

Generator Protection – Selector Guide

Generator Protection

Features	Device	489	G30	P342	G60	P346	P343/4/5	P348	889
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/X	P/X	P	P	P		P/X
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/N	P/G/N	P/G	P/G	P/G	P	P/N/G
TOC Phase/Ground/Neutral	51P/G/N	P/G	P/G/N	P/G/N	P/G	P/G	P/G	P	P/N/G
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	180	150	24	32	32		14
Contact Outputs (max)		6	108	90	24	32	32		10
GOOSE Remote Inputs									8 sets of 32
GOOSE Remote Outputs									3 sets of 32
Analog Inputs (max)		4	40	40	4	4	4		4
Analog Outputs (max)		4	20	20	4	4	4		7
RTD Inputs (max)		12	40	40	10	10	10		12
RRTD inputs (max)			12	12					
Virtual Inputs			64	64	64	64	64	64	32
Virtual Outputs			96	96	64	64	64	64	32
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	6	6	4	4	4	4	6
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	1024	1024	512	512	512	512	1024
Oscillography / Transient Recorder - Sampling Rate		12	64	64	24	24	24	24	128
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			3	3	2	2	2	3	2
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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