



Kinwong-Technology Introduction

**To become the most reliable printed
circuit board manufacturer in the world.**

Stock Code: 603228

Five Production Sites (SZ, LC, JX, ZHFS&GLG)



Plant Area



50,000 m²

F1

SZ Kinwong

- Headquarter
- PCB Division & FPC Division
- Monthly capacity: PCB**63,000**m², FPC**25,000**m²
- Employee: **2,300+**



230,000 m²

F2

LC Kinwong

- Subsidiary in Heyuan, South China's Guangdong Province.
- Three product lines: PCB, FPC, MPCB
- Monthly capacity: PCB**100,000**m², FPC **140,000**m², MPCB**40,000**m²
- Employee: **6,100+**



240,000 m²

F3

JX Kinwong-Intelligent factory

- Subsidiary in Ji'an, east China's Jiangxi Province
- JX PCB Division, world-leading intelligent PCB factory
- Monthly capacity: PCB **390,000**m²
- Employee: **3,000+**



85,000 m²

F4-1

ZH Kinwong

Fu Shan

- Subsidiary in Zhuhai, Guangdong Province
- Fushan FPC Division
- Monthly capacity: **45,000**m² FPC
- Employee: **1,300+**



150,000 m²

F4-2

Gaolangang-High Technology factory

- Subsidiary in Zhuhai, Guangdong Province
- High Layer Count & SLP factory
- Monthly capacity: **100,000**m² PCB (High Layer Count), **50,000**m² SLP
- Employee: **1600+**

PCB: Printed Circuit Board; FPC: Flexible Printed Circuit (Board) ; MPCB: Metal Printed Circuit Board
HLC: High Layer Count; SLP: Substrate like PCB

Five Production Sites Product Types



Location	Products	Monthly Capacity	PCB	FPC	M-PCB	R-Flex	HDI	HLC	HF	Copper Inlay	Module/Substrate/SIP	FPCA	Factory Specialty
SZ	PCB	63,000m ²	✓			✓	✓	✓	✓				Low Volume, various product technology, special base material, unique processing; Rigid-flex, High Frequency, high layer count heavy copper and HDI covers application field of automotive, telecommunication, industry control, power supply and medical products etc.
	FPC	FPC: 25,000m ² FPCA: 10KK		✓		✓						✓	Use for Display Module, Touch Screen, Automobile, Industrial Control, UAV, Electronic Cigarette, Smart Home, Medical Industry.
LC	PCB	100,000m ²	✓					✓	✓				Middle & Large Volume; Multi-layer board, applied in telecommunication, power supply, automotive and industrial.
	FPC	FPC: 140,000m ² FPCA: 60KK		✓		✓						✓	Middle & Large Volume; Use for Automobile, Display Module, Touch Screen, Smartphone, LED backlight, Electronic Cigarette, TWS.
	MPCB	40,000m ²			✓					✓			Middle & Large Volume, Dedicated to thermal management solutions applied in new energy automotive, automotive lighting, power module and other lighting.
JX	PCB	390,000m ²	✓						✓				Large volume normal FR-4 boards; Widely applied in automotive, consumer and telecommunication and etc.,.
ZH 2	Fu Shan FPC	FPC: 45,000m ² FPCA: 40KK		✓		✓							Large volume; Use for Medical Industry, Wireless Charging, Touch Screen, Automobile, TWS, Smart Home, Display Module, 5G etc.
	Gao Langang HLC	100,000m ²					✓	✓	✓				Large Volume; Dedicated on high layer count, widely applied in telecommunication, network, server, storage and automobiles.
	Gao Langang SLP	50,000m ²					✓				✓		Large Volume; Dedicated to SLP, applied in telecommunication, consumer products.



Customer Industries Development Trend & KW Technical Solution

Automotive-Development Trend & KW Technical Solution

- ✓ ● High Power ● High Voltage
- High Current
- Thermal Management Solution

Cu/Aluminum-based IMS

- ✓ Cu Pedestal
- ✓ High Thermal Conductivity
- ✓ Excellent thermal performance
- ✓ Good electrical performance

Heavy Copper

- ✓ Less Thermal Stress
- ✓ Max. 6oz base Cu UL recognized

Cu/AlN Inlay

- ✓ "I", "T", "U"-shaped Cu Coin
- ✓ Max. $\pm 30\mu\text{m}$ height performance



- Higher Transmission Rate
- Lower Loss

High Frequency Millimeter Wave Radar

- ✓ HC/PTFE-based Raw Material
- ✓ Hybrid | Blind Via
- ✓ High Accuracy Copper Image Pattern ($\pm 15\mu\text{m}$)
- ✓ High Layer Registration($\pm 5\text{mil}$)

