QINGDAO VATRAD GROUP., LTD.

青岛万国通衢进出口有限公司 · 质量保证与工艺技术工程部

STANDARD OPERATING PROCEDURE: SUP REWORK PROCESS PARAMETER CHANGE CONTROL

标准作业程序（SOP）：充气式桨板（SUP）返工工艺参数变更控制与验证规范

Document No. / 文件编号:	QMS-SOP-QC-CC-001	**Effective Date / 生效日期:**	2026-08-15
Revision / 版本号:	Rev 2.0 (Official Release)	**Scope / 适用范围:**	SUP Manufacturing & OEM/ODM Lines
Drafted by / 起草人:	Engineering & QC Dept.	**Approved by / 批准人:**	VP & Technical Quality Director

1. PURPOSE & SCOPE / 目的与适用范围

Purpose: To strictly govern all parameter, material, and method changes during rework of Stand-Up Paddleboards (SUP), ensuring airtightness, structural integrity, appearance, and batch traceability under ISO 9001 quality systems.
目的：规范站立式桨板（SUP）制造及返工过程中的所有参数、材料与工艺变更，杜绝随意手写修改或口头变更，确保气密性、结构耐久性、外观和追溯性完全受控。

Scope: Applies to all SUP production, rework cells (air chamber airtightness, valve seats, rail tapes, seam bonding, UV curing, pressure hold testing) at Qingdao Vatrad Group.,Ltd. and associated OEM/ODM plants.
范围：适用于青岛万国通衢进出口有限公司及所属 OEM/ODM 生产线气密性、阀门底座、导轨/接缝搭接、胶粘固化、保压测试等全返工工序。

2. MANDATORY CHANGE CONTROL SCOPE & RISK TIERS / 适用变更范围与风险分级

Category / 变更类别	Typical Scope & Examples / 典型例子	Risk / 风险等级	Customer Approval
Rework Material **返工材料**	Adhesive, primer, cleaning solvents, patch fabrics, valve seals, curing agents, or supplier substitution. 更换胶粘剂、清洁剂、补片材料、阀门密封件、底涂剂或原材料供应商。	High / 高风险	Mandatory / 必须书面确认
Process Conditions **工艺条件**	Surface treatment, hot air curing temp/duration, clamp pressure, holding duration, ambient temp/humidity window. 调整表面打磨、固化温度、保压时长、温湿度操作窗口及施工作业顺序。	High / 高风险	Required for Key Specs
Equipment & Tooling **工装设备**	Pressure gauges, leak testing apparatus, heating tools, valve torque wrenches, automated test software. 更换压力表、检漏仪、夹具、加热风枪、阀门专用工具或检测软硬件。	Med-High / 中高	Case by Case
Defect Extent **缺陷范围**	Expanded rework area, transition from pinhole leak to rail seam or valve base structural boundary. 允许返工面积扩大、由表面微漏扩大为导轨、接缝或阀座关键承压区域。	High / 高风险	Mandatory if structural
Test & Inspection **检验方法**		High / 高风险	Mandatory / 必须批准

Category / 变更类别	Typical Scope & Examples / 典型例子	Risk / 风险等级	Customer Approval
	Air-tightness test method, holding pressure (e.g. 15-20 PSI), test duration (24h/48h), AQL sampling plan. 改变检漏方式、测试压力、保压时长、抽检比例或验收判定标准。		
Documentation 文件与授权	WI revisions, NCR routing, operator qualification requirements, sign-off authorities. 修改返工作业指导书、检验表、NCR处置逻辑、操作工与检验员授权资质。	Medium / 中风险	Internal QA Approval
Packaging/Marking 包装与标识	Rework identification tags, serial number tracking, rework log inclusion, specialized packaging. 返工后增加追溯标识、序列号记录、专用维修标签或特殊包装要求。	Medium / 中风险	Required if specified

3. CHANGE CONTROL STANDARD WORKFLOW / 变更控制标准化流程

Standard Step-by-Step Execution Sequence / 标准九步执行闭环：
Step 1: Change Request Initiation (提出变更申请) → **Step 2:** Screening & Temporary Containment (初步筛选与临时遏制) → **Step 3:** Cross-Functional Risk Assessment (跨部门风险评估) → **Step 4:** Joint Review & Approval (联合评审与审批) → **Step 5:** Validation Plan Execution (验证计划制定与执行) → **Step 6:** Controlled Pilot Implementation (受控试产与受控实施) → **Step 7:** Re-Inspection & Effectiveness Verification (复检与效果确认) → **Step 8:** Document Revision & Operator Training (文件更新与人员培训) → **Step 9:** Closure & Traceability Archiving (闭环归档与追溯)

MANDATORY CONTAINMENT RULE / 强制暂停与遏制规则：
The existing rework method shall be immediately suspended if rework re-inspection repeatedly fails, or if changes involve critical structural seams, rail bounds, or unverified replacement adhesives. Temporary deviations must have strict expiry dates, lot caps, and written QA/Engineering sign-offs. No verbal authorizations are permitted.
若返工复检反复失败，或涉及关键接缝、轨道及未经验证的替代胶水，现行返工工艺必须立刻暂停。临时偏离必须设定严格时效与批次上限，严禁口头惯例。

