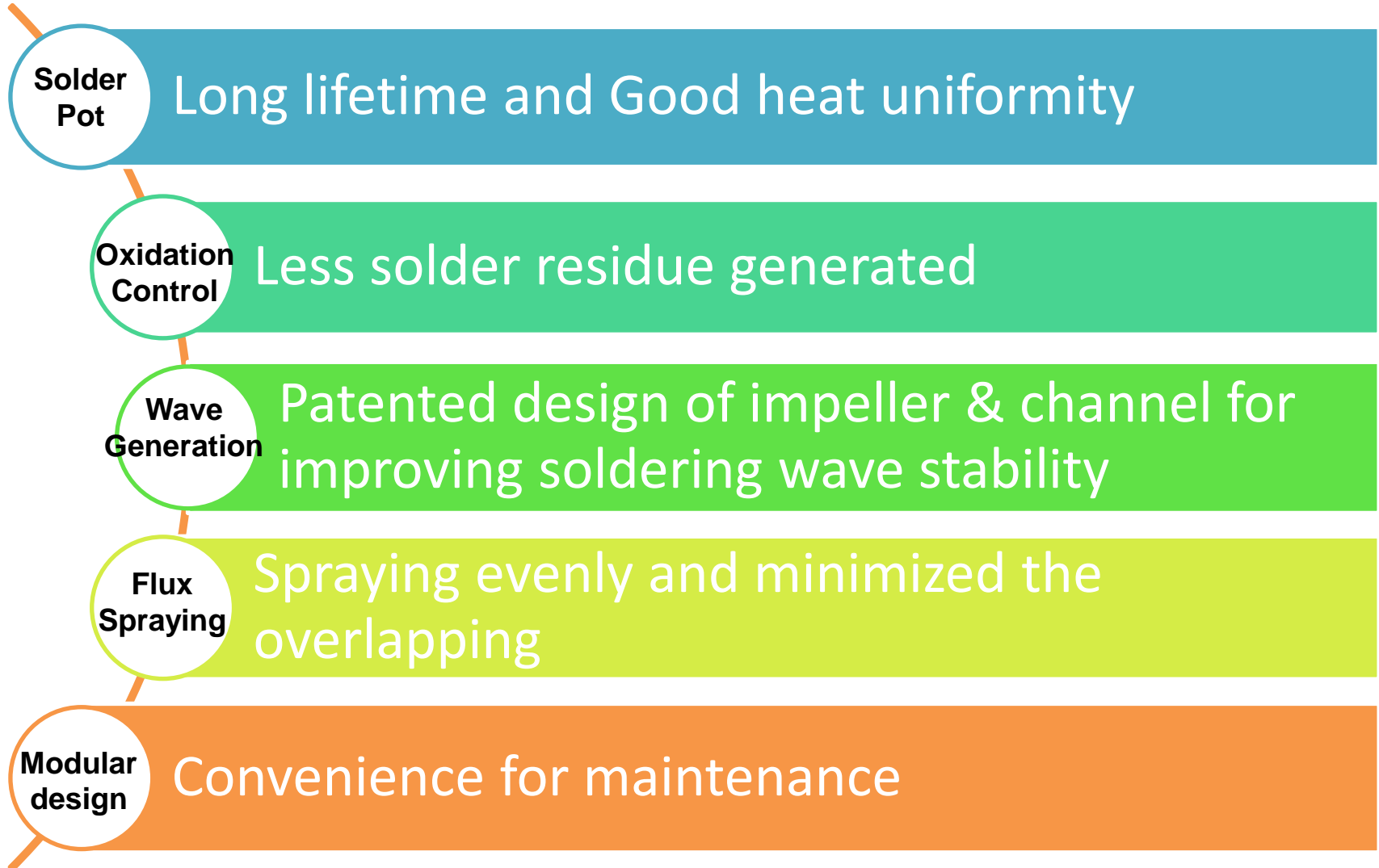
# Machine Schematic

- 01 LCD
- 02 Buffer system
- 03 Flux auto-supply system
- 04 Exhaust fan
- 05 Flux spray system
- 06 Pre-heater
- 07 Solder pot lifting unit
- 08 Dual wave solder pot
- 09 Cooling system
- 10 Angle adjustment controller
- 11 Finger cleaning system
- 12 Conveyor system



# Peak Series Main Features

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# Flux Spraying system

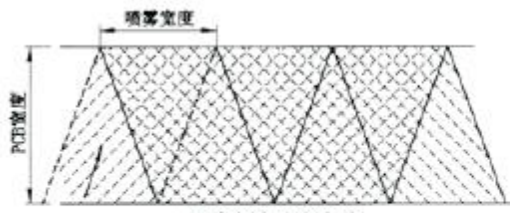
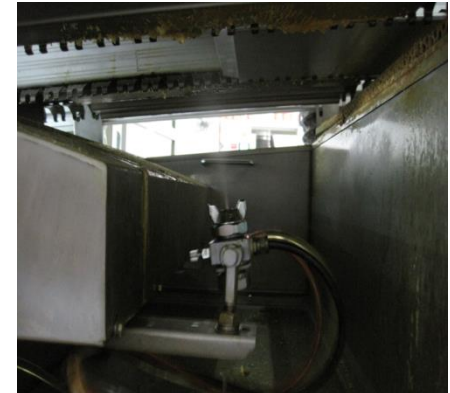
- Modularize Flux Spraying system
  - Plug in and remove connector easily
  - Drawer type structure that easy to install or disassemble to maintain
  - Air filter easy to remove for cleaning



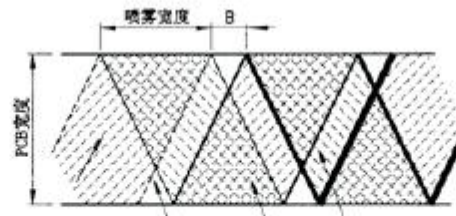
# Flux Spraying system

(Patent number in China: 201020220532.3)