HDI

- ✓ 4+N+4
- ✓ $50\mu\text{m}/50\mu\text{m}$ Trace Width/Spacing

Rigid-flex board

- ✓ 2~4L FPC
- ✓ Air Gap design
- ✓ 2+N+2 HDI Rigid-flex

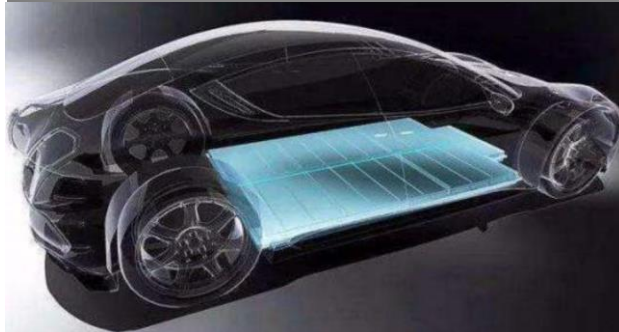


Large-size Display Screen FPC

More Feature-rich • Last Longer

- ▶ Longer Finger Pitch length (>100mm)
- ▶ Surface Finish: ENIG
- ▶ Drill Hole Min. 0.1mm,
Laser Blind Via Min. 0.05mm
- ▶ Min. Trace Width/Spacing of 45 μ m/45 μ m
- ▶ Impedance Control

Battery Management System FPC



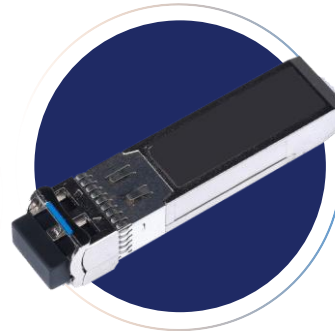
High Heat Resistance • High Power

- ▶ FPC Length more than 1000mm
- ▶ Copper Thickness > 2 OZ
- ▶ 3D Stiffener Assembly
- ▶ Conformal Coating for Component

High Speed ● Super Transmission Rate ● Lower Loss

High Layer Count

- ✓ Large Panel Size
- ✓ Small Hole Backed Drilled
- ✓ POFV
- ✓ Skip Via
- ✓ Impedance Control
- ✓ Insertion Loss



Optical Module

- ✓ ENIG/ENEPIG+G/F
- ✓ High Speed Material
- ✓ Hybrid
- ✓ HDI | N+N | Cavity
- ✓ Cu Inlay
- ✓ Segmented/Graded G/F
- ✓ Tight Size Tolerance

Antenna

- ✓ 2L~4L
- ✓ High Frequency Material
- ✓ Hybrid
- ✓ Cavity
- ✓ Strict RF Trace Tolerance



TRX/PA/Base

Band/Backplane

- ✓ Large Size
- ✓ Back drilling
- ✓ POFV
- ✓ Half-plated Hole
- ✓ Edge Plating

- High Density • Small Hole Size
- High Capacity
- Light weight, Thinner & miniaturized



HDI

- ▶ 3+N+3
- ▶ Anylayer
- ▶ SLP
- ▶ mSAP (Zhuhai 2021)
- ▶ amSAP (Zhuhai 2022)
- ▶ Min. Trace Width/Spacing of $30\mu\text{m}/30\mu\text{m}$
- ▶ Stacked/Staggered/Stepped Vias
- ▶ Min. Board Thickness of 0.2mm

5G Cellphone



5G Antenna FPC 5G Transmission Line FPC

- ▶ PTFE/LCP/MPI-based Material
- ▶ 3L~4L
- ▶ Laser Drilled Blind Via
- ▶ Copper Filled Via
- ▶ Impedance Control
- ▶ Insertion Loss Control
- ▶ Simulation and Test
- ▶ 3D SUS Stiffener

