ME Equipment Rough Handling Tester

IEC 60601-1 Threshold and Rough Handling Test System | GB 9706.1-2020 Compliant

Standards: IEC 60601-1, GB 9706.1-2020 (with reference to GB 9706.252 where applicable)
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Product Overview

The KingPo ME Equipment Rough Handling Tester is a professional mechanical test system designed to evaluate the mechanical strength and transport durability of mobile medical electrical (ME) equipment. It simulates the stresses experienced during pushing, moving, and handling in hospital environments, including threshold crossing, fixed obstacle negotiation, step shock, door frame impact, and rough handling on inclined or uneven surfaces.

The system supports test methods from IEC 60601-1 and GB 9706.1-2020 for movement-related mechanical stress, stability, and rough handling evaluation. It is suitable for mobile ME equipment such as medical carts, wheeled diagnostic/therapeutic devices, hospital equipment, and certain bed-type ME equipment. A servo-driven horizontal pushing mechanism combined with a force sensor and PLC control ensures precise, repeatable simulation of real-world transport conditions.

Key Advantages

- **Comprehensive Rough Handling Simulation**
  Engineering: Supports multiple test scenarios including threshold crossing, ascending/descending step shock, door frame impact, fixed vertical obstacle negotiation, and inclined platform movement (0–15° adjustable).
  Benefit: Enables thorough evaluation of structural integrity, wheel durability, frame strength, and functional safety under the full range of mechanical stresses encountered during clinical transport and relocation.

- **High-Precision Servo Control & Force Measurement**
  Engineering: Servo motor horizontal drive with force sensor provides 0–1000 N force range at ±1% accuracy, test speed 0.8 m/s ± 0.1 m/s (adjustable 0–2 m/s), and programmable test counts up to 9999 cycles.
  Benefit: Delivers highly repeatable and traceable test results with real-time force monitoring, essential for consistent quality control and regulatory compliance documentation.

- **Flexible Test Platform Configuration**
  Engineering: Test platform with M8 threaded holes allows easy installation and reconfiguration of replaceable obstacles, thresholds, steps, and door frame fixtures to match different sample sizes, wheelbases, and laboratory layouts.
  Benefit: Provides excellent adaptability for testing a wide variety of mobile ME equipment without requiring multiple dedicated test rigs, optimizing laboratory investment and workflow flexibility.

- **User-Friendly PLC + Touchscreen Control**
  Engineering: 7-inch touchscreen interface enables simple preset of test speed, movement distance, test count, and automatic execution of complex multi-cycle test sequences with real-time force display.
  Benefit: Reduces operator training time and minimizes setup errors, while ensuring consistent test execution across different technicians and shifts.

- **Safety-Focused Laboratory Design**
  Engineering: Protective guardrail around the equipment, stroke protection, and robust construction ensure operator safety during high-force pushing and impact tests.
  Benefit: Meets laboratory safety requirements and reduces risk during repeated high-energy mechanical stress testing of heavy mobile medical equipment.

Technical Specifications

3.1 General System Parameters

Parameter	Specification	Remark / Notes
Drive Method	Servo motor, horizontal drive	Precise speed and force control
Control System	7-inch touchscreen + PLC controller	Intuitive parameter setting and monitoring
Force Range	0–1000 N	Horizontal pushing and pulling force
Force Accuracy	±1%	High-precision force sensor with real-time display
Test Speed	0.8 m/s ± 0.1 m/s (adjustable 0–2 m/s)	Controlled movement speed for repeatable tests
Test Count	0–9999 times presettable	Programmable for long-duration durability testing
Power Supply	AC 220 V, 50 Hz	Standard laboratory single-phase supply
Equipment Size (W×D×H)	3500 × 2000 × 1800 mm	Customizable according to laboratory layout

3.2 Test Item Parameters

Test Item	Key Parameters	Purpose / Standard Reference
Movement Over Threshold	Fixed vertical obstacle: 10 × 85 × 1200 mm	Simulates threshold or raised obstacle crossing (IEC 60601-1 / GB 9706.1-2020 9.4.2.4.3)
Ascending Step Shock	Hardwood step: 40 × 1500 × 1200 mm	Simulates upward step impact during movement
Descending Step Shock	Concrete step: 40 × 1000 × 1200 mm	Simulates downward step impact (IEC 60601-1 / GB 9706.1-2020 15.3.5)
Door Frame Impact	Hardwood door frame: 40 × 40 × 1500 mm	Simulates impact with door frames during transport
Inclined Platform Movement	0–15° adjustable working table	Tests movement on ramps and inclined surfaces
Safety Features	Protective guardrail around equipment	Operator safety during high-force testing

Testing Principle

The system simulates the mechanical stresses experienced by mobile ME equipment during transport, relocation, and clinical use in hospital environments. A servo-driven horizontal pushing mechanism moves the test sample across thresholds, fixed vertical obstacles, steps, or door frames at controlled speed and force.

A force sensor continuously monitors pushing/pulling force while the PLC executes preset speed, distance, and cycle counts. This enables repeatable reproduction of real-world stresses such as pushing equipment over door thresholds, navigating ramps, encountering steps, or colliding with door frames. The system evaluates structural integrity, wheel and caster durability, frame strength, and functional safety after exposure to these mechanical stresses.

Test sequences can be configured for single-pass or repeated-cycle operation, with real-time force monitoring and automatic stop on anomaly detection or completion of programmed cycles.

Typical Applications

- Mobile ME equipment manufacturers — Type testing and design validation for medical carts, wheeled diagnostic/therapeutic devices, and transportable hospital equipment
- Third-party testing laboratories — Compliance testing and certification support according to IEC 60601-1 and GB 9706.1-2020 mechanical stress requirements
- R&D and engineering teams — Evaluation of wheel systems, frame designs, and transport durability under simulated hospital handling conditions
- Quality assurance departments — Production quality control and incoming inspection of mobile medical equipment
- Regulatory and compliance teams — Generation of mechanical stress and rough handling data for technical documentation and market approval submissions

Typical Test Workflow

1. Place the ME equipment sample on the test platform and secure as required.
2. Select the test item (threshold crossing, step shock, door frame impact, etc.) and install the corresponding fixture/obstacle.
3. Attach the telescopic pushing arm to the sample at the appropriate contact point.
4. Set test speed, movement distance, and cycle count on the touchscreen interface.
5. Confirm force sensor calibration, pushing mechanism alignment, and guardrail status.
6. Start the automatic test sequence and monitor real-time force and movement.
7. Stop and inspect if anomalies occur; record results and inspect the sample after test completion.

Compliance & Manufacturer

This equipment supports mechanical test methods from IEC 60601-1 and GB 9706.1-2020 for movement-related mechanical stress, stability, and rough handling evaluation (including clauses such as 9.4.2, 9.4.2.4.2, 9.4.2.4.3, and 15.3.5). It is designed to assist manufacturers and laboratories in assessing the mechanical strength and transport durability of mobile medical electrical equipment.

Note: Full compliance evaluation requires complete application of the relevant standards, including product design, risk management, and laboratory procedures. The system provides test capabilities aligned with specific mechanical stress test needs; final compliance determination remains the responsibility of the manufacturer and accredited testing bodies. For bed-type ME equipment, GB 9706.252 movement requirements may apply depending on the specific product category and test program.

Factory verification of motion, control, and force functions is performed before delivery. Regular calibration of the force sensor, servo drive, speed, and distance measurement is recommended. Fixture customization, obstacle arrangement, platform size, and test report format adaptation are available based on customer requirements. Manufactured under ISO 9001, ISO 14001, and ISO 45001 quality management systems.

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