White Paper

Quality Assurance Process
: Mass Production

29th 03, 2017
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1. Quality Policy

At Hanwha Techwin, we seek continuous research and development and to establish quality instructions and a quality management system for the purpose of achieving customer satisfaction.

1.1. Quality Vision

- Pursue Perfect Quality for Customer Satisfaction
- Our Quality Goal is to exceed your Expectation

Give customer value the highest priority to make the best products and build trust with customers in line with our quality-first culture.

1.2. Code of Conduct for Quality

Perform the following to realize our Quality Vision of continuous innovation and taking bold challenges.

- **Customer-oriented**
  Consider quality demands of the market from the customer’s perspective and reflect on them while finding a solution.

- **True to the Basics**
  Obey rules and processes to ensure the highest quality.

- **Professionalism**
  Work with a strong sense of responsibility to ensure a quality product.

- **Resolve the Root of the Problem**
  Find solutions for all issues in the field and get to the heart of the problem.

- **Create Customers**
  Resolve customer demands promptly and accurately to create loyal customers through quality products.
2. QMS (Quality Management System)

Hanwha Techwin has implemented ongoing quality assurance practices based on the international quality management system (ISO 9001) to ensure the quality management system is suitable for satisfying the demands of customers from design, development, production, to service, and to know whether it can be maintained effectively and remain implemented.

2.1. ISO 9001:2008 Certificate

![ISO 9001 Certificate Images]

Production Corporation  HQ R&D Center  Production Corporation

2.2. QA Organization

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CEO
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- Development Center
- Global CS Division
- Manufacture Center

CS: Customer Satisfaction

- Quality operation team
- Development quality team
- Service operation team

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2.3. Manufacturing Site

Hanwha Techwin's manufacturing sites which produce B2B and B2C video surveillance equipment are located both in Korea and Vietnam.

Image 1. Production Corporation in Vietnam
In order to ensure manufacturing / parts quality, we manage a quality assurance system for each process.
3.1. Vendor Assurance

3.1.1. Partner Company Q-STEP Evaluation

Stabilize production/market quality through partner company source quality management (Import Check, Process Quality, Market Quality, QPA)

فرق Partner Company P/I (Penalty/Incentive) Management: 3-Strike Out System

3.1.1.1. Operation Process

![Diagram](image)

3.1.1.2. Class

<table>
<thead>
<tr>
<th>Class</th>
<th>Score</th>
<th>Bronze (C)</th>
<th>Silver (B)</th>
<th>Gold (A)</th>
<th>Diamond (AA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>69 or less</td>
<td>70~79</td>
<td>80~89</td>
<td>90 or more</td>
<td>2 Consecutive Golds</td>
</tr>
</tbody>
</table>

3.1.2. Partner Company Evaluation (QPA: Quality Process Audit)

Preemptive defect management process achieved through improved autonomous quality management through a partner company

<table>
<thead>
<tr>
<th>Class</th>
<th>Score</th>
<th>Consecutive</th>
<th>QPA Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90 or more</td>
<td>AA</td>
<td>1 year</td>
</tr>
<tr>
<td>B</td>
<td>80 or more</td>
<td>AB, BB</td>
<td>1 year / 6 months</td>
</tr>
<tr>
<td>C</td>
<td>70 or more</td>
<td>BC, CC</td>
<td>6 months</td>
</tr>
<tr>
<td>D</td>
<td>69 or less</td>
<td>-</td>
<td>1 month (monthly)</td>
</tr>
</tbody>
</table>
3.2. IQA (Incoming Quality Assurance)

3.2.1. New Part Quality Evaluation Process

3.2.2. Mass-Production Part Warehouse Evaluation Process
3.2.3. CTQ (Critical To Quality) Control of Core Component

- SOC
- Image Sensor
- PCB
- SMPS / Power
- Zoom Module
- Fixed Lens
- Iris
- Slipring (For PTZ Camera)
### 3.3. Process Quality Control

#### 3.3.1. Preemptive Quality Prevention Management (Process Patrol)

Production process is monitored to implement preemptive improvement procedures.

| SMT PBA                | • Ship-in material management  
|                       | • Work standard for preparing carriage/material  
|                       | • Solder/Print management  
|                       | • Print AOI management  
|                       | • Chip mount management  
|                       | • M-AOI / S-AOI management  
|                       | • Reflow equipment management  
|                       | • SMD finished product management  
|                       | • Selective Soldering equipment management  
|                       | • Robot Soldering equipment management  
| Lens/Zoom module      | • Warehouse environment management  
|                       | • Auto Soldering equipment management  
|                       | • Bonding management  
|                       | • D/N Module linkage management  
|                       | • Heat caulking/compression management  
|                       | • Assembly management  
|                       | • PCB assembly and Con. Connection management  
|                       | • Punt adjustment management  
| Main Line             | • Assembly site environment management  
|                       | • Temperature/Humidity measures & history management  
|                       | • Work instruction compliance management  
|                       | • Work Standard, usage definition chart & method management  
|                       | • PBA repair management  
|                       | • Time error status management  
|                       | • Equipment & check program uniformity management  
|                       | • Final package specification uniformity management  
|                       | • Process change & special note management  
| Sub Line              | • Assembly site environment management  
|                       | • ESD & EOS request/repair management  
|                       | • Equipment measurement device calibration management  
|                       | • Carriage material uniformity management  
|                       | • On-site "5S, 3P (Proper items, Proper quantity and proper place)" condition,  
|                       | temperature/humidity management  

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3.4. OQA (Outgoing Quality Assurance)

3.4.1. Main Line process check

Exterior, performance/function, specification/package checks for assuring production quality are implemented automatically by PC.

