台达电子（东莞）有限公司
分析实验室

Delta Electronics (Dong Guan) Co., Ltd.
Analysis Lab

研发中心二楼

R & D Building Exterior

实验室座落在RD二楼

Labs on the second floor

实验室简介
Introduction to the laboratory

台达电子（东莞）有限公司分析实验室（简称东莞实验室）位于东莞石碣镇台达工业区，是台达电子（东莞）有限公司下属的检测机构,中国合格评定国家认可委员会(CNAS)认可实验室,专业从事电子电气产品的检测与量测,出具的检测报告可得到与CNAS签署互认协议的国家和地区实验室认可机构的承认。

The Analysis Laboratory of Delta Electronics (Dongguan) Co., Ltd. (referred to as Dongguan Laboratory) is located in the Delta Industrial Zone of Shijie Town, Dongguan. It is a testing institution under Delta Electronics (Dongguan) Co., Ltd. and a laboratory accredited by the China National Accreditation Service for Conformity Assessment (CNAS). The laboratory specializes in the testing and measurement of electronic and electrical products, and its testing reports can be recognized by national and regional laboratory accreditation institutions that have signed mutual recognition agreements with CNAS.

东莞实验室成立于2006年1月，独立于台达东莞区研制方、制造方、营销方以及产品使用方。东莞实验室作为台达东莞区产品研发、生产和采购的支持性部门 凭借着东莞实验室专业及高素质的技术团队及管理,以及秉着“科学严谨、客观公正、准确可靠、客户满意”的质量方针，为台达公司内部提供了专业而快捷的产品检测服务。

Dongguan Laboratory was established in January 2006, independent of Delta Dongguan's research and development, manufacturing, marketing, and product users. Dongguan Laboratory, as a supporting department for product research and development, production, and procurement in Delta Dongguan, relies on its professional and high-quality technical team and management, as well as its quality policy of "scientific rigor, objectivity, impartiality, accuracy, reliability, and customer satisfaction", to provide professional and efficient product testing services for Delta internally.

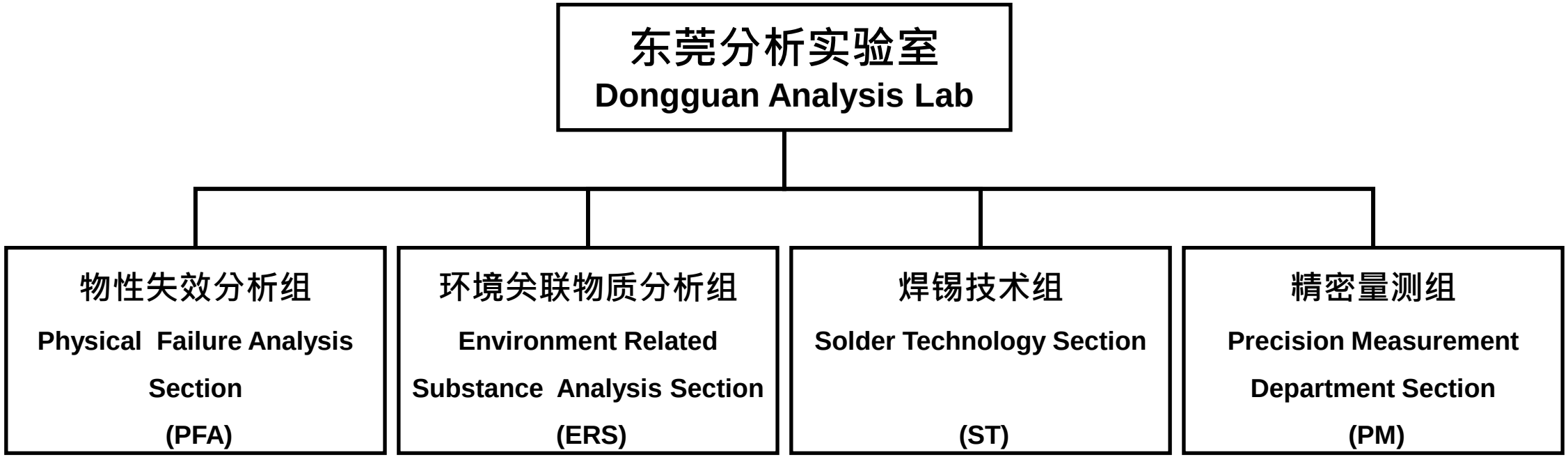
东莞实验室检测与量测包括电子电气产品环境危害物质检测、电子元器件及组件失效分析、元器件可焊性测试、计量四个领域，为集团客户与外部客户提供第三方的实验室服务。实验室并严格遵循国际标准ISO 17025的管理体系进行运作

Dongguan laboratory testing and measurement includes four fields: environmental hazard substance testing of electronic and electrical products, failure analysis of electronic components and assemblies, solderability testing of components, and metrology. We provide third-party laboratory services for group and external customers. The laboratory operates strictly in accordance with the management system of international standard ISO 17025

长期以来，东莞实验室全面服务并协助各厂区积极应对不断涌现的环保要求及制程改善， 优质的服务和检测、测量技术水准，获得了各厂区的认可，并建立了紧密的合作关系。

For a long time, Dongguan Laboratory has provided comprehensive services and assisted various factory areas in actively responding to emerging environmental requirements and process improvements. With high-quality services and testing and measurement technology, it has gained recognition from various factory areas and established close cooperative relationships.

实验室组织结构
Organization chart



CNAS L5971

实验室功能
Lab Function

东莞分析实验室
Dongguan Analysis Lab

物性失效分析组
Physical Failure Analysis Section (PFA)

- 3D X-Ray检测 (3D X-ray)
- 切片分析 Cross-section Analysis
- 电子显微镜/能谱仪 SEM/EDS Test
- 应变测试 Strain gage Test
- 半导体分析 Semiconductor FA

环境关联物质分析组
Environment Related Substance Analysis Section (ERS)

- 多溴联苯&多溴联苯醚检测 PBB&PBDE test
- 邻苯二甲酸检测 Phthalates test
- 重金属检测 Heavy Metal test
- 卤素检测 Halogen test
- 塑料熔融指数测试 Melt Flow Rates of Thermoplastics test

焊锡技术组
Solder Technology Section (ST)

- 合金成分检测 Alloy Composition Test
- 锡膏特性检测 Solder paste Characteristics
- 可焊性检测 Solder ability Test
- 推拉力检测 Pull & Push Test
- 离子污染度检测 Ionic Contamination Test

精密量测组
Precision Measurement Department Section (PM)

- 三次元测量系统 Coordinate Measurement system
- 表面粗糙度测量系统 Surface roughness measurement system
- 圆度测量系统 Roundness measurement system
- 影像测量系统 Vision measurement system
- 校准系统(卡尺/千分尺) calibration system (Caliper/Micrometer)

资质认证 CNAS Certification

中国合格评定国家认可委员会

实验室认可证书

（注册号：CNAS L5971）

兹证明：

台达电子（东莞）有限公司分析实验室

（法人：台达电子（东莞）有限公司）

广东省东莞市石碣镇台达工业区台达三厂，523308

符合 ISO/IEC 17025：2017《检测和校准实验室能力的通用要求》（CNAS-CL01《检测和校准实验室能力认可准则》）的要求，具备承担本证书附件所列服务能力，予以认可。

获认可的能力范围见标有相同认可注册号的证书附件，证书附件是本证书组成部分。

生效日期：2024-12-18

截止日期：2030-12-17

中国合格评定国家认可委员会授权人

中国合格评定国家认可委员会（CNAS）经国家认证认可监督管理委员会（CNCA）授权，负责实施合格评定国家认可制度。CNAS是国际实验室认可合作组织（ILAC）和亚太认可合作组织（APAC）的互认协议成员。

本证书的有效性可登陆www.cnas.org.cn获认可的机构名录查询。

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L5971)

Delta Electronics (Dongguan) Co., Ltd. Analysis Laboratory

(Legal Entity: Delta Electronics (Dongguan) Co., Ltd.)

Delta Plant 3, Delta Industrial Estate, Shijie, Dongguan, Guangdong, China

is accredited in accordance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence to undertake the service described in the schedule attached to this certificate.

The scope of accreditation is detailed in the attached schedule bearing the same registration number as above. The schedule forms an integral part of this certificate.

Effective Date：2024-12-18

Expiry Date：2030-12-17

Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is a signatory of the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA) and the Asia Pacific Accreditation Cooperation Mutual Recognition Arrangement (APAC MRA).

The validity of the certificate can be checked on CNAS website at http://www.cnas.org.cn/english/findanaccreditedbody/index.shtml.

