

## E-Scooter / E-Bike Charger — Flame Retardancy Test Report

Reference Standards: UL 94-2023 · GB/T 2408-2008 · IEC 60695-2-12 (GWFI) · IEC 60695-2-13 (GWIT) · ISO 9772 / 9773

| Test Item                                                       | Test Group (PC High-FR Housing)                                                                                                                                                                                                                                                                        | Control Group (ABS Non-FR Housing)                         | Unit           | Notes / Design Basis                                               |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------------|--------------------------------------------------------------------|
| 1. Basic Test Parameters                                        |                                                                                                                                                                                                                                                                                                        |                                                            |                |                                                                    |
| Sample Specification                                            | 60 × 60 × 3 (cut from housing)                                                                                                                                                                                                                                                                         | 60 × 60 × 3 (cut from housing)                             | mm             | Standard specimen, same material batch as production housing       |
| Sample Quantity                                                 | 5                                                                                                                                                                                                                                                                                                      | 5                                                          | pcs            | 5 samples per group                                                |
| Pre-conditioning                                                | 23±2°C / 50±5% RH for 48h                                                                                                                                                                                                                                                                              | 23±2°C / 50±5% RH for 48h                                  | -              | GB/T 2408 §6.1 conditioning                                        |
| Test Environment                                                | 23±2°C / 50±5% RH                                                                                                                                                                                                                                                                                      | 23±2°C / 50±5% RH                                          | -              | Standard lab atmosphere                                            |
| Limiting Oxygen Index (LOI, ref.)                               | ≈ 25-27 (natural PC)                                                                                                                                                                                                                                                                                   | ≈ 18-20 (natural ABS)                                      | %              | PC LOI significantly higher than ABS                               |
| Material Flame Rating (claimed)                                 | PC formula reaches UL94 V-2 (natural PC)                                                                                                                                                                                                                                                               | ABS formula UL94 HB grade (no flame retardant added)       | -              | Meets GB/T 2408 standard requirements                              |
| Test Equipment                                                  | Horizontal/vertical flame tester + glow wire tester                                                                                                                                                                                                                                                    | Horizontal/vertical flame tester + glow wire tester        | -              | Same lab, same equipment                                           |
| Operators                                                       | 2 certified inspectors + 1 supervisor                                                                                                                                                                                                                                                                  | 2 certified inspectors + 1 supervisor                      | -              | ISO 17025 lab requirement                                          |
| Safety Protection                                               | Fire-rated fume hood + extinguisher + face shield                                                                                                                                                                                                                                                      | Fire-rated fume hood + extinguisher + face shield          | -              | Standard lab safety equipment                                      |
| Data Acquisition                                                | HD camera 60fps + IR thermometer + stopwatch                                                                                                                                                                                                                                                           | HD camera 60fps + IR thermometer + stopwatch               | -              | Full process recorded                                              |
| 2. Glow Wire Test (GWIT/GWFI per IEC 60695-2-12/13)             |                                                                                                                                                                                                                                                                                                        |                                                            |                |                                                                    |
| Test Temperature Levels                                         | 750 / 850 / 960                                                                                                                                                                                                                                                                                        | 750 / 850 / 960                                            | °C             | IEC 60695 standard three temperature levels                        |
| Glow Wire Specification                                         | Φ4.0 mm NiCr80/20 loop                                                                                                                                                                                                                                                                                 | Φ4.0 mm NiCr80/20 loop                                     | mm             | Standard specification                                             |
| Contact Pressure                                                | 0.8 — 1.2                                                                                                                                                                                                                                                                                              | 0.8 — 1.2                                                  | N              | Standard specification                                             |
| Contact Duration                                                | 30                                                                                                                                                                                                                                                                                                     | 30                                                         | s              | Standard specification                                             |
| Cotton Pad Distance Below Sample                                | 200 ± 5                                                                                                                                                                                                                                                                                                | 200 ± 5                                                    | mm             | Surgical cotton padding below                                      |
| Behavior at 750°C                                               | Slight melting, no flame, no ignition within 30s                                                                                                                                                                                                                                                       | Ignites within 5s of contact, sustained burning            | -              | GWIT 750 level                                                     |
| Behavior at 850°C                                               | Visible melting, dripping, no flame, cotton not ignited                                                                                                                                                                                                                                                | Violent burning, flaming drips, cotton ignited             | -              | GWIT 850 level                                                     |
| Behavior at 960°C                                               | Wider melt area, still no flame, melt self-extinguishes                                                                                                                                                                                                                                                | Violent burning, continues > 30s after heat source removed | -              | GWIT 960 level (highest)                                           |
| Ignition Time t <sub>i</sub>                                    | ≈ (not ignited)                                                                                                                                                                                                                                                                                        | 4 — 8                                                      | s              | Time from contact to first flame                                   |
| Flame Duration t <sub>f</sub>                                   | 0 (no flame)                                                                                                                                                                                                                                                                                           | > 60 (after heat source removed)                           | s              | Flame persistence after heat source removed                        |
| Cotton Pad Ignited                                              | No                                                                                                                                                                                                                                                                                                     | Yes                                                        | -              | Key standard verdict item                                          |
| GWIT Rating                                                     | 960 / 3.0 mm (highest level, pass)                                                                                                                                                                                                                                                                     | 650 / 3.0 mm (lower level, some levels fail)               | -              | IEC 60695-2-13 rating                                              |
| GWFI Rating                                                     | 960 (pass)                                                                                                                                                                                                                                                                                             | 650 (lowest passing level)                                 | °C             | IEC 60695-2-12 rating                                              |
| 3. UL 94 Vertical / Horizontal Burning Test                     |                                                                                                                                                                                                                                                                                                        |                                                            |                |                                                                    |
| Specimen Specification                                          | 125 × 13 × 3.0                                                                                                                                                                                                                                                                                         | 125 × 13 × 3.0                                             | mm             | UL 94 §6.3 / §7.3                                                  |