UAV



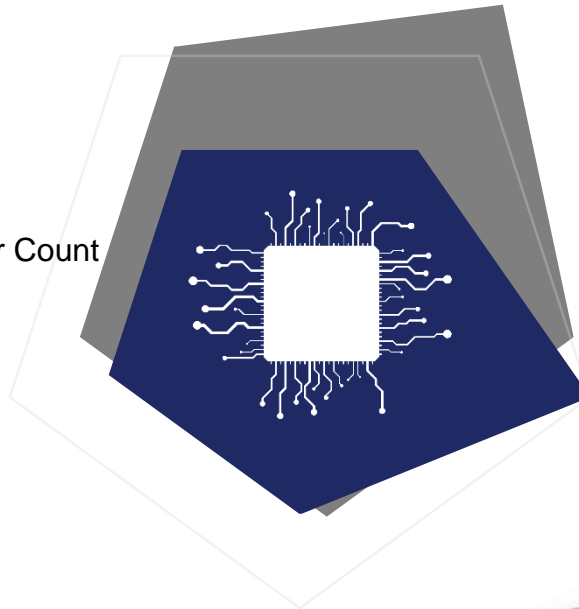
UAVs FPC

- ▶ L1~6L
- ▶ Drill Hole min. 0.1mm,
Laser Blind Via min. 0.05mm
- ▶ Min. Trace Width/Spacing of $45\mu\text{m}/45\mu\text{m}$
- ▶ Surface Finish: ENIG & ENEPIG & OSP
- ▶ Impedance Control
- ▶ 3D SUS Stiffener

Long Term Reliability ● High Stability

Rigid-Flex

- ▶ ENIG/LF HASL/OSP
- ▶ Max. 16L
- ▶ Max. 6L Flexible Layer Count
- ▶ Flexible Area with Different Layer Count
- ▶ CVL at Rigid
- ▶ HDI
- ▶ Gold Finger Design
- ▶ Dispensing
- ▶ $\pm 10\%$ Impedance Control



Semi-flex

- ▶ Max. 2L Bendable Layer
- ▶ Bending Area Thickness
 $0.25\text{mm} \pm 0.05\text{mm}$
- ▶ Bending Angle $0\sim 180^\circ$



Portable ● Miniaturized ● Intelligent

Rigid-flex

- ▶ Bendable and 3D assembly for small size
- ▶ Middle/High Tg Base Material
- ▶ Soldermask Plugging





KW Product Line& Technology Roadmap of Sites

Technology items	2021	2022	2023
Max.Layer Count	18L	24L	32L
Max. Delivery Panel Size	594*699mm	620*950mm	620*950mm
Min.Core Excl.Cu Thickness	0.075mm	0.05mm	0.05mm
Final Board Thickness	0.4~3.6mm	0.4~4.5mm	0.4~5.0mm
Min.Inner Layer Trace Width/Spacing	0.076mm/0.076mm	0.06mm/0.06mm	0.06mm/0.06mm
Min.Outer Layer Trace Width/Spacing	0.076mm/0.076mm	0.065mm/0.076mm	0.065mm/0.076mm
Min.Mechanically Drilled Hole Size	0.2mm	0.15mm	0.15mm
Min.Laser Drilled Hole Size	0.1mm	0.1mm	0.1mm
Max.Aspect Ratio for Mechanically Drilled Through Hole	12:1	18:1	20:1
Max.Aspect Ratio for Laser Drilled Blind Via	0.8:1	1:1	1:1
HDI Type	3+N+3	3+N+3	3+N+3
Soldermask Registration	±0.05mm	±0.040mm	±0.040mm
Min.Soldermask Dam	0.075mm	0.05mm	0.05mm
Min. BGA Pitch	0.65mm	0.5mm	0.40mm
Depth Control Routing Tol.	±0.05mm	±0.05mm	±0.05mm
Min.Single-ended Impedance Tol.	+/-8%	+/-7%	+/-5%
Min.Differential Impedance Tol.	+/-8%	+/-7%	+/-5%
Surface Finish	LF HASL, HASL, ENIG, Immersion Tin, Immersion Ag, OSP, Gold Finger, ENEPIG		
Base Material	General Tg, Middle Tg, High Tg, Halogen Free, High Frequency(Low Dk/Df), High Speed (Middle/Low/Very Low/Ultra Low Loss), High Thermal Conductivity , Low CTE and so on.		