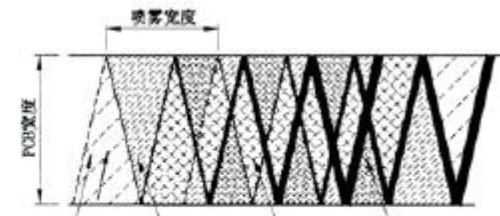
- Flux spraying is perpendicular to the PCB
  - Spread more even on PCB
  - Enhance flux penetrating property to the holes
  - Improve the adhesiveness of the solder metal
  - Effectively reduce the customer's operating cost
- Software will optimize the path to guarantee the flux coating uniformity



Suitable Nozzle speed  
Spreading evenly



Nozzle speed too low.  
spreading did not cover all



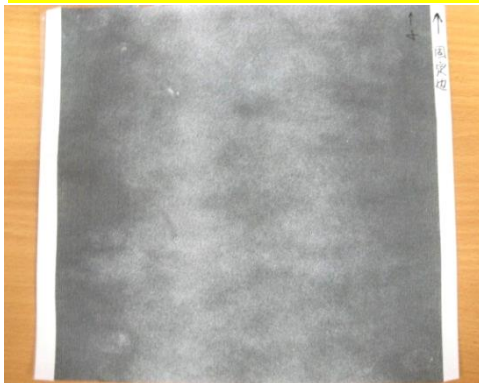
Nozzle speed too high. Introduce  
spreading overlap

# Flux Spraying system (option 1)

(Ultrasonic nozzles)

- Ultrasonic nozzles systems **reduce**:
  - Flux consumption
  - Wasteful overspray and wasteful contamination
  - Waste disposal
  - Servicing and downtime
- Flux spraying **cannot** be perpendicular to the PCB because of nozzle design
- Result :

Conventional nozzle



Ultrasonic nozzle



Ultrasonic nozzle



Flow meter



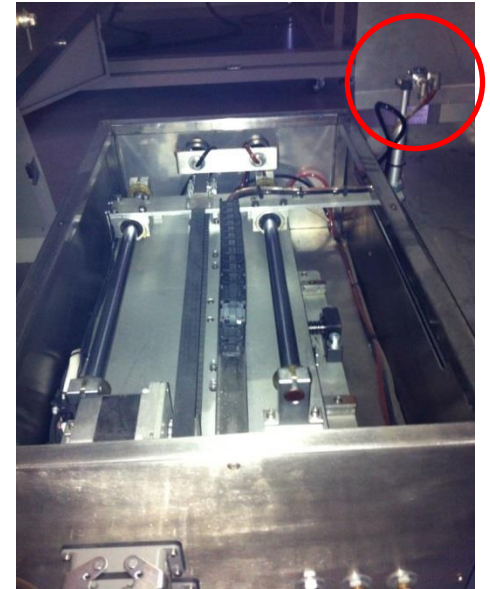
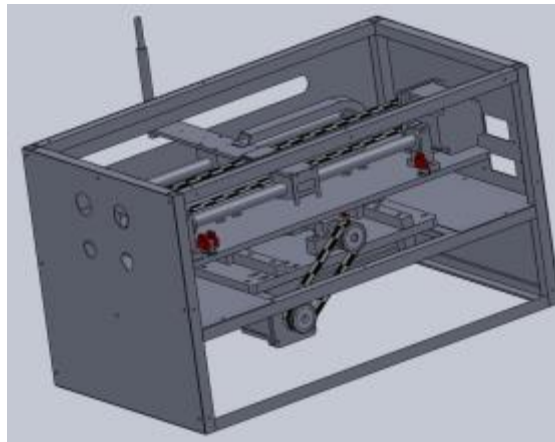
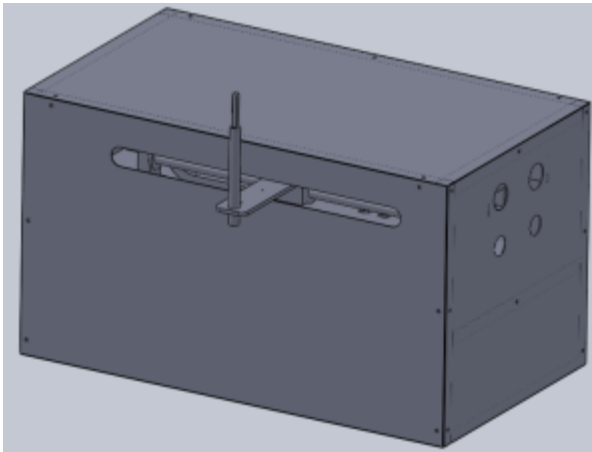
Controller



# Flux Spraying system (option 2)

(Selective Spraying)

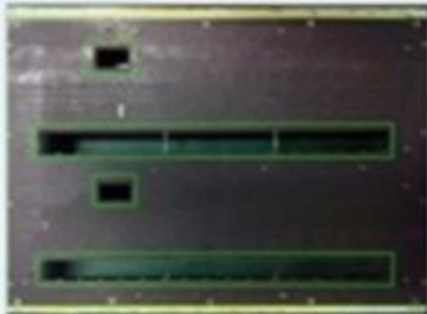
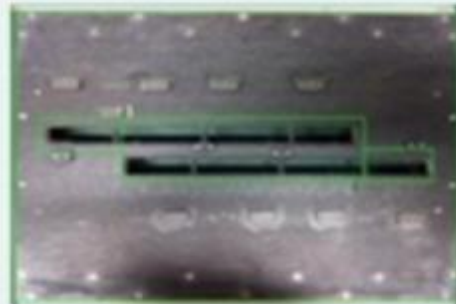
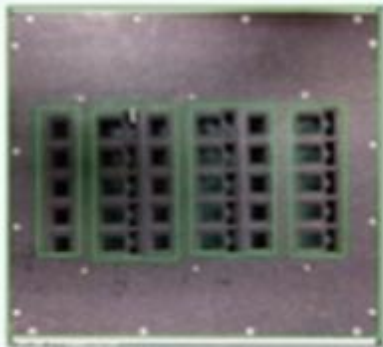