物性失效分析

Physical Failure Analysis

物性失效分析专注印刷电路板及组装（**PCB&PCBA**）、被动电子器件、半导体器件析的失效分析，致力于为客户提供专业的故障诊断、根本原因分析（**Root Cause Analysis**）与改善建议，同时帮助厂区制程应变风险验证分析（**Strain Gage Test**），确保元器件不会因制程应变导致失效，协助提升产品质量。

核心服务项目包括：

The Physical Failure Analysis focuses on the failure analysis of printed circuit boards and assemblies (PCB&PCBA), passive electronic devices, and semiconductor devices. It is committed to providing customers with professional fault diagnosis, root cause analysis, and improvement suggestions. At the same time, it helps with process strain risk verification analysis (Strain Gage Test) in the factory area to ensure that components will not fail due to process strain and assist in improving product quality.

The core service projects include:

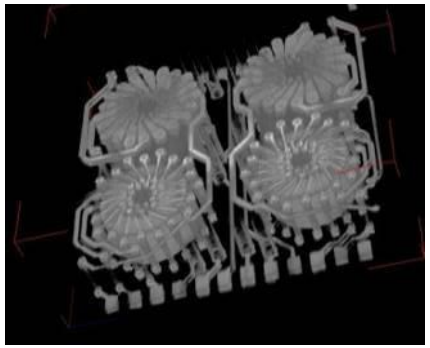
物性失效分析 (Physical Failure Analysis)

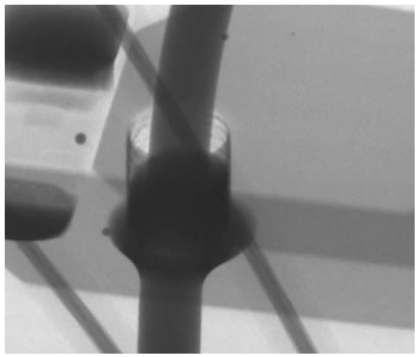
1.X-Ray穿透检查(X-Ray Inspection)

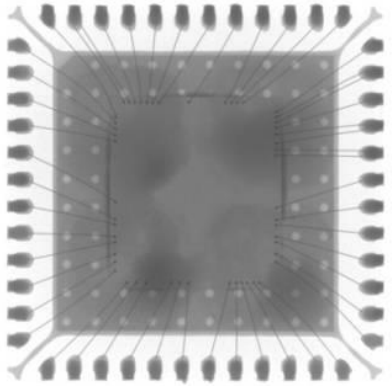
3D X-Ray检测仪 (3D X-Ray system)

- •元器件内部结构检查
  （Components internal inspection）
- •连接线材
  （Wire bonding inspection）
- •各类焊点质量检查
  （Solder joint quality inspection）
- •PCB内部检查
  （PCB Internal inspection ）

3D X-ray检测仪





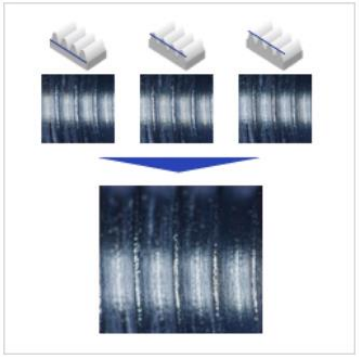


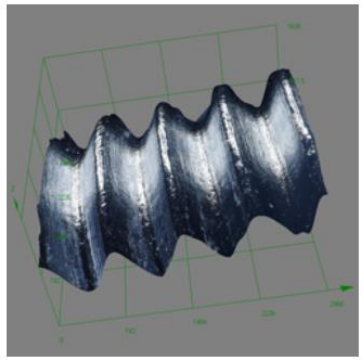
物性失效分析 (Physical Failure Analysis)

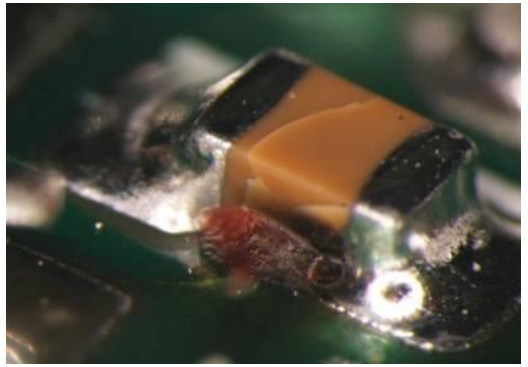
2.外观检查(Visual Inspection)

- •元器件外观检测
  （Components appearance inspection）
- •焊点检测
  （Solder joint appearance inspection）
- •PCBA外观检测
  （PCBA appearance inspection）

景深扩展 & 3D 观测分析





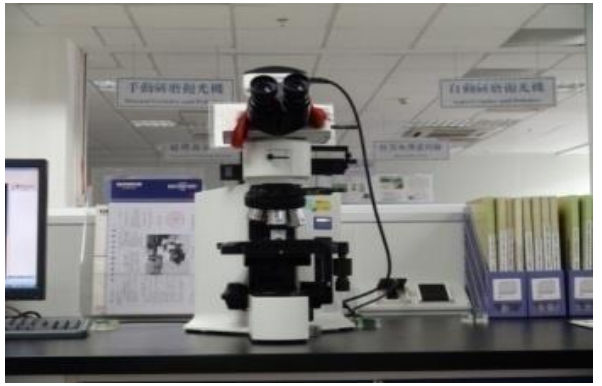


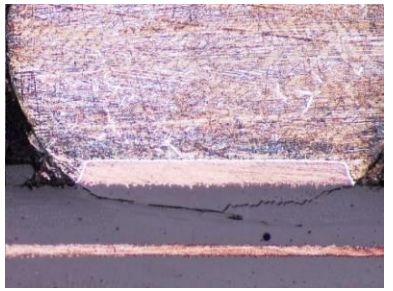
外观缺陷检查

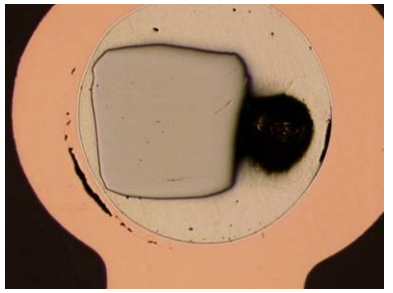
物性失效分析 (Physical Failure Analysis)

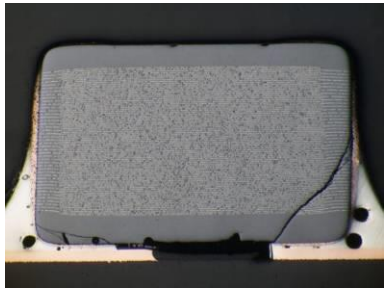
3.切片实验 (Cross Section Analysis):

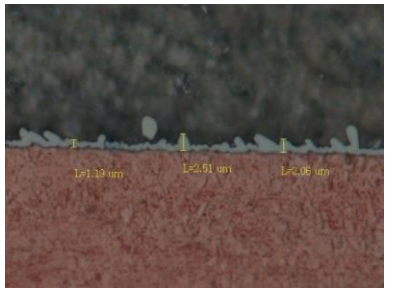
- 研磨抛光机（Polishing grinding M/C）
  - •各类金相样品
    （All kinds of metallographic specimen）
  - •自动抛光
    （Auto Polisher ）
- 金相显微镜（Metalloscope）
  - •焊点金相分析
    （solder joint status）
  - •PCB分析量测
    （PCB copper thickness measurement）
  - •镀层分析量测
    （solder joint status）
  - •MLCC金相分析
    （MLCC Analysis）
  - •其他金相分析
    (Other Cross Section Analysis)









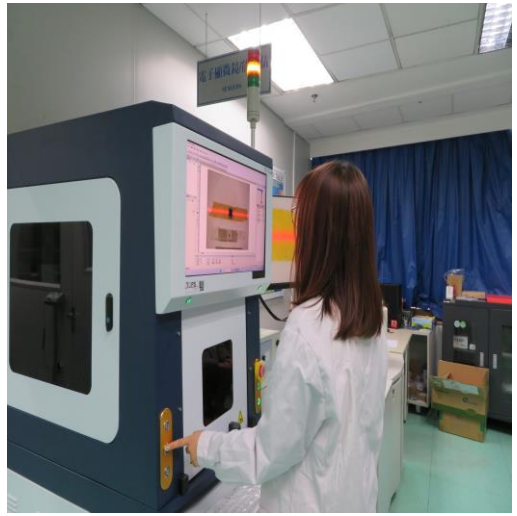


物性失效分析 (Physical Failure Analysis)

4.解封胶实验 (Decap Analysis):

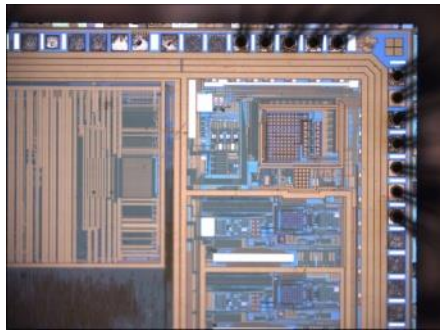
- 自动开封机
(Auto decapsulation M/C)
  - •BGA/MOSFET器件
  （BGA/MOSFET component）