☞ Program for Auto Check: Camera (SIT), DVR (BIST) auto check

3-man cell        Product assembly        Product check        Product package

3.4.2. Outgoing Inspection

3.4.2.1. Appearance / Packing

Appearance

Inner packing,
Accessories

Outer packing
3.4.2.2. Function / Efficiency / Network Connection

Focus  WDR  D/N

BLC  ATW  N/W connection

3.4.2.3. Specifications / Destination (Buyer)

Time  Barcode  Firmware version

Serial number  Etc
3.4.3. **Shipment Check Method**

3.4.3.1. **Random Sampling LOT Inspection (GBT-2828 Standard, Level G-II)**

Variable Application of Check Rigidity (Low/Medium/High): S-Mes System Auto Update

3.4.3.2. **Special Check**

(Full check for New Product, Modified Product, Market Sensing Model)

<table>
<thead>
<tr>
<th>Package Check</th>
<th>Exterior Check</th>
<th>Function Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Package box print check</td>
<td>• Package box exterior check</td>
<td>• Foreign substance, focus check</td>
</tr>
<tr>
<td>• Package box damage check</td>
<td>• Product exterior check</td>
<td>• Operation button condition check</td>
</tr>
<tr>
<td>• Accessory check</td>
<td>• Logo, print check</td>
<td>• Day&amp;Night, N/W check</td>
</tr>
</tbody>
</table>

3.4.3.3. **IBI (Internal Buyer Inspection)**

Implement check from the customer's perspective on products have which passed the shipment check

☞ Product Specification, Function/Performance, customer installation accessory verification

3.4.3.4. **Reliability Check**

New Product SR, Periodic Mass-production Function/Performance Verification
4. Mass Production Reliability

4.1. Part Reliability Evaluation

This is a test that determines a part’s performance, reliability and environmental impact by evaluating the demanded quality values at various environmental conditions including the use, transport and storage.

4.1.1. Roundness Measuring System

Measuring tube barrel circle shape
(Lens barrel concentricity / circularity measurement)

- Minimum measurement unit: 0.0001mm

4.1.2. Three-Coordinate Measuring Machine

Equipment measuring dimensions/shape of parts using 3D coordinates
(Tubes and precision extrusion parts, dimension measurement)

- Minimum measurement unit: 0.0001mm

4.1.3. X-ray fluorescence

Environmentally harmful substance analysis and evaluation (electrical, tool measurement)

- Detected Substances: Chloride (Cl), Bromine (Br), Lead (Pb), Mercury (Hg), Chrome (Cr), Cadmium (Cd)
• Harmful substance management standard

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Cd</th>
<th>Pb</th>
<th>Hg</th>
<th>Cr6+</th>
<th>Br(PBBs/PBDEs)</th>
<th>C1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymer</td>
<td>50</td>
<td>200</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>Metal</td>
<td>200</td>
<td>800</td>
<td></td>
<td>SPOT-TEST</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

4.1.4. Part Reliability Evaluation Equipment

<table>
<thead>
<tr>
<th>Thermo-hygrostat</th>
<th>Thermal impact tester</th>
<th>High temperature tester</th>
<th>Low temperature tester</th>
<th>Salt water spray tester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature/ Humidity cycle (-40~95°C)</td>
<td>Thermal impact test (-40~85°C)</td>
<td>High temp. test (90°C)</td>
<td>Low temp. test (-40°C)</td>
<td>Post processed parts corrosion evaluation</td>
</tr>
</tbody>
</table>

4.1.5. Parts Measuring Equipment

4.1.5.1. Common Measuring Equipment

<table>
<thead>
<tr>
<th>Microscope</th>
<th>XRF measuring device</th>
<th>Stereoscopic microscope</th>
<th>Push-pull gage</th>
<th>Calipers/Micro meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>High magnification precision measurement (100X)</td>
<td>Environmentally harmful substance evaluation</td>
<td>Exterior/Property check</td>
<td>Tensile/Compressi on evaluation (0.10~50kg/f)</td>
<td>Dimension measurement</td>
</tr>
</tbody>
</table>
### 4.1.5.2. Tool Dimension Precision Measuring Equipment