- Suggest applying to the product which the spraying area is less than 50%
- Flux spraying could be a spot, line or rectangle (Use Japanese Fuso Seiki nozzle HM-3φ1 ) by nozzle motion
- Nozzle is controlled by motor for partial selective flux spraying
- Flux spraying cannot be perpendicular to the PCB because of nozzle design
- The flux spraying module cannot be removed



# Flux Spraying system (option 2)

(Selective Spraying)

- Flux spraying area VS the percentage of reduced flux

| Flux spraying area   | % of reduced flux   | Flux spraying area | % of reduced flux |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
|--|---|--------------------|-------------------|--------|---------|-----|--------|------|--------|---|---|------|----------|--------|---------|-----|--------|------|--------|
|   | 78.20%<br><table><tr><td>輸入面積</td><td>25446.85</td></tr><tr><td>輸入区域面積</td><td>5547.14</td></tr><tr><td>面積比</td><td>21.80%</td></tr><tr><td>削減効率</td><td>78.20%</td></tr></table> | 輸入面積               | 25446.85          | 輸入区域面積 | 5547.14 | 面積比 | 21.80% | 削減効率 | 78.20% |   | 84.08%<br><table><tr><td>輸入面積</td><td>26002.56</td></tr><tr><td>輸入区域面積</td><td>4158.58</td></tr><tr><td>面積比</td><td>15.92%</td></tr><tr><td>削減効率</td><td>84.08%</td></tr></table> | 輸入面積 | 26002.56 | 輸入区域面積 | 4158.58 | 面積比 | 15.92% | 削減効率 | 84.08% |
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| 輸入区域面積   | 5547.14   |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
| 面積比  | 21.80%  |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
| 削減効率   | 78.20%  |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
| 輸入面積   | 26002.56  |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
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| 面積比  | 15.92%  |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
| 削減効率   | 84.08%  |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
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| 輸入面積   | 20894.02  |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
| 輸入区域面積   | 6659.77   |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
| 面積比  | 31.87%  |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |
| 削減効率   | 68.13%  |                    |                   |        |         |     |        |      |        |   |   |      |          |        |         |     |        |      |        |



# Preheating system

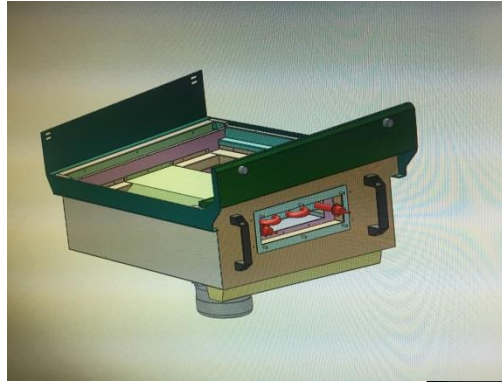
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- Modularize Flux Spraying system
  - Plug in and remove connector easily
  - Drawer type structure that easy to install or disassemble to maintain
  - Easy from hot air to IR



# Preheating system

- All hot air modules are for better temperature uniformity
- All IR modules are increasing the temperature in a short time
- When Hot air mixed with IR (flexible combination), the temperature can be ramping up in a short time and also good in temperature uniformity. It is suitable for water soluble flux



For standard, only lower part have heating modules and upper part is an option

# Soldering pot

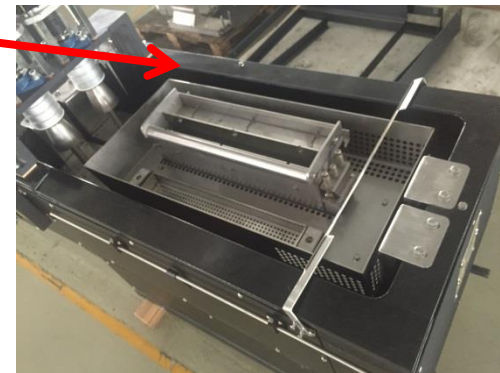
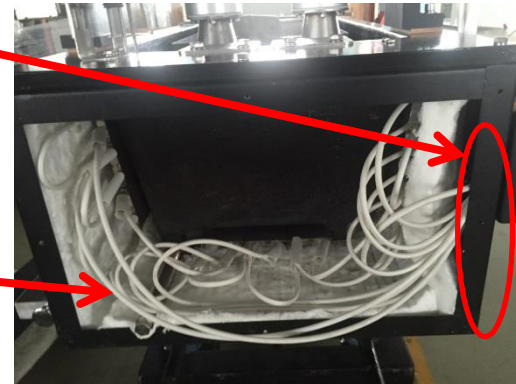
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- Modularize solder pot
  - Plug in and remove power source and thermocouple easily
  - Standard solder pot, suitable different models and PCB size
  - Peak series auto in/out & up/down



# Soldering pot – design characteristics

- 10mm thickness casting iron solder pot
  - No easy to deform when heating
  - Well contact with heater for more uniform heating
- Used graphite for insulation
  - anti-moisture and anti-corrosion
- Ceramic coating
  - smoother surface, anti-corrosion, longer lifetime
- Insulation and large solder pot
  - reduces heat loss
  - make the solder temperature to be more uniform
  - improves the solder pot heat storage capability.