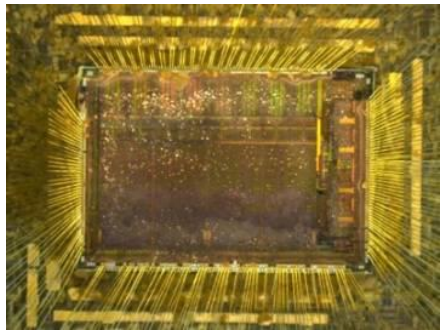
- Decap 分析
（Decap Analysis）
  - •其他器件Decap分析（Other decap analysis of semiconductor）

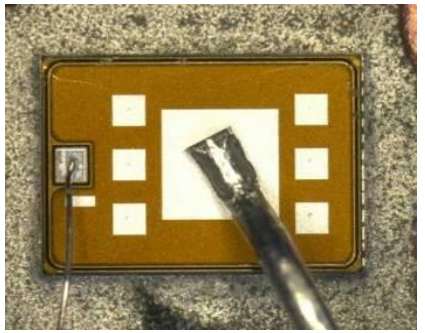


激光开封机

自动开封机





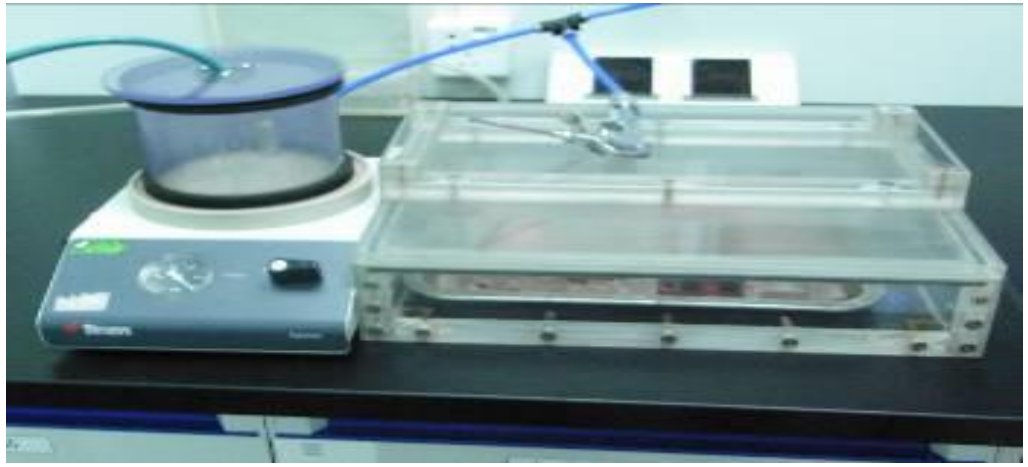


物性失效分析 (Physical Failure Analysis)

5. 红墨水试验(Dye & Pry Test):

抽真空系统（Vacuum system）

- BGA/QFN器件染色实验分析（BGA/QFN Dye & Pry Test）
- 其他器件染色实验分析（Other components Dye & Pry Test）



物性失效分析 (Physical Failure Analysis)

6.应变测试实验 (Strain gage measurement):

- **PCBA生产制程应变验证**

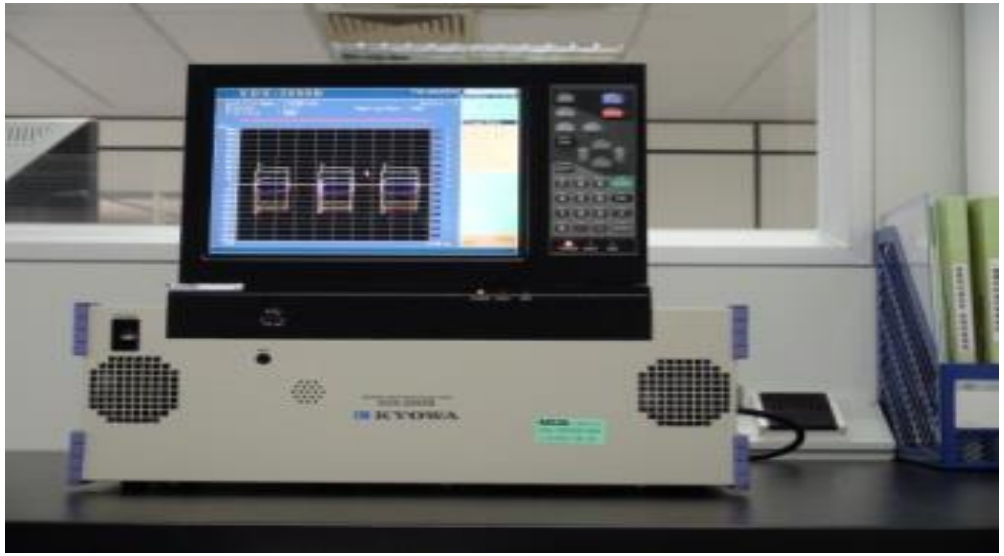
  (Thermal strain measurement)

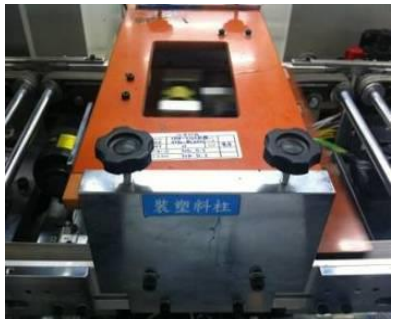
- **PCBA生产治具应变验证**

  （ Fixture strain measurement ）

- **产品可靠度测试应变测试**

  （ Reliability strain test ）





物性失效分析 (Physical Failure Analysis)

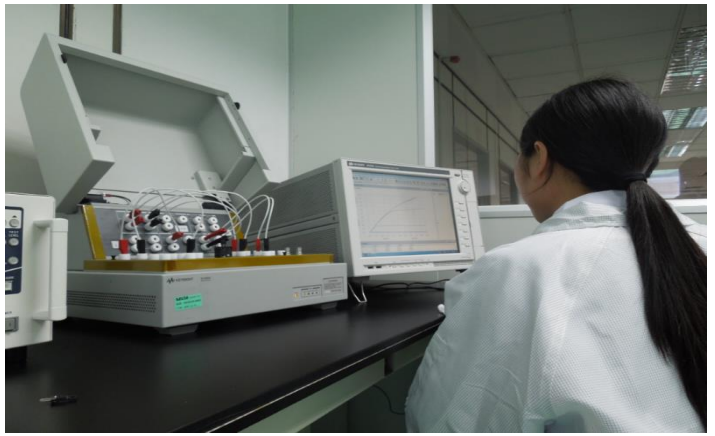
7.半导体失效分析（Semiconductor Fail Analysis）

7.1 Diode、BJT、FET等分立器件静态参数测量 (Diode、BJT、FET and other static parameters measurement)

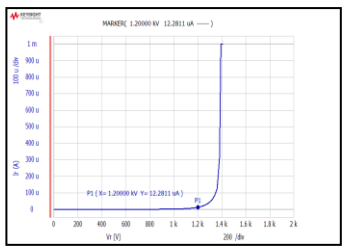
Diode：V_F、I_F、V_R、I_R、V_Z、I_{ZT}、Z_{ZT}、I_{ZK}、Z_{ZK}、I_F-V_F、I_R-V_R、I_{ZT}–V_{ZT}

BJT：BV_{CBO}、BV_{CEX}、BV_{CEO}、BV_{EBO}、BV_{ECX}、BV_{ECO}、I_{CBO}、I_{CEX}、I_{EBO}、$V_{CE(sat)}$、$V_{BE(sat)}$、$V_{BE(on)}$、H_{FE}、I_C-V_{CE}

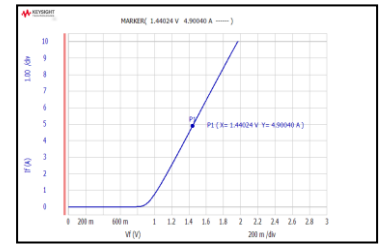
MOSFET：$V_{(BR)DSS}$、I_{DSS}、I_{GSS}、$V_{GS(th)}$、$R_{DS(on)}$、I_{SD}、V_{SD}、$V_{(BR)GSO}$、I_D-V_{DS}、I_D-V_{GS}、$R_{DS(on)}$-I_D、V_{DS}-I_{SD}



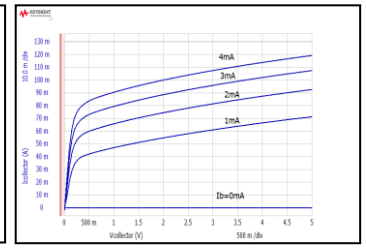
功率器件分析仪/曲线追踪仪
Power Device Analyzer/Curve Tracer



