Generator Protection Features Overview

(✓ = Standard, ○ = Option)

Protection functions	ANSI	MCDGV4-2	MRG3	MRG3-I	MRG3-IUO	MRG3-IE	MRG3-UO	MRG3-IER	MRR1	MRQ1	XR1	XE2	XG2	XD1-G
									Expansions					
Phase Distance Protection	21P	✓												
Overexcitation V/Hz	24	✓												
Synchro check	25	✓												
Undervoltage	27	✓	✓	✓	✓	✓	✓	✓						
Power protection: P, Q, Qr, S, Pr	32F, 37F, 32Q, 37Q, 37QR, 32S, 37S, 37R	✓												
QU protection (undervoltage- directional reactive power protection)	27&32Q<	✓												
Loss of excitation	40	✓								✓		✓		
Negative sequence elements (current/DEFT/INV)	46	✓												
Negative/positive sequence elements (voltage)	47	✓												
Overload protection with thermal replica	49	✓												
Circuit breaker failure protection	50BF / 62BF	✓		✓	✓	✓		✓						
Phase current elements (non-directional)	50/51			✓	✓	✓		✓				✓		
Phase current elements (non-directional and directional)	67	✓												
Earth current elements (non-directional)	50N / 51N					✓		✓						
Earth current elements (non-directional and directional)	67N	✓						✓						
Inrush detection IH2 (2nd harmonic)		✓												
Voltage controlled current protection	51C	✓												
Voltage restraint current protection	51V	✓												
Negative sequence elements (current/IEC/ANSI curves)	51Q	✓												
Power factor cos (φ)	55	✓												
Overvoltage	59	✓	✓	✓	✓	✓	✓	✓						
Residual voltage elements	59N	✓					✓							
100% stator earth fault protection	59TN / 27TN	✓												
Voltage transformer supervision	60FL	✓												
Current transformer supervision	60L	✓												
Rotor earth fault	64										✓			
Generator Rotor Protection	64N, 40 / 76								✓					
Out of Step Tripping / Power Swing Blocking (Pole Slip Protection)	68 / 78	✓												
Trip circuit supervision	74TC	✓												
Vector surge	78	✓	✓	✓	✓	✓	✓	✓					✓	
Underfrequency / Overfrequency	81 O/U	✓	✓	✓	✓	✓	✓	✓						
Frequency gradient (ROCOF)	81R	✓												
Lockout function	86	✓												
Generator differential protection	87G	✓												✓
Transformer differential protection	87T	✓												
Restricted earth fault elements	87N (64REF)	✓												
Breaker Wear Monitor	BKM	✓												
Protection parameter sets		4	2	2	2	2	2	2	1	1				
Reverse interlocking		✓												
Event, failure and disturbance recorder		✓	✓	✓	✓	✓	✓	✓						
Trend recording		✓												
Control														
Control function for 1 / up to 6 switchgear(s)		6												
Logic (up to 80 equations)		✓												
Measuring functions														
Currents		✓												
Thermal overload θ		✓												
Voltages		✓												
Frequency		✓												
Hardware														
Number of binary output relays (depends on type of device)		11/11/11/16	4	4	4	4	4	4	4	4	2	2	2	2
Number of digital inputs (depends on type of device)		16/8/24/16	2	2	2	2	2	2	2	2				
Number of analog inputs and outputs (depends on type of device)		0/2+2/0/0												
Communication														
IEC61850 (RJ45 or fiber optic [FO] LC)		○												
RS485 Open Data			✓	✓	✓	✓	✓	✓	✓	✓	○	○	○	
MODBUS RTU (via fiber optic [FO] ST or RS485)		○	○	○	○	○	○	○						
Modbus TCP (RJ45 or fiber optic [FO] LC)		○												
IEC60870-5-103 (via fiber optic [FO] ST or RS485)		○												
Profibus DP (via fiber optic [FO] ST or RS485)		○												
DNP3.0 RTU (via fiber optic [FO] ST or RS485)		○												
DNP3.0 TCP (RJ45 or fiber optic [FO] LC)		○												
IRIG-B interface (time synchronization)		✓												