

# AMA生能<sup>®</sup> Hien

浙江正理生能科技有限公司  
ZHEJIANG AMA & HIEN TECHNOLOGY CO., LTD

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## 产品手册

## Product manual

追求卓越品质 · 超越顾客期望

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## 公司基本信息 01

Company Basic Information

浙江正理生能科技有限公司创建于1989年，致力于研发、制造、销售为一体的专业化制造企业，公司主要生产汽车及家电连接器、汽车配件（开关盒、保险盒、空调出风口、控制装置等）、汽车线束、模具、空气能热泵、地暖、新风、储能等。

公司位于浙江省乐清市蒲岐镇，总占地面积7万多平方米，建筑面积近18万平方米，现有员工近1200人。

公司先后通过了IATF16949:2016汽车质量管理体系认证;ISO9001:2015质量管理体系认证;ISO14001:2015环境管理体系认证;ISO45001:2018职业健康安全管理体系认证;主要产品均通过UL、VDE认证，所有产品均符合欧盟环保要求。

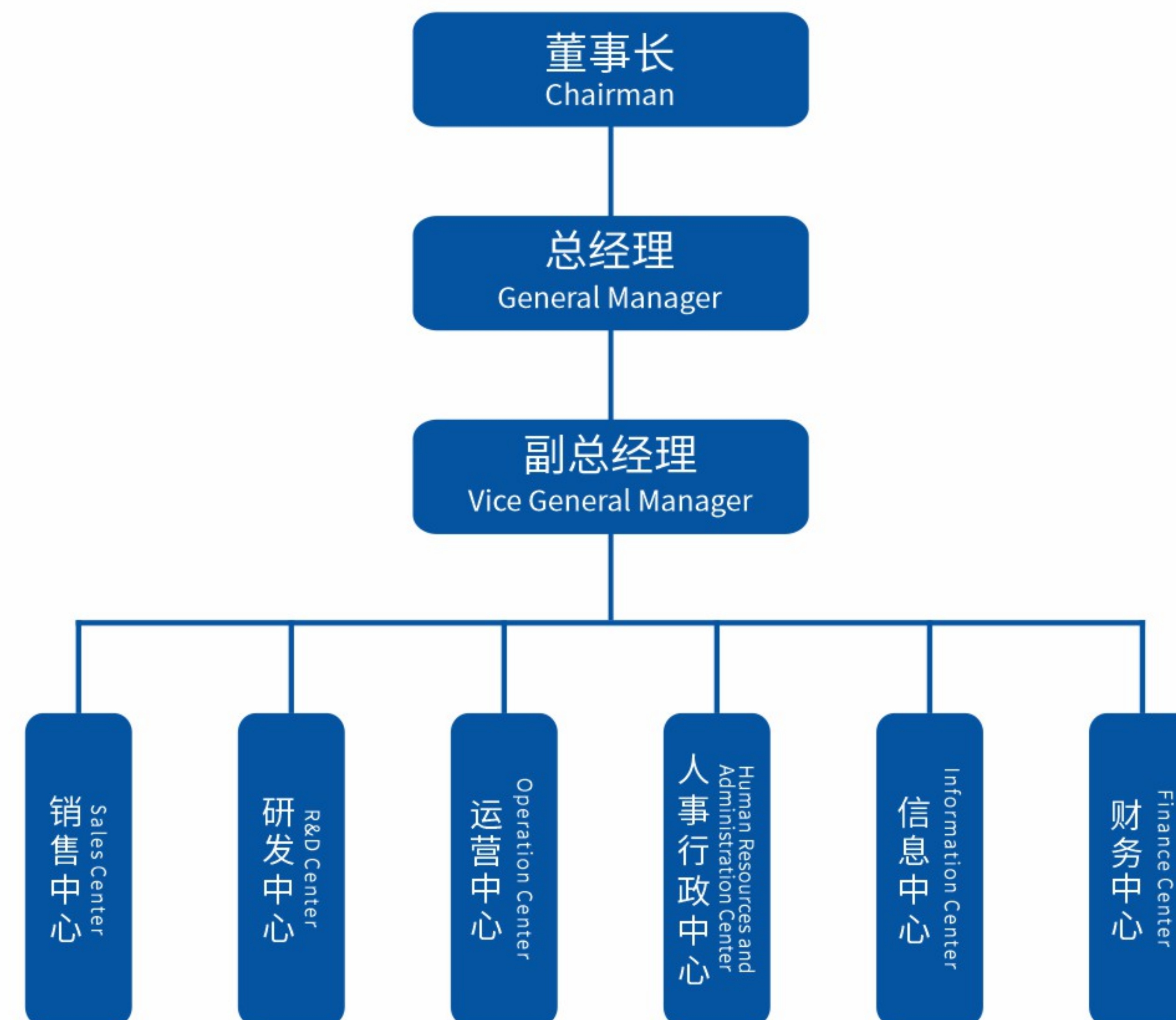
公司产品以精湛的研发技术，稳定的产品质量和快速的交货服务深得客户的信赖和支持。我们将不断提升内部管理，时刻关注客户需求，持续为客户提供更加优质的产品和服务。

Zhejiang AMA & Hien Technology Co., Ltd. was established in 1989 and is dedicated to the research and development, manufacture, and sales of professionalization manufacturing enterprises. We mainly produce automotive and household appliance connectors, automotive components (switch boxes, fuse box, air vents, control devices, etc.), automotive wiring harnesses, molds, air source heat pumps, floor heating, fresh air systems, energy storage, etc.

We are located in Puqi Town, Yueqing City, Zhejiang Province, with a total land area of over 70,000 square meters and a construction area of nearly 180,000 square meters. It currently has nearly 1200 employees.

We have successively obtained IATF16949:2016 automotive quality management system certification, ISO9001:2015 quality management system certification, ISO14001:2015 environmental management system certification, and ISO45001:2018 occupational health and safety management system certification. The main products have passed UL and VDE certifications, and all products meet the European Union's environment protection requirements.

With exquisite research and development technology, stable product quality, and rapid delivery services, our products have won the trust and support of customers. We will continuously improve internal management, always pay attention to customer needs, and consistently provide customers with higher quality products and services.



子公司  
Subsidiaries

► 正理电子事业部 (线束事业部)  
AMA Electronics Business Division (Wiring Harness Business Division)

## 品质体系认证 << 企业荣誉

Quality System Certification Corporate Honors



ISO/TS16949 标准建立  
文件化质量管理体系  
ISO/TS16949 Standard Establishes  
Documented Quality Management System



ISO 9001 质量管理  
体系证书  
ISO 9001 Quality Management  
System Certificate



ISO 45001 职业健康  
安全管理体系证书  
ISO 45001 Occupational Health and  
Safety Management System Certificate



ISO 14001 环境管理  
体系证书  
ISO 14001 Environmental  
Management System Certificate



国家知识产权局颁发国家  
知识产权优势企业  
Awarded as the title of National Intellectual  
Property Advantage Enterprise by the State  
Intellectual Property Office.



AAA级守合同重信用企业  
Awarded as AAA-level Contract-keeping and  
Credit-worthiness Enterprise



工信部颁发专精特新小巨人企业证书  
Awarded as the title of Specialized, Refined, Distinctive,  
and Innovative Small Giant Enterprise Certificate by the  
Ministry of Industry and Information Technology



国家级博士后科研工作站  
Awarded as national Postdoctoral  
Research Station



工信部颁发绿色工厂证书  
Awarded as the Green Factory Certificate by the  
Ministry of Industry and Information Technology



荣获23年度工信部  
绿色供应链管理企业  
Awarded as the Green Supply Chain Management  
Enterprise by the Ministry of Industry and  
Information Technology in the 23rd year

