

Generator Protection – Selector Guide

Generator Protection

Features	Device	489	P342	P346	889	G30	G60	P343/4/5	P348
APPLICATIONS & FUNCTIONALITY									
Small Size Generators		•	•	•	•	•	•	•	
Medium size Generators		•	•	•	•	•	•	•	
Large Size Generators							•	•	
Low Impedance Grounded generators		•	•	•	•	•			
High Impedance Grounding generators		•			•		•	•	
Hydro Generators with Split Phase, Stator Winding				•		•	•	•	
Generators with In-Zone Transformer				•	•	•		•	
Variable Speed Double Fed Induction Generators									•
Advanced M&D features					•				
PROTECTION & CONTROL									
Graphical Display with Bay Control & Monitoring					•	•	•		
Phasor/Harmonic measurement graphical display					15				
Switchgear Control and Configurable SLD					•	•	•		
Overspeed	12	•			•				
Underspeed	15				•				
Distance Backup	21P	•	•	•			•	•	
Volts/Hz	24	•	•	•	•	•	•	•	
Synchronism check	25		•	•	•	•	•	•	
Phase/Auxiliary Undervoltage	27P/X	P	P	P	P/X	P/X	P/X	P	
Directional Power	32	•	•	•	•	•	•	•	
Bearing RTD	38	•	•	•	•	•	•	•	
Loss of Field	40	•	•	•	•	•	•	•	
Loss of Field using Reactive Power	40Q	•	•	•	•	•	•	•	
Generator Unbalance	46	•	•	•	•	•	•	•	•
Voltage phase reversal	47	•			•				
Generator Thermal Overload	49/49TOL	•	•	•	•	•	•	•	
Transformer Hottest-spot Temperature			•	•				•	
Transformer Aging factor			•	•				•	
Transformer Loss of Life			•	•				•	
Transformer Thru Fault Monitoring			•	•				•	
Accidental Energization	50/27	•			•	•	•	•	
IOC Phase/Ground/Neutral	50P/G/N	P/G	P/G	P/G	P/N/G	P/G/N	P/G/N	P/G	P
TOC Phase/Ground/Neutral	51P/G/N	P/G	P/G	P/G	P/N/G	P/G/N	P/G/N	P/G	P
Voltage-Dependent Overcurrent (VCO/VRO)	51V	•	•	•	•	•	•	•	
Split Phase	50SP			•			•	•	
Breaker Failure	50BF	•	•	•	•		•	•	
Overvoltage - Phase	59P	•	•	•	•	•	•	•	•
Overvoltage - Neutral	59N	•	•	•	•	•	•	•	•
Overvoltage - Auxiliary	59X				•	•	•		
Overvoltage - Negative Sequence	59_2/47		•	•	•	•	•	•	
100% Stator Earth Fault (3rd harm. UV)	27TN	•			•	•	•	•	
100% Stator Earth Fault (3rd harmonic diff.)	64TN				•		•		
100% Stator Earth Fault (sub-harmonic volt. Inj.)	64S						•	P345 only	
Field Ground using low frequency injection	64F		•	•			•	•	
Directional overcurrent - Negative Sequence	67_2		•	•	•	•	•	•	
Directional overcurrent - Phase	67P		•	•	•	•	•	•	
Directional overcurrent - Ground	67G	•		•	•	•	•	•	
Directional overcurrent - Neutral	67N				•	•	•		
Field swappable power supply					•				
Maintenance/Simulation mode (test/commission facilities)					•				
Power Swing Blocking	68						•		
Out of Step Tripping	78				•		•	•	
Underfrequency	81U	•	•	•	•	•	•	•	
Overfrequency	81O	•	•	•		•	•	•	•
Rate of Change of Frequency	81R		•	•	•	•	•	•	
Frequency Out-Of-Band Accumulator	81A		•	•	•	•	•	•	
Lockout	86		•	•	•	•	•	•	
Generator Differential	87G	•		•			•	•	
Generator & Transformer Differential	87GT/87O			•	•	•		•	
Restricted Ground Fault	87G/REF/RGF		•	•	•	•	•	•	
Trip Bus	TB		Logic	Logic		•	•	Logic	

