

TECHNICAL ANNEX: SUP REWORK CHANGE CONTROL EXECUTION, FORMS & AUDIT PROTOCOLS

技术附件：SUP 桨板返工参数变更控制现场执行表单、工程验证细则与防呆审计规范

Annex Doc No. / 附件编号:	QMS-SOP-QC-CC-001-ANNEX-A	Effective Date / 生效日期:	2026-08-15
Associated SOP / 主文件:	QMS-SOP-QC-CC-001 (Rev 2.0)	Applicable Range / 适用范围:	Inflatable SUP & Kayak OEM/ODM Lines

1. STANDARD CHANGE REQUEST (ECR) DATA SPECIFICATION / 变更申请标准字段

Field Name / 字段名称	Standard Value / Format / 标准格式	Description & Mandatory Verification / 说明与必填要求
Change Control No. / 编号	ECR-SUP - [YYYYMMDD] - [SEQ]	Unique auto-generated ID (例如: ECR-SUP-20260815-001). 唯一流水号。
Trigger Source / 触发来源	NCR / CAPA / Customer Audit / Yield	Must link to specific Non-Conformance Report or Audit Finding. 关联合同或异常单号。
Current vs Proposed / 新旧参数	Side-by-side Technical Specification	E.g. Adhesive Type A (Curing 24h @ 25°C) → Type B (Curing 12h @ 40°C Hot Air). 明确前后对比。
Affected Scope / 受影响批次	Order PO#, Batch Lot#, SKU IDs	Define exact bounds of affected WIP, finished goods, and components. 划定影响批次边界。
Change Type / 变更性质	Temporary Deviation / Permanent Rev	If temporary: Must specify Max Unit Quantity & Expiry Date (到期自动作废)。

2. SUP CRITICAL PROCESS VALIDATION MATRIX / 充气桨板关键工艺工程验证细则

Sub-Process / 工艺环节	Controlled Parameter / 关键控制参数	Validation Methodology / 验证方法与实验条件	Acceptance Benchmark / 判定合格标准
Pinhole & Surface Patch 针眼与表面贴片返工	- Solvent cleaning cycle - Primer drying: 3–5 min - Heat gun: 60°C±5°C - Roller pressure ≥ 0.4 MPa	Submerge repaired section in clear water tank or apply liquid soap test at 18 PSI for 10 min continuous inspection. 18 PSI 压力下浸水或肥皂液涂抹持续观察 10 分钟。	Zero Bubble Leakage (零气泡泄漏) No edge curling under 180° peel stress (无起翘)。
Rail Seam Delamination 导轨/侧边条接缝开胶	- Adhesive mixing ratio (2-part) - Curing temp: 22°C–28°C - Relative humidity ≤ 65% RH - Press hold time: ≥ 4 hours	1. Over-pressure test @ 22 PSI for 2 hours. 2. Thermal cycle test: 50°C chamber for 6h → ambient 2h. 22 PSI 超压测试2小时 + 50°C 热箱循环6小时。	Zero delamination / 零脱胶 Pressure drop ΔP ≤ 0.1 PSI. No micro-wrinkles or glue whitening.
Valve Base Leakage 阀门底座松动或微漏	- Valve wrench torque: 18–20 N·m - Inner seal gasket seating - Internal thread cleanliness	Dynamic flex test (20 cycles inflation/ deflation) + soap immersion under full working pressure (15 PSI). 20次充放气动态循环 + 15 PSI 全水下浸泡检漏。	Zero bubble at valve seat & core Torque retained ≥ 16 N·m after cycle. No distortion of drop-stitch fabric.
24h/48h Pressure Hold 出厂保压与气密总测	- Baseline pressure: 15.0 PSI - Ambient temp recording - Gauge accuracy: Class 1.0 / ±0.5%	Digital pressure logger connected for 24h & 48h duration. Corrected for ideal gas law temperature fluctuations. 高精度数字记录仪连续记录24-48小时，经环境温度差补偿计算。	Net ΔP ≤ 0.20 PSI / 24h (After thermal correction). Zero cosmetic swelling or deformation.

3. FAILURE MODES & ROOT-CAUSE MISTAKE-PROOFING (POKA-YOKE) / 常见失控防呆对策

Failure Mode / 常见失控点	Quality Risk / 质量风险	Mandatory Mistake-Proofing Mechanism / 强制防呆与遏制机制
Post-facto Sign-off 先改参数、后补签字	Unverified parameters enter production; batch quality unpredictable.	System Lock / 系统锁定: Rework stations will not release pneumatic air supply or adhesive dispensing without scanned QA ECR barcode on traveler.
Endless "Temporary Deviation" 临时偏离无限期沿用	Process drift; non-conforming parameters become permanent habit.	Hard Expiry Trigger / 自动失效: Max lot cap (e.g. 50 units) or 7-day limit in MES. System automatically rejects lot after expiration unless permanent ECN is approved.
Single-Piece Success Fallacy 修好一块即当验证合格	Process lacks statistical repeatability across different shifts/temp.	Representative Batch Validation / 代表性批次验证: Minimum 5 sample boards across min/max tolerance conditions, evaluated by 2 independent QC inspectors.
Obsolete SOP Coexistence 新旧作业指导书混用	Operators follow outdated curing time/pressure parameters.	1-in-1-out Physical Scrap / 物理以旧换新: Document controller physically collects and destroys old laminated cards before issuing Rev B with red "CONTROLLED" stamp.

4. OPERATIONAL SOP EXECUTION CLAUSE (FOR WEB / MANUAL EMBED) / 标准作业文本

- OPERATIONAL GOVERNANCE DIRECTIVE / 现场操作管理红线:**
- No operator, shift lead, or department head is authorized to modify pressure, temperature, holding duration, or adhesive formulas without an active Engineering Change Request (ECR) signed by Quality Engineering.
 - All test gauges and thermometers must carry green "CALIBRATED" inspection tags with valid dates. Any uncalibrated gauge renders all associated airtightness tests null and void.
 - Any rework involving the valve seat or inner rail tape must pass 100% 48-hour pressure hold test before packaging.

5. SIGN-OFF & IMPLEMENTATION APPROVAL / 受控签署与放行栏

Quality Engineer (QE) / 质量工程师: Signed: _____ Date: 2026-08-15	Process Engineer (PE) / 工艺工程师: Signed: _____ Date: 2026-08-15	Production Lead / 生产主管: Signed: _____ Date: 2026-08-15
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