## 研发能力 02

R&D Capability

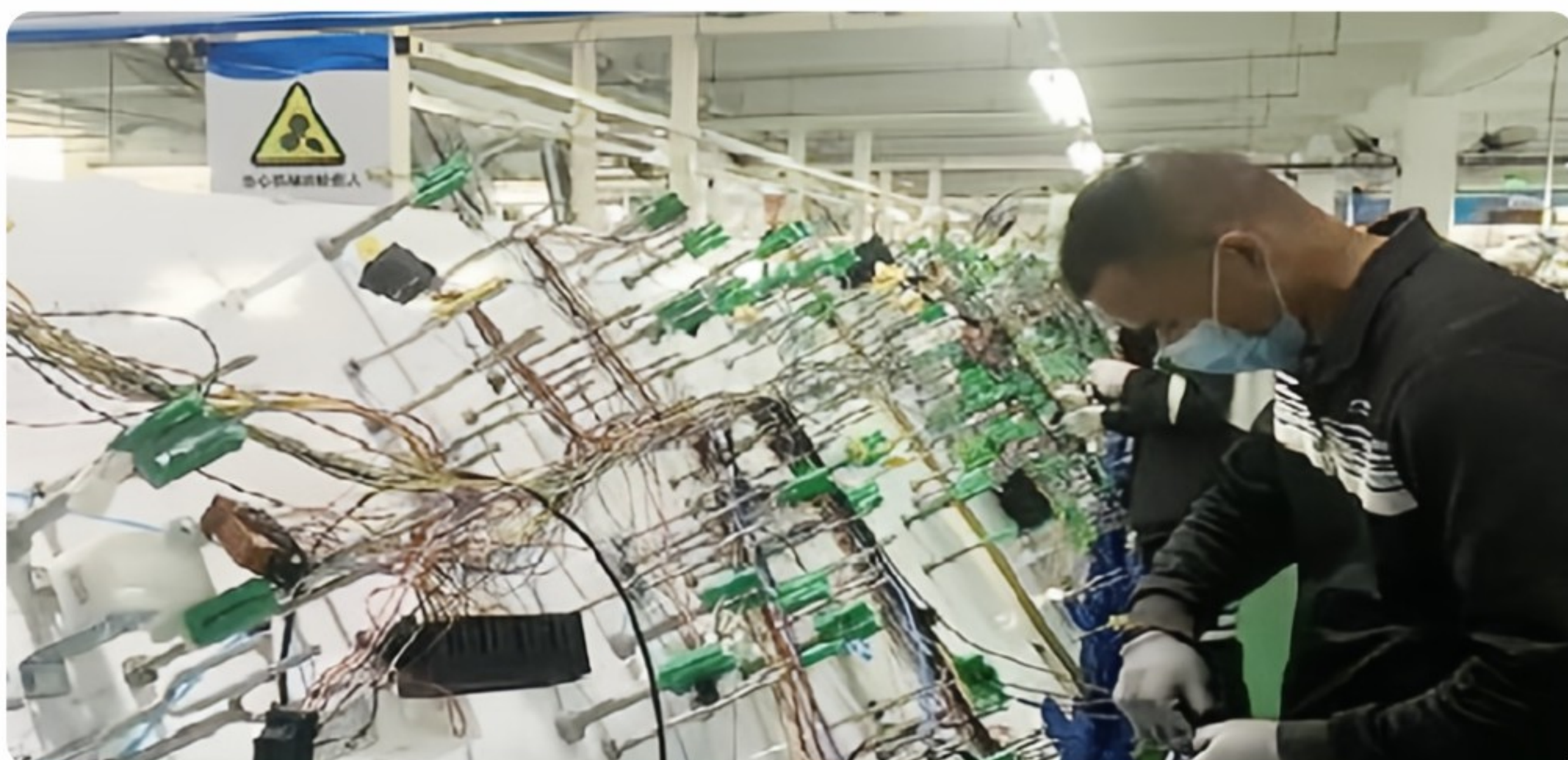
研发中心  
R&D Center



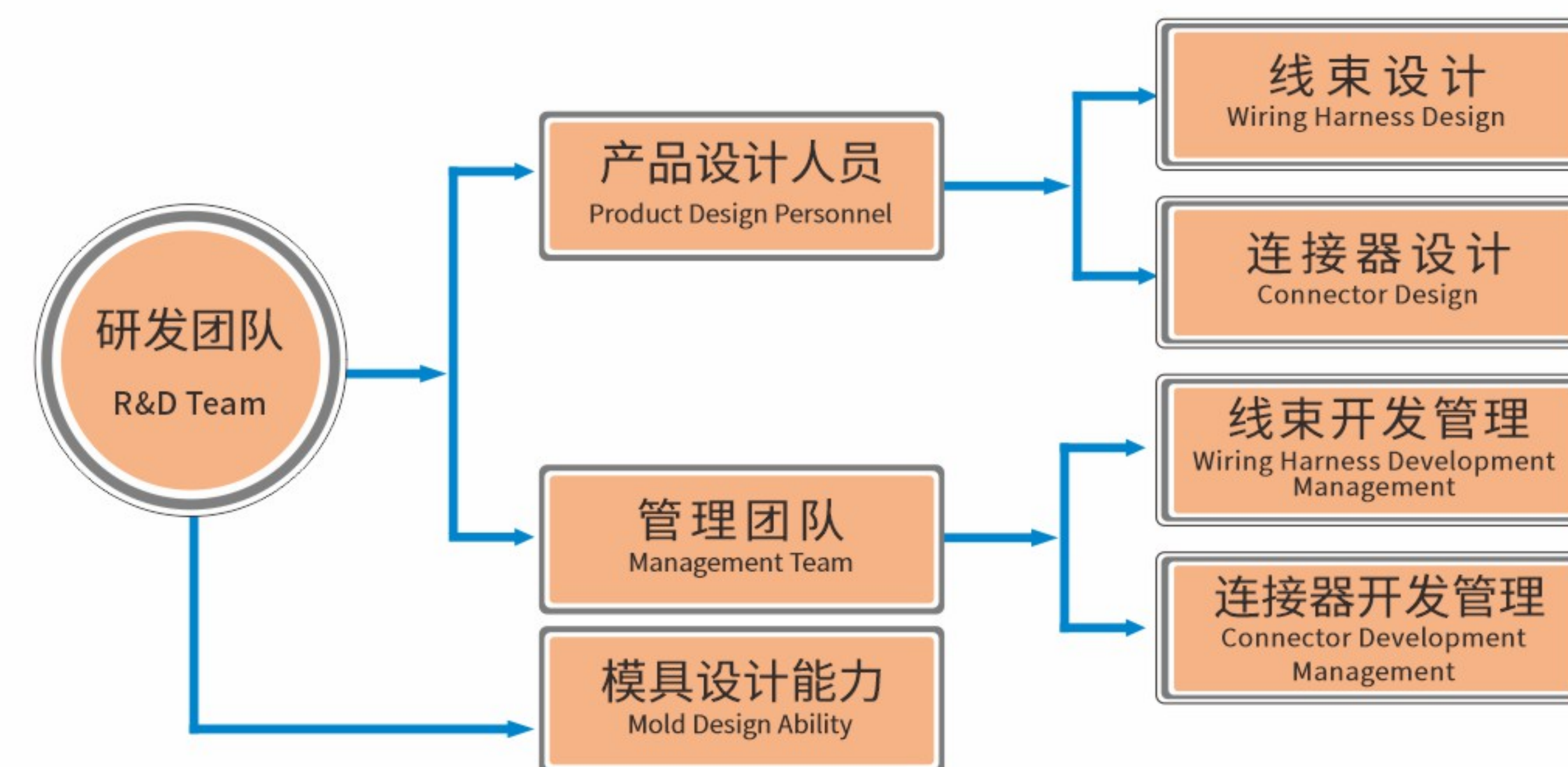
研发实验室  
R&D Laboratory



线束产品工程部  
Wire harness Product Engineering  
Department



新能源汽车连接器设计部  
New Energy Vehicle Connector  
Design Department



汽车高低压线束研发/工艺人员共50余人,都曾经在国内一线线束公司服务过,例如APTIV,LEAR,陕汽万方、得润、力达等,工程师80%具备大学本科,技术员均具备大专以上学历。汽车高低压连接器设计开发人员共30余人,都为本科及以上学历,具备连接器行业5年以上研发经验,对于连接器的选材,结构及应用有丰富的行业经验。

管理团队100%具备线束及连接行业6年以上研发经验。65%来自国内排名前十的线束制造公司研发部门,具备丰富的研发管理经验。

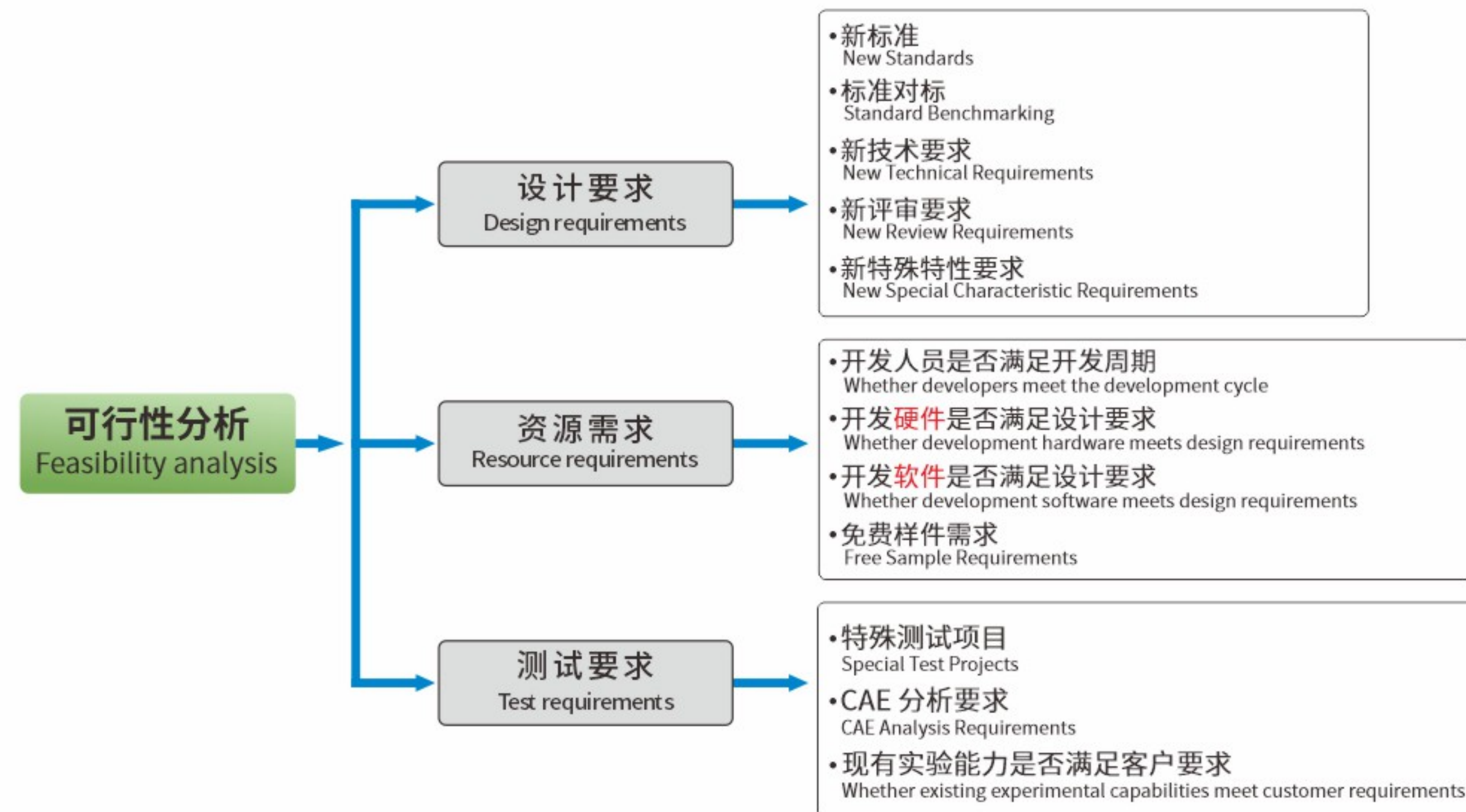
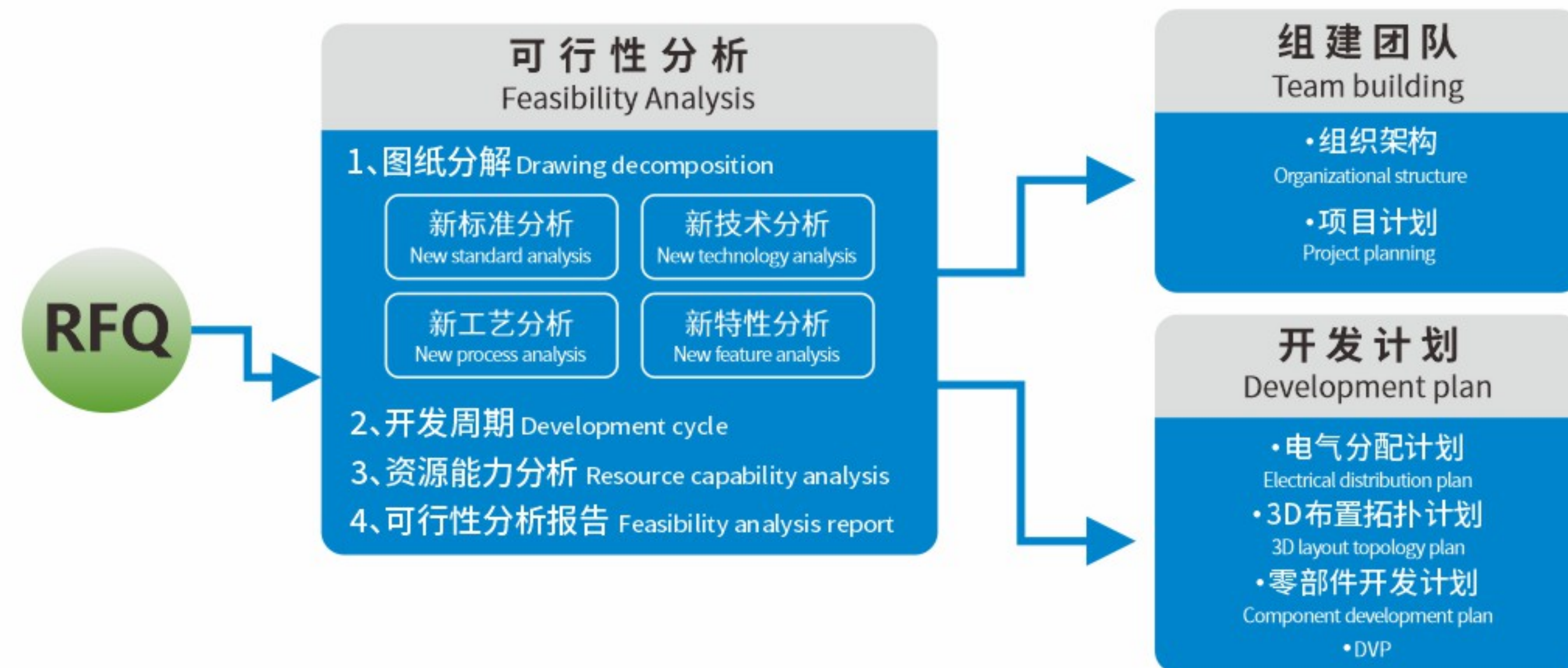
The R&D/technical personnel for automotive high and low voltage wiring harnesses total over 50, all of whom have served at top-tier domestic wiring harness companies such as APTIV, LEAR, Shaanxi Automobile Wanfang, Deren, and Lida, among others. 80% of the engineers hold a bachelor's degree, and all technicians have at least an associate degree. The design and development team for automotive high and low voltage connectors consists of over 30 individuals, all of whom have a bachelor's degree or higher and possess over 5 years of research and development experience, and have extensive industry experience in the selection of materials, design, and application of connectors.