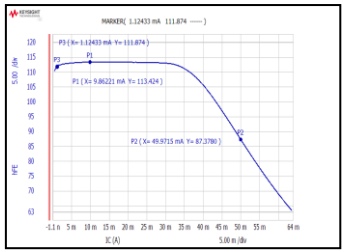
I_R-V_R



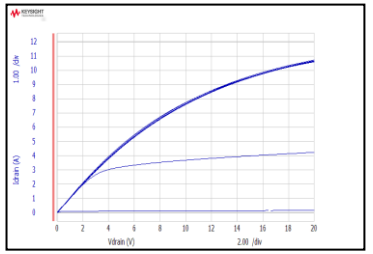
I_F-V_F



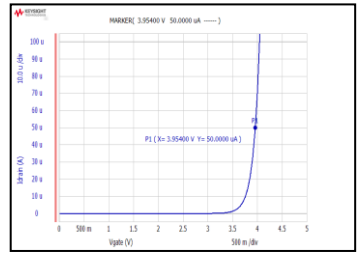
I_C-V_{CE}



h_{FE}



I_D-V_{DS}

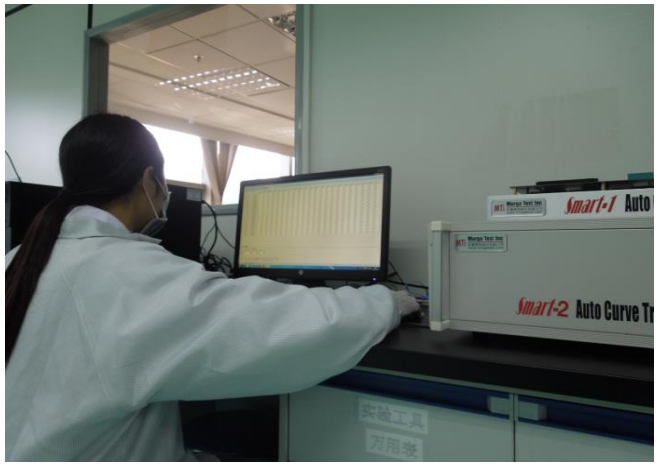


$V_{GS(th)}$

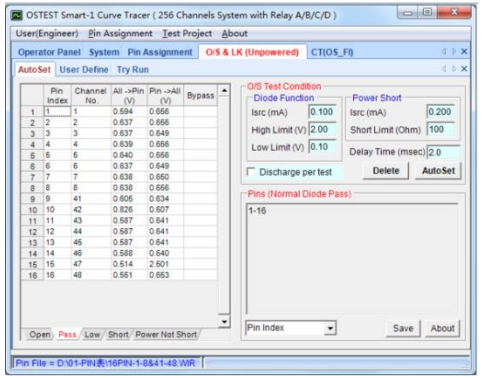
物性失效分析 (Physical Failure Analysis)

7.2 针对IC进行 O/S 测试以及Unpowered Leakage 测试可进行绘制IV曲线

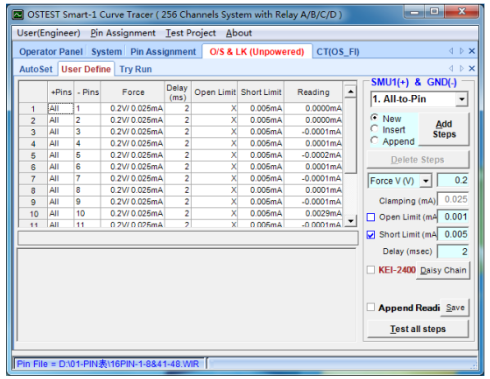
(Open/short, Unpowered Leakage and I/V measurement of integrated circuit)



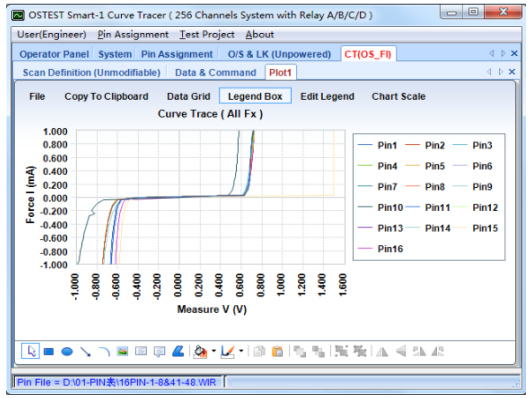
IV曲线量测仪（IV Curve Tracer）



O/S Test



Unpowered Leakage Test



Curve Tracer Test

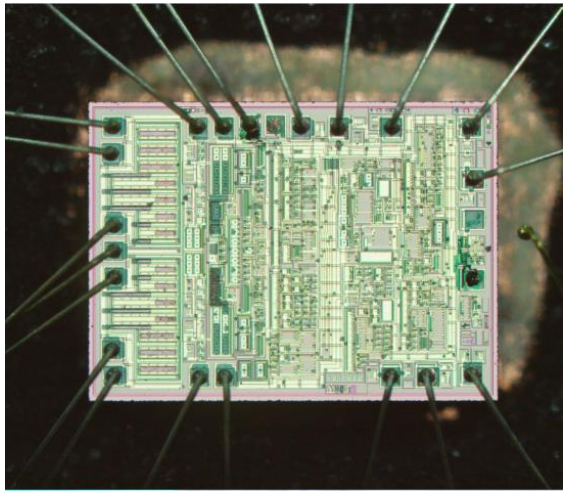
物性失效分析 (Physical Failure Analysis)

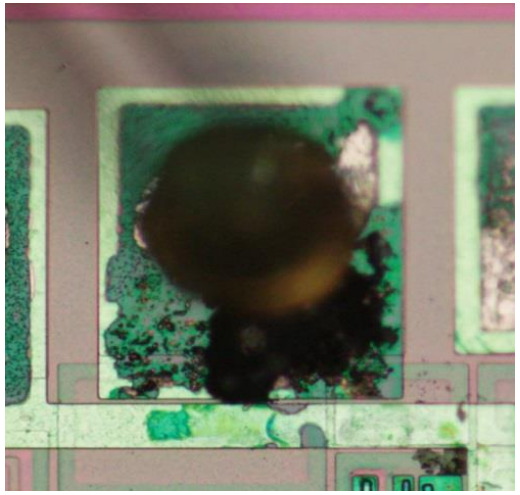
7.3 Decap后常规显微镜观察（Inspection after Decap）

- 芯片表面直接观察

（Direct observation of the surface of the chip）

- 烧痕点（Burn mark）
- 裂痕（Crack）



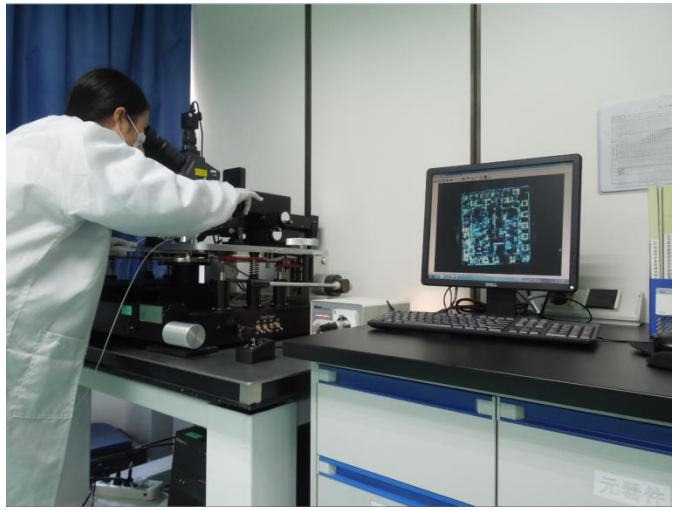


金相显微镜
（Metallographic Microscope）

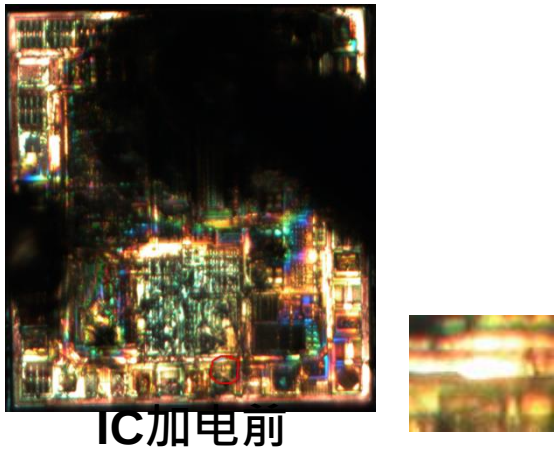
物性失效分析 (Physical Failure Analysis)