<table>
<thead>
<tr>
<th>3D measuring device</th>
<th>HITE gauge</th>
<th>Pin gauge Ø0.5~Ø15.0, 0.01mm scale</th>
<th>Block gauge 0.5~100mm</th>
<th>Torque measuring device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube parts</td>
<td>Deviation/Height measurement</td>
<td>Inner diameter/hole check</td>
<td>Gap measurement</td>
<td>Screw, caulking pin torque</td>
</tr>
</tbody>
</table>

### 4.1.5.3. Electric/Electronic Property Measuring Equipment

<table>
<thead>
<tr>
<th>Digital multi meter</th>
<th>Pressure resistance tester</th>
<th>LCR meter</th>
<th>Curve measuring device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power insulation resistance</td>
<td>Pressure resistance test</td>
<td>Electronic part property value analysis</td>
<td>Curve test</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DC power supply</th>
<th>Cable measuring device</th>
<th>Static electricity tester</th>
<th>Multi tester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuating parts/Adapter defect analysis</td>
<td>Open/Short check</td>
<td>Static electricity of parts/package</td>
<td>Resistance, Current measurement</td>
</tr>
</tbody>
</table>
4.2. Product Reliability Evaluation

4.2.1. Transport Test (Vibration/Falling)

It refers to the minimum test conducted to verify whether defects can be caused by vibration and falling during transport from the factory to the hands of consumers. Tests are implemented at room temperature conditions.

Vibration test  Falling test

4.2.2. Environment Test

4.2.2.1. High / Low temperature & humidity Storage

This is a test conducted to determine whether physical properties and characteristics are suitable when exposed to high temperatures, high humidity or low temperatures over long periods of time.

- Test Condition: 60°C / 90% / 120Hrs, -30°C / 48Hrs

High/Low temperature test  Temperature/Humidity test
4.2.2.2. Water Proof Test

4.2.2.2.1. Rain Spray Test

This is a test that determines whether the product remains suitable after physical property and characteristic changes due to water infiltration by submerging the product in water and continuously spraying water on it in real-life operating conditions.

4.2.2.2. Moisture Proof Test

This aims to prevent moisture build up in the product in high temperatures and high humidity environments by applying temperature and humidity changes to the product to verify moisture infiltration.

4.2.3. Power Environment Test

The Power Environment Test refers to all tests conducted to evaluate the product's strength under all sources of stress or electric charges generated in power environments by artificially simulating static electricity on the product.
5. System Operation

A comprehensive management system is operated to ensure partner company quality, new product development quality, production quality, standard management, customer VOC, service information, etc.

![Quality Information Operation System Diagram]

5.1. Partner Company Quality Management System

*(nTOPS: Next Techwin Open Purchasing Service)*

Hanwha Techwin's electronic system for partner company purchasing and payment management

- Order Delay Status
- Due Date Schedule Management
- Basic Partner Company Information Search
- Company Direction Sharing
5.2. New Product Development Quality Assurance System  
(MyPLM: Hanwha Techwin Product Life Cycle Management)

The system that manages product life cycle related documents such as product planning requirements, technical references, test result reports, BOM, design modification management, parts approval, etc.

- Product requirement management
- Development stage products
  (Test Results) Management
- Design BOM management
- Parts approval management
- Technical reference management
- Design modification management
- Development Task Monitoring

5.3. Standard Management System  
(HSDM: Hanwha Standard Documents Management system)

Hanwha Techwin Security Business Group observes rules and processes by standardizing all department work from marketing, development, production and support.

- Quality Manual
- New Product Technology Development Work Regulation
- Quality Assurance Rules
- Reliability Testing Regulation
- Import Inspection Work Standard
- Part Reliability Operation Work Regulation
- Shipment Check Work Regulation
5.4. Mass-Production Quality Management System
(SAP: System Analysis and Program Development)

- Ship-in check judgment
- Create check plan
- Adjust check rigidity
- Issue instructions for partner company
- NG measures
- Inventory/Ship-in history search, etc.

5.5. Production Process Operation System
(S-MES: Security Manufacturing Execution System)

The system is manages overall items related to the production process including production and checking, and aims to achieve efficient process quality management and consistent product quality.

- Integrated production standard information management
- Production plan/performance management
- Production equipment management (such as SMT equipment, etc.)
- Production KPI Monitoring
- Shipment/Process quality management & analysis
- Response to quality issues via production history tracking
5.6. Global Demand/Supply Network Management System

(GSCM: Global Supply Chain Management)

5.7. Customer VOC & Service Information Operation System

(4CUST, Hanwha Techwin Customer System, https://www.4cust.net)

This manages various types of information related to receiving requests for service as well as information supporting service activities, and it features a preemptive response system which identifies customer requests and on-site situations on a real-time basis.

- Service, Market Quality Performance Management
- Service Policy, Technical Reference, Manual Notification
- Request & Status Management per Service Type
- VOC/Complain Receipt & Status Management
- Service Agency Status Management
- Product & Service Material Standard Information Search