The management team is 100% composed of individuals with over 6 years of R&D experience in the wiring harness and connector industry. 65% of the team comes from the R&D departments of the top ten wiring harness manufacturing companies in China, bringing with them rich experience in R&D management.

模具研发团队由10余名资深模具工程师和40余名模具加工技师组成,团队具备先进的设计理念和丰富的结构设计经验以及五金、塑胶等材料方面的专业知识,可为客户提供最优秀的设计和完整的方案,提供高附加价值的技术支持服务。

The mold R&D team consists of over 10 senior mold engineers and more than 40 mold processing technicians. The team boasts advanced design concepts and extensive structural design experience, as well as expertise in materials such as metal and plastics. They are capable of providing clients with outstanding design and comprehensive solutions, offering high-value-added technical support services.

## 技术能力——(线束开发准备) Technical capabilities - (Wiring harness development preparation)

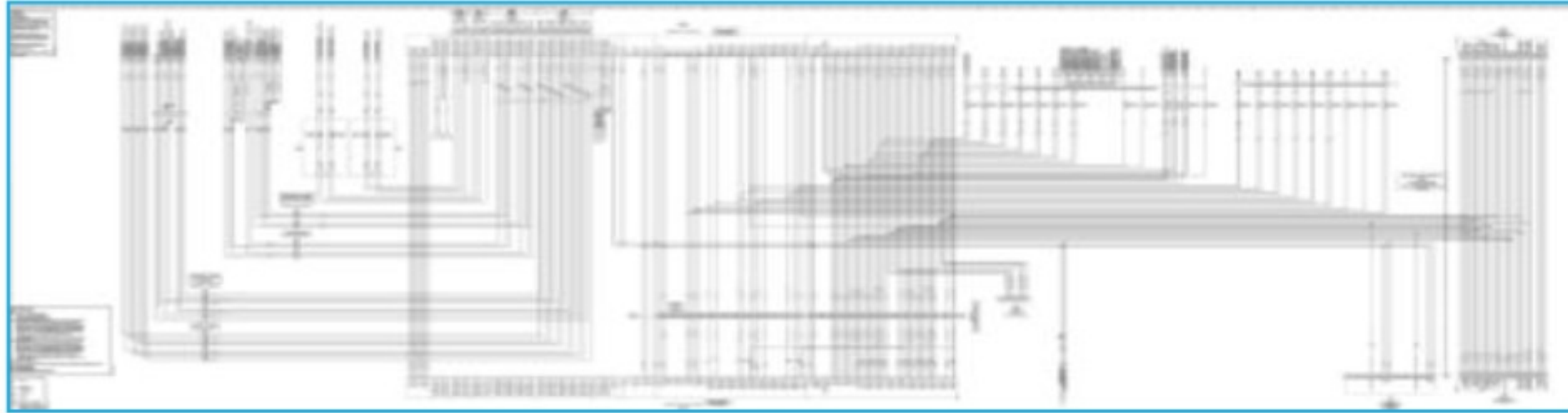


## 技术能力——(线束开发流程) Technical capabilities - (Wiring harness development process)

### APQP产品开发流程 APQP Product Development Process



## 技术能力——(线束原理设计) Technical capabilities - (Wiring harness principle design)



### 电源分配设计 POWER DISTRIBUTION DESIGN



- 电器盒设计  
Electrical box design
- 电源系统分配设计  
Power distribution design
- 保险丝继电器选型设计  
Fuse and relay selection design
- 保险丝位置排布设计  
Fuse location layout design
- 热模拟分析  
Fuse location layout design

### 接地分配设计 GROUNDING DISTRIBUTION DESIGN



- 接地点分布设计  
Grounding point distribution design
- 接地要求检查  
Grounding requirements check

### 线束模块化设计 WIRING HARNESS MODULAR DESIGN



- 线束模块  
Wiring harness module
- 组合设计  
Combination design
- 线束配置  
Wiring harness configuration
- 清单设计  
List design
- 线束零件  
Wiring harness parts
- 总成管理  
Assembly management

### 原理图设计 Schematic Design



- 特殊导线选型  
Special Wire Selection
- 线径&线色选型设计  
Wire Diameter & Color Selection Design
- 原理图绘制  
Schematic Drawing
- 原理图更改管理  
Schematic Change Management

### 原线束分段设计 Wiring harness Segment Design



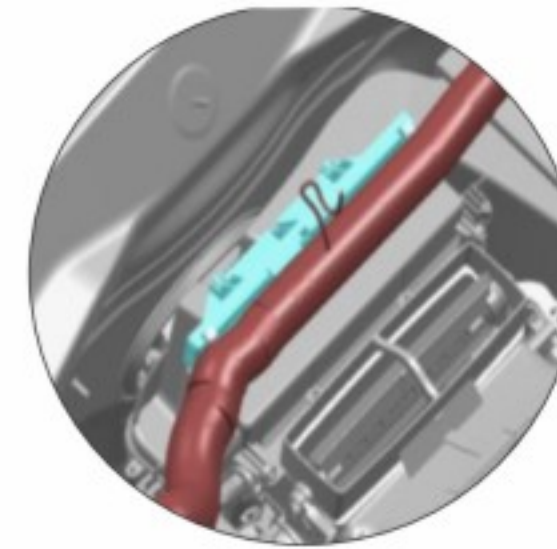
- 线对线对插护套选型  
Wire-to-Wire connector Selection
- 对插护套PIN孔分布设计  
Connector Pinout Distribution Design
- EMC相关要求检查  
EMC Requirements Check

### 电平衡分析 Electrical Balance Analysis



- 整车电平衡分析  
Vehicle Electrical Balance Analysis
- 静态电流设计  
Static Current Design
- 负载矩阵分析  
Load Matrix Analysis

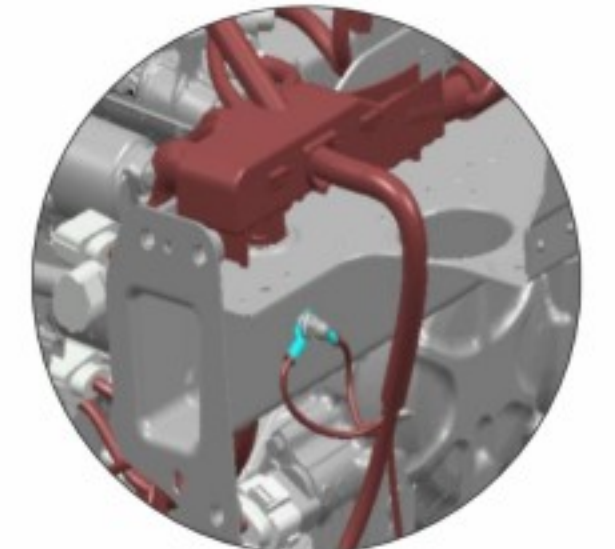
## 技术能力——(线束布置设计) Technical Capability - (Harness Layout Design)



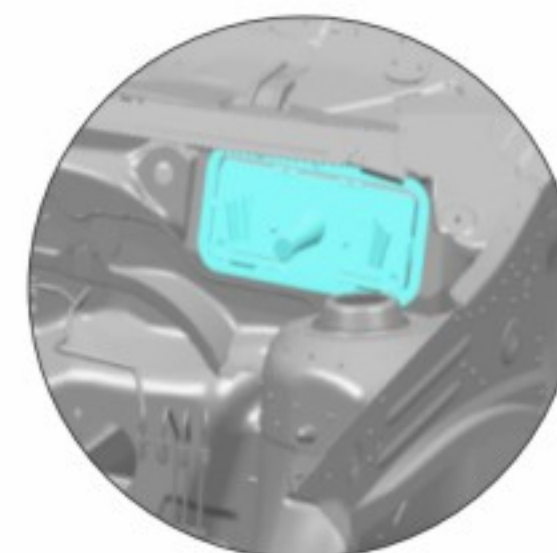
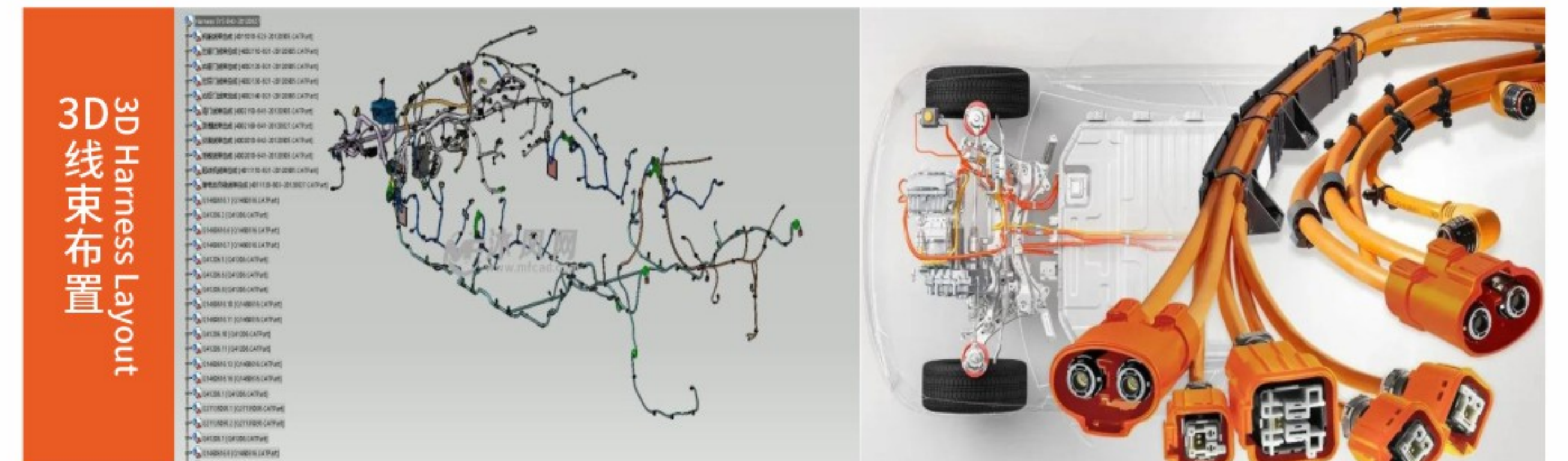
- 固定设计  
Fixed Design
- 卡扣选型设计  
Clip Selection Design
- 支架设计  
Bracket Design