7.4 Decap后液晶显示观察
(Decap liquid crystal display observation)

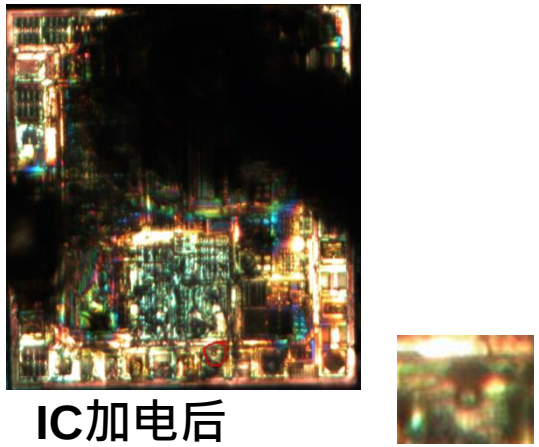
- 芯片表面间接观察
  (The chip surface indirect observation)
- 针对金像显微镜观察不到的点进行LC显示观察如ESD造成的失效点(To observe the metallographic microscope can not see the point Such as the failure point caused by ESD)



LC液晶探针台(Liquid Crystal Probe Station)



IC加电前
（IC before Power）



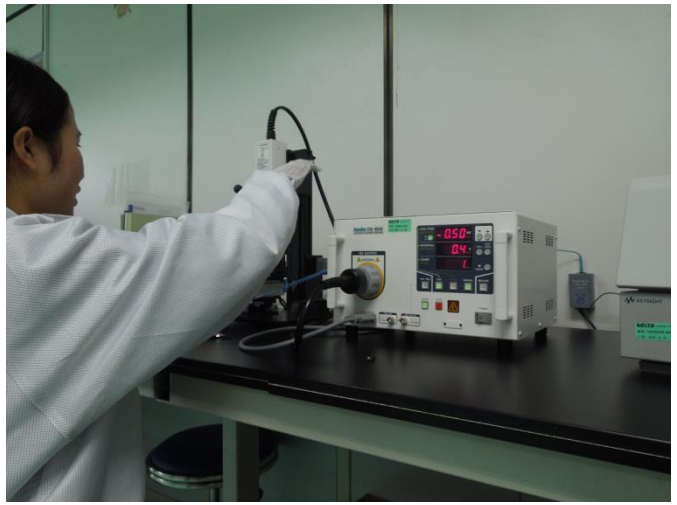
IC加电后
（IC after Power）

IC加大加电后
（IC increase Power）

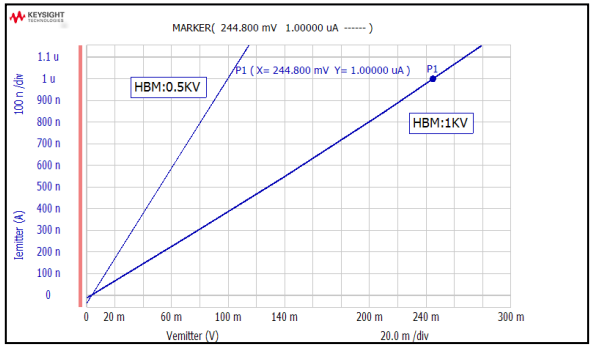
物性失效分析 (Physical Failure Analysis)

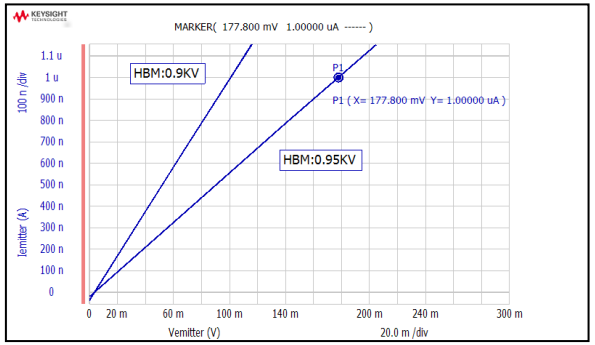
7.5 ESD测试实验（Electrostatic Discharge Test）

- HBM、MM两种静电放电模式静电失效现象再现器件耐静电等级判断
（ HBM, MM two kinds of electrostatic discharge model ,Reproduce the failure Phenomenon caused by ESD and Electrostatic rating of devices ）



半导体静电放电仿真器
（ESD Simulator For Semiconductors）



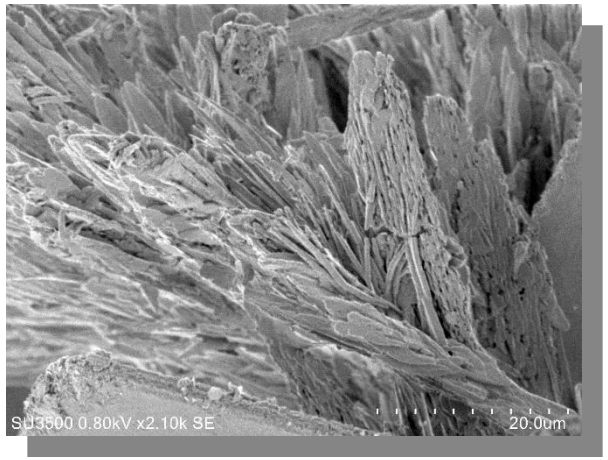


对BJT进行ESD测试前后ICEO变化对比
（ESD Test for the BJT）

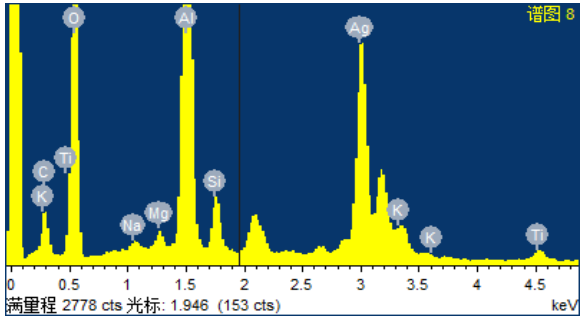
物性失效分析 (Physical Failure Analysis)

8. 电子扫瞄显微镜/元素分析
(scanning electron microscope/elemental analysis)

Hitachi SU3500
Scanning Electron Microscope



超薄面的显微结构
（Microstructure of ultra-thin surface）



Elements Analysis

环境关联物质分析

Environmental Related Substance Analysis

环境关联物质分析致力于检测与分析各种环境关联物质，确保产品符合RoHS、TSCA以及其他多项环保法规要求。我们配备了各种先进的化学分析仪器，并严格遵循国际标准ISO 17025进行运作，确保所有检测结果的准确性和可靠性。

主要分析仪器及其应用：

ERS is committed to detecting and analyzing various environmentally related substances to ensure that products comply with RoHS, TSCA, and other environmental regulations. We are equipped with various advanced chemical analysis instruments and operate strictly in accordance with the international standard ISO 17025 to ensure the accuracy and reliability of all test results.

Main analytical instruments and their applications:

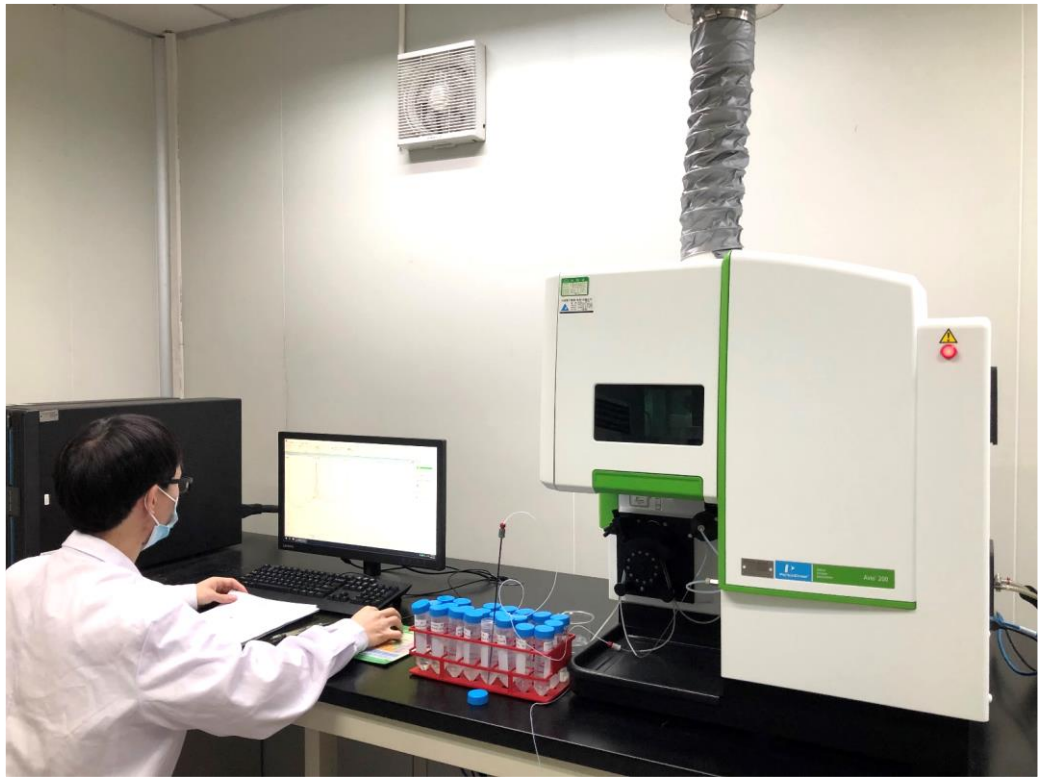
环境关联物质分析 (Environmental Related Substance Analysis)

1.金属元素检测
（Metallic element test ）

铅(Pb)、镉(Cd)、汞(Hg)、砷(As)、铬(Cr)、锑(Sb)、铍(Be) 、磷(P)....