# Soldering pot – Warranty

Long lifetime and good temperature uniformity solder pot by casting iron solder with ceramic coating

casting iron solder pot

Guaranteed for  
5 years



|                             | Solder Pot Size (mm)         | Solder Pot Thickness (mm) | Service life (year)<br>8 hour / day |
|-----------------------------|------------------------------|---------------------------|-------------------------------------|
| 316 stainless steel         | <b>1150 × 480 × 26<br/>5</b> | <b>3</b>                  | <b>≥1</b>                           |
| Titanium                    |                              | <b>2</b>                  | <b>≥5</b>                           |
| Heat-resistant casting iron |                              | <b>10</b>                 | <b>≥8</b>                           |

\*Titanium solder pot guaranteed for 2 years



# Soldering pot – anti-oxidation

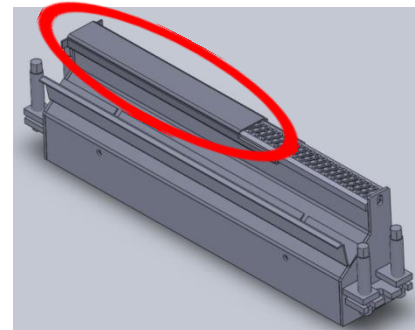
- In 2007, Harbin Institute of Technology researched the factors of oxidation during wave soldering process.
  - Contact area, wave velocity, soldering temperature and wave exposed level
- Reviewed the design by above factors. Solder residue is limited  $< 0.4\text{kg}$  per hour. Cost saved by better utilization.

Dynamic rotating cap isolate air and limit the oxidation



Cap should be clean at least a week

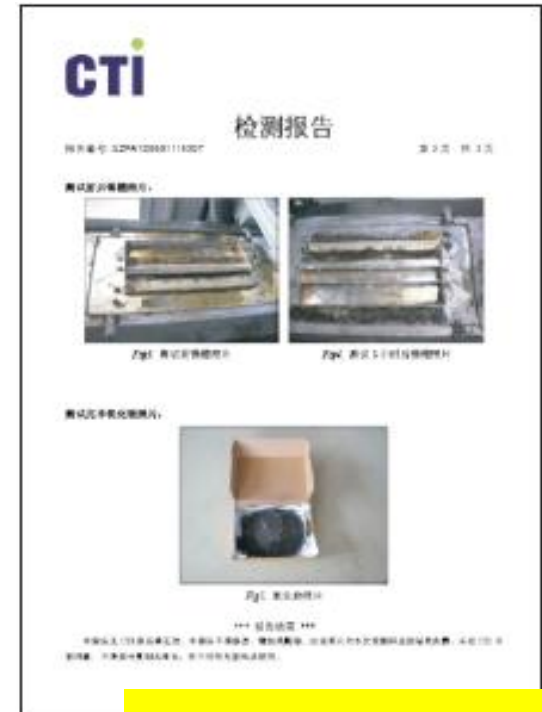
The oxidation reducing cover effectively control the wave flowing speed, lower the falling height and eliminate oxide.



Solder residue should be removed everyday

# Soldering pot – Oxidation residue report

- Testing Criteria
  - Simulate normal plate production process
  - Solder pot temperature : 250 degree
  - Peak width : 400mm
  - Wave height : 8mm
  - Testing time : 8 hours



Third Party Certificate

|           | 国内  |       | 国外      |         |
|-----------|-----|-------|---------|---------|
| 机型        | 日东  | 国内某品牌 | 美国 著名品牌 | 德国 著名品牌 |
| 波峰宽度 (mm) | 400 | 400   | 600     | 500     |
| 成渣量 kg/8h | <2  | 4     | 8       | 8       |

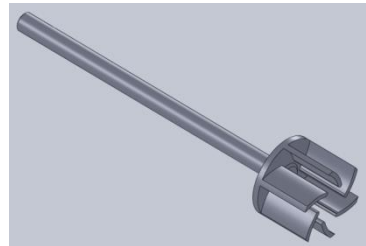
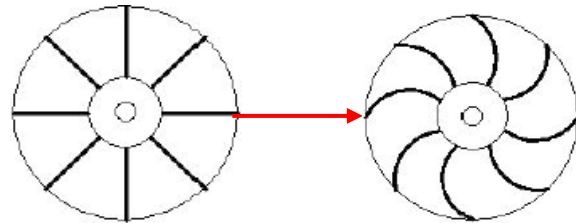
# Soldering pot – Wave generation

(Patent number in China: ZL201020220271.5 & ZL200720121628.2)

- The structure of channel and impeller directly influence the soldering wave stability
- The variation of wave level can be controlled within 0.5mm to ensure good welding.

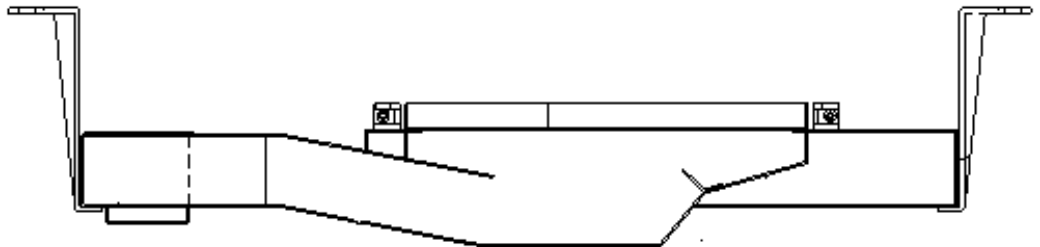
## Impeller design

- The impeller design can convert the energy to solder pot constantly for forming more stable solder wave



## Channel design

- The channel design optimize the interference between solder wave (more stable)
- Rectifier make the peak of wave more flat



