

TESTING & COMMISSIONING SERVICES

Mahyan Engineering Solutions — Substation Verification, Diagnostic & Safety Lifecycle

At **Mahyan Engineering Solutions**, our Testing and Commissioning division serves as the fundamental link between electrical infrastructure layout deployment and live grid synchronization. Operating under strict conformance to international engineering standards (IEC, IEEE, and ANSI), our elite technocrats and field specialists systematically execute specialized verification protocols. We ensure that critical power assets—spanning indoor/outdoor medium and high-voltage networks up to 400kV—are rigorously checked, completely optimized, and securely validated before live load distribution.

Operational Intent: When website users click "Read More" on the homepage, this document details our end-to-end technical scope, showing how we protect critical grids against structural faults, design errors, and insulation breakdowns.

1. FULL TURNKEY TESTING AND COMMISSIONING FRAMEWORK

Our technical commissioning roadmap follows strict sequence procedures to provide structural assurance across any complex electrical infrastructure lifecycle:

Pre-Commissioning Visual Inspection

- Complete verification of site layouts against approved physical drawings, engineering schematics, and connection wiring plans.
- Strict inspection of physical frame structural assembly, safety clearances, and grounding circuit terminations.
- Verification of nameplate technical ratings, serial profiles, and structural seals against vendor technical data sheets.

Site Acceptance Testing (SAT)

- Dynamic diagnostic evaluations executing localized physical test procedures before power integration.
- Comprehensive physical insulation assessments, contact loop resistances, and phase matching validations.
- Dynamic injection profiling mapping circuit behavior against predefined protective thresholds.

Energization & Integration Vetting

- Step-by-step physical coordination checking interlocking mechanism sequences under manual and automatic configurations.
- Controlled, incremental step live voltage deployment tracking incoming balance parameters.
- Real-time telemetry and control verification confirming zero loop error transmission to SCADA systems.

Post-Energization Phase Mapping

- Full operational synchronization monitoring thermal loading characteristics via digital instrumentation profiles.
- Continuous wave monitoring to verify secondary outputs match technical design thresholds.
- Formal handover indexing of certified test sheets into client operational tracking libraries.

2. DEEP TECHNICAL COMPETENCIES BY COMPONENT CATEGORY

A. Power & Distribution Transformers

As the single most critical asset inside any yard layout, transformers undergo deep operational diagnostic mapping to verify physical performance characteristics and insulation health:

- **Insulation Resistance (IR) Mapping:** Multi-voltage tracking (up to 5kV DC) logging polarization indexes (PI) to evaluate core insulation health.
- **Voltage Ratio & Vector Group Verification:** Confirming precise step ratios across all tap changer connections while checking phase-angle orientation.
- **Winding Resistance Testing:** Precision milliohm tracking across all phases to check winding integrity and contact connections.
- **Transformer Oil BDV Diagnostics:** Dielectric breakdown voltage inspections identifying moisture intrusion and fluid deterioration indicators.

B. Switchgears, Circuit Breakers & Disconnectors

Ensuring that high and medium-voltage interruption mechanics execute extreme fault isolation maneuvers safely, consistently, and within strict microsecond target ranges:

- **Contact Resistance Profiling (Ductor Testing):** Micro-ohm tracking across terminal paths to verify uniform current passage and prevent local overheating.
- **Breaker Speed & Mechanical Timing Logs:** High-resolution microsecond analytics evaluating concurrent contact engagement speed, open/close sync, and bounce profiles.
- **SF6 Gas Integrity Analysis:** Moisture density mapping, chemical purity tracking, and pressure seal assessments across Gas Insulated Switchgear (GIS) architectures.

C. Protective Relaying Networks & Metering Arrays

Validating the intelligent protection logic of digital Intelligent Electronic Devices (IEDs) to guarantee high-speed network protection during fault conditions:

- **Secondary Current & Voltage Injection:** Injecting simulated analog thresholds to test pick-up timing, inverse curves, and trip delay sequences.
- **Primary Current Injection (Up to 2500A):** High-amperage primary bus injection verifying the entire protective loop—including CT ratios, core polarization, and secondary circuit routing.
- **Logic Scheme & Interlocking Simulation:** End-to-end trip logic scheme checkouts mapping breaker failure routines and automatic bus transfer schemes (ATS).

3. CALIBRATED TECHNICAL INSTRUMENT FLEET & RENTAL POOL

Mahyan maintains an extensive, modern, and rigorously calibrated fleet of high-precision diagnostic and measurement platforms. This fleet supports both internal projects and flexible client field equipment rentals:

Equipment Group	Available Diagnostic Fleet & System Inventory Assets
Injection & Relay Test Blocks	3-Phase Secondary Current Injection Test Platforms • High-Output Primary Injection Test Systems (0-2000A / 0-2500A) • Phase Angle Identification Instruments
High Voltage Insulation	High Voltage Dielectric AC Test Sets ($\leq 30\text{kV}$) • High Voltage DC Testing Instrumentation ($\leq 30\text{kV}$) • Automated Transformer Oil BDV Test Systems
System Response Analytics	Multi-Channel Circuit Breaker Motion & Time Analyzers • Tesla 4000 Advanced Transient Power System Fault Recorders • Precision SF6 Purity & Moisture Analyzers
DC Storage Testing Arrays	Intelligent Controlled Battery Bank Discharge Load Units (BLU) • Variable External Dissipation Banks • Low-Internal-Resistance Battery Evaluation Meters
Precision Handheld Tools	Digital Ground Earth Resistivity Bridges • Specialized High-Voltage Insulation Testers (5KV Range) • Non-Contact AC/DC Leakage Current Measurement Clamps (1000A)

4. UNCOMPROMISING COMMITMENT TO SAFETY & CORE STANDARDS

Every field engineering action performed by our teams adheres strictly to the **Mahyan Occupational Health and Safety Manual**. Zero-energy verification loops, explicit multi-point lock-out/tag-out (LOTO) procedures, and mandatory personal protective gear configurations are verified daily. We approach testing not just as a final validation step, but as a critical process that ensures operational efficiency, regulatory compliance, and personnel safety.

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