- 线束保护设计  
Wiring harness Protection Design
- 胶带选型设计  
Tape Selection Design
- 波纹管选型  
Corrugated Tube Selection
- PVC 管选型  
PVC Tube Selection



- 接地点设计  
Grounding Point Design
- 接地位置选择设计  
Grounding Position Selection Design
- 接地端子选型设计  
Grounding Terminal Selection Design
- 接地端子防转设计  
Grounding Terminal Anti-rotation Design



- 防水设计  
Waterproof Design
- 焊接点防水设计  
Waterproof Design for Welding Points
- 卡扣防水选型  
Waterproof Selection for Clips
- 橡胶件设计  
Rubber Part Design



- 装配可行性分析  
Feasibility Analysis of Assembly
- 线束安装预留长度分析  
Analysis of Wiring harness Installation Allowance Length
- 线束安装空间分析  
Analysis of Wiring harness Installation Space
- 线束安装顺序分析  
Analysis of Wiring harness Installation Sequence



- 动态仿真分析  
Dynamic Simulation Analysis
- 悬架动态仿真ABS线束设计  
Suspension Dynamic Simulation ABS Harness Design
- 门动态仿真  
Door Dynamic Simulation
- 门线束橡胶件设计  
Door Wiring harness Rubber Part Design

## 技术能力——(线束布置设计) Technical capability - (Harness layout design)

### 装车问题分析处理

Analysis and handling of vehicle installation issues

### 装车问题方案现场验证

On-site verification of vehicle installation issues solutions

### 同客户沟通并关闭装车问题

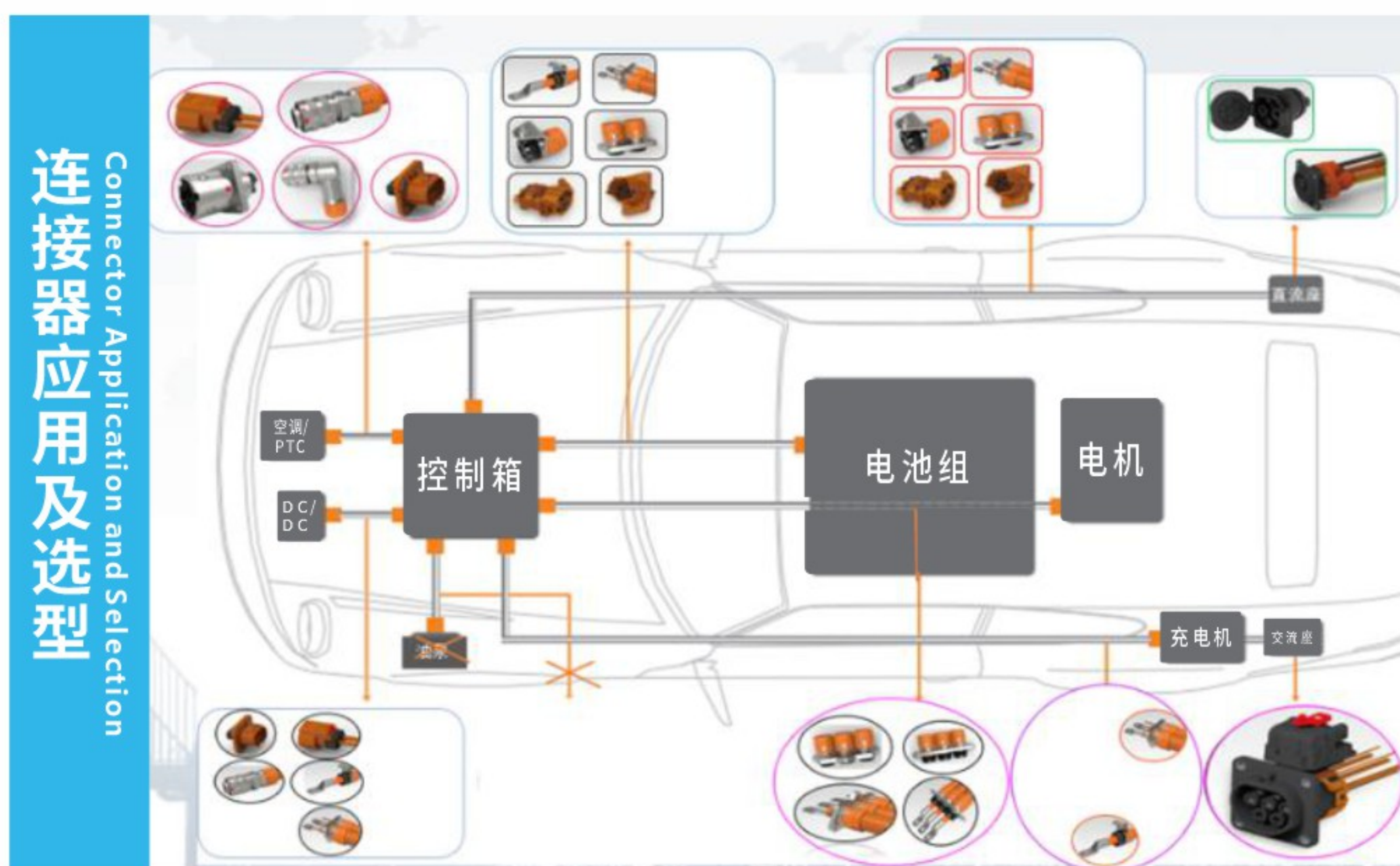
Communication with customers and closure of vehicle installation issues

### 装车问题现场临时方案处理

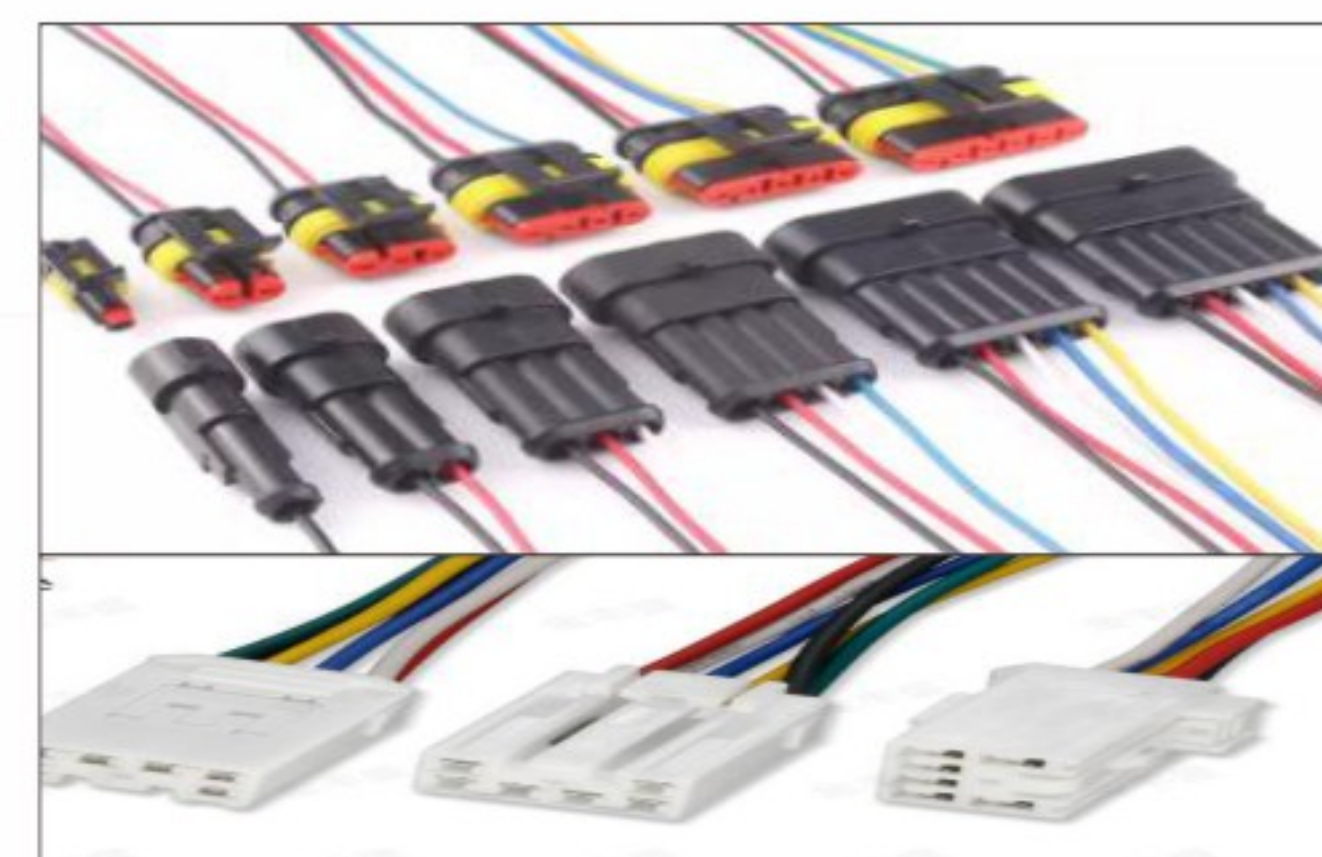
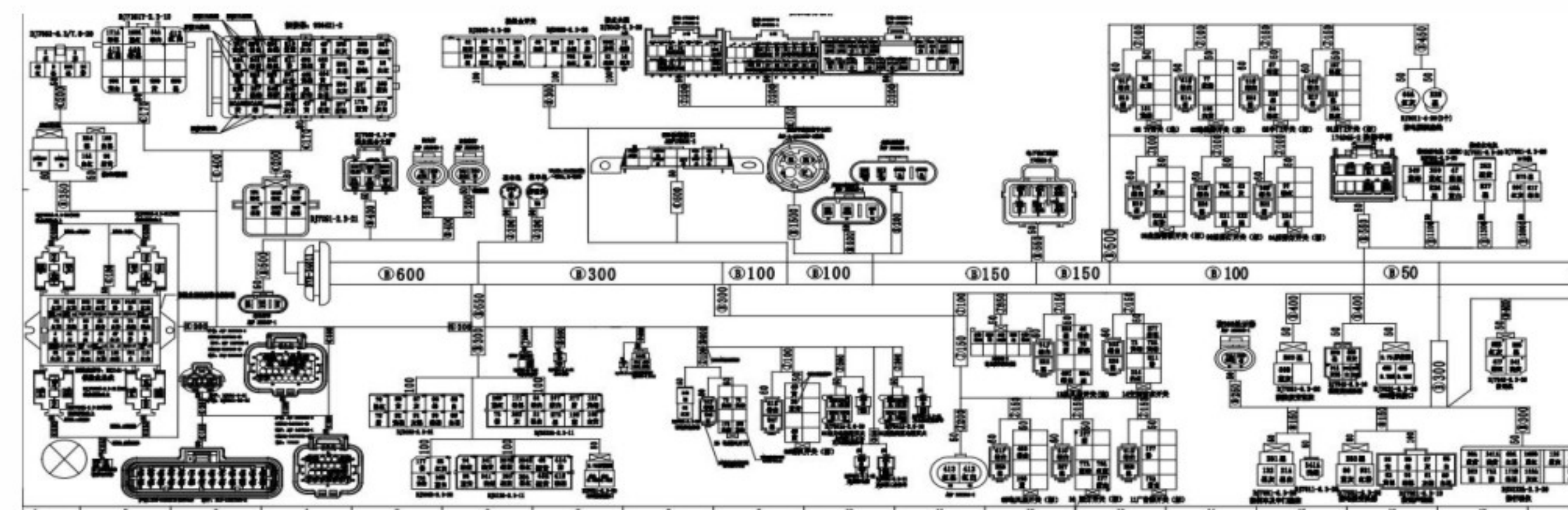
Temporary on-site solutions for vehicle installation issues

