

# Transmission Line Distance & Backup – Selector Guide

Transmission Protection

Features	Device	D30	D60	D90 <sup>Plus</sup>	P441/2/4	P443/5/6	P841
<b>APPLICATIONS</b>							
Stepped Distance	21	•	•	•	•	•	
Pilot Protection / Channel Aided Schemes			•	•	•	•	
Delta Directional Comparison						•	
Breaker-and-Half Configurations			•	•		P446	P841b
Petersen Coil / Isolated Ground Systems						•	
<b>PROTECTION &amp; CONTROL</b>							
Typical Operating Time (cycles)		<1.5	<1.5	<1	<1.1	<1 (P445 <1.25)	
Mho Phase & Ground Distance (No. of Zones)	21P/G	5	5	5		5 (P443 - 6)	
Quad Phase & Ground Distance (No. of Zones)	21P/G	5	5	5	6	5 (P443 - 6)	
Instantaneous Overcurrent	50G/NP/ 2	•	•	•	•	•	•
Time Overcurrent	51G/NP/ 2	•	•	•	•	•	•
Directional overcurrent - Neutral	67N	•	•	•	•	•	•
Directional overcurrent - Phase	67P	•	•	•	•	•	•
Directional overcurrent - Negative Sequence	67_ 2	•	•	•	•	•	•
Restricted Ground Fault	87G					•	
Wattmetric Ground Fault	32N		•	•	•	•	
Sensitive Directional Power	32		•				
Overvoltage - Phase	59P	•	•	•	•	•	•
Overvoltage - Measured Neutral Displacement/Auxiliary	59X	•	•	•	•	•	•
Overvoltage - Neutral	59N	•	•	•	•	•	•
Overvoltage - Negative Sequence	59_ 2	•	•	•			
Undervoltage - Phase/Auxiliary	27P/X	•	•	•	•	•	•
Under Frequency	81U		•	•	P442/4	•	•
Over Frequency	81O		•	•	P442/4	•	•
Frequency Rate of Change	81R		•			•	•
Power Swing Blocking	68	•	•	•	•	•	
Out-of-Step Tripping / System Separation	78	•	•	•	P442/4	•	•
Switch onto Fault (Line Pickup)	SOTF	•	•	•	•	•	
Load Encroachment		•	•	•	P442/4	•	
Breaker Failure	50BF		•	•	•	•	•
Lockout Functionality	86	•	•	•	•	•	•
Synchronism Check or Synchronizing	25	•	•	•	•	•	•
AC Reclosing (No. of Shots)	79	4	4	4	4	4	4
Trip Modes: Three-Pole/Single-Pole		3	1&3	1&3	1&3	1&3	1&3
Channel Aided Schemes			•	•	•	•	
Petersen Coil / Isolated Ground Systems						•	
Series Compensation		•	•	•	•	•	
Three terminal lines			•	•	•	•	
Lines with In-zone transformers				•	•	•	
Synchrophasors			•	•			
<b>AUTOMATION</b>							
Programmable Protection Logic		•	•	•	•	•	•
FlexElements™ (number)		8	8	16			
Watchdog/Critical Failure Self-Test Monitoring		•	•	•	•	•	•
Settings Groups		6	6	6	4	4	4
Non-volatile latches (including contact latches) (up to)		16	16	16	•	•	
Contact Inputs Programmable - (up to)		80	80	115	8/16/24	32/16/24	24
Contact Outputs Programmable - (up to)		70	70	60	14/21/46	32/16/32	32
Virtual Inputs - (up to)		64	64	64	64	32/32/64	32
Virtual Outputs - (up to)		96	96	96	32	32/32/64	32
Virtual GOOSE Outputs / Remote Outputs (up to)		•	•	•	•	•	•
Breaker Control (up to)		2	4	2	1	1/1/2	2
User-Programmable LEDs (up to)		48	48		18 (P441 - 8)	18	18
User-Programmable Annunciator Alarms (up to)				288			
User-Programmable Push Buttons (up to)		16	16	30	10 (P442/4)	10	10
User Definable Displays		•	•				
Graphical HMI				•			
Timers (number)		32	32	32	16	16	16
Selector Switch (number)		2	2	10			
Digital Counters (number)		8	8	8			
Digital Elements / Limit Values (number)		48	48				
IRIG-B Input		•	•	•	•	•	•
Transducer Analog Inputs (up to)		24	24				
Transducer Analog Outputs (up to)		12	12				
RTD Inputs (up to)		24	24				

Features	Device	D30	D60	D90 <sup>Plus</sup>	P441/2/4	P443/5/6	P841
<b>MONITORING &amp; METERING</b>							
Voltage		•	•	•	•	•	•
Current		•	•	•	•	•	•
Symmetrical Components		•	•	•	•	•	•
Power - Apparent, Real, Reactive		•	•	•	•	•	•
Energy		•	•	•	•	•	•
Power Factor		•	•	•	•	•	•
Frequency		•	•	•	•	•	•
Demand				•	•	•	•
Fault Location		•	•	•	•	•	•
Fault Report (number)		15	15	15	5	15	15
Event Recorder - Number of Events		1024	1024	8192	512	1024	512
Oscillography/Transient Recorder - Sampling Rate		64/32/16/8	64/32/16/8	256/128/64/32/16	48	48	48
Voltage Transformer Fuse Failure	VTFF/VTS	•	•	•	•	•	•
Current Transformer Supervision	CTS				•	•	•
Open Pole Detector / Pole Dead			•	•	•	•	•
Broken Conductor Detection		•	•		•	•	•
Thermal Overload		•	•		•	•	•
Breaker Arcing Current		•	•	•	•	•	•
Breaker Flashover			•	•			
Breaker Restrike			•				
Trip/Close Coil Supervision		•	•	•	•	•	•
Data Logger / Trend Recording			•	•			
<b>COMMUNICATIONS INTERFACES</b>							
Front Port Local Access		•	•		•	•	•
Rear RS485 Port		•	•	•	•	•	•
Rear Ethernet Port (Fiber and Copper, up to)		3	3	3	3	3	3
Inter-Relay Direct Fiber Communications		•	•	•	•	•	•
Rear Communication Interface (G.703, C37.94)		•	•	•		•	
Rear Communication Interface (RS422/RS485)					P442/4	•	•
Rear Communication Interface (V.35, X.21)					32	32/32/64	32
<b>PROTOCOLS</b>							
ModBus RTU		•	•	•	•		•
DNP3 Serial		•	•	•	•	•	•
IEC 60870-5-104		•	•	•			
IEC 61850		•	•	•	•	•	•
IEEE 1588 (PTP)		•	•		•	•	•
IEC 62439 Parallel Redundancy Protocol		•	•	•	•	•	•
Simple Network Time Protocol (SNTP)		•	•	•	•	•	•
HTTP, TFTP, SFTP		•	•	•			
IEC 60870-5-103		•	•		•	•	•
Process Bus (IEC 61850-9-2)		•	•		•	P446	•



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