4. APPROVAL AUTHORIZATION MATRIX / 跨部门批准授权矩阵

Change Content / 变更内容	Eng. / 工程	QA / 质量	Prod. / 生产	Proc. / 采购	Sales / 项目	Customer / 客户
Doc text clarification / 文档措辞澄清	Review 审核	Approve 批准	Info 知会	—	—	—
Operation sequence micro-adjust / 作业微调	Approve 批准	Approve 批准	Sign 会签	—	Info 知会	Optional 视项目
New operator qualification / 新增操作员	Review 审核	Approve 批准	Approve 批准	—	—	—
Tooling/testing gauge change / 工装量具更换	Approve 批准	Approve 批准	Sign 会签	If needed	—	Optional 视项目
Alternative material/supplier / 替代材料或供应商	Approve 批准	Approve 批准	Sign 会签	Sign 会签	Info 知会	Required 可能需要
Adjust pressure/curing/hold time / 调温/压/保压参数	Approve 批准	Approve 批准	Sign 会签	—	Info 知会	Mandatory if critical
Rail/valve/seam method change / 轨道接缝阀座工艺	Approve 批准	Approve 批准	Sign 会签	If needed	Info 知会	Recommended 建议确认

Change Content / 变更内容	Eng. / 工程	QA / 质量	Prod. / 生产	Proc. / 采购	Sales / 项目	Customer / 客户
Customer spec/sample/criteria / 改变客户规格与标准	Approve 批准	Approve 批准	Sign 会签	—	Sign 会签	**Mandatory (Written)**

5. ENGINEERING VALIDATION & ACCEPTANCE PROTOCOL / 工程验证与验收标准

Validation Item / 验证项目	Verification Criteria / 验证内容与技术要求	Method & Acceptance / 验收标准
Leak Elimination & Pressure 漏点消除与气密保压	Zero bubble leakage in bubble test; maintain specified test pressure (e.g. 15–18 PSI) for 24h/48h without unapproved pressure drop. 原始漏点彻底消除，肥皂水检漏无气泡；在规定测试压力下维持24-48小时保压无异常压降。	Pressure gauge log & differential ≤ allowed threshold (ΔP ≤ 0.2 PSI / 24h adjusted for ambient temp).
Valve Base Integrity 阀门底座完整性	Valve core torque, internal gasket seal, perimeter airtightness under dynamic flexing and max inflation. 阀芯扭矩正常，密封垫圈完好，高压充气与动态弯折下周边无微漏。	Soap immersion & torque wrench inspection (15-20 N·m compliance).
Rail & Seam Adhesion 轨道与接缝粘接强度	Peel resistance, no delamination, edge lifting, wrinkling, or adhesive embrittlement under thermal stress. 粘接层无分层、起翘、褶皱，经热风/日照温热循环后无软化或脆裂。	Visual inspection under 1000 lux + manual edge peel test + heat chamber cycle.
Cosmetic & Workmanship 外观与工艺一致性	No color aberration, excessive glue stains, EVA pad damage, deformation, or blurred printing. 无明显色差、胶水溢出溢痕、EVA垫损伤、板体变形或品牌Logo印花受损。	100% visual sign-off against Master Golden Sample (对照封样板确认).

> **FORMAL SOP CLAUSE (Auditable Text for QMS & Website Quality Manual):**
> "Any proposed change to approved rework materials, process conditions, equipment, test methods, inspection criteria or authorized personnel shall be managed through documented change control before implementation. High-risk changes shall require an approved validation plan and controlled pilot implementation before routine release. Changes affecting customer-approved specifications or samples shall not be implemented without written customer approval."
> “任何对已批准的返工材料、工艺条件、设备、测试方法、检验标准或授权人员的拟议变更，均须在实施前执行受控文件化变更流程。高风险变更必须经过工程验证计划与受控试产确认。凡影响客户批准技术规格或样品标准的变更，未经客户书面授权绝不得擅自实施。”

6. IMPLEMENTATION, EFFECTIVENESS REVIEW & CLOSURE / 实施、效果追踪与关闭

- **Document Release (文件受控发布):** Update WI-QC-AT-001, inspection logs, parameter setup sheets. Obsolete files marked & withdrawn.
- **Material & Calibration (物料与量具放行):** Verify raw material lot certificates, expiry dates, and ensure all pressure gauges & sensors are within valid calibration period.
- **Operator Qualification (人员考核培训):** Mandatory hands-on training and test-piece sign-off before executing new rework protocols.
- **Effectiveness Metrics (效果确认指标):** First-pass rework yield ≥ 98%, repeat leak recurrence rate ≤ 0.5%, zero customer cosmetic/pressure complaints.
- **Sign-off & Closure (归档闭环):** Change control records, validation reports, and revised files archived in QMS for minimum 3 years.

Quality Assurance Dept. Approval / 质量部批准:	Technical Director / 工程与技术总监批准:
Signature / 签名: ____________________________ Date / 日期: 2026-08-15	Signature / 签名: ____________________________ Date / 日期: 2026-08-15