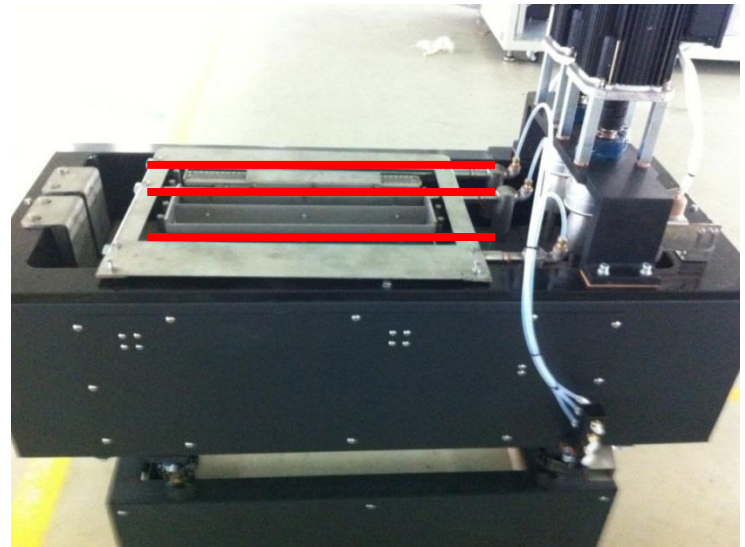
# Soldering pot – Nitrogen control

(Patent number in China: 201220052902.6)

- Partial nitrogen charging device for solder pot
- Stainless steel porous pipe sprays nitrogen evenly and stably
- Nitrogen will be blocked below the PCB and from a low oxygen layer between the PCB and the solder pot surface in order to achieve high welding quality and low oxidation.
- Since it is not closed area, oxygen analyzer cannot be installed

1000ppm, 12m<sup>3</sup>/h  
Test at soldering level

Pressure: 5bar  
Flow rate : >18m<sup>3</sup>/h



# Soldering pot – Nitrogen control

(Patent number in China: 201220052902.6)

- Field feedback for wave soldering with N2
  - Short-circuit and incomplete weld are reduced.
  - PCB surface is clean and smooth, without oxidation, and few solid residues.
  - The welding spot is bright, clean, without oxidation and few flux residues.
  - The flux residues is largely reduced, compared with welding under air and the PCB has little adhesion.
  - In addition, the welding spot strength will be enhanced in principle, reducing return to factory repair and the machine using life will be prolonged.