Technology items		2021	2022	2023
Finished Board Thickness		0.05~0.8mm	0.05~0.8mm	0.05~0.8mm
Min.Laser Drilled Hole Size		Ø0.05mm	Ø0.05mm	Ø0.035mm
Min.Mechanical Drilled Hole Size		Ø0.1mm	Ø0.1mm	Ø0.1mm
Max.Mechanical Drilled Hole Size		Ø6.3mm	Ø6.3mm	Ø6.3mm
Min.Trace Width/Spacing		0.045mm/0.045mm	0.04mm/0.04mm	0.035mm/0.035mm
Min.Annular Ring of Single/Double-sided Board		0.1mm(Panel Plating) 0.125mm(Button Plating)	0.1mm(Panel Plating) 0.125mm(Button Plating)	0.1mm(Panel Plating) 0.1mm(Button Plating)
Min.Inner Layer Annular Ring of Multi-layer Board		0.125mm	0.125mm	0.1mm
Min.Outer Layer Annular Ring of Multi-layer Board		0.1mm(Panel Plating) 0.125mm(Button Plating)	0.1mm(Panel Plating) 0.125mm(Button Plating)	0.09mm(Panel Plating) 0.125mm(Button Plating)
Min.Coverlay Bridge		0.3mm	0.3mm	0.3mm
Min.Soldermask Opening		0.25mm	0.25mm	0.25mm
Min.Single-ended Impedance Tolerance		±8%	±7%	±6%
Min.Differential Impedance Tolerance		±8%	±7%	±7%
Min.Coverlay Opening		Ø0.5mm	Ø0.5mm	Ø0.5mm
		0.5mm*0.5mm	0.5mm*0.5mm	0.5mm*0.5mm
Coverlay Registration	Machine Alignment	±0.1mm	±0.1mm	±0.1mm
	Fixture	±0.1mm	±0.1mm	±0.1mm
Max.Layer Count	Flex Board	6L	6L	8L
	Stratified Board	6L	6L	6L
	Rigid-flex Board	8L	10L	12L
	Rigid-flex Board HDI	8L	10L	12L
Surface Finish		Gold Plating、ENIG、OSP、ENIG+OSP、Gold Plating+OSP、Gold Plating+ENIG		

Technology items		2021	2022	2023
Max. Layer Count		8L	8L	8L
Max. Panel Size		610*710mm	610*710mm	610*710mm
Metal Base Thickness		0.5~4.0mm	0.5~4.0mm	0.4~4.0mm
Min. Dielectric Thickness		0.038mm	0.038mm	0.038mm
Min. FR4 Core Thickness (excl.Cu)		0.076mm	0.076mm	0.076mm
Etching Tolerance		±15%	±15%	±15%
Min. Inner Layer Trace Width/Spacing		0.076mm/0.076mm	0.076mm/0.076mm	0.076mm/0.076mm
Min. Outer Layer Trace Width/Spacing		0.076mm/0.076mm	0.076mm/0.076mm	0.076mm/0.076mm
Min. Drilled Hole Size	Aluminum Base	0.55mm (≥1/2 board thk.)	0.50mm (≥1/2 board thk.)	0.50mm (≥1/2 board thk.)
	Copper Base	0.60mm (≥3/4 board thk.)	0.60mm (≥3/4 board thk.)	0.55mm (≥3/4 board thk.)
Drilling Hole Tolerance		+0.05/-0mm	+0.05/-0mm	+0.05/-0mm
Punching Hole Tolerance		+0.03/-0mm	+0.03/-0mm	+0.03/-0mm
Min.Counter-sink Hole	1/3/5 Series Al Base	0.50mm	0.50mm	0.50mm
	6 Series Al Base/Cu Base	0.60mm	0.60mm	0.60mm
Countersink Hole Depth Tolerance		±0.05mm	±0.04mm	±0.03mm
Soldermask Registration		±0.04mm	±0.04mm	±0.04mm
Breakdown Voltage of Raw Material		6KVAC	6KVAC	6KVAC
Outline tolerance by punching		±0.05mm	+0/-0.05mm	+0/-0.05mm
Outline tolerance by laser routing		±0.05mm	±0.05mm	±0.05mm
T/C(Thermal Conductivity)		D5470: 1-3W/mK T0220: 1-12W/mK	D5470: 1-3W/mK T0220: 1-12W/mK	D5470: 1-3W/mK T0220: 1-12W/mK
Surface Finish		OSP , LF-HASL , ENIG , ENEPIG ,Immersion Silver, Immersion Tin(only for copper base)		

