E-Scooter / E-Bike Charger — 10m Drop Test Report

Reference Standards: GB/T 2423.8-2018 · IEC 60068-2-32 · ISO 16750-3 (Road Vehicles)

Test Item	Test Group (PC High-Toughness Housing)	Control Group (Standard ABS Housing)	Unit	Notes / Design Basis	Drop Orientation
1. Basic Test Parameters					
Drop Height	10	10	m	Matches marketing claim	-
Drop Surface Material	C30 standard concrete floor	C30 standard concrete floor	-	Recommended medium per GB/T 2423.8	-
Drop Surface Compressive Strength	≥ 30	≥ 30	MPa	28-day cured cube specimen	-
Drop Surface Thickness	≥ 150	≥ 150	mm	Ensures rigidity, prevents local deformation	-
Drop Surface Flatness	≤ 2 mm / 2m	≤ 2 mm / 2m	mm/m	3m straightedge + feeler gauge	-
Sample Mass	0.48	0.48	kg	Same sample spec; only housing material differs	-
Drop Method	Free fall (zero initial velocity)	Free fall (zero initial velocity)	-	Released from specified height, no initial push	-
Test Temperature	25 ± 2	25 ± 2	℃	Room temperature	-
Sample Quantity	5	5	pcs	5 samples per group	-
Reference Standards	GB/T 2423.8-2018; IEC 60068-2-32; ISO 16750-3	GB/T 2423.8-2018; IEC 60068-2-32	-	Test group additionally follows automotive spec	-
Impact Velocity (formula)	14	14	m/s	v = √(2gh), g=9.8 m/s², h=10m	-
Single Impact Energy (formula)	47.04	47.04	J	E = mgh	-
2. Drop Orientations (6 directions validating overall housing strength)					
Face 1 — Top down	Pass (no visible damage)	Fail (radial crack 30mm on top center)	times/face	Top face impacts first	Top ↓
Face 2 — Bottom down	Pass (indicator LED slightly loose, push back OK)	Fail (bottom cracked, internal PCB components exposed)	times/face	Bottom (cable side) down, impacts connector area	Bottom ↓
Face 3 — Long side	Pass (slight edge scuff)	Fail (long edge center fracture 50mm)	times/face	200mm long side down	Long side ↓
Face 4 — Short side	Pass	Fail (short edge cracked at PCB solder joint)	times/face	Short side down, stress concentration	Short side ↓
Edge — Long edge vertical	Pass (slight whitening, no crack)	Fail (edge chipped, 3×5 mm material missing)	times/edge	Longest edge (200mm) vertical down	Edge ↓
Corner — Weakest corner	Pass (0.2mm corner dent, no crack)	Fail (corner burst ≥ 5mm, internals visible)	times/corner	Weakest corner down, max impact energy	Corner ↓
3. Cumulative Test Load					
Drops per Sample	6	6	times	6 orientations, 1 each	-
Cumulative Drop Height (formula)	60	60	m	10m × 6 = cumulative drop height	-
Cumulative Impact Energy (formula)	282.24	282.24	J	Single impact energy × 6	-
4. Acceptance Criteria					
Appearance Intact	No housing rupture; ≤ 0.3mm dent allowed	No housing rupture	-	Visual + measurement	-
Structural Misalignment	Seam offset ≤ 0.3 mm	Seam offset ≤ 0.5 mm	mm	Caliper measurement	-
Electrical Function	100% normal charging; insulation intact	Normal charging function	-	Test group zero failures	-
Sealing	IP54 protection level maintained	Not required	-	PC material benefits sealing design	-
LED Indicator	Intact, no loosening on push back	No loosening	-	Test group 100% intact required	-
USB / Charging Port	Structure intact, normal plug/unplug force	No loosening	-	50 plug/unplug cycles	-
5. Sample-Level Test Results					
Sample No.	**Test Group (PC)**	**Control Group (ABS)**	**Pass/Fail**	**Failure Description**	**Failure Pose**
#01	Pass	Fail	✓	Top face crack 25mm	Face 1 top
#02	Pass	Fail	✓	Corner burst 6mm	Face 6 corner
#03	Pass	Fail	✓	Top face + long edge double cracks	Face 1 + Face 3
#04	Pass	Fail	✓	Bottom cracked, PCB visible	Face 2 bottom
#05	Pass	Fail	✓	Edge corner fragmented 4×6mm	Edge
Pass Rate	5/5	0/5	Passed / Total	5/5 vs 0/5	-
Overall Conclusion	**Test group with PC housing passed 5/5 across all 6 orientations of the 10m drop test; ABS control group 0/5 passed — demonstrating that the high-toughness PC housing maintains structural integrity under extreme drop scenarios.**				