### 装车问题清单跟踪记录

Tracking and recording of vehicle installation issues checklists



## 技术能力——(线束图纸设计&产品工程) Technical Capability - (Harness Drawing Design & Product Engineering)

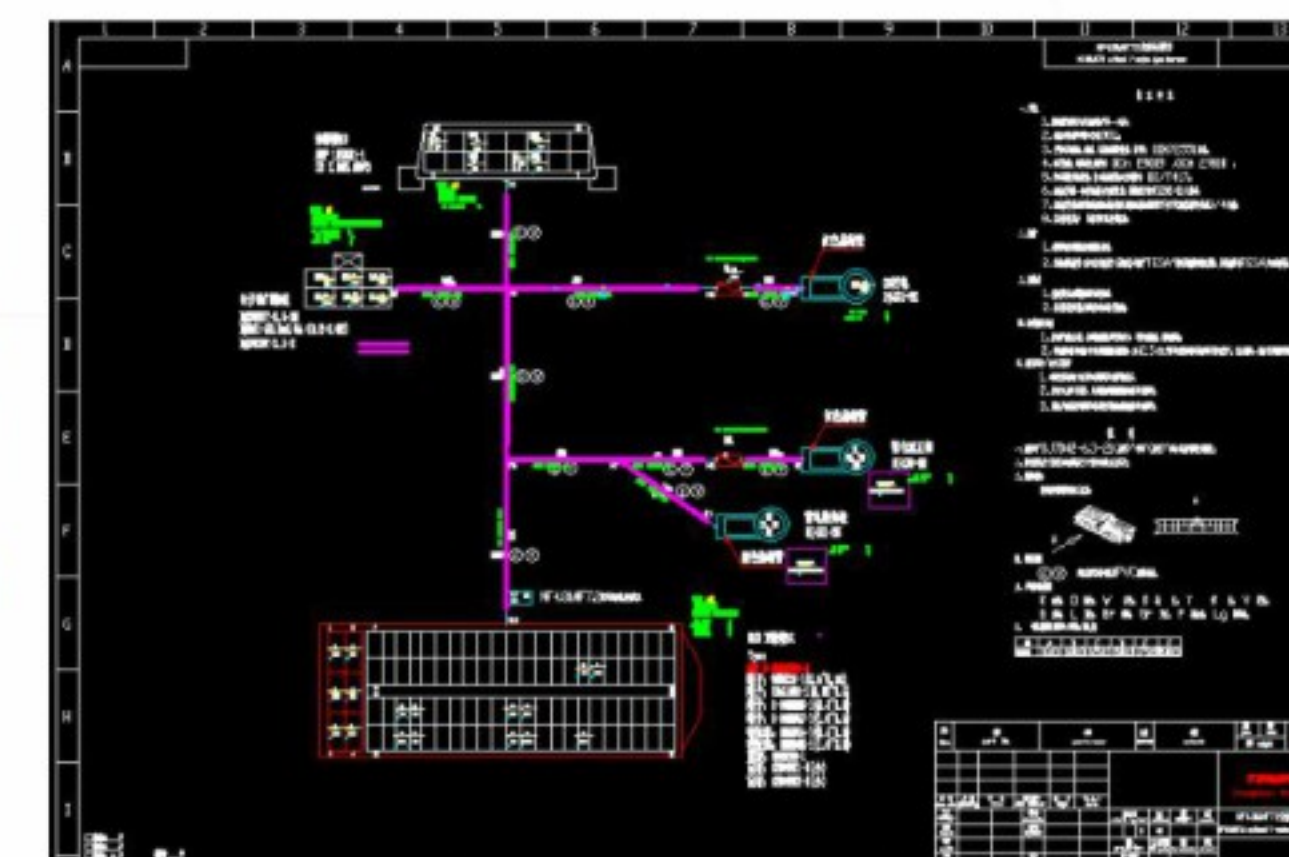


### 匹配设计

Matching Design

护套、端子、防水栓、导线间的匹配

The matching among the sheath, terminal, waterproof plug and wire



### 2D图纸绘制及更新管理

2D Drawing Creation and Update Management

图纸绘制  
Drawing Creation

设计变更  
Design Changes

图纸更新  
Drawing Update

样件试制  
Prototype Manufacturing



BOM管理  
BOM Management

IBOM EBOM  
建料号  
Material Number Establishment



变更管理  
Change Management

工程变更评审  
Engineering Change Review  
变更执行  
Change Implementation  
变更履历管理  
Change History Management



## 技术能力——(开发周期) Technical Capability - (Development Cycle)



## 技术能力——(设计检查) Technical Capability - (Design Inspection)



## 整车线束过程开发能力——（高压线工艺流程）

Development capability of vehicle wiring harness process - (high-voltage line process flow)



生产过程连接架  
Production process connection frame

### 生产流程跟传统线束的主要区别

The main difference between the production process and the traditional wiring harness

1. 生产区域总装和开线压接工序必须连接在一起  
The assembly and wire opening crimping process in the production area must be connected together
2. 连接架必须是活动的  
The connection frame must be movable
3. 压接前必须先预装  
Pre-assembly must be performed before crimping
4. 电测必须要经过高压和泄漏测试  
Electrical testing must go through high voltage and leakage tests
5. 每个塑件和端子必须单独包扎后才能装箱  
Each plastic part and terminal must be individually wrapped before packing into boxes

## 整车线束过程开发能力——（低压线工艺流程）

Development capability of vehicle wiring harness process - (low-voltage wire process flow)



生产过程挂线架  
Production process wire rack

### 生产流程说明

Production Process Description:

1. 生产区域总装和开线压接工序可单独规划  
The assembly and wire pressing processes in the production area can be planned separately
2. 挂线架必须是活动的  
The wire hanging rack must be movable
3. 预装架和总装架可单独规划  
The pre-assembly rack and the assembly rack can be planned separately
4. 所有湿区线束必须测试接点密封及接插件密封性能  
All wet area harnesses must be tested for contact sealing and connector sealing performance
5. 每个塑件和端子必须单独包扎后才能装箱  
Each plastic part and terminal must be individually wrapped before packing

## 制造能力 03

Manufacturing Capacity

### 设备能力——(线束制造设备)

Equipment Capacity - (Wiring Harness Manufacturing Equipment)



低压线裁线设备  
Low Voltage Wire Cutting Equipment



压接设备  
Crimping Equipment



高压线裁线设备  
High Voltage Wire Cutting Equipment



高压线压接设备  
High Voltage Wire Crimping Equipment



裁线设备  
Wire Cutting Equipment



多芯绞线设备  
Multi-core twisted wire equipment



超声波设备  
Ultrasonic equipment



穿橡胶件设备  
Rubber part through equipment



裁管设备  
Tube cutting equipment

#### 前工序设备:

- 行业领先的裁线压接过程
- 所有的端子压接都经过验证放行
- 裁线设备采用THB、komax、卓迈
- 全/半自动压接设备都可联网并采集质量数据, 有利于质量和效率的持续改善
- 拥有端子压接机、裁线压接热缩一体机、超声波焊接机、绞线机、大平方开线机、大线径压接机等

#### PRE-PROCESS EQUIPMENT:

- Industry-leading wire cutting and crimping process
- All terminal crimping has been verified and released
- Wire cutting equipment uses THB, komax, Zhuomai
- Both full and semi-automatic crimping equipment can be networked and collect quality data. Networking and collecting quality data is conducive to continuous improvement in quality and efficiency.
- Equipped with terminal crimping machines, wire cutting and crimping heat-shrink machines, ultrasonic welding machines, wire twisting machines, large square opening machines, large diameter crimping machines, etc.

### 设备工装能力——(线束制造设备)

Equipment and tooling capability - (Wiring harness manufacturing equipment)



总装流水线  
Assembly line



预装工装  
Pre-assembly tooling



外观检测设备  
Appearance inspection equipment



低压线束检测设备  
Low voltage wire harness inspection equipment



总装流水线  
Assembly Line

#### 总装低压

Low Voltage Assembly

- 所有工装、模具、工艺都经过放行验证  
All tools, molds, and processes have undergone release verification
- 先进的工艺设计可以保证多品种生产  
Advanced process design ensures the production of multiple varieties
- 产品100%的电测试  
Products undergo 100% electrical testing
- 保险丝、继电器使用影像监测系统防错  
Fuses and relays use an image monitoring system to prevent errors
- 产品100%经过尺寸检验  
Products undergo 100% dimensional inspection
- 产品在包装采用条码防错系统  
The product adopts barcode error prevention system in packaging
- 保证产品正确数量正确  
Ensure that the product is correct and the quantity is correct

#### 高压检测

High Voltage Detection

- 回路导通: 100%导通, 无错路、短路  
Circuit continuity: 100% continuity with no open or short circuits
- 绝缘耐压: DC3000V, 5S, 漏电流<1mA  
Insulation withstand voltage: DC3000V for 5 seconds, leakage current <1mA
- 绝缘电阻: DC1000V, >100M欧姆  
Insulation resistance: DC1000V > 100M ohms
- 气密性: 6Psi, 保压5s, 泄漏值≤5cc/min  
Leakage: 6Psi, hold pressure for 5 seconds, leakage value ≤5cc/min
- 产品追溯: 系统保留所有测试数值  
Product traceability: The system retains all test values