Wave soldering without N2

incomplete welding



Missing welding



Wave soldering with N2

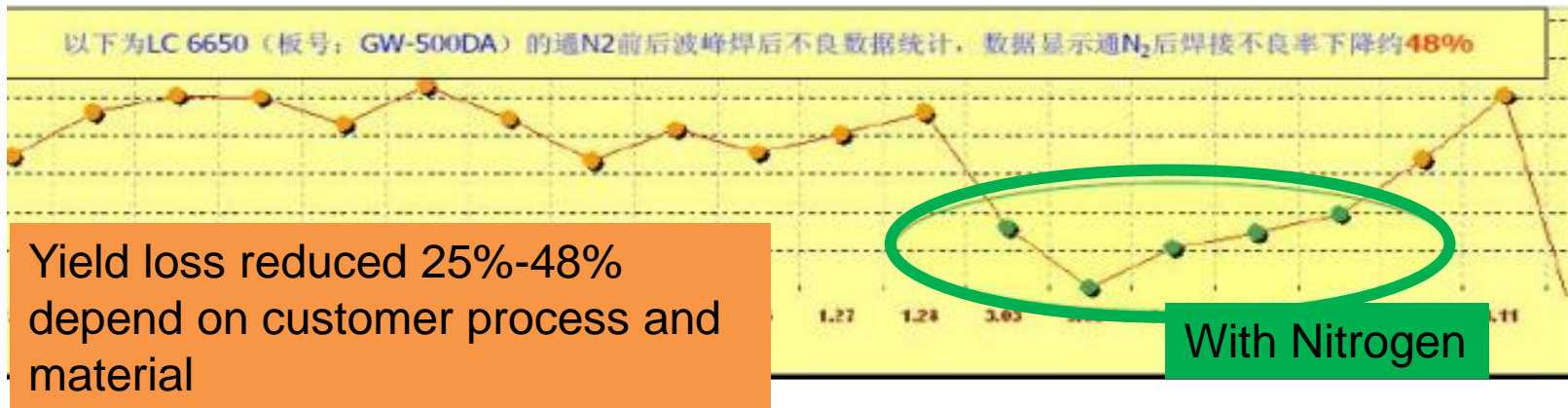




# Soldering pot –

## Performance improved by Nitrogen control

- Yield improvement

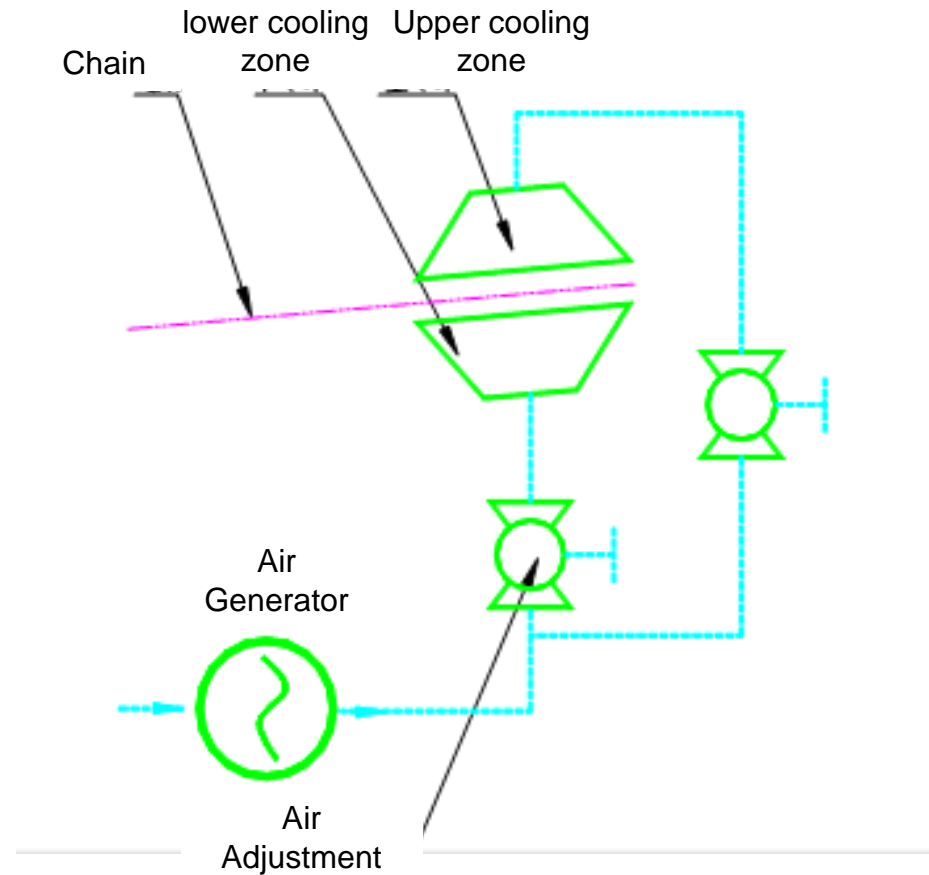


- Reducing solder dross amount by nitrogen

| Solder dross amount<br>(without nitrogen) | Solder dross amount<br>(with nitrogen) | Solder dross<br>reduced % |
|---|--|---------------------------|
| 0.4kg/h                                   | 0.027kg/h                              | 93.30%                    |

# Cooling system

- Air cooling from up and down



# Clamping



▲ 轻型双钩爪  
Light-duty double Hook Finger

| Item  | 参数(Parameter)  |
|---|--|
| Technical distance                              | $\geq 3\text{mm}$  |
| PCB thickness                                   | $\leq 2.5\text{mm}$  |
| Carrying ability parameter : the whole conveyor | $\leq 130\text{kg}$  |
| Material  | 材料有不锈钢和钛合金两种<br>Material is stainless steel and titanium alloy |

Cost down  
version for double  
hook finger

Type 1 finger : Stainless steel  
Type 2 finger : Titanium



▲ 重型双钩爪  
Double hook finger

| Item  | 参数(Parameter)           |
|---|-------------------------|
| Technical distance                              | $\geq 2\text{mm}$       |
| PCB thickness                                   | $\leq 3.5\text{mm}$     |
| Carrying ability parameter : the whole conveyor | $\leq 130\text{kg}$     |
| Material  | 钛合金材料<br>Titanium alloy |

Current standard

Type 3 finger : Titanium

# Clamping



▲ 重型弹簧压片爪  
Spring pressed finger

| Item   | 参数(Parameter)   |
|--|---|
| Technical distance                                 | $\geq 4\text{mm}$   |
| PCB thickness                                      | $\leq 5\text{mm}$   |
| Carrying ability parameter :<br>the whole conveyor | $\leq 130\text{kg}$   |
| Material   | 支撑片钛合金材料，压片不锈钢材料<br>support chip is titanium alloy,<br>tableting is stainless steel |

## Type 4 finger



▲ D-40鸭嘴爪  
D-40 duckbill finger

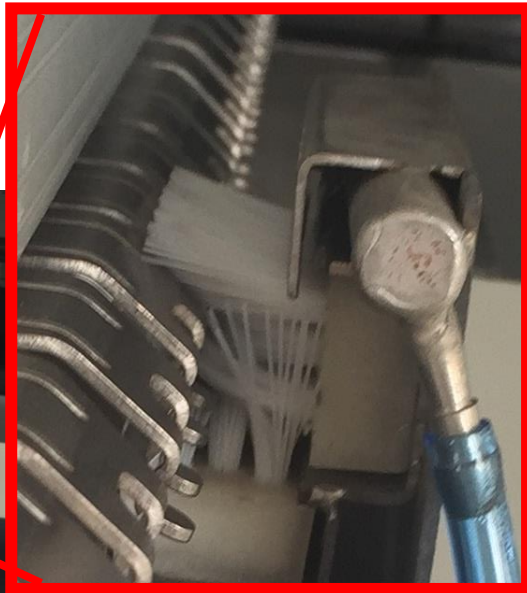
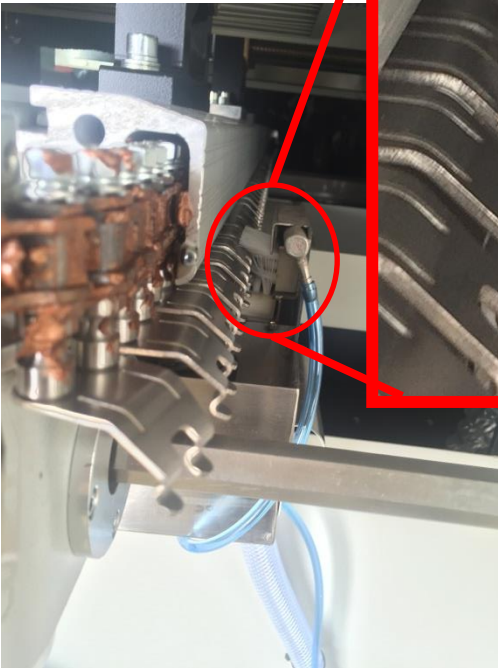
| Item   | 参数(Parameter)           |
|--|-------------------------|
| Technical distance                                 | $\geq 3\text{mm}$       |
| PCB thickness                                      | $\leq 2\text{mm}$       |
| Carrying ability parameter :<br>the whole conveyor | $\leq 130\text{kg}$     |
| Material   | 钛合金材料<br>Titanium alloy |