Technology items	2021	2022	2023
Layer count (max)	24	32	40
Working panel size (max)	24.5"*37.5" (620mmX950mm)	24.5"*37.5" (620mmX950mm)	24.5"*37.5" (620mmX950mm)
Board thickness (max)	3.5mm	4.0mm	5.0mm
Min Line W/S	I/L: 2.5mil/2.5mil O/L: 4mil/4mil(POFV)	I/L: 2.5mil/2.5mil O/L: 3.5mil/4mil(POFV)	I/L: 2.0mil/2.0mil O/L: 3.5mil/3.5mil(POFV)
Min DHS(mil)	6mil	6mil	6mil
Aspect ratio (by drill bit)	18:1	20:1	22:1
Min core thickness	2mil	2mil	1mil
Overall layer registration	5mil	5mil	5mil
Impedance tolerance	+/-8%	+/-7%	+/-5%
Back drill stub	2-10mil	2-10mil	2-8mil
POFV	Yes	Yes	Yes
Skip-via(L1-3)	No	Yes	Yes
HDI	No	Yes	Yes
N+N	Yes	Yes	Yes
Embedded Coin	Yes	Yes	Yes
Embedded capacitor	No	Yes	Yes
High-speed Material	Mid loss: TU862HF,IT-170GRA1,EM828G,M2,S7040G, NPG-1711,IS415,H175HF etc Low loss: M4/M4S, S7439, TU872SLK, IT958G, NPG-170D, TU863+, I-speed, EM888S,FR408HR etc; Very low loss: M6, IT968,TU883, Synamic 6, EM891, EM528,Meteorwave1000/2000,I-Tera,LW-900G,DS-7409DV ; Ultra low loss: M7, TU933+, Synamic 6N,EM890K,Meteorwave3000/4000,Tachyon100G,IT988GSE,LW910G,DS-7409DVN. Super low loss: M8, EM892K, TU943N,Synamic8G,IT998G,Meteorwave8000,DS-7409DJN.		
High Frequency Material	Ceramic: RO4350B,S7136H,RO4730G3,Aerowave300 PTFE: TC350, TC350,TC350plus,RO3003,RO3006,TLX,RF-35A,RF-30,TSM-DS3.		



Zhuhai SLP Technology Roadmap



Item/Year		2021	2022	2023
Technology Application		Subtractive, mSAP	Subtractive, mSAP, amSAP	
Structure	Max Layer	14L	16L	
	Stack-up	1+N+1, 2+N+2, 3+N+3, 4+N+4, Anylayer		
	Pnl Size	18.3x24.3, 20.3x24.3, 21.3x24.3		
Line Width / Spacing [um]	35/40	May.: PQ / Jun.: HVM		
	30/30	Sep.: PQ / Oct.: HVM		
	25/25		Q3: PQ / Q4: HVM	
	20/20			Q2: PQ / Q3: HVM
BMV Open Diameter [um]		65	60	50
BMV Pad Diameter [um]		140	120	110
PTH Open Diameter [mm]		0.15		
Core Thickness [um]		50	40	25 (Coreless)
Thinnest Prepreg Type		1027	1017	1010
Board Thk (min/max) [mm]		0.3 / 2.2		0.25 / 2.2
SR Opening Size [um]		80		70
SR Registration [um]		20	15	



**JiangXi Operational Excellence
Zhuhai Gaolangang Plant
LC SMT MES System**



Quality, Cost and Efficiency Come from the Perfect Process Layout!

Quality

- Chemical Analysis On-line
- Parameter Collection
- Copper & board thickness In-line test
- Traceability by Lot
- Smart Warehouse

Cost

- Electricity and water dose monitor
- Energy saving system

Efficiency

- Board Cutting - Trimming - Rounding - Cleaning - Baking
- Inner Layer Pretreatment - Coating - Exposure - DES - Brown Oxidation
- Pressing - PP Cutting - Pre-lay - Composing - Lamination - Decomposing
- AGV Logistics



1

Realize material FIFO

2

Dynamic inventory with real time control

3

EBS seamless interfaced with smart warehouse

The application of smart warehouse ensures the speed and accuracy of data input in all aspects of warehouse management, realizing FIFO and quality assurance of raw materials.



SPC for Chemical



Auto Dosing System



On-line Chemical Analysis

Concentration : On line chemical analysis, Auto-dosing system can add or adjust.



Lot Control & Traceability

1

CCD reading code

CCD reading code to identify product info in whole process

2

Capture code after product cleaning finished

Stack by lot No.# and date code

3

Capture code before Packaging

Distinguish lot No.# and date code

Realize lot management in the whole PCB process by on line reading code and classification system, which can avoid different product mixed, and same product but in different date code mixed when shipping.