材料（Material）:
塑料（Plastic ）
橡胶（rubber ）
金属（Metal ）

测试方法（Test method ）:
IEC 62321
EPA3050B
EPA3052。



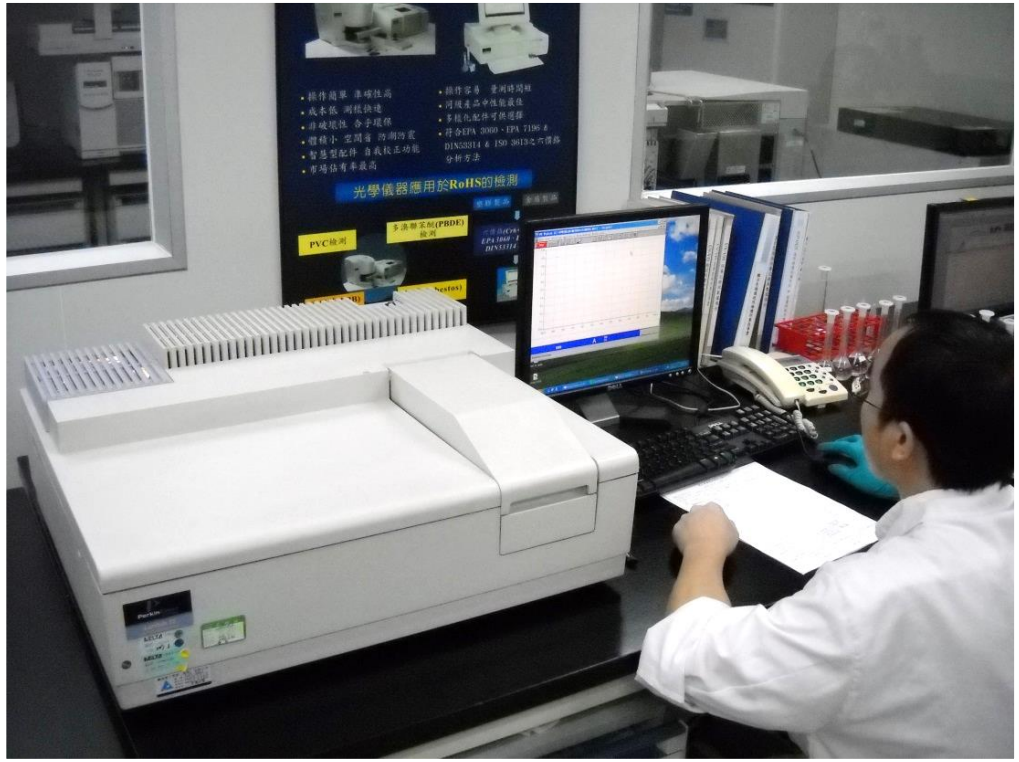
ICP-OES (电感耦合等离子体发射光谱仪)

环境关联物质分析 (Environmental Related Substance Analysis)

2.六价铬检测
（Cr^{6+} test）

材料（Material）:
塑料（Plastic）
金属表面镀层
（Metal surface coating），
金属（Metal）

测试方法（Test method）:
IEC 62321-7-1
IEC 62321-7-2



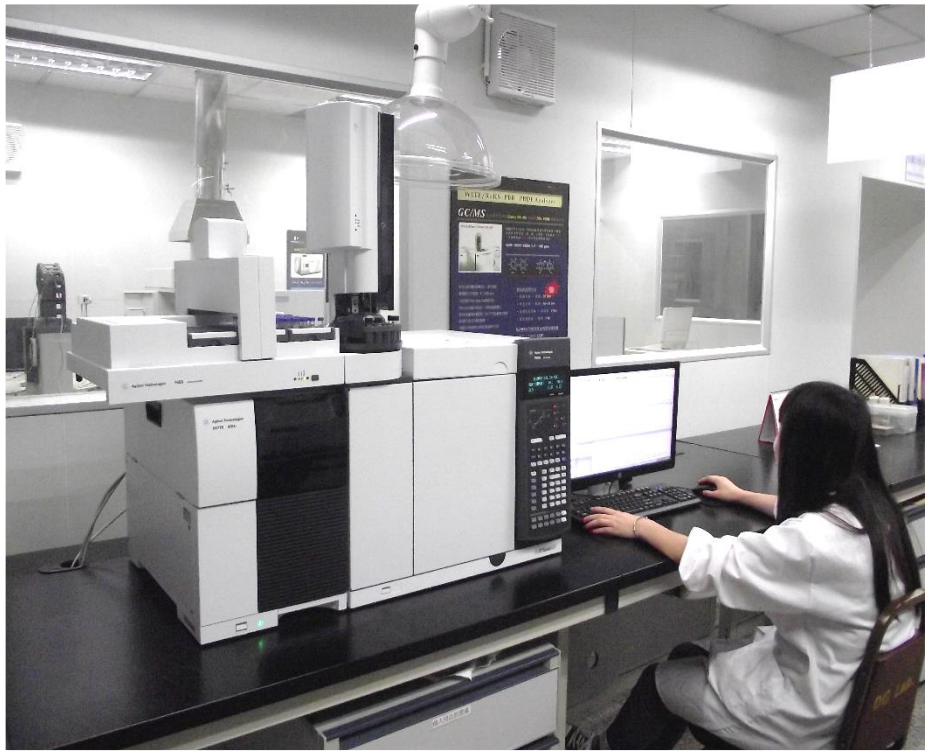
UV-VIS (紫外光-可见光光谱仪)

环境关联物质分析 (Environmental Related Substance Analysis)

3.多溴联苯&多溴联苯醚检测
（PBB&PBDE test）

材料（Material）:
塑料（Plastic ）
橡胶（rubber ）

测试方法（Test method ）:
IEC 62321
EPA 3550C



GC-MS (气相色谱-质谱联用仪)

环境关联物质分析 (Environmental Related Substance Analysis)

4.邻苯二甲酸酯&六溴环十二烷检测
(Phthalate & HBCDD test)

材料（Material）:
塑料（Plastic ）
橡胶（rubber ）

测试方法（Test method ）:
EN14372
EPA3550C

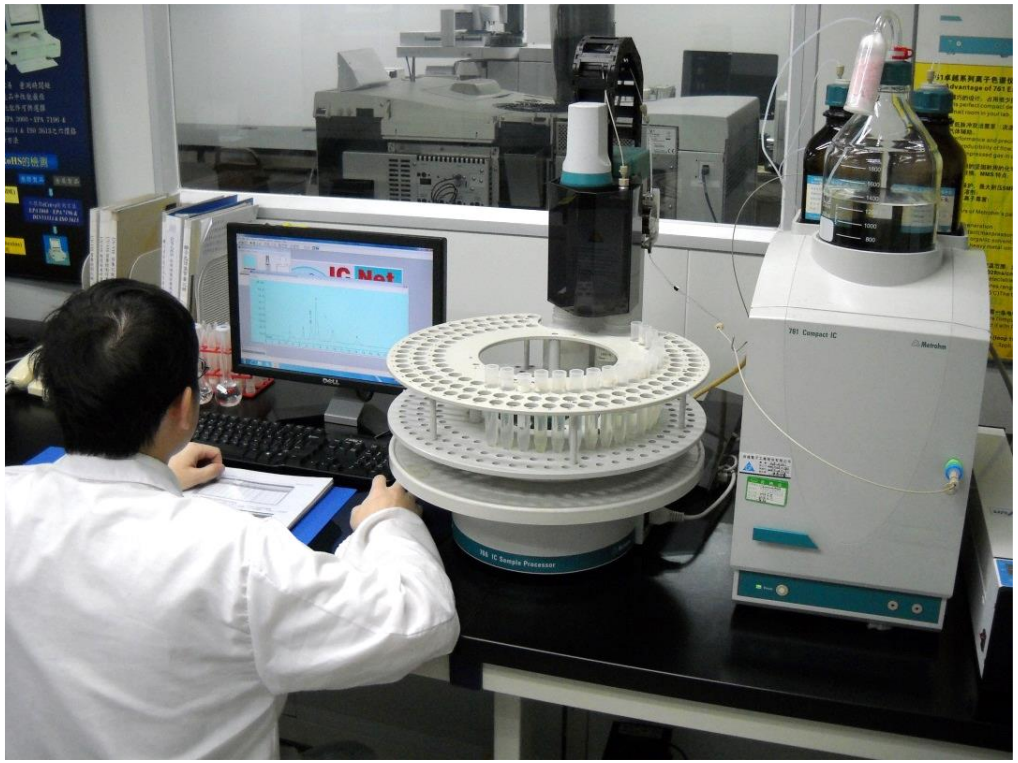
GC-MS (气相色谱-质谱联用仪)

环境关联物质分析 (Environmental Related Substance Analysis)

5.卤素&其它阴离子检测
（Halogen & other anion test）

材料（Material）:
塑料（Plastic ）
橡胶（rubber ）...