## Type 5 finger

# Cleaning

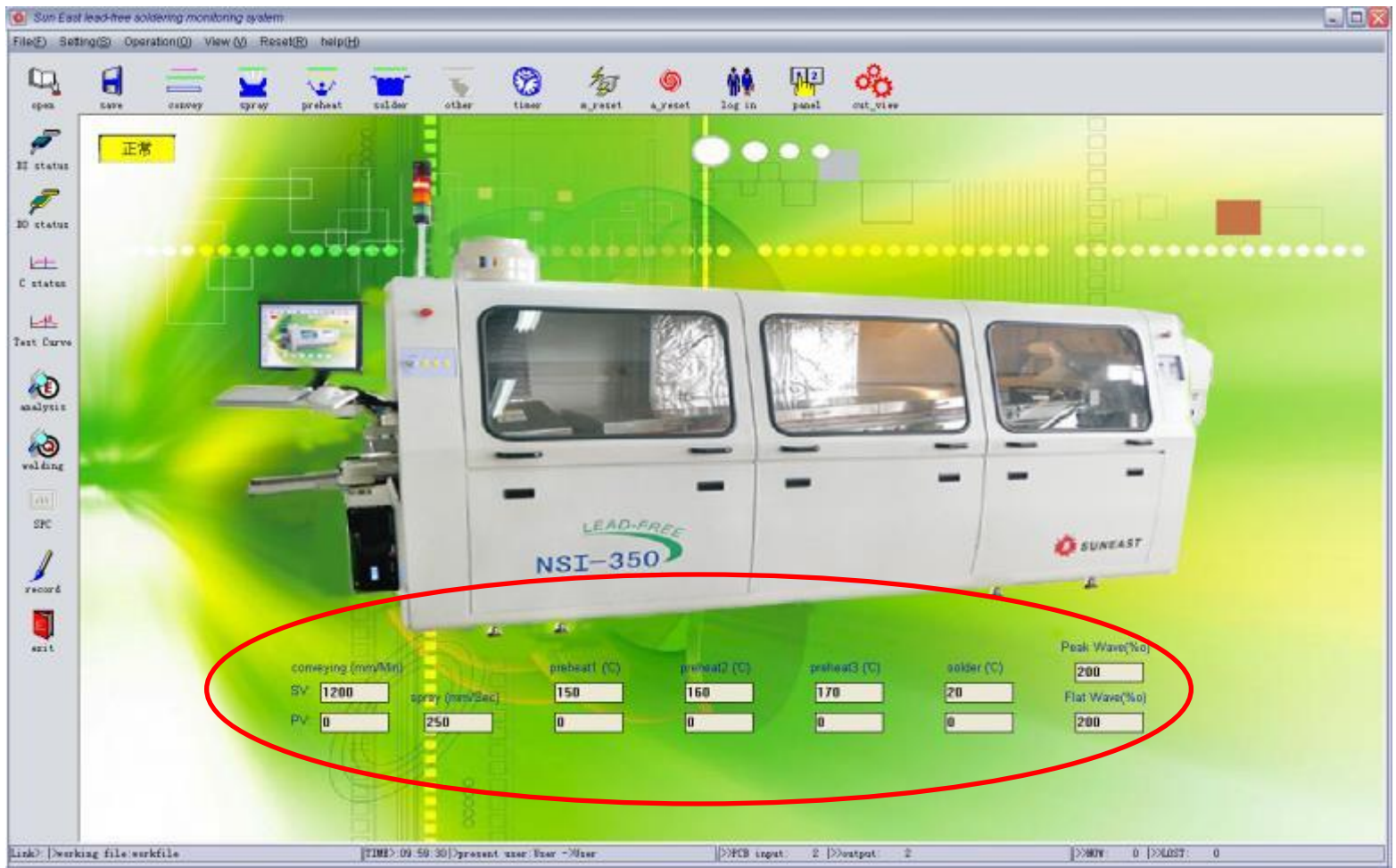
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- Alcohol will to pump to the brush and clean the clamp during moving





# Other feature – User friendly interface



Direct input target temperature into the program  
Display actual temperature

# Other feature – Digitization interface



Digital display for rail angle adjustment



Set the max temperature for protection



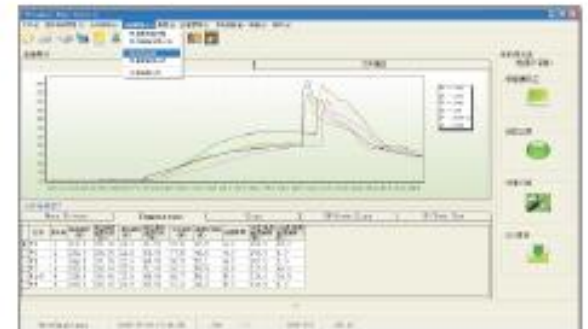
Digital display for rail width adjustment

# Machine qualification

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Use ESAMBER tester to check the thermal performance

- Temperature profile
- Temperature accuracy
- Temperature repeatability of different heating zones