AGV Logistics

1

Adjust the route flexibly according to requirement

2

Order with Reasonable distribution

3

Reduction of scratch caused by handling

AGV logistics can make the transportation in high-efficiency, transferring the raw materials/semi-finished products to production line at beginning process, then end process to WIP or finished product warehouse, and the material output after sorting, which can reduce the possibility of handling, as well as the scrap .



HLC (High Layer Count)

Capacity planning: 100K m²/Month

Equipment Installation and Full Process Trial Run March, 2021

Ramp up Plan m²/Month

2021.4	2021.7	2021.11	2022.5
20K	50K	75K	100K

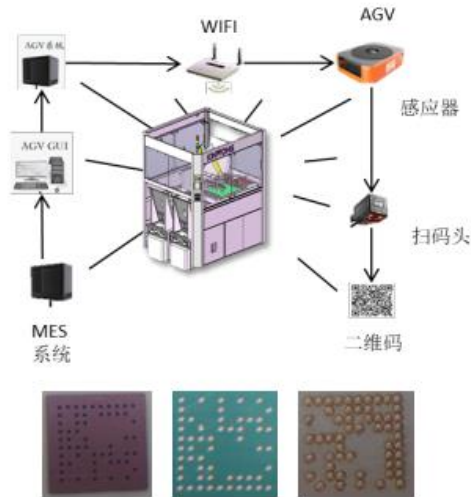
SLP (Substrate Like PCB)

Capacity planning: 50K m²/Month

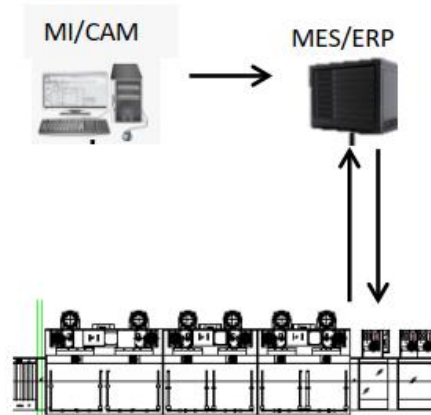
Equipment Installation and Full Process Trial Run May 2021

Ramp up Plan m²/Month

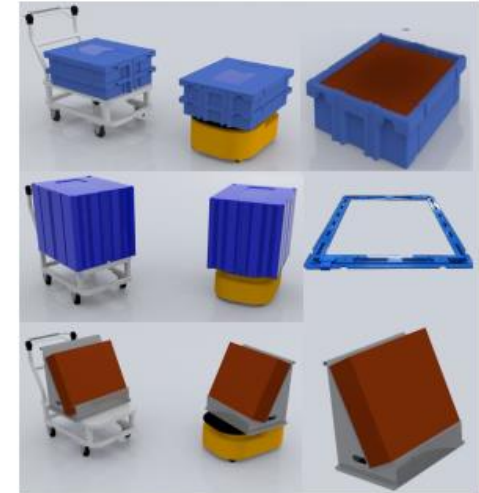
2021.6	2021.10	2022.5	2023.5
10K	20K	35K	50K



The full-process QR code traceability system, which can be controlled to each PCS, the size of the QR code is 2*2mm



All processing parameters are defined in the MI/CAM system and automatically downloaded to the equipment through MES/ERP.



Design different vehicles and transportation methods of AGV according to the product characteristics of each process.

Barcode Management, LOT Management and Trace System



Reading code before production



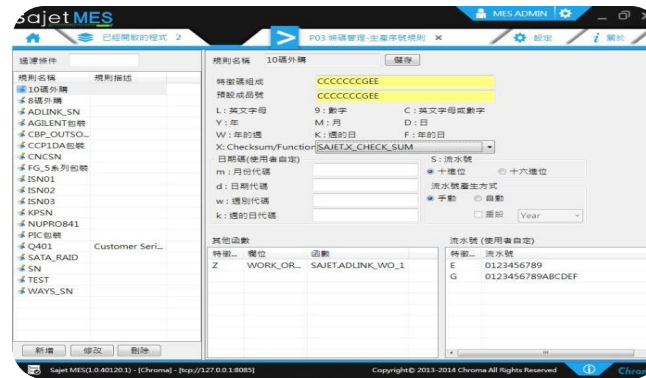
Scanning code in the processes



Scanning code while packing

Customizable barcode format, compatible with various industry standards.