测试方法（Test method ）:
EN 14582



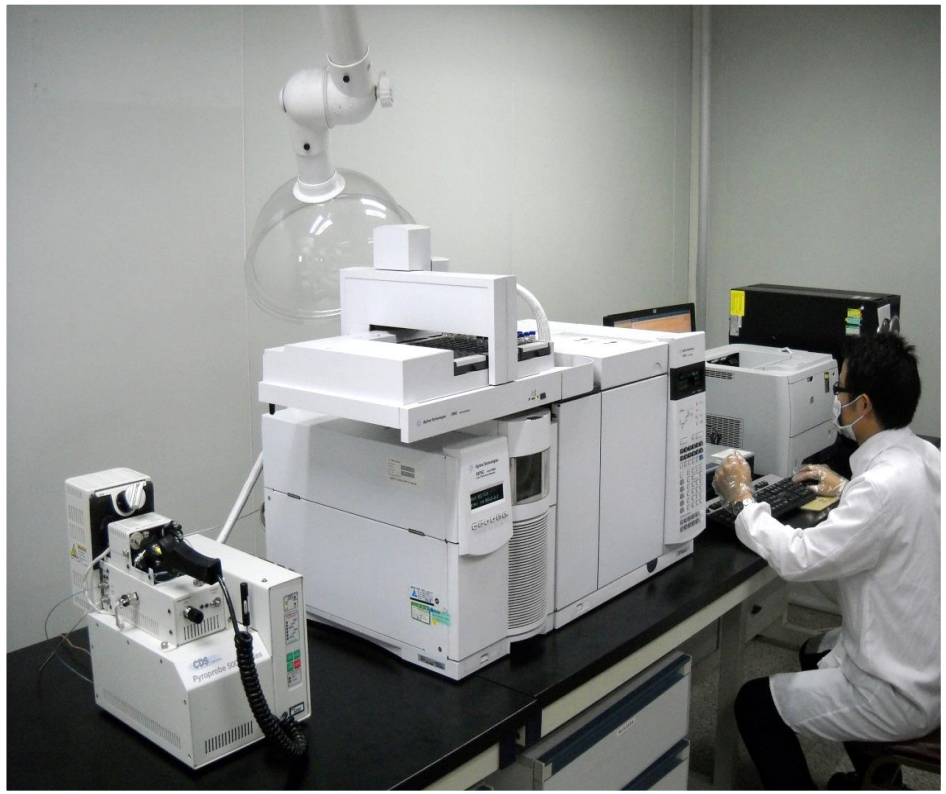
IC 离子色谱仪

环境关联物质分析 (Environmental Related Substance Analysis)

6. 红磷检测
(Red phosphorus test)

材料（Material）:
塑料（Plastic ）
橡胶（rubber ）

测试方法（Test method ）:
PY-GC/MS



PY-GC/MS（热裂解-气象色谱/质谱联用仪）

环境关联物质分析 (Environmental Related Substance Analysis)

7. 塑料熔融指数测试
(Melt Flow Rates of Thermoplastics test)

材料（Material）:
PC
ABS
PBT
PPO

测试方法（Test method ）:
ASTM D1238-13

德国Zwick Mflow型熔融指数仪

焊锡技术
Soldering Technology

焊锡技术提供焊接材料测试与分析，锡丝、锡膏、助焊剂等焊锡制程材料的成份检测、焊锡制程条件、焊接能力试验、焊接不良分析与改善为客户提供专业的焊锡技术服务。

焊锡分析服务项目：

The Soldering Technology provides testing and analysis of soldering materials, composition testing of soldering process materials such as solder wire, solder paste, and flux, soldering process conditions, soldering ability testing, and analysis and improvement of soldering defectsProvide professional soldering technology services to customers.

Solder analysis service project:

焊锡技术 (Soldering Technology)

1.合金成份检测(Alloy Composition Test)

焊锡条及炉锡块(Solder Bar and Used Solder)

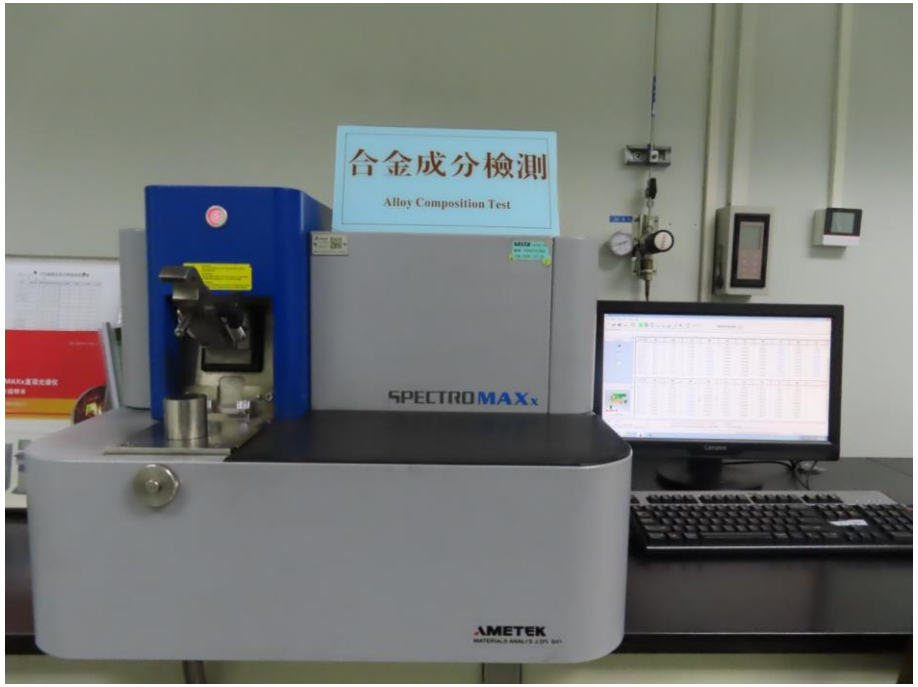
焊锡丝(Solder Wire)

焊锡膏(Solder Paste)

测试标准(Testing Standards)

IPC J-STD-001/IPC J-STD-005/IPC J-STD-006

JIS Z3197; JIS Z3284



火花直读光谱仪
(Spark Optical Emission Spectrometer)

焊锡技术 (Soldering Technology)

2.推拉力测试(Shear Test & Pull Test)

功能：可以针对焊点的强度进行评估

(Function : The strength of the solder joint can be evaluated)

测试标准(Testing Standards)

JIS-Z3198

推拉力测试
(Shear & Pull Tester)

焊锡技术 (Soldering Technology)

3.可焊性测试 (Solderability Test)

元器件可焊性测试 (Component Solderability Test)

印制板可焊性测试试 (PCB Solderability Test)

测试标准(Testing Standards)

IPC J-STD-002/IPC J-STD-003

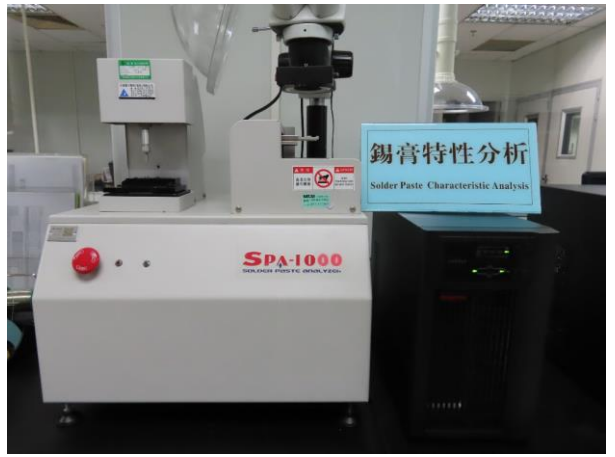
润湿称量
(Wetting Balance)

焊锡技术 (Soldering Technology)

4.焊锡膏(Solder Paste)

- 金属含量 (Metal Content)
- 粘度 (Viscosity)
- 触变系数 (Thixotropic index)
- 锡珠试验 (Solder Ball Test)
- 坍塌试验 (Slump Test)
- 润湿性试验 (Wetting Test)
- 粘附力试验及开封时间 (Tack Test & Open Time)
- 扩展率测试 (Spread Test)
- 合金部分成分及杂质检测 (Alloy Composition Test)
- 测试标准(Testing Standards)
- IPC J-STD-001/IPC J-STD-004/IPC J-STD-005