# Wave Soldering Machine

## – Specification

| 型号 Model NO                         | PEAK-350                           | PEAK-450                           | PEAK-610                           |
|-------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 外形尺寸 Dimension: L×W×H(mm)           | 4450×1400×1700                     | 4450×1500×1700                     | 4450×1670×1700                     |
| 重量 Weight                           | Approx.1800kg                      | Approx.2100kg                      | Approx.2600kg                      |
| 电源 Power Supply                     | 3PH 380V 50HZ                      | 3PH 380V 50HZ                      | 3PH 380V 50HZ                      |
| 启动功率 Startup Power                  | 32KW                               | 32KW                               | 45KW                               |
| 正常运行功率 Operation Power Consumption  | Approx.8KW                         | Approx.8KW                         | Approx.11KW                        |
| 控制系统 Control System                 | PC+PLC                             | PC+PLC                             | PC+PLC                             |
| 喷雾移动 Spraying movement              | 步进马达(Step motor)                   | 步进马达(Step motor)                   | 步进马达(Step motor)                   |
| 喷雾气压 Spray Pressure                 | 0.2Mpa~0.4Mpa                      | 0.2Mpa~0.4Mpa                      | 0.2Mpa~0.4Mpa                      |
| 助焊剂流量控制 Flux Flow Arrange           | Option                             | Option                             | Option                             |
| 助焊剂自动添加 Auto Fill Flux              | 标配(Standards)                      | 标配(Standards)                      | 标配(Standards)                      |
| 抽风方式 Exhaust                        | 上抽风(Top exhaust)+侧抽风(Side exhaust) | 上抽风(Top exhaust)+侧抽风(Side exhaust) | 上抽风(Top exhaust)+侧抽风(Side exhaust) |
| 抽风管直径 Exhaust Ducting Diameter (mm) | Ø250                               | Ø250                               | Ø250                               |
| 排风量 Exhaust Capacity                | 30M³/min                           | 30M³/min                           | 30M³/min                           |
| 预热方式 Preheating Mode                | 微热风/红外(Convection/IR emitter)      | 微热风/红外(Convection/IR emitter)      | 微热风/红外(Convection/IR emitter)      |
| 温度控制方式 Control Mode                 | PID                                | PID                                | PID                                |
| 预热区数量 Preheating Zone Number        | 3                                  | 3                                  | 3                                  |
| 预热区长度 Preheating Length (mm)        | 1800                               | 1800                               | 1800                               |
| 预热温度可调范围 Preheating Temperature     | 室温(Room temperature)~200℃          | 室温(Room temperature)~200℃          | 室温(Room temperature)~200℃          |
| 预热升温时间 Warm-up Time(min)            | Approx.12min(setting:150℃)         | Approx.12min(setting:150℃)         | Approx.12min(setting:150℃)         |
| 热风马达 Blower Motor                   | 250W 3PH 220 VAC                   | 250W 3PH 220 VAC                   | 250W 3PH 220 VAC                   |
| 宽度范围 PCB Width(mm)                  | 50~350                             | 50~450                             | 50~610                             |





# Wave Soldering Machine

## – Specification

| 型号 Model NO                              | PEAK-350  | PEAK-450                         | PEAK-610   |
|--|---|----------------------------------|--|
| PCB传送方向 Conveyor Direction               | L→R(Option:R→L)   | L→R(Option:R→L)                  | L→R(Option:R→L)                                    |
| 传送速度范围 Conveyor Speed(mm/min)            | 500~1800  | 500~1800                         | 500~1800   |
| 运输高度 Conveyor Height(mm)                 | 750±20  | 750±20                           | 750±20   |
| 允许PCB元件高度 Available Component Height(mm) | 上(Top)120(Option:250)下(Bottom)15  | 上(Top)120(Option:250)下(Bottom)15 | 上(Top)120(Option:250)下(Bottom)15                   |
| 速度控制方式 Conveyor Speed Control Mode       | 变频器闭环无级调速(Closed loop)  | 变频器闭环无级调速(Closed loop)           | 变频器闭环无级调速(Closed loop)                             |
| 爪 Fingers                                | 新型双钩爪(New Design Double-hook Type) Approx: ①弹簧压片爪(Spring Pressing Finger); ②D-40型鸭嘴爪(D-40 Type Finger); ③双钩爪(Double-hook Finger); |                                  | 新型双钩爪(New Design Double-hook Type)<br>Option:治具专用爪 |
| 导轨角度 Conveyor Angle                      | 4~7°  | 4~7°                             | 4~7°   |
| 锡炉类型 Type of solder Pot                  | 机械式(Motor drive)  | 机械式(Motor drive)                 | 机械式(Motor drive)                                   |
| 锡炉材质 Solder Pot Material                 | 铸铁(Casting Iron)  | 铸铁(Casting Iron)                 | 全钛(Full titanium)                                  |
| 波峰调节方式 Wave Height Adjustment            | 变频器(Inverter) Approx: 电脑数字控制(Digital Control by PC)   |                                  |  |
| 冷却方式 Cooling Method                      | 强制风冷(Air Cooling) Option: 冷水机(Water cooling)  |                                  |  |
| 锡炉加热功率 Heater Power                      | 220V 13.5KW   | 220V 13.5KW                      | 380 VAC 18KW                                       |
| 锡炉最高温度 Solder Pot Temperature            | 300℃  | 300℃                             | 300℃   |
| 锡炉容量 Solder Pot Capacity                 | 500kg   | 500kg                            | 650kg  |
| 波峰驱动功率 Wave Drive Power                  | 180W×2 3PH 220 VAC  | 180W×2 3PH 220 VAC               | 180W×2 3PH 220 VAC                                 |
| 锡炉升温时间 Solder Pot Warm-up Time           | Approx.150min(setting: 250℃)  | Approx.150min(setting: 250℃)     | Approx.150min(setting: 250℃)                       |
| 炉温控制方式 Temperature Control Mode          | PID   | PID                              | PID  |
| 洗爪系统 Finger Cleaning System              | 毛刷(Brush)   | 毛刷(Brush)                        | 毛刷(Brush)  |



# Option

|                              | Peak series / NSI series  |
|------------------------------|---|
| Selective Flux spraying      | Option  |
| Digital flow meter           | Option  |
| Auto-adjusted track width    | Option  |
| Solder pot                   | Standard for 500kg casting Iron<br>Option for 350kg Titanium (no recommend)   |
| Solder auto-feeding system   | Option  |
| Local Nitrogen safety device | Option  |
| Water Cooling                | Option  |
| PCB unloading                | <div>  <p>BF-350 Buffer conveyor</p> </div> <div>  <p>UB-350Z Un-Loading Belt Conveyor with upper cooling</p> </div> |

# Wave Soldering Machine

- The material of Peak series will be higher class
- The price of NSI will be more competitive

|                                      | Peak series                        | NSI series   |
|--------------------------------------|------------------------------------|--|
| PLC control                          | Siemens                            | China brand  |
| PC                                   | Industrial PC                      | Commercial PC from China                           |
| Cover                                | Streamline design and stronger     | Standard   |
| CE Certification                     | Yes                                | No   |
| Flow channel & nozzle                | Titanium                           | Stainless steel                                    |
| Finger                               | Titanium double hook<br>(Type III) | Stainless steel Light-duty<br>double hook (Type I) |
| Auto up/down/in/out<br>of solder pot | Yes                                | No   |

**THANKS!**