#### 高压线束检测设备

High Voltage Wire Harness Detection Equipment



## 产品介绍 04

Product Introduction

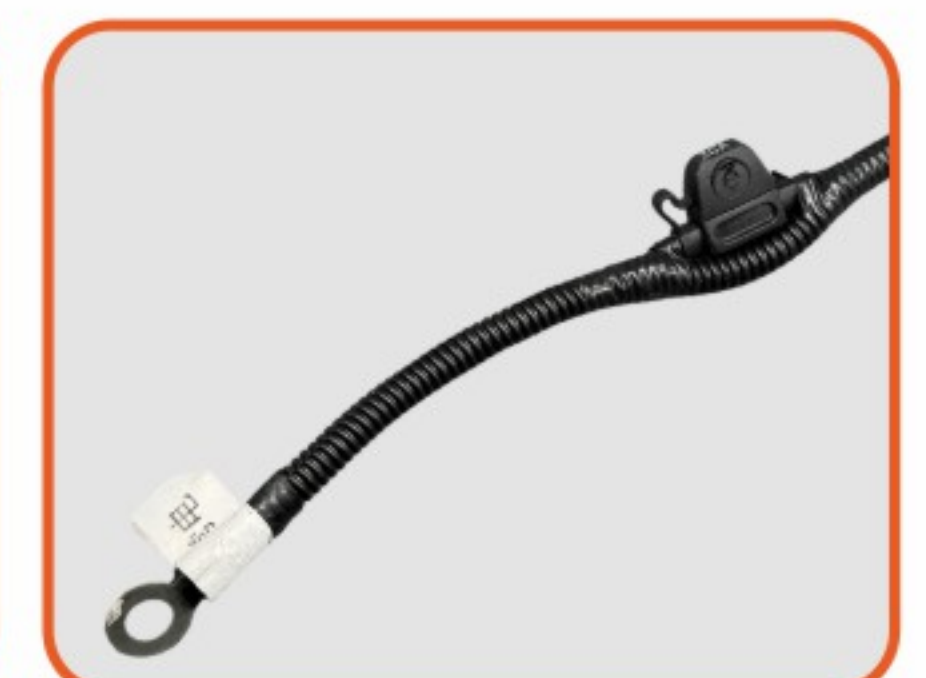
### 汽车低压线束

Automotive Low Voltage Wiring Harness

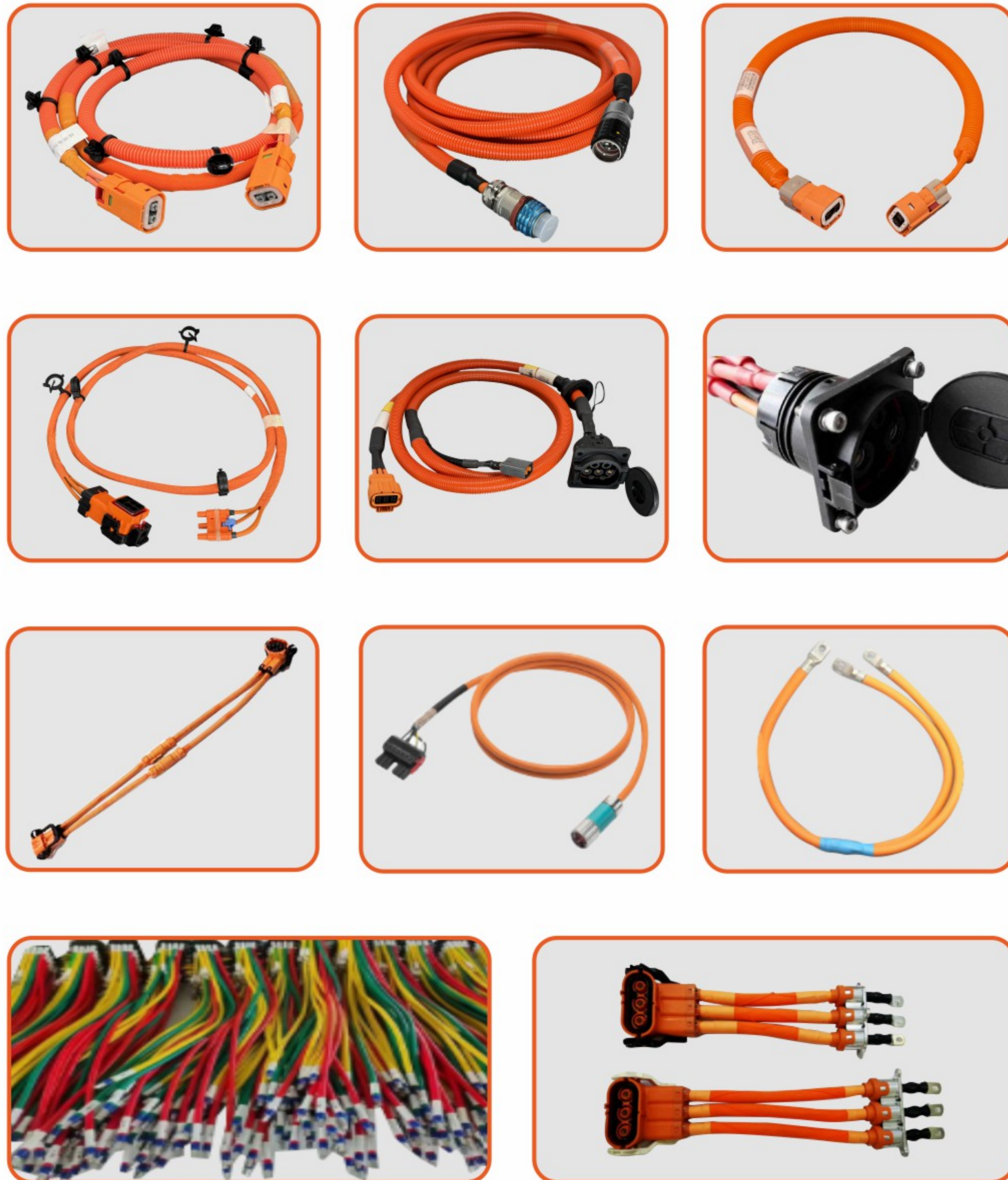


### 低压线束连接器

Low Voltage Wiring Harness Connector



## 新能源高压线束 New Energy High Voltage Wiring Harness



## 质量保证 Quality Assurance

05

## 公司环境 Company Environment



## 检测设备 Detection equipment



## 质量策划

Quality Planning

- ◆ 客户规范  
Customer Specification
- ◆ 产品先期质量策划及控制计划 (APQP)  
Advanced Product Quality Planning and Control Plan (APQP)
- ◆ 生产件批准程序 (PPAP)  
Production Part Approval Process (PPAP)
- ◆ 模具放行  
Mold Release
- ◆ 设备放行  
Equipment Release
- ◆ 工装主板/复制板验收  
Tooling Main Board/Auxiliary Board Acceptance
- ◆ 电测台验收  
Electrical Test Bench Acceptance
- ◆ 生产线过程放行  
Production Line Process Release
- ◆ 检验板放行  
Inspection Board Release
- ◆ 首样件放行  
First Sample Release
- ◆ 潜在的失效模式及后果分  
Potential Failure Mode and Effects Analysis/Control Plan
- ◆ 析/控制计划  
Quality Control

## 质量控制

Quality Control

- ◆ 过程及产品审核  
Process and Product Audits
- ◆ 过程能力研究  
Process Capability Studies
- ◆ 一次合格率控制 (FTQ-First Time Quality)  
First Pass Yield Control (FTQ-First Time Quality)
- ◆ 不合格原材料控制  
Non-conforming Raw Material Control
- ◆ 不合格品控制  
Non-conforming Product Control
- ◆ 来料检验  
Incoming Inspection
- ◆ 标签防错扫描系统  
Label Error Proofing Scanning System
- ◆ 电测台影像系统  
Electrical Test Bench Imaging System
- ◆ 技能培训及资格认证  
Skills Training and Qualification Certification
- ◆ 业绩考核  
Performance Evaluation
- ◆ 工装/设备保养与维护检具/量具定期保养  
Tooling/Equipment Maintenance and Inspection Gauges/  
Measuring Tools Regular Maintenance

## 持续改善 Continuous Improvement

客户抱怨处理控制程序  
Customer Complaint Handling Control Procedure

质量工具运用  
Application of Quality Tools

改善计划  
Improvement Plan

质量成本  
Quality Cost

内部审核  
Internal Audit

## 制造品质管控过程

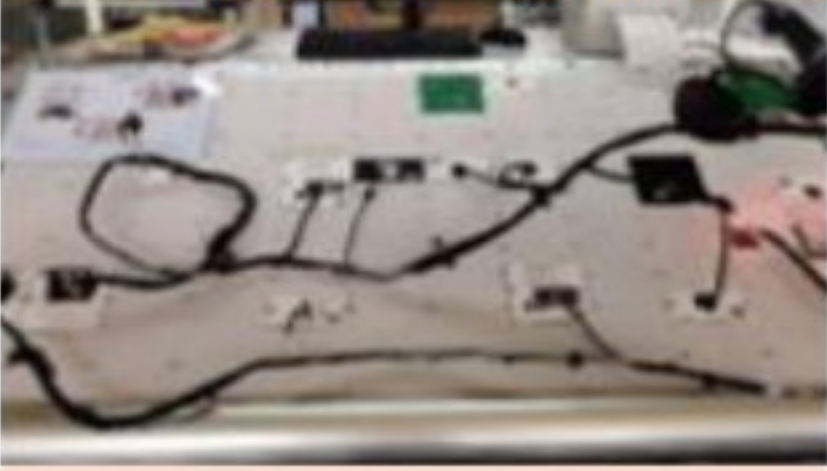
Manufacturing Quality Control Process

| 原材料检验<br>Raw Material Inspection                                                                                                                                                                                                                                                                                                                                                  | 压接参数测量<br>Crimping Parameter Measurement                                                                                                                                                                                                                                                                                                                                                                                | 端子拉力测试<br>Terminal Tensile Test                                                                                                                                                                                                                                                                                                                                                                                         | 端子外观检验<br>Terminal Appearance Inspection                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                  |
| <ul style="list-style-type: none"><li>◆ 检验频率<br/>Inspection Frequency</li><li>◆ 原材每批次按照GB2828要求抽检<br/>Raw materials are spot-checked per batch according to GB2828 requirements</li><li>◆ 原材料型式试验一年一次<br/>Raw Material Type Test Once a Year</li><li>◆ 检验内容<br/>Inspection Content</li><li>◆ 原材料的外观尺寸颜色性能<br/>Appearance, size, color, and performance of raw materials</li></ul> | <ul style="list-style-type: none"><li>◆ 检验频率<br/>Inspection Frequency</li><li>◆ 首末例检验<br/>First and Last Inspection</li><li>◆ 例检每500条抽检一次<br/>Example Inspection once every 500 pieces</li><li>◆ 检验内容<br/>Inspection Content</li><li>◆ 测量端子的线芯和绝缘层压接高度和宽度, 保证产品的物理性能<br/>Measuring the height and width of the terminal's core and insulation layer crimping to ensure the physical properties of the product</li></ul> | <ul style="list-style-type: none"><li>◆ 检验频率<br/>Inspection Frequency</li><li>◆ 首检、中检、末检验<br/>First Inspection, Intermediate Inspection, Last Inspection</li><li>◆ 例检每500条抽检一次<br/>Example Inspection once every 500 pieces</li><li>◆ 检验内容<br/>Inspection Content</li><li>◆ 测量端子的压接抗拉伸力量, 保证产品的机械性能<br/>Measuring the terminal's crimping tensile strength to ensure the mechanical properties of the product</li></ul> | <ul style="list-style-type: none"><li>◆ 检验频率<br/>Inspection Frequency</li><li>◆ 100%检验<br/>100% Inspection</li><li>◆ 检验内容<br/>Inspection Content</li><li>◆ 检验端子压接后的外观状态, 包括端子是否变形, 线芯是否压接过长, 绝缘层的压接状态。<br/>Inspect the appearance of the terminal after crimping, including whether the terminal is deformed, whether the wire core is crimped too long, and the crimping status of the insulation layer.</li></ul> |

制造质量 = 自我保证 + 质量门  
Manufacturing Quality = Self-Assurance + Quality Gate

自我保证: 可以让操作工和设备能够预防制造和流出不良品。  
Self-Assurance: allows operators and equipment to prevent the manufacturing and flow of defective products

质量门: 验证自我保证是否有效, 以确保可能的不良品流出制造过程。  
Quality Gate: verifies the effectiveness of Self-Assurance to ensure that potential defective products do not flow out of the manufacturing process.