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AUTOMATION									
Contact Inputs (max)		9	24	32	14	180	150	32	
Contact Outputs (max)		6	24	32	10	108	90	32	
GOOSE Remote Inputs					8 sets of 32				
GOOSE Remote Outputs					3 sets of 32				
Analog Inputs (max)		4	4	4	4	40	40	4	
Analog Outputs (max)		4	4	4	7	20	20	4	
RTD Inputs (max)		12	10	10	12	40	40	10	
RRTD inputs (max)						12	12		
Virtual Inputs			64	64	32	64	64	64	64
Virtual Outputs			64	64	32	96	96	64	64
Direct Inputs						32	32		
Direct Outputs						32	32		
Teleprotection Inputs & Outputs						•	•		
Programmable Logic			•	•	•	•	•	•	•
Setting mode- Simple/Regular					•				
FlexElements						•	•		
Trip-Coil Supervision		•	Logic	Logic	•	•	•	Logic	Logic
User-Programmable LED's			•	•	•	•	•	•	•
User-Programmable Pushbuttons			•	•	•	•	•	•	•
Setting Groups		2	4	4	6	6	6	4	4
Selector Switch						•	•		
Digital Counters			•	•	•	•	•	•	•
Digital Elements / Limit Values						•	•		
Redundant Power Supply						•	•		
MONITORING & METERING									
Current		•	•	•	•	•	•	•	•
Voltage		•	•	•	•	•	•	•	•
Frequency		•	•	•	•	•	•	•	•
Power Factor		•	•	•	•	•	•	•	•
Power - Real, Reactive, Apparent		•	•	•	•	•	•	•	•
Energy		•	•	•	•	•	•	•	•
Demand - Current, MW, MVA, Mvar		•	•	•	•	•	•	•	•
Temperature		•	•	•	•	•	•	•	•
Breaker Health					•	•			
Environmental monitoring					•	•			
Event Recorder (number of events)		256	512	512	1024	1024	1024	512	512
Oscillography / Transient Recorder - Sampling Rate		12	24	24	128	64	64	24	24
Fault Reports (user programmable)			•	•	•	•	•	•	•
Data Logger / Trend Recording		5s			15ms	15ms	15ms		
Voltage Transformer Fuse Failure	VTFE/VTS	•	•	•	•	•	•	•	•
Current Transformer Supervision	CTS	•	•	•	•	•	•	•	•
COMMUNICATIONS									
Front Port Local Access		•	•	•	•	•	•	•	•
USB Front Port					•				
Rear Communications Interface (RS232/RS485)		•	•	•	•	•	•	•	•
IEEE C37.94 fiber interface						•	•		
Ethernet Communications			2	2	2	3	3	2	3
Fiber Optic Ethernet			•	•	•	•	•	•	•
PROTOCOLS									
DNP 3.0 Protocol		•	•	•	•	•	•	•	•
Courier			•	•				•	•
EGD (Ethernet Global Data) Protocol						•	•		
Modbus Protocol		•	•	•	•	•	•	•	•
IEC 61870-5-103 protocol			•	•	•	•	•	•	•
IEC 61870-5-104 protocol					•	•	•		
IEC61850 protocol			•	•	•	•	•	•	•
Peer-to-Peer Communications (GSSE/GOOSE)			•	•	•	•	•	•	•
CyberSentry Level 1 for cyber security			•	•	•	•	•	•	•
Synchrophasors (PMU using IEEE C37.118)							•		
IEEE 1588					•	•	•		
Parallel Redundancy Protocol - PRP (IEC 62439-3)			•	•	•	•	•	•	•
High Availability Seamless Redundancy Protocol - HSR (IEC 62439-3 Clause 5)			•	•	•	•	•	•	•
Simple Network Time Protocol (SNTP)			•	•	•	•	•	•	•
IRIG-B Input		•	•	•	•	•	•	•	•
Process Bus (IEC 61850-9-2)						•	•		•



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