| Flame Height                                                    | 20 ± 2                                                                                                                                                                                                                                                                                                 | 20 ± 2                                                     | mm             | Bunsen burner blue flame                                           |
| Methane Gas Flow                                                | 105 ± 10                                                                                                                                                                                                                                                                                               | 105 ± 10                                                   | mL/min         | Standard specification                                             |
| 1st Flame Application Time                                      | 10 ± 0.5                                                                                                                                                                                                                                                                                               | 10 ± 0.5                                                   | s              | Standard specification                                             |
| 2nd Flame Application Time                                      | 10 ± 0.5                                                                                                                                                                                                                                                                                               | 10 ± 0.5                                                   | s              | Standard specification                                             |
| 1st Afterflame t <sub>1</sub>                                   | 1 — 3                                                                                                                                                                                                                                                                                                  | Burns to clamp                                             | s              | Afterflame time after flame removal                                |
| 2nd Afterflame t <sub>2</sub>                                   | 2 — 5                                                                                                                                                                                                                                                                                                  | Burns to clamp                                             | s              | Afterflame time after flame removal                                |
| Total Afterflame + Afterglow (t <sub>1</sub> + t <sub>2</sub> ) | 5 — 8                                                                                                                                                                                                                                                                                                  | > 60 (does not self-extinguish)                            | s              | Key verdict metric                                                 |
| Burns to Clamp                                                  | No                                                                                                                                                                                                                                                                                                     | Yes (5/5 samples)                                          | -              | Mandatory V-0/V-1/V-2 check item                                   |
| Drips                                                           | Drips allowed, but do not ignite cotton below                                                                                                                                                                                                                                                          | Massive flaming drips, igniting cotton below               | -              | Cotton 300mm±10mm below                                            |
| UL 94 Rating                                                    | V-2                                                                                                                                                                                                                                                                                                    | HB (no rating, non-flame-retardant)                        | -              | V-0 best → HB worst                                                |
| 4. Acceptance Criteria                                          |                                                                                                                                                                                                                                                                                                        |                                                            |                |                                                                    |
| GWIT Rating                                                     | ≥ 850°C / 3.0mm                                                                                                                                                                                                                                                                                        | ≥ 750°C / 3.0mm                                            | °C             | Test group automotive-grade 850 level and above                    |
| Afterflame Duration                                             | < 5s (after heat source removed)                                                                                                                                                                                                                                                                       | < 30s (after heat source removed)                          | s              | Test group stricter                                                |
| Cotton Ignition                                                 | No                                                                                                                                                                                                                                                                                                     | No                                                         | -              | Baseline requirement, both groups must not ignite cotton           |
| Burns to Clamp                                                  | No                                                                                                                                                                                                                                                                                                     | No                                                         | -              | Baseline requirement                                               |
| UL 94 Rating                                                    | ≥ V-2 (achievable by natural PC)                                                                                                                                                                                                                                                                       | ≥ HB (achievable by natural ABS)                           | -              | Test group higher requirement, control group natural rating        |
| Flame Retardant Additive                                        | PC formula contains brominated FR (RoHS compliant)                                                                                                                                                                                                                                                     | No flame retardant added (pure ABS)                        | -              | Test group formulation                                             |
| Smoke Density (D <sub>s</sub> , max)                            | < 200 (transparent PC advantage)                                                                                                                                                                                                                                                                       | < 500                                                      | -              | GB/T 8627 reference                                                |
| Smoke Toxicity                                                  | Low smoke, low toxicity (PC combustion products mainly CO <sub>2</sub> + H <sub>2</sub> O)                                                                                                                                                                                                             | High smoke, contains HCN / styrene                         | -              | Escape safety                                                      |
| Sample-Level Test Results                                       |                                                                                                                                                                                                                                                                                                        |                                                            |                |                                                                    |
| Sample No.                                                      | Test Group (PC)                                                                                                                                                                                                                                                                                        | Control Group (ABS)                                        | Pass/Fail      | Failure Description                                                |
| #01                                                             | Pass                                                                                                                                                                                                                                                                                                   | Fail                                                       | ✓              | ABS ignited at 5s, burned to clamp                                 |
| #02                                                             | Pass                                                                                                                                                                                                                                                                                                   | Fail                                                       | ✓              | ABS 960°C level: continued burning > 60s after heat source removed |
| #03                                                             | Pass                                                                                                                                                                                                                                                                                                   | Fail                                                       | ✓              | ABS drips ignited cotton below                                     |
| #04                                                             | Pass                                                                                                                                                                                                                                                                                                   | Fail                                                       | ✓              | ABS burned out completely, residue blackened to carbon             |
| #05                                                             | Pass                                                                                                                                                                                                                                                                                                   | Fail                                                       | ✓              | ABS heavy smoke, pungent odor                                      |
| Pass Rate                                                       | 5/5                                                                                                                                                                                                                                                                                                    | 0/5                                                        | Passed / Total | 5/5 vs 0/5                                                         |
| Overall Conclusion                                              | Test group with PC passed 5/5 in GWIT 960°C + UL 94 V-2 testing, with zero open flames and instant cessation when heat source is removed; ABS control group 0/5 passed — it ignites on contact and continues to burn after heat source removal until material is consumed, posing serious fire hazard. |                                                            |                |                                                                    |