| 成品电测试<br>Finished Product Electrical Testing                                                                                                                                                                                                                                      | 外观和尺寸检验<br>Appearance and Dimension Inspection                                                                                                                                                                                                                                                                                                                                                                                              | 成品包装扫描<br>Finished Product Packaging Scanning                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                         |
| <ul style="list-style-type: none"><li>◆ 检验频率<br/>Inspection Frequency</li><li>◆ 100%测试<br/>100% Testing</li><li>◆ 检验内容<br/>Inspection Content</li><li>◆ 测试产品的电性能是否符合设计要求。<br/>Testing whether the electrical swperformance of the product meets the design requirements</li></ul> | <ul style="list-style-type: none"><li>◆ 检验频率<br/>Inspection Frequency</li><li>◆ 生产和品质部均100%检验<br/>100% Inspection by both Production and Quality Departments</li><li>◆ 检验内容<br/>Inspection Content</li><li>◆ 检验产品的尺寸外观分支走向覆盖物是否符合图纸要求, 辅件是否遗漏。<br/>Inspecting whether the size, appearance, branch routing, and covering materials of the product meet the requirements of the drawings, and whether any accessories are missing.</li></ul> | <ul style="list-style-type: none"><li>◆ 检验频率<br/>Inspection Frequency</li><li>◆ 100%<br/>100%</li><li>◆ 检验内容<br/>Inspection Frequency</li><li>◆ 检验产品包装时的数量是否正确, 实现产品的可追溯性。<br/>Checking whether the quantity of the product during packaging is correct, ensuring the traceability of the product.</li></ul> |

| AMA生能 浙江正理生能科技有限公司 线材事业部 进料检验记录 |       |                             |       |      |      |       |          |     |    |
|---------------------------------|-------|-----------------------------|-------|------|------|-------|----------|-----|----|
| 日期                              | 线材名称  | 规格                          | 生产数量  | 检验数量 | 合格数量 | 不合格数量 | 不合格原因    | 检验员 | 备注 |
| 2023.12.12                      | 铜包铝绞线 | 1.5mm <sup>2</sup> ±0.05mm  | 10000 | 1000 | 980  | 20    | 1. 绞合松散  | 王小明 |    |
| 2023.12.13                      | 铜包铝绞线 | 2.5mm <sup>2</sup> ±0.05mm  | 15000 | 1500 | 1480 | 20    | 2. 表面氧化  | 王小明 |    |
| 2023.12.14                      | 铜包铝绞线 | 4.0mm <sup>2</sup> ±0.05mm  | 20000 | 2000 | 1980 | 20    | 3. 直径偏差  | 王小明 |    |
| 2023.12.15                      | 铜包铝绞线 | 6.0mm <sup>2</sup> ±0.05mm  | 25000 | 2500 | 2480 | 20    | 4. 长度偏差  | 王小明 |    |
| 2023.12.16                      | 铜包铝绞线 | 10.0mm <sup>2</sup> ±0.05mm | 30000 | 3000 | 2980 | 20    | 5. 重量偏差  | 王小明 |    |
| 2023.12.17                      | 铜包铝绞线 | 16.0mm <sup>2</sup> ±0.05mm | 35000 | 3500 | 3480 | 20    | 6. 表面氧化  | 王小明 |    |
| 2023.12.18                      | 铜包铝绞线 | 25.0mm <sup>2</sup> ±0.05mm | 40000 | 4000 | 3980 | 20    | 7. 直径偏差  | 王小明 |    |
| 2023.12.19                      | 铜包铝绞线 | 35.0mm <sup>2</sup> ±0.05mm | 45000 | 4500 | 4480 | 20    | 8. 长度偏差  | 王小明 |    |
| 2023.12.20                      | 铜包铝绞线 | 50.0mm <sup>2</sup> ±0.05mm | 50000 | 5000 | 4980 | 20    | 9. 重量偏差  | 王小明 |    |
| 2023.12.21                      | 铜包铝绞线 | 70.0mm <sup>2</sup> ±0.05mm | 55000 | 5500 | 5480 | 20    | 10. 表面氧化 | 王小明 |    |



