Protection Relay Commissioning & Functional Test Report

OMICRON Test Universe (CMC 256plus / 353 / 356) — Generator & Transformer Protection Suite

Site / Substation:		**Feeder / Bay:**	
Relay Make / Model:		**Serial Number:**	
CT Ratio:		**VT Ratio:**	
Firmware / Config File:		**Test Set Used:**	
Tested By:		**Date:**	
Witnessed By:		**Signature:**	

#	Protection Function	ANSI / IEC Code	Test Universe Module	Test Method Summary	Setting Value	Measured Pickup/Op.	Op. Time (ms/s)	Pass	Fail	Remarks
1	Generator Differential	87G	Advanced Differential	Balanced restraint check; differential trip above bias slope; sweep 2-3 points of restraint/operate boundary				■	■	
2	Generator Stator Earth Fault (95% + 100%)	59N / 27TN(3H)	Ramping / State Sequencer (harmonic inj.)	95%: ramp neutral VT voltage to pickup, verify time delay. 100%: inject 3rd harmonic ratio on neutral/terminal VT				■	■	
3	Overcurrent	50 / 51	Overcurrent / State Sequencer	50: step above pickup, confirm instantaneous. 51: inject 2x,5x,10x Is, trace IDMT curve vs IEC/IEEE tolerance (±5%)				■	■	
4	Negative Sequence	46	State Sequencer (symmetrical components)	Ramp I2 to pickup via I1/I2/I0 fields or phase unbalance; confirm trip/alarm threshold and inverse-time curve				■	■	
5	Overvoltage / Undervoltage	59 / 27	Ramping	Slow ramp voltage from nominal toward setpoint; record pickup value and operate/reset timers				■	■	
6	Overfrequency / Underfrequency	81O / 81U	Ramping (frequency)	Ramp frequency at set rate (Hz/s) toward setpoint; record pickup value and operate/reset timers				■	■	
7	Reverse Power	32R	State Sequencer (V/I magnitude + angle)	Set V-I angle >90° (motoring/import); ramp power magnitude into operate region				■	■	
8	Over Power	32O	State Sequencer (V/I magnitude + angle)	Forward real power at 0° angle; increase magnitude until pickup				■	■	
9	Loss of Excitation	40	Advanced Distance / Impedance	Move apparent impedance trajectory into offset-mho LOE circle; test several boundary points (0°, 45°, 90°)				■	■	
10	Overfluxing / V/Hz	24	State Sequencer (independent V & f)	Vary V and f together to control V/Hz ratio; ramp ratio up, confirm pickup and inverse-time curve				■	■	

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11	Generator-Transformer Differential	87GT	Advanced Differential	Through-fault stability, internal fault trip, 2nd-harmonic inrush restraint, 5th-harmonic overexcitation restraint				■	■	
12	Transformer Differential	87T	Advanced Differential	Through-fault stability, internal fault trip, 2nd-harmonic inrush restraint, 5th-harmonic overexcitation restraint				■	■	
13	Restricted Earth Fault	64REF	State Sequencer (independent phase + neutral CT)	External fault (balanced, restrain) vs internal fault (imbalance, trip); ramp stabilizing resistor voltage if HI-Z				■	■	
14	Transformer Earth Fault	51N / SBEF	Overcurrent / State Sequencer	Injected on neutral/earth CT input; pickup + IDMT/DT timing verification				■	■	
15	Busbar Differential	87B	Multi-channel injection (CMC356 + amplifiers / sync)	Balanced through-current across all feeder CTs of a zone (stability); unbalance one feeder to confirm trip				■	■	
16	Breaker Failure	50BF	State Sequencer (binary I/O)	Trigger initiating trip BI, inject current above BF detector level, hold beyond BF timer; confirm backup trip timing and block-below-detector behaviour				■	■	
17	Synchronism Check	25	Dual voltage source hardware	Vary ΔV, Δangle, Δslip between two sources; confirm permissive-close asserts only within configured windows				■	■	
18	Trip Circuit Supervision	74TCS	Binary I/O (continuity)	Open trip circuit path (simulate broken wire/blown fuse); confirm alarm after debounce delay; reconnect, confirm clear				■	■	
19	Lockout Relay	86	Binary I/O (functional)	Trigger protection trip binary(s); confirm 86 picks up, latches through signal clearing, requires manual/electrical reset				■	■	
20	Field / Rotor Earth Fault	64F / 64R	Relay self-test / dedicated rotor EF test box	Simulate fault condition at relay rotor-EF input; verify alarm/trip logic and output contacts				■	■	

General method (all functions): build one State Sequencer test file per function with states for (a) pre-fault/normal, (b) fault/operate condition, (c) post-trip — capturing pickup values, operate times and binary output timing in a single record. Print/export the individual Test Universe PDF report per function and attach as an appendix to this summary sheet.

Tested By (Name/Signature): _____ **Date:** _____

Reviewed By (Name/Signature): _____ **Date:** _____

Client Witness (Name/Signature): _____ **Date:** _____