粘度测试仪
(Viscosity Tester)



锡膏特性分析仪
(Solder paste characteristic analyzer)

焊锡技术 (Soldering Technology)

5.助焊剂(Flux)

- 密度/粘度(Density/Viscosity)
- 固体含量 (Nonvolatile Content)
- 扩展率 (Spread Test)
- 残留物干燥度 (Residues Dryness)
- 酸值 (Acid Value)
- 水萃取液电阻率 (Water Solution Resistance Test)
- 测试标准(Testing Standards ANSI IPC/J-STD-004)

焊锡技术 (Soldering Technology)

6.离子污染残留测试 (Ionic Contamination Test)

PCB/PCBA

测试标准(Testing Standards)

IPC J-STD-001

离子污染测试仪
(Ionic Contamination Tester)

精密量测

Precision Measurement

精密量测是专注于高精度尺寸测量、形位公差分析以及量具校准的专业技术服务平台。依托于国际领先的精密量测设备，资深专业技术团队和严格的质量管理体系，严格遵循国际标准ISO 17025进行运作，致力于先进制造，科研开发，品质管控等领域提供精准、高效、可靠的量测解决方案。

PM is a professional technical service platform dedicated to high-precision dimensional measurement, geometric tolerance analysis, and gauge calibration. The PM relies on internationally leading precision measuring equipment, a senior professional technical team, and a strict quality management system. It operates strictly in accordance with the international standard ISO 17025 and is committed to providing accurate, efficient, and reliable measurement solutions in advanced manufacturing, scientific research and development, quality control, and other fields.

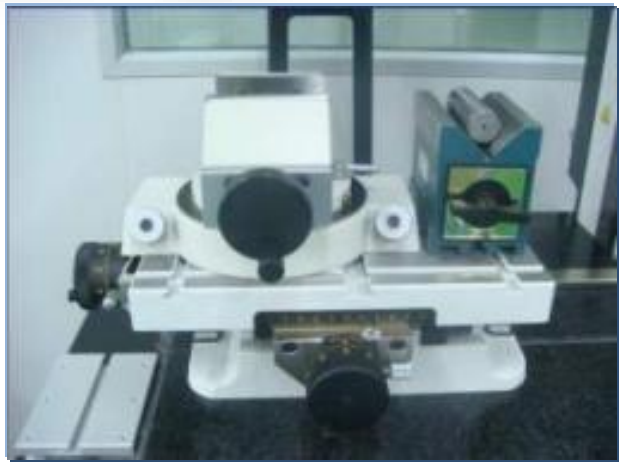
精密量测 (Precision Measurement)

三坐标测量系统 Coordinate Measurement system	
厂牌（Label)：	Germany　WENZEL
型号（Model）：	LH 65
量测范围 Measuring range：	（650×750×500）mm
精度(Precision）：	(2.5＋L／350) μm，L　unit：mm
量测类型 Measurement type：	各种模具、夹治具、零组件等产品之几何尺寸以及形位尺寸 All kinds of mold ,clip fixture,components of products such as geometry size and form size

精密量测 (Precision Measurement)

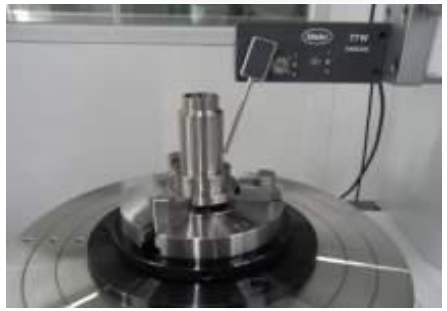
影像测量系统 Vision measurement system	
厂牌（Label)：	Mitutoyo
型号（Model）：	QV-X606P1L-C
量测范围 Measuring range：	（600×650 ×250) mm
精度(Precision）：	XY= (1.5+3L/1000) μm Z = (1.5+4L/1000) μm
量测类型 Measurement type：	各种模具、夹治具、零组件等产品之几何尺寸 All kinds of mold, clip fixture ,components of products such as geometry size

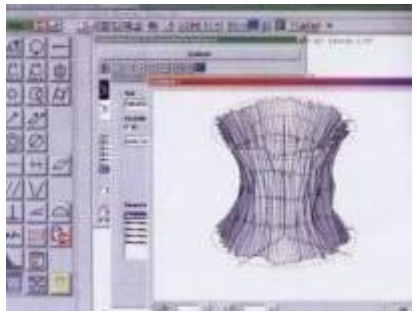
精密量测 (Precision Measurement)



表粗轮廓测量系统 Surface roughness / texture measurement system	
厂牌（Label)：	Mitutoyo
型号（Model）：	SV-C4100S4
量测范围 Measuring range：	100 mm (X axis)
精度(Precision）：	轮廓直线位移Outline linear displacement： ±(0.8+0.01L) μm, 表粗直线位移Table rough linear displacement:(0.05+1.5L/1000) μm
量测类型 Measurement type：	表面粗糙度轮廓测量 Surface roughness Profile measurement

精密量测 (Precision Measurement)



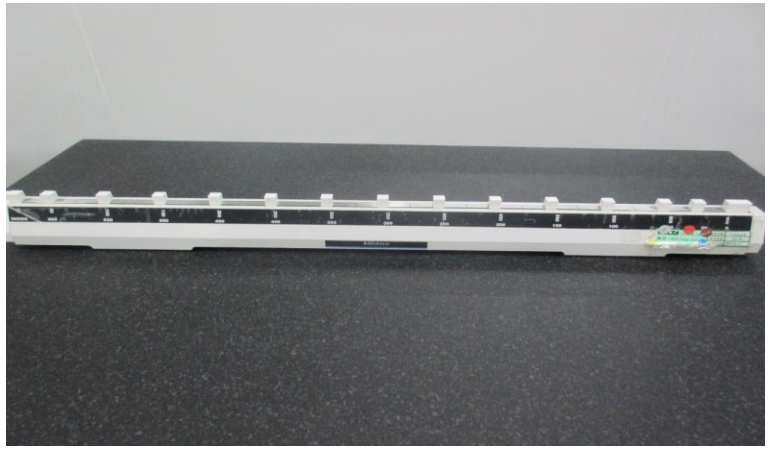


圆度仪测量系统 Roundness measurement test system	
厂牌（Label)：	The German Mahr
型号（Model）：	MarForm MMQ 400-2
量测范围 Measuring range：	（1 to 250) mm
精度(Precision）：	(0.01+0.00025*H) μm H is the measurement height (mm)
量测类型 Measurement type：	真圆度、圆柱度、同心度、同轴度 Roundness, cylindricity ,concentricity ,coaxiality

精密量测 (Precision Measurement)

高度计测量系统 Height gauge measurement system	
厂牌（Label)：	Trimos
型号（Model）：	VT 600
量测范围 Measuring range：	（0 to 600) mm
精度(Precision）：	(1.2+L/1000) μm L is the measurement height (mm)
量测类型Measurement type：	高度、深度尺寸；直径等 Height, diameter, depth;

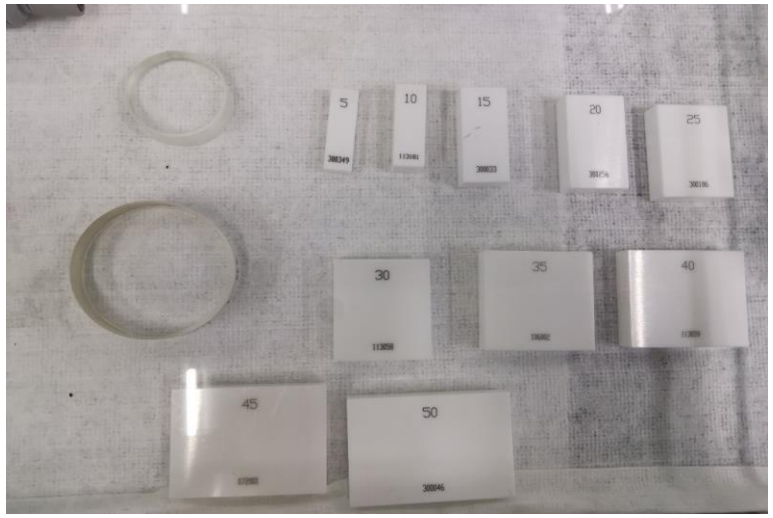
精密量测 (Precision Measurement)



卡尺校正器Caliper Calibration

校准系统
Calibration system

1、卡尺校准Caliper Calibration
2、千分尺校准Micrometer Calibration
3、量表校准Dial gauge Calibration
4、PIN规校准 Pin gauge Calibration
5、高度计校准 Height gauge Calibration



陶瓷量块Ceramics Gauge block

I-checker-dial guage
校表仪-量表

洽询窗口 Contact Window

DG Lab:田春港 电话: (86)769-8663-9008 分机5068 / 136-0236-5961

mail: JOHNSON.TYAN@DELTAWW.COM

Smarter. Greener. Together.