Using the online reading-code classification system, we have made all processes of production under LOT management.



LC SMT MES Control Chart



- » Label
- » Code print
- » Laser carving

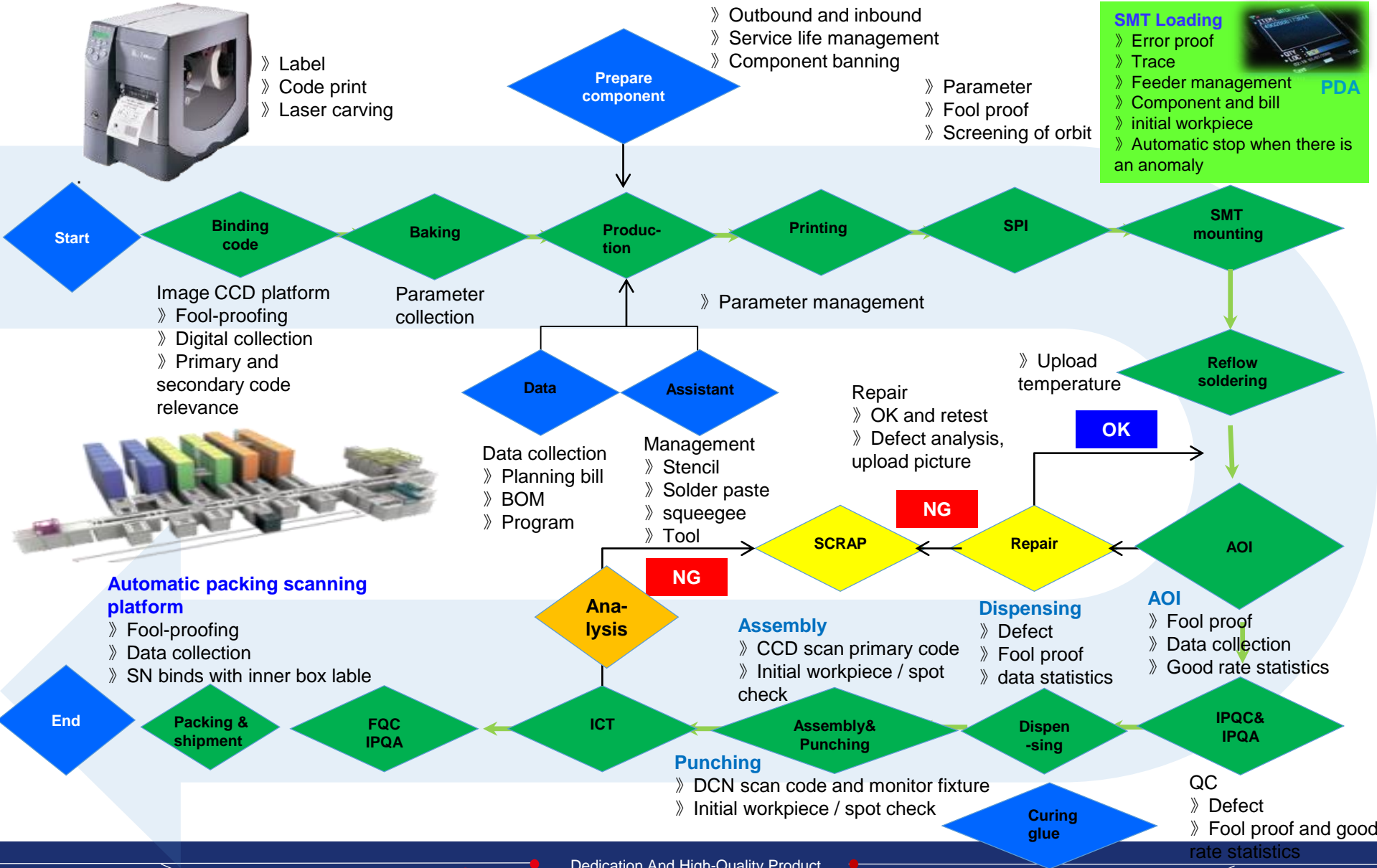
- » Outbound and inbound
- » Service life management
- » Component banning

- » Parameter
- » Fool proof
- » Screening of orbit

SMT Loading

- » Error proof
- » Trace
- » Feeder management
- » Component and bill initial workpiece
- » Automatic stop when there is an anomaly

PDA





THANKS

**To become the most reliable printed circuit
board manufacturer in the world.**