原材料来料检验

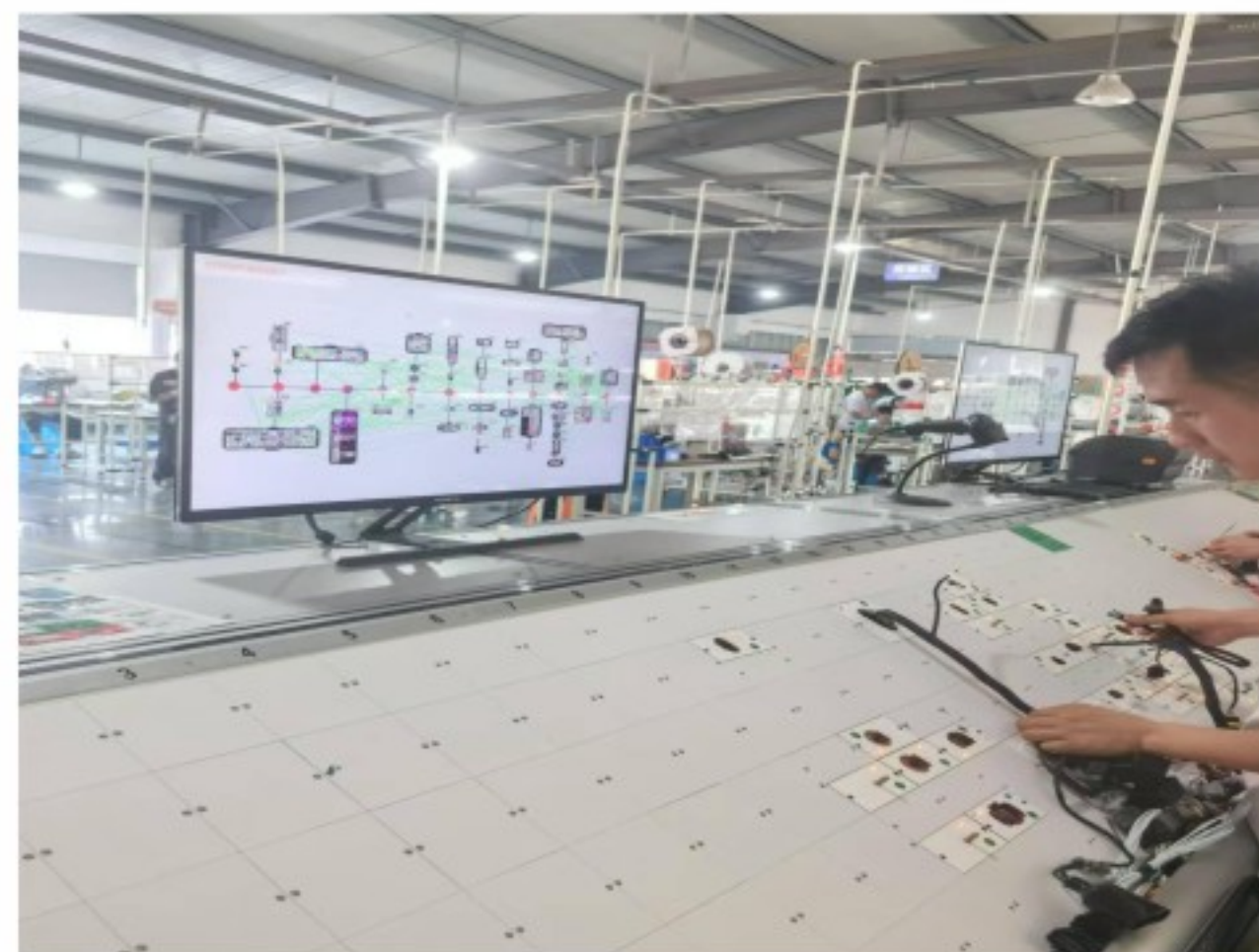
Raw material incoming inspection

端子压接拉拔力测试

Terminal crimping pull-out force test

端子压接截面分析测试

Terminal crimping cross-sectional analysis test



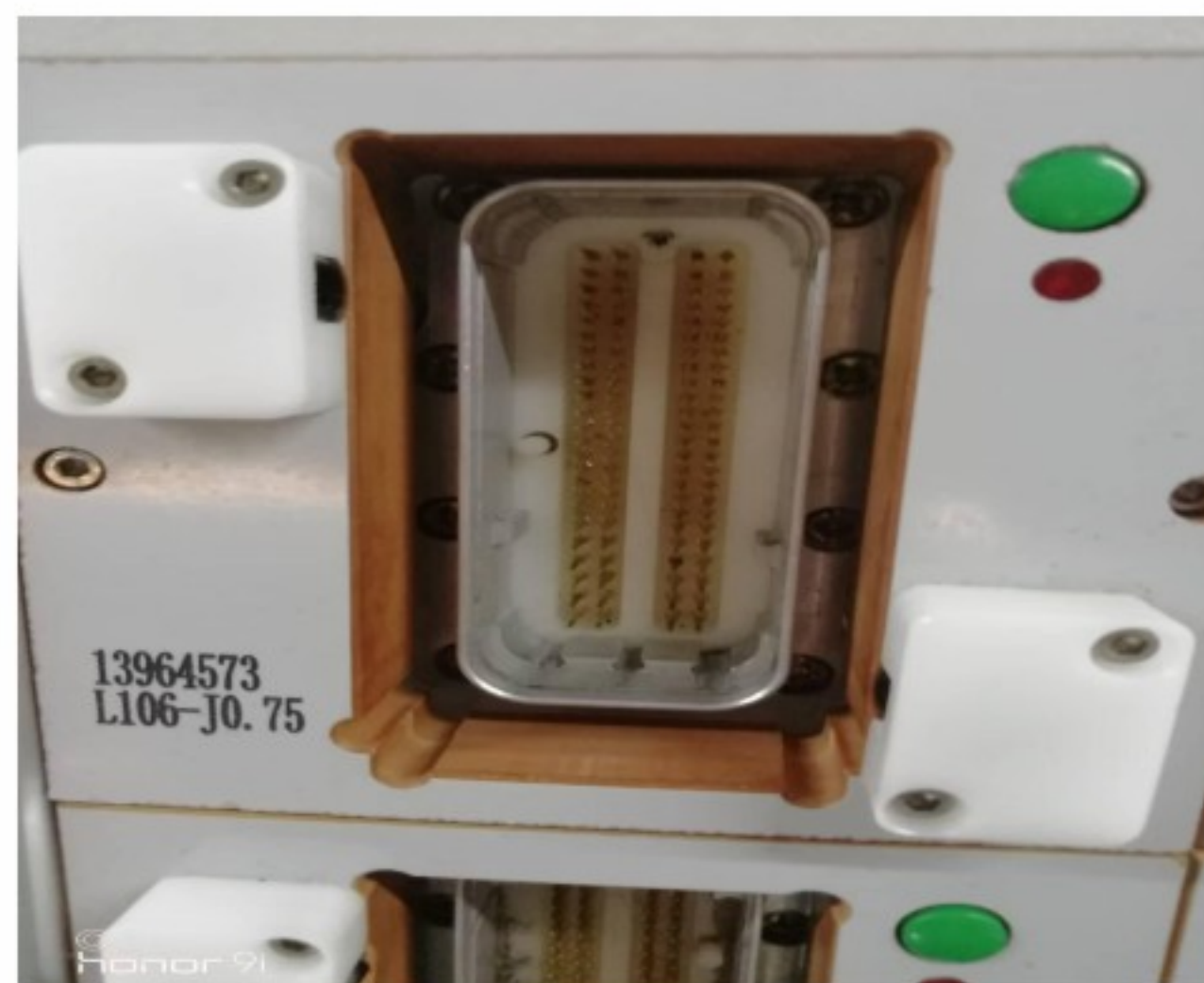
电路导通检测

Circuit Conduction Detection

| AMA生能 浙江正理生能科技有限公司 线材事业部 外观检查记录表 |       |                             |       |      |      |       |          |     |    |
|----------------------------------|-------|-----------------------------|-------|------|------|-------|----------|-----|----|
| 日期                               | 线材名称  | 规格                          | 生产数量  | 检验数量 | 合格数量 | 不合格数量 | 不合格原因    | 检验员 | 备注 |
| 2023.12.12                       | 铜包铝绞线 | 1.5mm <sup>2</sup> ±0.05mm  | 10000 | 1000 | 980  | 20    | 1. 绞合松散  | 王小明 |    |
| 2023.12.13                       | 铜包铝绞线 | 2.5mm <sup>2</sup> ±0.05mm  | 15000 | 1500 | 1480 | 20    | 2. 表面氧化  | 王小明 |    |
| 2023.12.14                       | 铜包铝绞线 | 4.0mm <sup>2</sup> ±0.05mm  | 20000 | 2000 | 1980 | 20    | 3. 直径偏差  | 王小明 |    |
| 2023.12.15                       | 铜包铝绞线 | 6.0mm <sup>2</sup> ±0.05mm  | 25000 | 2500 | 2480 | 20    | 4. 长度偏差  | 王小明 |    |
| 2023.12.16                       | 铜包铝绞线 | 10.0mm <sup>2</sup> ±0.05mm | 30000 | 3000 | 2980 | 20    | 5. 重量偏差  | 王小明 |    |
| 2023.12.17                       | 铜包铝绞线 | 16.0mm <sup>2</sup> ±0.05mm | 35000 | 3500 | 3480 | 20    | 6. 表面氧化  | 王小明 |    |
| 2023.12.18                       | 铜包铝绞线 | 25.0mm <sup>2</sup> ±0.05mm | 40000 | 4000 | 3980 | 20    | 7. 直径偏差  | 王小明 |    |
| 2023.12.19                       | 铜包铝绞线 | 35.0mm <sup>2</sup> ±0.05mm | 45000 | 4500 | 4480 | 20    | 8. 长度偏差  | 王小明 |    |
| 2023.12.20                       | 铜包铝绞线 | 50.0mm <sup>2</sup> ±0.05mm | 50000 | 5000 | 4980 | 20    | 9. 重量偏差  | 王小明 |    |
| 2023.12.21                       | 铜包铝绞线 | 70.0mm <sup>2</sup> ±0.05mm | 55000 | 5500 | 5480 | 20    | 10. 表面氧化 | 王小明 |    |

线束全检记录

Harness Full Inspection Record



配有气密检测模块

Equipped with airtightness detection module

| AMA生能 浙江正理生能科技有限公司 线材事业部 产品出厂检验报告 |            |      |                            |      |            |      |              |      |            |
|-----------------------------------|------------|------|----------------------------|------|------------|------|--------------|------|------------|
| 客户                                | 东风汽车集团有限公司 | 产品名称 | 东风汽车集团有限公司                 | 规格   | 东风汽车集团有限公司 | 生产数量 | 东风汽车集团有限公司   | 检验数量 | 东风汽车集团有限公司 |
| 零件名称                              | 铜包铝绞线      | 规格   | 1.5mm <sup>2</sup> ±0.05mm | 生产数量 | 10000      | 检验数量 | 1000         | 合格数量 | 980        |
| 零件编号                              | 13964573   | 检验日期 | 2023.12.12                 | 检验员  | 王小明        | 检验地点 | 浙江正理生能科技有限公司 | 检验设备 | 拉力计        |
| 检验项目                              | 外观检查       | 检验结果 | 合格                         | 检验项目 | 拉力测试       | 检验结果 | 合格           | 检验项目 | 长度测试       |
| 1                                 | 外观检查       | 合格   | 1                          | 拉力测试 | 合格         | 1    | 长度测试         | 合格   | 1          |
| 2                                 | 外观检查       | 合格   | 2                          | 拉力测试 | 合格         | 2    | 长度测试         | 合格   | 2          |
| 3                                 | 外观检查       | 合格   | 3                          | 拉力测试 | 合格         | 3    | 长度测试         | 合格   | 3          |
| 4                                 | 外观检查       | 合格   | 4                          | 拉力测试 | 合格         | 4    | 长度测试         | 合格   | 4          |
| 5                                 | 外观检查       | 合格   | 5                          | 拉力测试 | 合格         | 5    | 长度测试         | 合格   | 5          |
| 6                                 | 外观检查       | 合格   | 6                          | 拉力测试 | 合格         | 6    | 长度测试         | 合格   | 6          |
| 7                                 | 外观检查       | 合格   | 7                          | 拉力测试 | 合格         | 7    | 长度测试         | 合格   | 7          |
| 8                                 | 外观检查       | 合格   | 8                          | 拉力测试 | 合格         | 8    | 长度测试         | 合格   | 8          |
| 9                                 | 外观检查       | 合格   | 9                          | 拉力测试 | 合格         | 9    | 长度测试         | 合格   | 9          |
| 10                                | 外观检查       | 合格   | 10                         | 拉力测试 | 合格         | 10   | 长度测试         | 合格   | 10         |
| 11                                | 外观检查       | 合格   | 11                         | 拉力测试 | 合格         | 11   | 长度测试         | 合格   | 11         |
| 12                                | 外观检查       | 合格   | 12                         | 拉力测试 | 合格         | 12   | 长度测试         | 合格   | 12         |
| 13                                | 外观检查       | 合格   | 13                         | 拉力测试 | 合格         | 13   | 长度测试         | 合格   | 13         |
| 14                                | 外观检查       | 合格   | 14                         | 拉力测试 | 合格         | 14   | 长度测试         | 合格   | 14         |
| 15                                | 外观检查       | 合格   | 15                         | 拉力测试 | 合格         | 15   | 长度测试         | 合格   | 15         |
| 16                                | 外观检查       | 合格   | 16                         | 拉力测试 | 合格         | 16   | 长度测试         | 合格   | 16         |
| 17                                | 外观检查       | 合格   | 17                         | 拉力测试 | 合格         | 17   | 长度测试         | 合格   | 17         |
| 18                                | 外观检查       | 合格   | 18                         | 拉力测试 | 合格         | 18   | 长度测试         | 合格   | 18         |
| 19                                | 外观检查       | 合格   | 19                         | 拉力测试 | 合格         | 19   | 长度测试         | 合格   | 19         |
| 20                                | 外观检查       | 合格   | 20                         | 拉力测试 | 合格         | 20   | 长度测试         | 合格   | 20         |

出货检验报告

Shipping Inspection Report

## 行业先进检测设备、检测标准 Advanced industry testing equipment and standards

投入500万元建造行业领先的实验室，产品试验检测中心，拥有先进的试验设备和试验能力。能科学、正确的进行GB2423、IEC60068、IEC60270、GB/T21563、ISO3497、ISO8092、SAE1742、USCAR2标准，标准规定的高温、低温、温度冲击、盐雾、振动、自由跌落、紫外老化、微电流连接电阻、电压降、绝缘电阻、温升等试验、及IP6K、IP9K和IP68防尘防水的生产检测能力，阻燃、加速老化等可靠性试验，为公司产品提供全方位试验方案的策划与制定、产品故障分析与诊断、环境可靠性、加速寿命的试验与分析，建立完整的质量保证体系和高素质的试验队伍，全面保证客户品质求。

Invested 5 million yuan to build an industry-leading laboratory and product testing center equipped with advanced testing equipment and capabilities. Scientifically and accurately conducts tests according to standards such as GB2423, IEC60068, EC60270, GB/T21563, ISO3497, ISO8092, SAE1742, USCAR2, which include high temperature, low temperature, temperature shock, vibration, free fall, ultraviolet aging, micro-current contact resistance, voltage drop, insulation resistance, temperature rise, and other tests. Also possesses production testing capabilities for IP6K, IP9K, and IP68 dust and water resistance, as well as reliability tests such as flame retardancy and accelerated aging. Provides comprehensive planning and formulation of all-around testing solutions for company products, product failure analysis and diagnosis, environmental reliability, accelerated life testing and analysis, establishes a complete quality assurance system, and a high-quality testing team to fully ensure customer quality requirements.

## 精密检测 / 准确分析 Precision Detection / Accurate Analysis



实验中心  
Experimental Center



## 实验室—可靠性验证 Laboratory - Reliability Verification

整车线束  
Complete Vehicle Wiring Harness

高低温循环测试  
High and Low Temperature Cycle Test

恒温恒湿测试  
Constant Temperature and Humidity Test

温湿循环测试  
Temperature and Humidity Cycle Test

冷热冲击测试  
Thermal Shock Test

盐雾测试  
Salt Spray Test

温升测试  
Temperature Rise Test

机械冲击测试  
Mechanical Shock Test

机械寿命测试  
Mechanical Life Test

机械振动测试  
Mechanical Vibration Test

安规综合测试  
Mechanical Shock Test

可靠性验证  
Reliability Verification

耐臭氧测试  
Ozone Resistance Test

紫外老化测试  
Ultraviolet Aging Test

微电流连接电阻测试  
Micro-current Connection Resistance Test

温升  
Temperature Rise

阻燃测试  
Flame Retardant Test

接触电阻测试  
Contact Resistance Test

载流测试  
Current Carrying Test

耐压测试  
Dielectric Withstand Test

喷淋测试  
Spray Test

气密测试防护等级  
Air Tightness Test Protection Level

## 外观尺寸检测 Appearance Size Detection



## 电性能检测—温升测试, 耐压绝缘 Electrical performance testing-- Temperature rise test, voltage withstand insulation



电源循环测试台  
Power cycle test bench



温升测试台  
Temperature rise test bench



IP6X 沙尘试验箱  
IP6X dust test chamber



温升测试台  
Temperature rise test bench



IPX7全自动浸水试验箱  
IPX7 Automatic Immersion Test Chamber



IP9K高压喷淋试验箱  
IP9K high-pressure jet test chamber

## 可靠性检测(抗拉力、连接插拔寿命) Reliability testing (tensile strength, connection plugging and unplugging life)



万能拉力试验机  
Universal tensile testing Machine



电子推拉力  
Electronic push-pull force



全自动插拔力  
Automatic Insertion and Withdrawal Force



连接器机械寿命测试台  
Connector mechanical life Test bench



环境检测(恒温恒湿、冷热循环)  
Environmental Testing (Constant Temperature and Humidity, Cold and Hot cycle)



盐雾腐蚀试验箱  
Salt spray corrosion test chamber



环保元素分析  
Environmental Element Analysis



三综合测试机  
Three Comprehensive Test Machine



电压降测试仪  
Voltage Drop Tester



耐压测试仪 数字式电阻分选仪  
Dielectric withstand tester Digital Resistance Sorting Instrument



高低温试验设备  
High and low temperature test equipment



老化试验设备  
Aging test equipment



三箱式温度冲击试验箱  
Three-box type temperature shock test chamber



盐雾腐蚀试验箱  
Salt spray corrosion test chamber



紫外线老化试验箱  
Ultraviolet Aging Test Chamber



温升测试台  
Temperature Rise Test Stand

订单交付能力06

Order Delivery Capability



独立完成线束设计制造, 缩短开发周期, 高效应对客户需求。  
Independently complete wire harness design and manufacturing, shorten development cycle, and efficiently respond to customer needs.